Chapter 17: Construction Effects

A. INTRODUCTION

This chapter describes the construction process for the Proposed Project and assesses the potential environmental impacts associated with these activities. Section B gives an overall description of the construction sequence and schedule, Section C includes a description of the construction methods and equipment that would likely be used to complete each of the key project elements, and Section D discusses potential environmental impacts and mitigation measures.

As discussed in Chapter 2, "Project Alternatives," this Environmental Assessment (EA) evaluates two Build Alternatives: Alternative 9A and Alternative 9B. Alternative 9A was selected as the Preferred Alternative. The Build Alternatives (Alternative 9A or Alternative 9B) would likely be constructed using the same general construction sequencing and methods. The No Action Alternative would not involve any construction and is therefore not discussed further.

The construction means and methods presented in this chapter are based on the current conceptual engineering design and the project sponsors' past experience on similar projects. While the construction techniques ultimately utilized for the Proposed Project may vary, the potential for environmental impacts and types of mitigation measures described herein would not be substantially different.

B. CONSTRUCTION SCHEDULE AND SEQUENCE

CONSTRUCTION SCHEDULE

The Proposed Project requires careful scheduling and coordination between various stakeholders. Before a construction contract can be awarded, preliminary design, final design, environmental permitting, and contractor procurement must be completed. Based on the work that needs to be completed prior to the contractor procurement, the Proposed Project schedule assumes that contracted construction will commence in 2020, subject to project funding. Certain force account work (work performed by railroad personnel rather than a contractor), which also requires design and procurement phases, must be completed prior to commencement of contracted construction.

This section presents a construction schedule that is typical for a rail bridge replacement project. The schedule for the Proposed Project will comply with in-water restrictions and other limitations likely to be required by permits. Federal and state natural resource and permitting agencies typically enforce seasonal in-water work restrictions to prevent disturbance to the channel bottom during shellfish gestation and development or disturbance of migratory fish during spawning. These agencies may impose additional schedule restrictions to protect birds or other species. Any federal or state restrictions on in-water work will be more clearly defined during the final design and permitting stage.

With these potential limitations to the schedule, the Federal Railroad Administration (FRA) and Maryland Department of Transportation (MDOT) anticipate that contracted construction work for Alternative 9A and Alternative 9B can be completed over approximately 5 years, beginning in 2020 and ending in 2025. The initial track work and catenary infrastructure installation and construction of the new bridges are the critical path elements.

CONSTRUCTION SEQUENCE

Construction will be carried out in three phases, plus early action work that would occur prior to the start of Phase A.

Table 17-1
Construction Sequence and Duration

Phase	Key Components	Estimated Duration
Early Action (Pre-Phase A)	Construct OCS/transmission structures	12 months prior to Phase A (Continues concurrent with Phase A)
Phase A	Construct new west bridge approach spans; complete modifications to existing bridges and construction of retaining walls. Complete modifications to Prince, Perry and Grace Interlockings.	24 months
Phase B	Construct main channel span and install track and systems on bridge. Shift service to new west bridge. Demolish existing swing span.	5 months
Phase C	Demolish existing bridge approaches. Construct new east bridge and approaches. Construct track/systems and cut new bridge into service.	36 months
	Total Phases A-C:	**65 months**

Source: HNTB

C. CONSTRUCTION OF KEY ELEMENTS

SUBSTRUCTURE

Substructure construction is similar for the two Build Alternatives. Material transport and debris removal would be accomplished through a combination of barge and truck transport. To enable barge delivery of materials and equipment access in shallow water areas, finger piers (temporary docks) will be constructed both east and west of the proposed bridge alignment in Perryville. The finger piers would be constructed within the National Railroad Passenger Corporation (Amtrak) right-of-way (ROW) east of the proposed alignment, and in a vacant Town-owned lot (Plot #231) west of the proposed alignment[1] (see **Figure 17-1**). The upstream finger pier would have an estimated overwater length of 495 feet and width of 38 feet; the downstream finger pier would have an approximate overwater length of 260 feet and width of 38 feet. Light required to support any submerged aquatic vegetation (SAV) in this area would likely reach 15 feet in on each side of the finger piers, but may adversely affect SAV survival over the 3 to 5 years they

[1] HNTB Constructability Memo, January 2015.

Legend

Finger Pier

1,000 ft Study Area

N

0 200 400 Feet

Susquehanna River Rail Bridge Project

Figure 17-1

Proposed Finger Piers

are in place, so mitigation is planned. Precast concrete, concrete, steel reinforcement bars, and structural steel members could be transported to the Proposed Project site by barge.

IN-RIVER STRUCTURES

Construction work is assumed to begin simultaneously at multiple locations. Foundations in water are time-consuming but are completely off-line from the existing bridge; therefore, construction will start with drilled shafts for in-water piers using barge-mounted equipment. The use of several barges is anticipated for the construction of the drilled shafts, caps and piers—including barges used for mounted cranes, storage barges, and barges to hold materials. In shallow water, a temporary finger pier supported on piles or a causeway would be used for access and construction; dredging would have considerable adverse effects to benthic habitat and is not proposed. For piers located in shallow water, typical cofferdams may be used. For those in deeper water, float-in precast forms are anticipated to minimize on-site construction and to function as formwork for the caps.

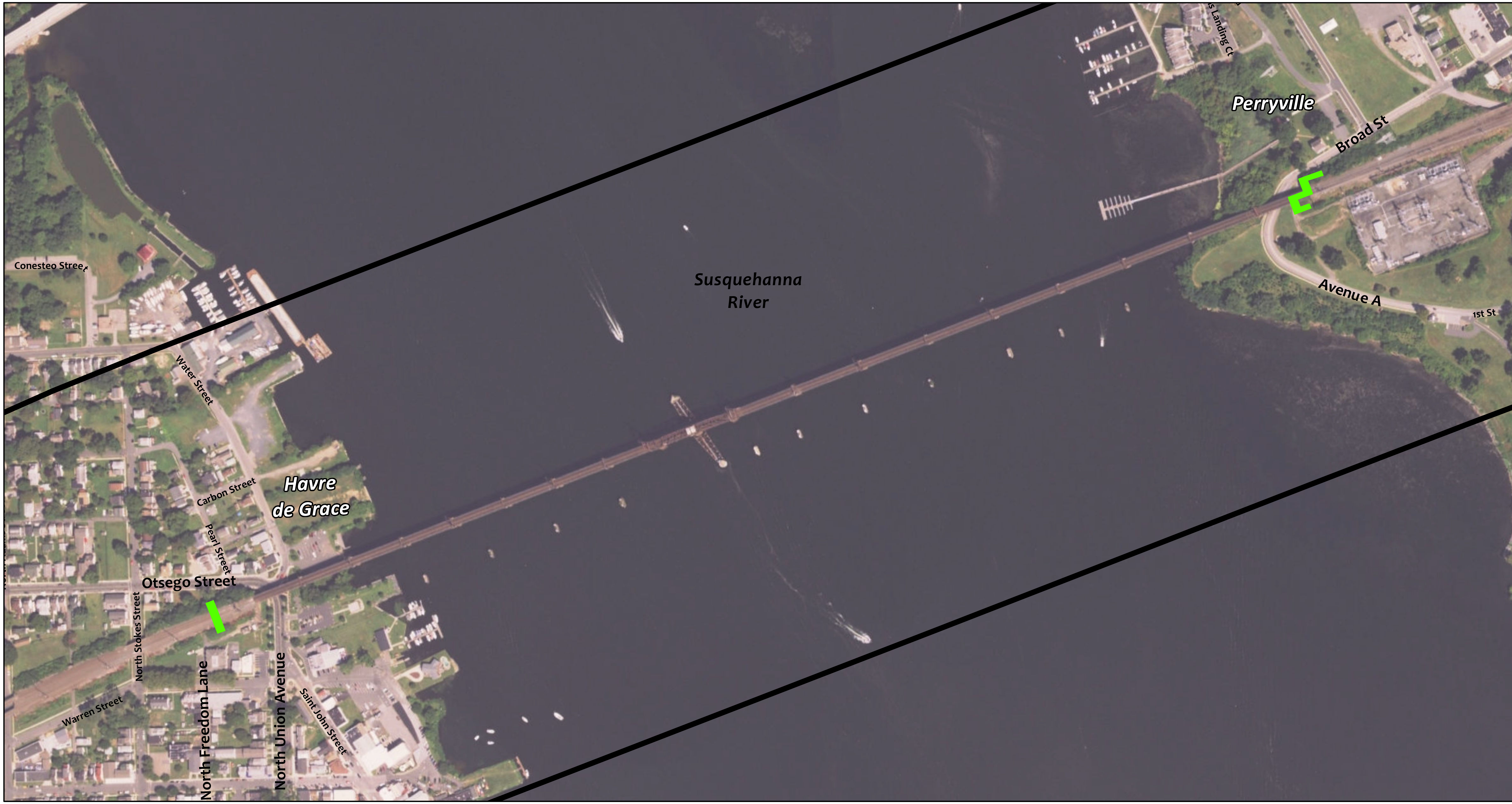
Once the foundations have been completed, the piers will be constructed using the arrangement put in place for the construction of the drilled shafts. During this step, construction activity will be above the MHW level. Construction of the fender system could start after completion of the piers adjacent to the navigable channel. Overall, the loss of 0.37 acre of bottom habitat for aquatic biota from construction of the new bridges will be more than offset by the approximately 0.5 acre of river bottom that would return to benthic habitat upon demolition of the existing bridge and remnant piers. All other impacts will be temporary, including the potential loss of SAV from the finger piers that will be mitigated; this is expected to result in a potential net gain in the populations of benthic organisms and their predators who are higher in the food web.

LAND-SIDE STRUCTURES

New abutments can be built simultaneously with the erection of the piers in the water. New concrete walls will be built adjacent to existing masonry to support the new structure where feasible. New concrete backwalls will be installed. Existing masonry walls may be reinforced using tie-backs and wall heights extended as needed. Consolidation surcharge (the pre-compression of soft soils to avoid future structural damage from soil settlement) may be applied at the beginning of construction to minimize settlement of future embankment. Widening of the existing embankment will likely be accomplished with the use of modular precast systems (T-walls or similar).

In Havre de Grace, the alignments of Alternative 9A and Alternative 9B mostly overlap with the existing alignment, with a slight westward shift near the waterfront and the abutment. To realign the intersection of Otsego Street and North Union Avenue, as requested by the City, the new abutment will be located farther south (toward North Freedom Lane). At Perryville, the new abutment will be adjacent to the existing abutment, and a slight realignment of Avenue A (at the location of the existing abutment) may be necessary to accommodate the shifted abutment (see **Figure 17-2**).

Along the north and south bridge approaches, one existing overhead bridge (in Havre de Grace) and 10 existing undergrade bridges (four in Perryville and six in Havre de Grace) will require modification to accommodate the proposed track alignments (see Figure 3-1). Two of the undergrade bridges in Perryville and one in Havre de Grace will be extended with a precast concrete culvert to extend the existing stone masonry arch; the remaining undergrade bridges will likely need to have their superstructures replaced in full, while further engineering studies



Legend

- Bridge Abutment
- 1,000 ft Study Area

N

0 300 600 Feet

Susquehanna River Rail Bridge Project

Figure 17-2

Proposed Abutments

will determine whether their substructures can be replaced or retained and expanded. The Lewis Lane overhead bridge in Havre de Grace will need to be replaced under Alternative 9A.

SUPERSTRUCTURE

The preferred bridge type combines plate girder approach spans with a network tied arch navigation span. The 170-foot-long plate girder approach spans will likely be lifted into place by crawler cranes or barge-mounted cranes, based on their location. The network tied arch navigation span would be constructed off-site to reduce the schedule and minimize impacts to marine traffic in the channel. Upon erection of the approach spans and installation of the channel span bearings, the fully assembled network tied arch would be transported by barge to the site and lifted into position. Reinforced concrete deck will be cast in place on each of the spans.

Due to the proximity of the existing and proposed alignments, the existing swing span cannot operate once the installation of the new channel span superstructure has started. Therefore, the installation of the superstructure over the channel span can only be accomplished between November and March, when no openings of the swing span typically occur. The erection of the superstructure should be scheduled early during this time window as the track work and removal of the existing through truss must also occur during this period.

DEMOLITION OF THE EXISTING STRUCTURE

For both Alternative 9A and Alternative 9B, after erection of the channel span and opening of the new structure to rail traffic, the swing span of the existing bridge will not be able to operate and will need to be removed. The demolition of the existing structure will most likely use a combination of barge crane(s) and barges equipped with transporters to lower the existing truss. Once the new bridge is in service, the existing swing span will need to be removed immediately in order to reopen the navigation channel. To prevent buckling, the existing truss spans may have to be modified prior to demolition. It is presumed that no blasting would be required; the anticipated method for removal of the substructure would require divers equipped with wire saws to cut the piers down to two feet below the mudline, after which the material would be removed with barge-mounted cranes. Another method of construction, which would involve blasting, is a cofferdam with blast mats and controlled explosives.

ADDITIONAL STRUCTURES AND SYSTEMS

Other railroad components will need to be replaced and/or reconstructed as part of Alternative 9A and Alternative 9B. Fiber optic communications will need to be maintained during all phases of construction, as well as other communications infrastructure such as CCTV, telephones, and radio equipment. The rail signal system will be redesigned based on the new track configuration and new interlockings. A new compound auto-tensioned style catenary system is proposed. This will require replacement of some existing catenary structures and modification of others.

Alternative 9A and Alternative 9B would have minimal impact to the Perryville Electrical Substation. The transmission tower on the west side of the tracks may require relocation, but any relocation would be in close proximity to the existing tower. It is imperative to maintain the existing connections to the power grid throughout the construction period.

CONSTRUCTION ACCESS AND STAGING

The Proposed Project reserves 10 feet from the embankment toe of slope or face of retaining wall for future maintenance along the corridor. In general, this width is sufficient for future maintenance with the exception that, at certain intervals, the width must be increased to allow for vehicles to pass each other and/or turn around. Based on conceptual design, these turn-around zones can likely be accommodated within Amtrak's existing ROW and outside sensitive environmental resources, avoiding the need for property acquisition and further environmental impacts.

The construction access road for the embankment and retaining walls along the corridor would be built to remain in place as the permanent access road. As the corridor approaches the structures on each side of the Susquehanna River, maintenance access is available utilizing local roads. However, staging areas temporarily required for construction fall outside Amtrak's ROW. The staging areas include a vacant Town-owned lot in Perryville, which may be temporarily affected to build Pier 1W and Pier 2W. In Havre de Grace, staging and construction access will be avoided on the north side of the ROW between North Juniata Street and Lewis Lane, where larger forest tracts occur along Lily Run and Lewis Run. This area contains portions of three private commercial properties, one nonprofit commercial property (an Elks Club Lodge), and one property owned by the Havre de Grace Housing Authority[2].

Construction access for equipment and materials is not expected to be a major constraint. The project area is readily accessible from Interstate 95, US Route 40, several rail lines and the Susquehanna River, which supports commercial marine traffic. Access to the undergrade bridges along the NEC is achievable through the local roadway network. Access to the existing ROW for rubber-tired and rail equipment is available at several points in the project area. A construction access plan will be developed in coordination with the community to determine appropriate highway access routes and acceptable street closure schedules.

The contractor would require a large area for site facilities including field offices, equipment and material storage, etc. The preferred solution would be to have access to an area within Amtrak's ROW. One option is the area adjacent to the Perryville Electrical Substation. This appears to be the only viable location within Amtrak's ROW; lease of privately owned land is another possibility.

SOLID WASTE DISPOSAL

The contractor will dispose of solid waste, including excavated soil or sediment, in accordance with all applicable regulations and the requirements of off-site waste disposal facilities. Most of the construction and demolition debris, including the existing river bridge structure, would be removed by barge. Some debris would be removed by truck. Special provisions will be made for handling and disposal of any contaminated or hazardous materials encountered during construction and demolition; these procedures are described in Chapter 15, "Contaminated and Hazardous Materials."

---

[2] Maryland Department of Planning, *FINDER* Online Light. http://mdpgis.mdp.state.md.us/finderonlinejs/pi/index.html, accessed 3/8/2016.

D. SOCIAL, ECONOMIC, AND ENVIRONMENTAL IMPACTS

TRANSPORTATION

Alternative 9A and Alternative 9B allow for construction during normal hours while maintaining train operations without substantial impediment. This would be accomplished by pre-constructing the components of the replacement bridge along the new alignment off-site. The new bridge would be tied in and rail service would be redirected to it before starting demolition and reconstruction of the second new bridge along the existing alignment.

INTERCITY RAIL, FREIGHT SERVICE, AND COMMUTER RAIL

During the construction period, intercity, freight, and commuter trains operating through the project area may need to operate at slower speeds to ensure safety. Limited track outages may also be required to connect the newly constructed bridge approach spans to the existing track.

PUBLIC TRANSPORTATION

Bus Service

Construction of the Proposed Project would have only minimal effects on bus service. Some riders may temporarily switch to bus service to avoid any train service delays caused by the construction of the new bridge; however, this effect would be temporary.

Transportation for the Elderly and Disabled

Construction of the Proposed Project would have no adverse effects on paratransit service.

NAVIGABLE WATERS

To reduce the need for ROW acquisitions for the Proposed Project, the new bridge would be constructed within the swing of the existing movable span. This will prevent the existing bridge from opening for mariners while the channel span is being constructed, restricting navigation to vessels less than 52 feet high until the new bridge is placed into service and the existing movable through truss is removed. Typically, the existing bridge does not open for a five-month period from November 1 to March 31 due to low demand outside the recreational boating season. For Alternative 9A and Alternative 9B, it is anticipated that construction of the new channel span and removal of the existing swing span could be completed within the five-month window when the bridge typically does not open.

During the swing bridge closure period, there will be some impacts to river navigation beyond the restriction of swing bridge openings. Coordination will be required between the contractor, the U.S. Coast Guard, and local mariners to permit safe passage of vessels during construction activities. The contractor will be working in the channel to construct new bridge elements including the channel span piers and superstructure. Most of the contractor's work can be performed while maintaining one of the existing navigation channels for mariner use. Brief channel closure periods will be needed for erecting superstructure elements, demolishing the existing through trusses, and performing selected overhead work.

In order to avoid damage to commercial fishing equipment during the construction period, waterborne construction traffic would use navigation routes selected in consultation with the local fishermen’s organization. Additional consultation with the commercial fishing community would occur as needed during the construction process. Provisions to avoid damage to commercial fishing equipment will be included in construction documents for the Proposed Project.

In summary, construction of the Proposed Project would result in some limited, temporary disruptions to mariners. Impacts to navigation will be temporary and limited to the construction of the replacement bridge. In addition, efforts will be made to undertake a large portion of the required construction activities outside of the recreational boating season, during the winter months, which will further reduce impacts to navigation.

REGIONAL HIGHWAY SYSTEM

Construction of the Proposed Project would have no adverse effects on regional highways.

LOCAL ROADWAYS

Construction access will be primarily from public streets. A construction access plan will be developed in coordination with the community, to determine appropriate highway access routes and acceptable street closure schedules. With these measures in place, construction of the Proposed Project would have no adverse effects on local roadways.

LAND ACQUISITION, DISPLACEMENT, AND RELOCATION

In addition to the necessary land acquisitions discussed in Chapter 4, “Land Use and Community Facilities,” Alternative 9A and Alternative 9B would require temporary acquisition of several parcels for construction access and staging. These temporary acquisitions are discussed further under “Construction Access and Staging,” above. No significant adverse impacts to local land uses are expected from construction of the Proposed Project.

PARKS AND RECREATIONAL RESOURCES

The City of Havre de Grace recently approved the purchase of four properties, totaling 3.2 acres, as part of a proposed plan to develop Waterfront Heritage Park along the Susquehanna River, west of the existing NEC. The contractor may consider using this as yet undeveloped site as a construction staging area through a lease or other agreement with the City before the onset of park development.

Beyond this potential use and the permanent impacts to parks discussed in Chapter 6, “Parks, Trails, and Recreational Resources,” there are no additional temporary impacts caused by construction.

SOCIOECONOMIC CONDITIONS

Local businesses will not be significantly affected during the construction period. There will be a detour to reconstruct the Otsego-Union Street alignment and local marinas and their customers may be affected by the short-term navigation restrictions. Therefore, no significant adverse impacts to socioeconomic conditions are expected from construction of the Proposed Project.

VISUAL AND AESTHETIC CONDITIONS

During construction, there would be an increase in the level of activity within the study area. As the Proposed Project proceeds, cranes and other large pieces of equipment would be visible from much of the study area. As described previously in Chapter 7, “Visual Resources,” the locations in the study area from which substantial views of the Susquehanna River Rail Bridge are currently available are recreational resources along the Susquehanna River, the roadways and rail corridors that transect the study area, and the river itself, from which boaters have uninhibited views of the bridge. The views to visual resources that motorists and rail passengers experience are generally of short duration, due to the relatively high speeds at which they tend to travel through the study area. Boaters in the immediate vicinity of the bridge and pedestrians in nearby recreational areas would experience the longest duration and closest range views of the replacement bridge construction area. For the duration of construction, cranes, barges and other construction equipment, as well as staging areas on both sides of the Susquehanna River would be visible to boaters and pedestrians. These temporary changes would not constitute an adverse impact to visual resources.

CULTURAL RESOURCES

Cultural resources include both architectural and archaeological resources. As described in Chapter 8, “Cultural Resources,” no adverse effects on archaeological resources are expected to result from the construction of the Proposed Project. In terms of architectural resources, the S/NR-eligible Susquehanna River Rail Bridge would be replaced under both Build Alternatives. The removal of this resource constitutes an adverse effect under Section 106. Additionally, adverse effects on the undergrade bridges along the approaches to the Susquehanna River Rail Bridge, the Havre de Grace Historic District, the Rodgers Tavern, and the Perryville Railroad Station are anticipated as a result of constructing the Proposed Project, as described in Chapter 8. In order to avoid accidental damage to adjacent resources as a result of construction activities associated with the Proposed Project, a Construction Protection Plan (CPP) will be developed in consultation with SHPO for all historic properties that may be subject to inadvertent damage resulting from construction activities. Mitigation measures are discussed in further detail in Chapter 8.

AIR QUALITY

For a full description of the pollutants of concern and the regulatory context for air quality analyses, see **Appendix F**, “Air Quality, Noise, and Vibration.” The pollutants of concern include particulate matter (both $PM_{2.5}$ and PM_{10}) including dust and diesel engine emissions and nitrogen dioxide (NO_2) from engine emissions.

FUGITIVE EMISSIONS

Fugitive dust emissions from land clearing and grading operations can occur from excavation, hauling, dumping, spreading, grading, compaction, wind erosion, and traffic over unpaved areas. Actual quantities of emissions depend on the extent and nature of the clearing operations, the type of equipment employed, the physical characteristics of the underlying soil, the speed at which construction vehicles are operated, wind speed, direction and duration, and the types of fugitive dust control methods employed. Much of the fugitive dust generated by construction activities consists of relatively large-sized particles, which are expected to settle within a short distance from the construction site.

Common construction practices include extensive mitigation measures that would be implemented to suppress dust emissions. Appropriate fugitive dust control measures that could be employed include: temporarily paving areas expected to be used extensively, watering of exposed areas regularly and/or using approved non-toxic soil stabilizers, minimizing the time that bare soil is exposed, requiring the use of continuous water spray on all materials transfer (e.g., excavation, loading/unloading) and demolition operations, covering lose materials and protecting them from wind, temporary vegetation planting on stockpiled soils, truck wash down stations at each exit from each site required to be used by all exiting vehicles, and use of dust tarps on trucks. Contracts will require the submission and approval of a detailed dust control plan for each site prior to the beginning of operations; the plan will define the precise measures to be used for each operation type and location and the enforcement mechanism so as to ensure that significant adverse impacts from fugitive emissions do not occur.

MOBILE SOURCE EMISSIONS

Mobile source emissions are emissions of air pollutants from vehicles operating off-site en route to and from the site, such as delivery vehicles, employee vehicles, and tug boats, and from on-road and non-road vehicles and engines operating on-site such as dump trucks, readymix concrete trucks, tug boats, cranes, excavators, portable generators, and more. Mobile source emissions are categorized according to whether they are from on-road sources (vehicles on public roadways) or non-road sources (marine engines, construction equipment and locomotives). Ultra-low sulfur diesel (ULSD) fuel is the primary fuel, although some smaller engines may use gasoline.

Non-road Engines

Major construction activities associated with the Build Alternatives would occur simultaneously at a number of locations throughout the project area. In order to reduce pollutant emissions from non-road engines and to reduce or avoid potential adverse impacts on air quality in the area surrounding the Proposed Project, construction contracts would include the following requirements along with appropriate enforcement mechanisms.

Tier 4 engines or, where Tier 4 is not available or practicable, Tier 3 engines retrofitted with EPA, California Air Resources Board (CARB), or VERT[3]-approved after-market diesel particle filters (DPF) would be used where technically feasible (including safety considerations) for all non-road diesel engines greater than 60 horsepower (hp). After-market DPF for Tier 3 engines with ULSD fuel achieve nearly the same particulate matter emissions as the newer Tier 4 engines, and the use of Tier 3 engines ensures the lowest practicable NO_x emissions so as to minimize NO_2 concentrations in the nearby areas to the extent practicable. These requirements will apply to all construction engines including but not limited to marine engines, nonroad engines, and portable and/or truck mounted equipment such as generators, pumps, and drills, including all phases of construction and any exploratory work such as test drilling. Material and equipment delivery via rail is not proposed at this time. A reevaluation would be needed if deliveries via rail are proposed in the future.

On-Road Engines

In order to reduce pollutant emissions from on-road vehicles and to reduce or avoid potential adverse impacts on air quality in the area surrounding the Proposed Project, construction contracts would include the following requirements along with appropriate enforcement mechanisms. Localized effects due to increases in on-road mobile source emissions would be minimized through the use of barges or materials transport where feasible and the use of

[3] An association dedicated to the promotion of best available technology for emission control.

appropriate routes for truck deliveries (that avoid residential areas to the extent practicable); these truck routes would be identified and specified in all construction contracts as appropriate. Truck idling will be strictly prohibited by contract and enforced, other than in cases where a truck engine is required to operate auxiliary devices such as loading and unloading or concrete mixing. All trucks expected to operate on site, including but not limited to concrete mixing trucks and dump trucks, would be required to be of model year (MY) 2007 or newer or equipped with DPF-approved similar to the above non-road requirements; MY 2007 or newer vehicles are equipped with advanced systems to substantially reduce both PM and NO_x emissions.

STATIONARY SOURCE EMISSIONS

Electric power at land-based sites would be provided by applying for an electric grid power connection in advance and distributing grid power throughout the various sites where power would be needed. The use of small portable generators (including truck-mounted generators) up to 50 hp would be allowed at land-based sites only for sites where construction duration would be limited (less than two weeks) and at which obtaining a grid connection would be impracticable. Large generators would not be used at land-based sites.

POTENTIAL EFFECTS

Diesel particulate matter and NO_2 are a concern, particularly from non-road engines that have traditionally been subject to lower emission standards than on-road sources. The potential for adverse air quality impacts during construction of the Build Alternatives would be reduced to the extent practicable using the strategies listed above. These measures would be specified in all construction contracts, including implementation details, reporting, and enforcement procedures.

With these measures in place, the construction-related impacts on air quality would be substantially reduced, and any remaining impacts would be temporary and limited to the local vicinity. Therefore, no significant adverse impacts on air quality are expected from construction of the Proposed Project.

Total maximum annual emissions from construction were estimated at 31 tons per year (tpy) of NO_x, 4 tpy of VOC, and 3 tpy of $PM_{2.5}$ in each of the adjacent non-attainment and maintenance areas—substantially lower than the *de minimis* levels defined in the general conformity regulations. Therefore, the construction of the Proposed Project would not substantially impact region-wide pollutant concentrations, would not interfere with the SIP for region–wide attainment of the ozone NAAQS or maintenance of the $PM_{2.5}$ NAAQS, and would not require a conformity determination.

NOISE AND VIBRATION

Noise and vibration from construction equipment operation and noise from construction vehicles and delivery vehicles traveling to and from the Proposed Project area may occur during construction of the Proposed Project. The level of impact of these noise sources depends on the noise characteristics of the construction equipment and activities, the schedule, and the location of potentially sensitive noise receptors. Noise and vibration levels at a given location are dependent on the type and number of pieces of construction equipment being operated, as well as the distance from the construction site. Like most construction projects, construction of the Build Alternatives would result in increased noise and vibration levels for a limited time period.

NOISE

Typical noise levels of construction equipment that may be employed during the construction process are provided in **Table 17-2**. Noise from construction equipment is regulated by U.S. Environmental Protection Agency (USEPA) noise emission standards. These federal requirements mandate that: (1) certain classifications of construction equipment and motor vehicles meet specified noise emissions standards; and (2) construction materials be handled and transported so as not to create unnecessary noise. These regulations would be carefully followed. Appropriate low-noise emission level equipment would be used and operational procedures implemented to ensure equipment noise emission levels that do not exceed the values shown in **Table 17-2**. Compliance with noise control measures would be ensured by including them in the contract documents as material specifications and by directives to the construction contractor. The contractor would be encouraged to use quiet construction equipment.

Noise generated by construction equipment would decrease with distance. In general, the outdoor drop-off rate for moving noise sources is a decrease of 4.5 dBA for every doubling of distance between the noise source and the receiver. For stationary sources, the outdoor drop-off rate is a decrease of 6 dBA for every doubling of distance between the noise source and the receiver. In general, noise caused by construction activities would vary widely in volume, duration and location, depending on the task being undertaken and the piece of equipment used. Noise caused by delivery trucks, employees traveling to and from the site, and other construction vehicles would not be severe in volume or duration, and would be limited to the major access roadways leading to the project site. Highway access to the project site is good, minimizing the need for project-related trucks to travel on local roads. Major elements of the Proposed Project, such as the steel trusses for the river crossings, would be assembled off-site and delivered by barge. Some components would be delivered by truck, with the number of daily deliveries by estimated to range between 25 and 50 during peak construction activity. This level of truck traffic would not be expected to result in noise levels at any residential receptors that would constitute significant adverse impacts.

The Federal Transit Administration's (FTA) General Analysis methodology for construction noise was used to evaluate the potential for noise impacts resulting from construction of the Proposed Project. The General Analysis methodology considers the noise level produced by the two loudest pieces of construction equipment compared with construction noise impact criteria, which is 90 dBA during daytime hours and 80 dBA during nighttime hours[4]. In the case of the Proposed Project, two impact pile drivers were assumed to represent the two noisiest pieces of equipment. **Table 17-3** shows the results of the general construction noise analysis.

---

[4] While most construction is expected to occur during daytime hours, some specific activities may be required to occur during the evening, and schedule constraints may require some night-time work.

Table 17-2
Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level (dBA) 50 feet from source
Air compressor	81
Backhoe	80
Bulldozer	85
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Generator	81
Grader	85
Impact Wrench	85
Jackhammer	88
Loader	85
Paver	89
Pile Driver (Impact)	101
Pile Driver (Sonic)	96
Pneumatic Tool	85
Pump	76
Rail Saw	90
Rock Drill	98
Roller	74
Saw	76
Scarifier	83
Scraper	89
Shovel	82
Spike Driver	77
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	88
Source: Transit Noise and Vibration Impact Assessment, FTA-VA-90-1003-06, May 2006.	

Table 17-3
Construction Noise Levels in dBA

Site	Receptor Location	Distance to Work Area (feet)	Construction Noise Level
1	Broad Street at Susquehanna Avenue, Perryville	118	62.6
2	Elm Street at Susquehanna Avenue, Perryville	820	45.7
3	River Road North of Broad Street, Perryville	744	46.6
4	Woodlands Farm Road South, Perryville	>5000	49.5
5	Avenue D at 1st Street, Perryville	728	46.8
6	Ellis Court South of Broad Street, Perryville	1200	53.7
7	Freedom Lane at Franklin Street, HdG	719	46.9
8	David Craig Park, HdG	109	63.3
9	North Stokes Street at Otsego Street, HdG	87	65.2
10	Anderson Avenue Cul-de-Sac, HdG	>5000	61.7
11	Warren Street at Legion Drive, HdG	787	53.4
12	Williams Drive East of Oakington Road, HdG	>5000	59.2

As shown in **Table 17-3**, the predicted levels of construction noise are well below the 80 dBA threshold that is considered significant even during nighttime hours according to FTA's construction noise evaluation criteria. However, construction activities related to the bridges, approach structures, embankment and retaining walls, and new track and ancillary equipment along each alignment would result in short-term noise increases in the vicinity of the actual work site. At receptors located along the waterfront and along the approach structures, construction activity would be audible and would result in perceptible increases in noise level during the periods of heavy construction activity, such as excavation and foundation construction. Like many corridor-type transportation projects, construction in any given area would be limited as the work progresses, minimizing the adverse noise impacts on any one site.

However, because of the distance between the construction work areas and adjacent receptors, no significant adverse noise impacts are expected to result from construction of the Proposed Project.

VIBRATION

Tables 17-4 and Table 17-5 show architectural and structural damage risk and perceptibility distances for residential and historic structures in proximity to the types of construction activities that would occur during construction of the Proposed Project. Architectural damage includes cosmetic damage, such as cracked plaster, etc. Architectural damage is not considered potentially dangerous. As shown in **Table 17-4**, pile driving has the greatest potential to result in architectural damage to most building types. While not shown in the table, controlled blasting also can result in high vibration levels in excess of 100 VdB with resultant damage to existing structures. Most other construction activities require very small (i.e., less than 25 feet) distances between the structure and the construction equipment or the presence of highly fragile buildings for impacts to occur. For fragile and highly fragile buildings respectively, FTA recommends a limit of peak particle velocities of 0.2 and 0.12 inch per second (in/sec) or 94 and 90 VdB.

Table 17-4
Vibration Source Levels for Construction Equipment

Equipment	PPV at 25 ft (in/sec)	Approximate L_{v*} at 25 ft
Pile Driver (impact)	0.644	104
Pile Driver (sonic)	0.170	93
Clam Shovel drop (slurry wall)	0.202	94
Hydromill (slurry wall in soil)	0.008	66
Hydromill (slurry wall in rock)	0.017	75
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drilling	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

Note: * RMS velocity in decibels (VdB) re 1 micro-inch/second
Source: *Transit Noise and Vibration Impact Assessment*, FTA-VA-90-1003-06, May 2006.

Table 17-5
Construction Vibration Damage Criteria

Building Category	PPV (in/sec)	Approximate L_{v*}
I. Reinforced-concrete, steel or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Note: * RMS velocity in decibels (VdB) re 1 micro-inch/second
Source: *Transit Noise and Vibration Impact Assessment*, FTA-VA-90-1003-06, May 2006.

The structure of most concern with regard to the potential for structural or architectural damage due to vibration is Rodgers Tavern in Perryville, west of the north approach to the proposed new bridge. Pile driving is the construction activity with the greatest potential to result in high levels of vibration. No pile driving is expected to occur within 80 feet of this structure, and consequently the maximum Peak Particle Velocity (PPV) expected to occur is less than 0.12 in/sec, which is the threshold of potential for damage suggested by the FTA for buildings most susceptible to vibration damage. Consequently, the vibration resulting from construction of the Proposed Project would not have the potential to cause damage at this location. At other buildings and structures, which would be located still farther from construction activity, maximum PPV values resulting from construction of the Proposed Project would be even lower.

While the predicted level of PPV is below the threshold that would have the potential to result in architectural or structural damage, vibration would be perceptible and have the potential to result in annoyance within approximately 500 feet of pile driving activities, or within approximately 95 feet of other heavy construction activity. While vibration within these ranges would be perceptible, it would be of limited duration because construction activity would move along the Proposed Project corridor. Consequently, vibration in the perceptible range would not occur over a prolonged period of time at any one receptor location. Typically, pile driving in a single pile location will take no more than two to five days, depending on the number and size of piles in the group to be driven for a single bridge support. Depending on the number of bridge supports within 500 feet of a given receptor, the duration of perceptible vibration at the receptor may last multiple weeks. Consequently, the vibration resulting from construction of the Proposed Project would not constitute a significant adverse impact.

Special Provisions for Historic Structures

In addition to the establishment of a project-wide Construction Protection Plan (CPP), special measures set forth by the Maryland Historical Trust (MHT) would be followed to protect historic resources from increased vibration levels associated with construction activities. At any construction location where historic resources, and particularly older fragile buildings, are within an area of potential effect (see Chapter 8 for more details), construction contractors would be required to implement special vibration protection measures. These measures, to be included as part of the construction protection program for historic resources (discussed above under "Cultural Resources"), would likely include the following:

- Inspect and report on the current foundation and structural condition of any historic resources.
- Set up a vibration monitoring program to measure vertical and lateral movement and vibration to the historic structures within 150 feet of pile-driving activities. Details as to the frequency and duration of the vibration monitoring program would be determined as part of the Proposed Project's ongoing consultation process with MHT.
- Establish and monitor construction methods to limit vibrations to levels that would not cause structural damage to the historic structures, as determined by the condition survey.
- Issue "stop work" orders to the construction contractor, as required, to prevent damage to the structures, based on any vibration levels that exceed the design criteria in lateral or vertical direction. Work would not begin again until the steps proposed to stabilize and/or prevent further damage to the designated buildings were approved.

With these measures in place, the construction-related vibration impacts would be minimized, and any remaining impacts would be temporary and of short duration. Therefore, no significant adverse impacts to vibration conditions are expected from construction of the Proposed Project.

NATURAL RESOURCES AND PERMITTING

An analysis of construction period impacts on natural resources is provided in **Appendix E**, "Natural Environmental Technical Report."

CONTAMINATED AND HAZARDOUS MATERIALS

An analysis of construction period impacts related to contaminated and hazardous materials is provided in Chapter 15, "Contaminated and Hazardous Materials."

INFRASTRUCTURE AND UTILITIES

As described above, construction of Alternative 9A and Alternative 9B would require minor modifications to Amtrak's Perryville Electrical Substation. A transmission tower on the west side of the tracks provides power to the substation from the Safe Harbor Generating Station. Given the importance of the substation and its close proximity to the proposed installation of a new large retaining wall, the substation must be protected during construction so as to maintain power to the Proposed Project throughout the work.

Alternative 9A would require that a county-owned water main currently located on Havre de Grace Middle School/High School property be relocated beneath the schools' track and field facility. This would temporarily affect the use of the facility. Alternative 9B will not require relocation of the water main, and will not affect the track and field facility.

Another utility consideration for Alternative 9A and Alternative 9B is a fiber optic duct bank that carries Amtrak, AT&T, Qwest, and Verizon Business. The duct bank runs along the east side of existing rail for the full length of the proposed alignment; these utilities are carried across the existing bridge. Other known utilities that would be affected by the Proposed Project include lines owned by Zayo Fiber Optics, Comcast Communication, BGE (electric and gas), Delmarva Power (electric), and a Town of Perryville sewer line. The presence of additional aboveground and underground utilities may be determined during the final engineering stage. Relocation of the known utilities described above will be coordinated with the utility provider to minimize service disruptions. Therefore, no significant adverse impacts to utilities are expected from construction of the Proposed Project. ✷