2014 TIGER DISCRETIONARY GRANT APPLICATION

Kittery, Maine - Portsmouth, New Hampshire

SARAH MILDRED LONG BRIDGE

Proposed SML Bridge with Integrated Highway/Rail Deck Lift Span

Bridge Number 3641
Federal Project BH-1671(000)
MaineDOT Work Identification Number 016710.00

Maine Department of Transportation
New Hampshire Department of Transportation
April 22, 2014

MaineDOT

New Hampshire DOT
Department of Transportation

STATE OF MAINE
OFFICE OF THE GOVERNOR
1 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0001

Paul R. LePage
GOVERNOR

April 14, 2014

The Honorable Anthony R. Foxx
Secretary
U.S. Department of Transportation
1200 New Jersey Ave., S.E.
Washington, DC 20590

Dear Secretary Foxx:

I am writing to express my strong support for the TIGER 2014 grant application for $25 million submitted by the State of Maine in partnership with the State of New Hampshire to complete the rail portion of a larger project to replace the Sarah Mildred Long (SML) Bridge. You may be aware that Maine, again in partnership with New Hampshire submitted this same application in 2013 for a TIGER grant. We are resubmitting it as the need is even more imminent than it was last year.

The SML Bridge carries the U.S. Route 1 Bypass over the Piscataqua River between Kittery, Maine and Portsmouth, New Hampshire. The bridge is 74 years old, is structurally deficient and functionally obsolete. The truss spans on the bridge are Fracture Critical, meaning that failure of certain steel tension members could result in failure of the entire structure. Due to its condition, SML has been posted at 20 tons (small pickup trucks and cars only) since 2009. The bridge has been closed multiple times in recent years due to malfunctions and for unplanned major repairs. It needs to be replaced.

It is especially important to note that the SML Bridge carries the Pan-Am Railways line over the river and connects the Portsmouth Naval Shipyard (PNS) to the national railway system. PSN is responsible for the overhaul, repair and modernization of Los Angeles–class nuclear-powered submarines. The rail portion of the bridge is the only means PNS can safely and securely transfer spent nuclear fuel from its servicing of the nuclear submarines. It is therefore critical that the bridge be replaced in order to maintain the needs of national security.

If the bridge is not replaced, the future viability of PNS' current workload could be jeopardized. PNS currently employs about 5,300 middle class workers with a $361 million annual payroll. PNS also expends about $67.5 million annually in contracted facility services. A June 2012 economic impact analysis noted this facility has a $1.6 billion/year overall economic impact for the region. Loss of the rail connection would not only affect national security but could also result in a large loss of work for middle class workers and a major negative economic impact to the region.

The flexibility of TIGER funding for the rail portion of the bridge is critical to the overall replacement project. Formula funding from FHWA and FRA are not available for the rail

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portion of the project. Without replacement, we expect the bridge could no longer be maintained in a safe condition, even with major maintenance funding and would likely close by 2020. In addition to severely impacting PNS and the regional economy, closure of SML would have dramatic negative effects on the capacity of the I-95 High Level Bridge, Maine's only interstate connection. SML closure would result in traffic volumes in excess of capacity of the I-95 High Level Bridge. The I-95 bridge would experience sustained traffic delays, particularly on summer weekends and other high traffic volume days.

The SML Bridge plays a critical role for both states by serving as the emergency bypass route in the event of temporary or long-term closure of the I-95 High Level Bridge. These two bridges combined account for 62% of all commercial vehicle traffic crossing Maine borders and provide over $8.4 billion in economic impact to Maine annually. With the SML Bridge posted, any temporary closure of the I-95 High Level Bridge would result in a 21 mile detour.

This investment of TIGER funds will enhance the quality of life for residents of both states, promote economic development, and is one of the only sources of funding to replace the deck that carries rail across the bridge to the shipyard. I urge your strong consideration of the SML Bridge TIGER application.

Sincerely,

Paul R. LePage
Governor

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
16 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0016

Paul R. LePage
GOVERNOR

David Bernhardt
COMMISSIONER

April 25, 2014

The Honorable Anthony R. Foxx
Secretary
U.S. Department of Transportation
1200 New Jersey Ave., S.E.
Washington, DC 20590

Dear Secretary Foxx:

The Maine Department of Transportation (MaineDOT) and the New Hampshire Department of Transportation (NH DOT) are pleased to submit this TIGER 2014 grant application as project partners, with MaineDOT being the lead applicant and NH DOT being the partnering agency. The application is for $25 million to construct the rail portion of a larger project to replace the Sarah Mildred Long (SML) Bridge connecting Kittery, Maine and Portsmouth, New Hampshire.

Our two states have a financial agreement in place and the project is under design. We have partnered in both the development and funding of this project, and we confirm that project funding will be ready to be obligated as early as this fall well before the June 30, 2106 requirement.

As our application will demonstrate, this multimodal bridge replacement project, including the rail portion for which we seek TIGER funding, is of regional and national significance. It is of regional interest to the states of Maine and New Hampshire as the primary emergency connection in the event the I-95 High-Level Bridge must be temporarily closed. I-95 is Maine's only interstate connection and it carries over 55% of Maine's cross-border truck traffic. It is of national significance due to its national security interest, as the rail portion of the bridge is used to move spent nuclear fuel off base from the Los Angeles–class nuclear-powered submarines that are serviced at the base to the national rail system for disposal.

In terms of roles and responsibilities, Maine and New Hampshire have agreed to replace SML Bridge. The two states will share the costs of replacing the SML Bridge, which is now estimated to be $172 million. This includes equal shares of the TIGER grant request of $25 million for the rail portion of SML, or $12.5 million each. MaineDOT is the lead agency, with NH DOT being a full partner in design, construction and future maintenance and operations of the SML Bridge. Each state will address, or has already addressed, its separate environmental, historic and other necessary reviews, approvals and permits where required. MaineDOT is the lead on obtaining U.S. Army Corps of Engineers and U.S. Coast Guard permits.

Thank you for your consideration of this Maine-New Hampshire joint application.

Sincerely,

David Bernhardt
Commissioner
Maine Dept. of Transportation

Christopher Clement
Commissioner
New Hampshire Dept. of Transportation

THE MAINE DEPARTMENT OF TRANSPORTATION IS AN AFFIRMATIVE ACTION - EQUAL OPPORTUNITY EMPLOYER
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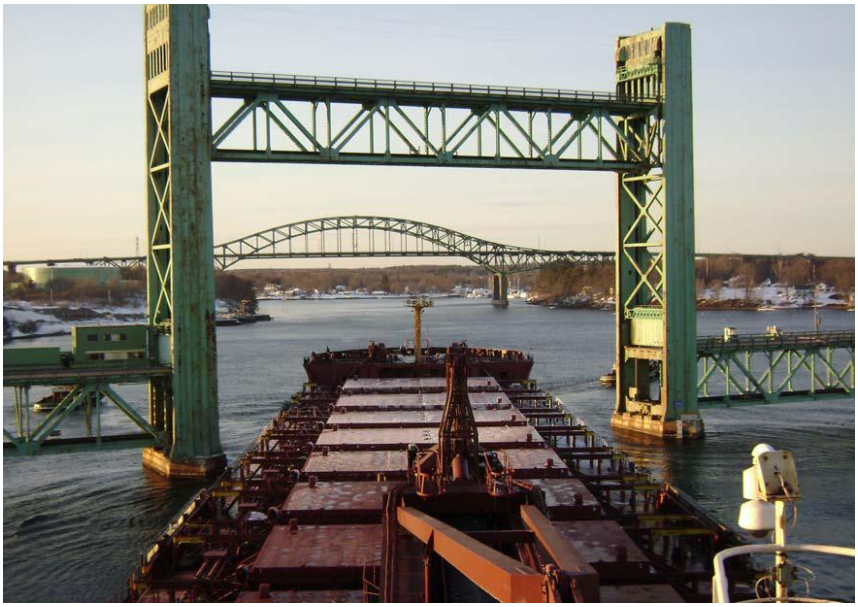
2014 TIGER GRANT APPLICATION TITLE PAGE



Bridge Number 3641
Federal Project BH-1671(000)
MaineDOT Work Identification Number 016710.00

PROJECT TITLE: $25 Million Toward Replacement of the Sarah Mildred Long Bridge

LOCATION: Kittery, Maine-Portsmouth, New Hampshire

TYPE OF APPLICATION: Capital Rail Project

LEAD APPLICANT: Maine Department of Transportation

PARTNERING AGENCY: New Hampshire Department of Transportation

TYPE OF ELIGIBLE APPLICANTS: State Government

TOTAL PROJECT COST: $172 Million

AMOUNT OF TIGER FUNDING REQUESTED: $25 Million ($12.5 Million per/State)

Date of Submittal: April 22, 2014

PROJECT OVERVIEW

Project Name: Sarah Mildred Long Bridge Replacement
Kittery, Maine – Portsmouth, New Hampshire

Project Begin Location: North 43 degrees, 4 minutes, 56.58 seconds; West 70 degrees, 45 minutes, 57.11 seconds
Project End Location: North 43 degrees, 5 minutes, 24 seconds; West 70 degrees, 45 minutes, 23.90 seconds

General Description:

Constructed in 1940, the Sarah Mildred Long Bridge (SML or the "Long Bridge") currently services highway, rail and navigation over or on the Piscataqua River between Kittery, Maine (ME) and Portsmouth, New Hampshire (NH) and also serves as the U.S. Route 1 Bypass. SML serves as the principal emergency alternate bridge for the I-95 High Level Bridge. The I-95 and SML bridges are the two most important bridges in Maine. Combined, these two bridges represent an estimated $8.4 billion/year to Maine's economy and carry 62 percent of all large trucks crossing Maine borders. SML is in poor condition and is prone to closures for emergency repairs. It has been posted to 20 tons since 2009, has Fracture-Critical Truss Spans, is "structurally deficient" and has reached the end of its effective service life. The rail crossing portion of SML provides the only viable transportation mode for the Portsmouth Naval Shipyard (PNS) to ship spent nuclear fuel from its servicing operations of the U.S. Navy's fleet of nuclear submarines.

An innovative, hybrid bridge replacement featuring an integrated rail-highway deck for the lift span structure is proposed. The lift span will rise for tall ships and will lower for rail use. The deck of the lift span will be at a higher elevation than the existing bridge, allowing for a 64 percent reduction in the number of required bridge lifts. This feature will allow for the elimination of a retractable rail span currently used to allow passage of smaller vessels outside the navigation channel. The reduced number of bridge lifts will also reduce vehicular and navigational delay costs. The new bridge will provide bicycle access.

The new SML will feature a wider navigation opening. The existing bridge opening is narrow and skewed to the navigational channel and river currents, creating a hazard to marine transport and a restrictive obstruction to ship size. Larger ships currently must wait for slack tides due to the hazard. The new bridge will provide a reduction in bridge skew to the river channel from the current 25 degrees to 15 degrees. A wider opening for navigation and a protective fender system will also be provided. The new bridge will reduce the navigation hazard and associated marine delay costs, and will allow safe passage of the upcoming generation of cargo vessels to ensure the economic well-being of the Port of Portsmouth and the businesses utilizing this important shipping lane.

The total SML bridge replacement cost is estimated at $172 million, of which $158.5 million is for construction and construction engineering. This application is submitted by the State of Maine (Lead State) and the State of New Hampshire (Partnering State) to request $25 million ($12.5 million/State) in TIGER funds for the rail portion of the bridge, as that portion of the work is not eligible for FHWA funding and FRA funding is generally not available for the type

of work needed. Construction is expected to begin in early FY2015, well in advance of the June 30, 2016 NOFA requirement.

Key Threshold Requirements:

- ✓ Eligible Project: Rail Projects Eligible. Because the rail portion of SML cannot exist without the entire SML Bridge, benefit-to-cost analyses are provided for the entire bridge.
- ✓ Lead Applicant: State of Maine (Department of Transportation).
- ✓ Partnering Agency: State of New Hampshire (Department of Transportation).
- ✓ Included in Relevant Planning Documents: MaineDOT & NHDOT STIPs (Preliminary Engineering), Maine and New Hampshire MPO TIPS.
- ✓ Project Readiness:
  - ✓ NEPA: Under Way; NEPA complete expected by May 30, 2014.
  - ✓ All Permits and Approvals complete by June 30, 2016 in accordance with the TIGER NOFA 2013.
  - ✓ Ability to Obligate Funds well before June 30, 2016.
  - ✓ Ability to begin construction in 2014.
- ✓ Project addresses interstate and regional multimodal needs (rail, highway, marine, bicycle).
- ✓ Project provides redundancy to the I-95 High Level Bridge, Maine's only interstate connection and its largest commercial border crossing.
- ✓ TIGER is the only federal funding source available for the rail portion of the project.
- ✓ Total Non-Federal Match Provided:
  - ✓ Maine: $30 million
  - ✓ New Hampshire: $5 million
- ✓ Total Non-Federal: $35 million (22% of $158.5 million construction costs)
- ✓ The project will yield a benefit-cost ratio of 2.5 at a 3% discount rate and 1.2 at 7%.

Key Indicators in Support of the TIGER 2014 Grant Application:

- Existing Bridge Condition
  - Due to its condition, national and regional significance, the replacement of SML is both Maine's and New Hampshire's highest bridge priority.
  - SML is a 74 year-old bridge currently classified as structurally deficient and functionally obsolete.
  - The truss spans are fracture-critical, meaning the failure of certain steel tension members could result in failure of the entire structure.
  - Based on detailed bridge inspections conducted in 2009, 2011 and 2013, the bridge is in Poor Condition.
  - SML has been posted at 20 tons since 2009. Prior to the bridge posting, about 7% of all commercial vehicles crossing Maine state lines used SML.
- Rail Crossing Impacts
  - The rail portion of SML is critical to the safe and secure transport of spent nuclear fuel the Portsmouth Naval Shipyard (PNS). PNS is one of only two nuclear submarine repair and maintenance facilities located on the east coast.
  - The rail crossing greatly impacts regional jobs and the regional economy as well as the region's quality of life.
- Economic impacts
  - PNS employs about 5,300 workers with a $361 million annual payroll. PNS also expends about $67.5 million annually on contracted services.

    - The regional economic impact of PNS has been estimated to be $1.6 billion per year.
    - The new bridge will ensure safe and secure rail service continues to service PNS and the nation's nuclear submarines.
- Marine Crossing Impacts
    - The existing bridge lift opening is insufficiently wide to allow safe unimpeded passage of current marine traffic and is not wide enough to allow the next generation of ships to cross. The narrow bridge opening width, combined with 6 knot river currents and at times heavy winds requires many ships to wait for slack tides to make passage through the bridge. Also, towing barges must disengage because all three vessels cannot simultaneously pass through the bridge at the same time.
    - The existing bridge air draft height is very low at the river navigation channel and requires the bridge to be lifted to allow ship passage.
    - The new bridge will feature an innovative deck including both the highway and rail at the lift section. This will yield a much higher air draft to the river, resulting in 64% fewer bridge lifts.
    - The new bridge will also have a much longer lift section with a reduced skew to the river channel, allowing for safer passage of current and next generation ships.
    - The lift towers will be protected by fenders, thereby reducing the potential for hazardous material spills that might otherwise occur from a ship striking the existing rigid bridge lift towers.
- Highway Impacts
    - Over 3,100 bridge lifts occur annually. The bridge lifts take on average 9 minutes to complete and result in significant traffic delays and rear-end collisions.
    - The new bridge will result in a 64% reduction in bridge lifts, resulting in large reductions in Vehicle Hours of Travel and accidents. Air quality will also be improved due to reduced vehicle idling.
    - The new bridge will serve as an emergency route in the event the I-95 High Level Bridge must be closed. In addition to serving as Maine's only interstate connection, the I-95 High Level Bridge carries 54% of all commercial vehicles crossing Maine borders. Prior to being posted at 20 tons, SML carried an additional 8% of commercial vehicle traffic, accounting for a total of 62% of the Maine's commercial vehicles crossing state borders.
- National Security Impacts
    - As noted under Rail Crossing Impacts above, the rail connection is necessary for the safe and secure transport of spent nuclear fuel from PNS, which services nuclear-powered submarines. The rail crossing is of significant importance to national security.
    - SML serves as the primary emergency route, particularly for commercial vehicles, in the event the I-95 High Level Bridge is closed for maintenance, weather (fog, icy conditions, etc.), accidents and incidents or for security reasons. As noted previously, I-95 is Maine's only interstate connection to the rest of the U.S.
- Effects of Not Replacing SML
    - No direct emergency route for I-95 commercial vehicles. The nearest alternate detour route would be 21 miles.
    - No means of transporting spent nuclear fuel from PNS. Should the rail connection provided by SML be discontinued, work at PNS could be threatened and could

result in major layoffs, dramatically affecting the regional economy and in particular the middle class workers of the entire region.

- Affects national security (both for PNS nuclear fuel shipments and eliminating an alternative emergency route when I-95 must be shut down.
- Potential for significant loss of middle class work if PNS work is lost.
- Potentially devastating economic impacts if PNS work is lost.

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Project Website **http://www.maine.gov/mdot/tigergrants/tiger2014/smlbrg/index.htm**

2014 TIGER DISCRETIONARY GRANT APPLICATION
FOR
SARAH MILDRED LONG BRIDGE
KITTERY, MAINE – PORTSMOUTH, NEW HAMPSHIRE

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1. PROJECT DESCRIPTION

1.1 Existing Conditions

Constructed in 1940, the Sarah Mildred Long Bridge (SML) is located over the Piscataqua River. It connects Kittery, Maine (ME) and Portsmouth, New Hampshire (NH) via the U.S. Route 1 Bypass. The bridge services highway, rail and marine traffic and consists of a 27-span structure comprised of 15 floor beam girder and two deck truss approach spans on the New Hampshire side, two deck truss and seven floor beam girder approach spans including a retractable rail span on the Maine side, and a vertically separated highway and rail deck truss lift span measuring 2,804 feet. The highway and rail traffic are on separate levels, with the rail portion being nearest the water. The 4 fixed spans and the 1 movable lift are comprised of riveted straight-back Warren-type truss spans. The roadway spans are built-up riveted deck girders and floor beams as well as I-shaped and C-shaped sections. SML has one two-level combined highway-over-rail vertical lift span providing 10 feet of vertical air draft clearance at the navigation channel in the normally closed position. A retractable rail span is located outside the navigation channel in shallower water close to the Kittery shore, providing 35 feet of navigational air draft clearance when open for smaller vessels. See Table 1 for horizontal and vertical clearance dimensions.

The railroad spans consist of three deck girder spans on the south (NH) approach and two fixed deck girder spans and a retractable deck girder span on the north (ME) approach. Truss spans are supported by reinforced concrete piers with granite facades. Approach spans are supported by reinforced concrete piers and abutments and steel-pier bents. The roadway and an access walk are reinforced concrete. Bicycle and pedestrian access is not allowed due to posted speeds and narrow shoulder widths. There are no fenders to protect the lift towers - several large ships in the past have side-scraped the bridge lift tower foundations and in 2013 a runaway ship struck the bridge, causing over $1 million in damage to the bridge.

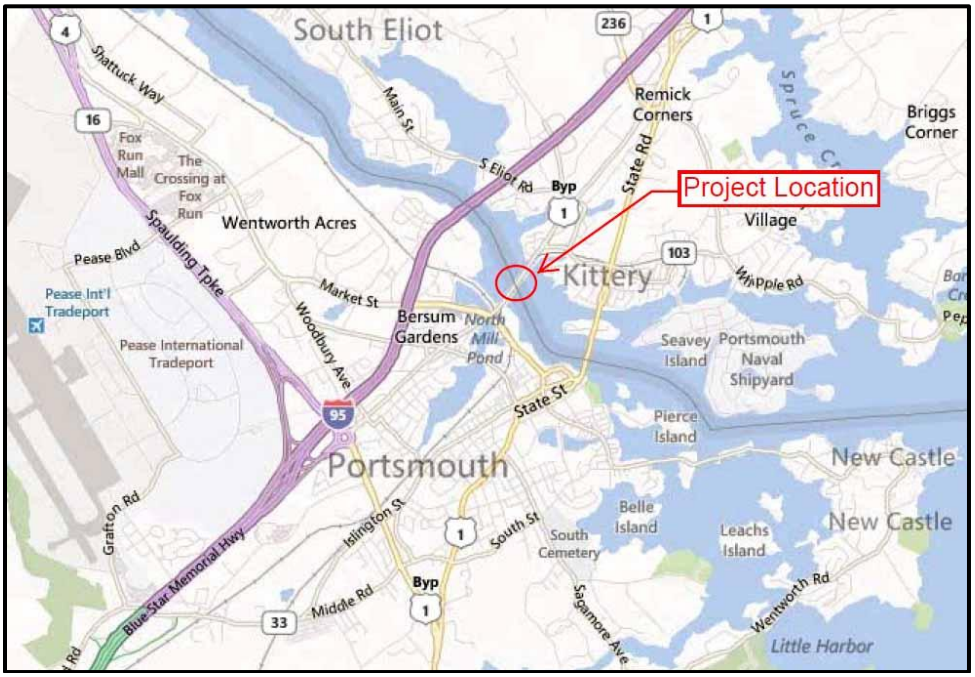

Figure 1: Project Location Map

SML has been closed for extended periods several times in recent years for emergency repairs: January 23–27, 2013 due to a lift malfunction and April 1–May 13, 2013 due to a tanker collision. The bridge was also closed temporarily due to lift malfunctions and for alternate lane use during an emergency project to reinforce select steel beams.

The bridge is in Poor Condition and has been posted at 20 tons since July 10, 2009. Due to its poor condition and fracture-critical truss connections, bridge inspections are now required every six months. SML is also classified as Structurally Deficient by FHWA. The truss spans are Fracture Critical – meaning that failure of certain steel tension members could result in bridge failure. Even with increased maintenance, SML is at the end of its service life. Additionally, the marine opening is narrow and is skewed to the navigation channel, creating a safety hazard to marine transport.

1.2 General Description of the Proposed Project

The proposed project is a joint Maine and New Hampshire effort led by MaineDOT for a complete bridge replacement. The new bridge will be located upstream of the existing bridge. It will provide significantly greater horizontal and vertical clearances to the Piscataqua River, thereby reducing disruptions to both highway and marine traffic. These disruptions occur due to the over 3,100 total bridge lifts (2008), including 2,637 bridge lifts for vessels. The additional lifts were for testing, maintenance and training purposes. Over 64% of the bridge lifts will be eliminated due to the bridge's innovative design.

Project Begin Location:	North 43 degrees, 4 minutes, 56.58 seconds; West 70 degrees, 45 minutes, 57.11 seconds
Project End Location:	North 43 degrees, 5 minutes, 24 seconds; West 70 degrees, 45 minutes, 23.90 seconds

The innovative project will provide rail, highway and bicycle access on one deck at the lift span structure. The deck will provide highway access in its normally closed position, will raise to allow passage beneath of large ships, and will lower for rail use. In the normally closed position, the bridge will provide 56 feet of vertical clearance for ships. Additionally the new bridge will provide a clear effective opening width of at least 250 feet, versus the current effective opening width of 175 feet. The much-improved vertical clearance will also eliminate the need for the rail retractable span

1.3 Expected Users

SML is one of three bridges in Kittery and Portsmouth connecting the two states, but each bridge serves a separate and vital function:

- The I-95 High Level Bridge serves as the only designated Interstate Highway connection between Maine and the U.S. It carries 55 percent of the trucks crossing Maine borders and contributes over $8.4 billion per year to Maine's economy. It is Maine's busiest border crossing.

- SML provides regional connectivity. It serves as the main trucking route when the I-95 High Level Bridge is out of service. Combined, SML and the I-95 High Level Bridge carried 62 percent of all trucks crossing Maine borders prior to the 2009 SML posting. Also, SML provides the sole rail connection to the Portsmouth Naval Shipyard (PNS) and as such, is the only rail spur line connecting PNS to the national rail system. The Shipyard is of significant importance to National Security because it services the U.S. Navy nuclear-powered submarine fleet. The PNS mission includes the shipment of spent nuclear fuel by rail. The shipments are made exclusively by rail using specially designed containers integral to rail cars. Due to logistics concerns for safety and security, rail access is the only viable means to transport the nuclear fuel from PNS. The new bridge will also introduce bicycle access along U.S. Route 1 Bypass.

Aerial view of the three bridges looking south - SML is in the center of the photo and I-95 is at the bottom.

- The Memorial Bridge serves primarily as a local connection between the downtown areas of Kittery and Portsmouth. Heavy trucks do not use Memorial Bridge due to the congested narrow streets, on-street parking, confined intersections and indirect routes to the bridge. Memorial Bridge provides the only pedestrian crossing of the Piscataqua River between Kittery and Portsmouth.

1.4 Transportation Challenges

1.4.1 Highway Challenges. The existing bridge presents multiple challenges to transportation. It has a "Poor" rating, is prone to closures for emergency repairs and is at the end of its useful life. SML has a load limit of 20 tons, which means only cars and small commercial vehicles are allowed on the highway portion of the bridge. It has been closed several times, including for emergency replacement of a submarine electrical feed cable, a major electrical overhaul project, installation of a protective barrier due to safety concerns of the bridge rail, the addition of supports to critical steel beams and multiple lift failures. Due to the current condition of the bridge, a detailed bridge inspection is required every six months, as compared to the normal 24-month bridge inspection schedule. Also, the bridge must be opened frequently in order to allow ships exceeding 36 feet in height and 70 feet in width. The frequent bridge lifts (3,178 in 2008) also result in unnecessary traffic delays and degradation of air quality. Due to narrow shoulders, bicycles are not currently allowed on SML.

1.4.2 Rail Challenges. Rail access is a critical need of PNS, as this is the only viable mode of transportation allowed by the U.S. Navy for PNS to transport spent nuclear fuel from its servicing of U.S. Navy submarines. Other modes of transport are too risky, both from safety and security perspectives. In the normally closed position, the rail portion of the lift section provides

only 10 feet of vertical air draft clearance to the water. A retractable rail span north of the lift section provides 36 feet of vertical clearance for vessels narrower than 70 feet. The rail bridge must be lifted frequently and must also be maintained for service to PNS. Due to advanced deterioration, temporary blocking has been installed at the two lift towers and other pier supports to allow rail movements to continue.

1.4.3 Navigational Challenges. SML presents a major impediment to navigation. It allows passage of ships served by the Port of Portsmouth and over 60 business that rely on marine service, such as oil and LNG terminals, fishing and manufacturing facilities. The bridge is skewed to the river channel at 25 degrees, reducing the effective opening width to 175 feet. This creates a major safety concern for the bridge, which has no fender system, and prevents access to the next generation of wider cargo vessels. Tugboats that steer the ship must disengage from larger ships because they cannot fit through the bridge opening with the ship. Additionally, the tidal current is ranked the 6th fastest in the lower 48 states. Due to the high currents and narrow effective bridge opening, all commercial ships must wait for slack tides to pass under the bridge, adding significant delay costs to navigational users. The lift tower pier foundations show evidence of having been scraped by ships and SML was struck in 2013 by a runaway ship, causing over $1 million in damages to the bridge. The railroad retractable span located at the north end of the bridge provides 36-foot vertical air draft clearance, allowing small boats to pass, but many pleasure sailboats and non-commercial river traffic must wait for the main bridge lift. The retractable span is manually operated. Lifts are required by federal regulation to occur twice per hour from 7:00 AM to 7:00 PM between May 15 and October 31, and on demand the rest of the year.

Table 1. SML Existing Horizontal and Vertical Clearances

SML Water Clearances	Horizontal	Vertical	
		Open	Closed
Lift	200 feet	135 feet	10 feet
Rail Retractable Span	70 feet	36 feet	5 feet

1.5 Addressing the Transportation Challenges

The new SML will provide reliable access to rail, critical to the PNS. It will dramatically improve safe access to navigation by virtue of the bridge's greater horizontal and vertical clearances. The number of required bridge lifts is expected to drop from 3,178 per year to 1,145, a 64 percent reduction. The new bridge will also provide bicycle access, not currently allowed on SML. Improved access and the 64 percent reduction in bridge lifts will reduce delays. The project has led to a Maine businesses working together to seek ways to improve the highway's attractiveness to visitors.

The Maine–New Hampshire Connections Study, conducted in 2009-2011, had significant public involvement and a very high public interest level. The report concluded all three bridge crossings will be needed to meet the projected traffic demands and to address the local, regional and interstate needs of both states. It recommended the SML for either a bridge rehabilitation with full replacement of all approach spans or a new bridge. The rehabilitation option was not well received by the U.S. Coast Guard, marine interests or the general public due to the narrow horizontal clearance provided by SML, its negative effect on upstream marine-related businesses and related economic impacts. Additionally the State of New Hampshire enacted NH RSA 193:9 requiring NHDOT to participate financially only if a wider bridge opening were to be provided.

Upon further analysis, a hybrid bridge was selected. The hybrid bridge will integrate the rail lift section into the highway deck. This will result in the lift section providing 56 feet of vertical water clearance in the normally closed condition, thereby reducing the number of required bridge lifts by 64 percent. The bridge opening will also be increased to an effective width of 250 feet. These features will result in significant reductions in both highway and navigational user delays. Bicycle access will be added. Rail use will be safer and more reliable by removing temporary shoring needed to bolster the existing rail portion of the bridge and eliminating the retractable rail span. The bridge will be reinforced concrete to a height above the highway deck, thereby eliminating the need for paint maintenance in the highly corrosive seacoast atmosphere.

1.6 Design Standards

U.S. Route 1 Bypass has a federal functional classification of Principal Arterial/Other Freeway. The appropriate design standards for this classification of roadway are based on a design speed of 40 miles per hour. Standards to be used include:

1. State of Maine Department of Transportation (MaineDOT), Highway Design Guide, 2004.
2. State of New Hampshire Department of Transportation (NHDOT), Highway Design Manual, 1999 with current interim re-writes.
3. American Association of State Highway and Transportation Officials (AASHTO), A Policy on Geometric Design of Highways and Streets, 6th Edition, 2011.
4. American Railway Engineering and Maintenance-of-Way Association (AREMA), Manual for Railway Engineering, 2012.
5. Federal Highway Administration (FHWA), Manual on Uniform Traffic Control Devices, 2009 Edition.

1.7 Traffic Capacity

The 2009 Average Annual Daily Traffic (AADT) for U.S. Route 1 Bypass is 13,430 vehicles per day (VPD). The Design Hourly Volume (DHV) is 10 percent of the AADT, with heavy trucks comprising 8 percent of the DHV (amount of large commercial vehicles using SML prior to its posting at 20 tons in 2009).

The Estimated Time of Completion (ETC) for this project is the year 2018. The years 2035 and 2065 were assumed to be the ETC+20 and ETC+50, respectively. Table 2 provides the 2009 traffic volumes as well as those calculated for 2015, 2035 and 2065 using a growth factor of 1.2 percent per year from 2009 to 2035. No traffic projections beyond 2035 have been modeled, so constant volumes have been assumed after 2035 for the purpose of this analysis. The projected

traffic volumes were used in the modeling that forms the basis for the Benefit-Cost Analysis discussed in Section 4.3.

Table 2. Existing and Projected Traffic Volumes				
Traffic Volume	**Year**			
	2009	**2015**	**2035**	**2065**
AADT (Vehicles/Day)	13,430	14,040	16,100	16,100
DHV (Vehicles/Hour)	1,343	1,404	1,610	1,610

1.8 Structural Conditions

The bridge, constructed in 1940, is in generally Poor Condition, as based on the 2009, 2011 and 2013 Detailed Bridge Inspection Reports. SML was posted at 20 tons on June 27, 2009. See Table 3 for a summary of the pertinent condition ratings, and note the deterioration rates from 2009 to 2013.

Table 3. Detailed Bridge Inspection Report Ratings			
Item	**2009 Inspection Report**	**2011 Inspection Report**	**2013 Inspection Report**
Approach Spans			
Deck	Poor	Not Inspected	Poor
Superstructure	Serious	Not Inspected	Serious
Substructure	Fair	Not Inspected	Serious
Truss Spans			
Deck	Poor	Poor	Poor
Superstructure	Fair	Poor	Poor
Substructure	Fair	Poor	Poor

Major unplanned work undertaken on SML in recent years included:

- 2005: Emergency underwater electrical service cable replacement
- 2006: Major electrical upgrade
- 2009: Select steel repairs and blocking up of rail stringers at tower
- 2012: (July 5-August 4) Steel barrier installed to protect traffic from unsafe bridge rails ($1,054,400)
- 2013: Began temporary shoring on 12 floor beams to retain 20-ton posting
- 2014: Continued temporary shoring and repaired three stringers.

Numerous temporary bridge closures have occurred due to lift malfunctions and most recently a tanker striking the bridge due to a mooring failure:

- 2008 – 5 closures totaling 9.5 hours
- 2009 – 8 closures totaling 16 hours

- 2010 – 6 closures totaling 11 hours
- 2011 – 4 closures totaling 17 hours
- 2012 – 1 closure totaling 3 hours plus one closure totaling 30 days
- 2013 – 2 closures totaling 47 days, plus 15 short-term disruptions due to electrical and mechanical issues

The following photographs illustrate the general condition of the bridge in 2009. As evidenced by the more recent 2011 and 2013 detailed bridge inspections and emergency work, the bridge has continued to deteriorate.

Superstructure and Deck – Roadway Approach Spans

Span 10, Bay 3: Curb Stringer S1 (West) Deterioration.

Span 13, East Girder: Bottom Flange Deterioration at Hinge near Pier 13.

Span 6, Floor Beam 3: West Cantilever Top Flange Deterioration at End of Tie Plate.

Span 13, West Girder: Bottom Flange Hole at Hinge near Pier 13.

Truss Span 1, Joint L2 West: Interior of Bottom Chord at joint. Vertical web and splice plate shown in back of photo. Conditions typical of interior of bottom chord at joints.

Truss Span 4, Diagonal U3-L4 West: Surface rust on top flange and lacing bars. Condition typical of diagonals.

Truss Span 3, Bottom Chord L3-L4 West: Welded utility connection to bottom chord. Surface rust on top flange and web. Heavy corrosion on rivet head.

Pier 17 (South Tower), South Cross Girder: Laminar corrosion with corrosion holes on top flange. Condition typical of Cross Girders at Towers.

Superstructure and Deck – Railroad Approach Spans

Retractable Railroad Approach Span 21, North Lifting Girder: Laminar corrosion on top flange over full-length, with more severe corrosion at ends, adjacent to knee brace.

West Screw Housing Brace at Pier 21: Severe deterioration with up to 50 percent of cross-sectional area lost.

Bearings

West Girder, Span 3: Bearing Deterioration at Pier 3.

Retractable Railroad Approach Span Bearing. Northwest bearing shown. Laminar corrosion and section loss to bolt nuts typical of Bearing Plates.

Pier 3, West Column: Concrete Deterioration with Exposed Reinforcing.

Pier 6: South Face Deterioration.

Pier 12: Cracking at East Girder Bearing.

Pier 13, Bridge Seat: Up to 4 inches of erosion on the bridge seat with exposed rebar.

Existing Typical Deck Repairs: Walk-way at left is not a public sidewalk. Note jersey barriers at left and steel beam at right, added in 2012 due to inadequate stringer end connections. (Source: 2013 Bridge Report).

Typical Deterioration at Bridge Rail.

1.9 Mechanical Condition of Lift Span

The lift span requires constant attention by the maintenance crew. The lift span has failed for various reasons 27 times over the past six years, resulting in major traffic disruptions. Most recently, the bridge was closed to traffic from January 23–27, 2013 when the bridge lift went off its track and became stuck one foot above the bridge deck. Fortunately, crews were able to raise the lift span to allow three waiting ships through after a four-day delay. At the time, Memorial Bridge was under construction, so all traffic had to be diverted to the I-95 Piscataqua River Bridge. The bridge was also closed 42 days in April 1 – May 13, 2013 (42 days of traffic disruption) for emergency repairs following a tanker collision. Temporary works were removed on May 23rd.

1.10 Mechanical Condition of the Retractable Railroad Span

The retractable railroad span is currently operational due to a $0.5 million screw replacement project conducted in 2009. That project was undertaken due to problems in maintaining bridge alignment of the retractable span.

1.11 Navigational Clearances

Table 4 provides the existing navigational clearances for the three Kittery–Portsmouth bridges as identified on National Oceanic and Atmospheric Administration (NOAA) Chart 13283, 20th Edition. The vertical clearance noted is the distance between mean high water and the underside of the bridge. The Memorial and SML bridges have lift spans that provide additional vertical clearance when opened. SML also provides a retractable span for the lower rail level that is not in the main channel, but rather in the shallower water close to the Kittery shore.

Table 4. Bridges Existing Horizontal and Vertical Clearances				
Bridge Name	**Bridge Span**	**Horizontal Clearance (Feet)**	**Vertical Clearance (Feet)**	
			Open	**Closed**
Memorial Bridge[1]	Lift	260	150	19
Sarah Mildred Long	Lift	200	135	10
Sarah Mildred Long	Rail	70	36	5
I-95 High Level	Fixed	440	135	

[1]Conditions prior to Memorial Bridge replacement.

The proposed wider opening of the new SML will better support marine traffic to the NH Port of Portsmouth and will increase the Port's competitiveness. According to the Port of Portsmouth Economic Impacts Study Report published by the University of New Hampshire and University of Southern Maine, the total regional impacts of the port-related activities include 2,357 jobs (2,078 in NH and 280 in ME) paying $156 million in income and $274.5 million in value added. In addition, $25 million in state and local taxes are generated as a result of these activities.

The left side of the photo below provides a view of the rail retractable span.

1.12 Project Details

The Preliminary Design Report, approved on November 18, 2013 identified several key aspects of the new bridge, which are described below. The anticipated begin construction date later this year.

1.12.1 Bridge Alignment. Several horizontal alignments were considered, all located upstream of the existing bridge. The Construction Manager/General Contractor (CM/GC) Design Team has identified the final alignment to be immediately upstream of the existing SML. The new alignment increases the effective bridge opening widths from 175 feet at 25 degrees to the navigation channel to 250 feet at 15 degrees.

1.12.2 Structure Type. The bridge is being designed for a 100-year life. Due to the harsh marine environment and ongoing maintenance issues with steel structures, reinforced concrete will be used to the maximum extent possible for the foundations up to and above the bridge deck to minimize the potential for fog, road salt and rainfall runoff to adversely affect the structural elements of the bridge. The bridge deck will also be constructed of reinforced concrete. All approach spans will be segmental precast concrete. Lift span towers will be precast concrete.

Steel members will be metalized rather than painted, dramatically reducing future maintenance costs.

1.12.3 Innovative Features. MaineDOT is utilizing a project delivery method known as the Construction Manager/General Contractor (CM/GC) process, under the provisions of Special Experimental Project No. 14 (SEP-14) for the use of innovative contracting practices.

Although accelerated project delivery is one of the expected benefits of this contracting method, it is the cost reduction, cost containment and cost certainty advantages that make CM/GC the most attractive procurement option for this project. See Section 4.2 for further details.

The CM/GC process has allowed MaineDOT to obtain commitments from PNS to use space on their facility as staging areas. The staging area will be used for storage and pre-assembly activities such as to precast the bridge towers, which will then be floated into place, resulting in a substantial cost and time savings. The State Historic Preservation Offices have participated in the public meetings, helping them to provide timely information. Environmental agencies have been given presentations on using drilled shafts so they can better understand the construction means and methods. The CMGC process is facilitating a collaborative process of back and forth with the regulating agencies, designers and builders and allowing all to provide timely feedback. All of this adds up to schedule and cost reductions and predictability.

The project has been termed a Categorical Exclusion. FHWA is streamlining the review process by allowing NEPA to be conducted concurrent with preliminary design. NEPA is expected to be complete by May 30, 2014. The process has already allowed discussions with the likely contractor and Federal and State fisheries agencies on fish passage and noise, and is leading to optimal construction sequencing and resulting permit conditions. The process has increased the Project Team's confidence in its ability to obtain permits in a timely manner.

Bridge innovation features are listed below and are described more fully in Section 4.2.1. Innovation:

- Bridge Span. A hybrid lift span deck will carry both the rail and highway. Under the normally open position, highway traffic will travel unimpeded. When necessary for passage of a large ship (over 60 feet in height), the bridge deck will rise. When a rail movement occurs, the bridge deck will lower. As a result of the innovative bridge feature, traffic movement and air quality will improve.
- Lift Span Drive. A modified tower drive will be incorporated, utilizing the benefits of a tower drive (protection from the harsh environment) and span drive (service accessibility).
- Roadway Lighting. LED lights will be provided, largely reducing power needs for bridge lighting.
- Lift Power Costs. The higher bridge deck will result in a 64 percent reduction in bridge lifts.

2. PROJECT PARTIES

MaineDOT and NHDOT, along with the Maine and New Hampshire Division Offices of FHWA, are funding partners in the design and construction of SML.

2.1. Grant Recipients

MaineDOT is the Lead Applicant and serves as the administrative lead on the project. NHDOT is the Partnering Agency.

2.2. Other Project Parties

MaineDOT and NHDOT, along the Maine and New Hampshire Division Offices of FHWA , have teamed with a design consultant and general contractor through an innovative Construction Manager/General Contractor (CM/GC) process.

MaineDOT has also included stakeholders who are participating in design development of the SML. Following is a listing of the stakeholders.

Albacore Park, PPMMA
Bicycle Coalition of Maine
Federal Employees Metal Trades Council
Free Flow Energy, Inc.
Greater York Chamber of Commerce
Kittery Area Comprehensive Transportation System (Metropolitan Planning Organization
Kittery, Town of
Kittery Harbor
Maine Environmental Agencies
Maine Historic Preservation Commission
Naval Facilities Engineering Command, PNS
New Hampshire Environmental Agencies
New Hampshire Division of Historic Resources
Oak Terrace Neighborhood
Portsmouth, City of
Port of Portsmouth
Portsmouth Chamber of Commerce
Portsmouth Naval Shipyard
Portsmouth Pilots Association
Pres. Veterans Council
Rockingham Planning Commission
Save our Bridges
Seacoast Greenway
Southern Maine Regional Planning Commission
U.S. Coast Guard

Several public meetings and design charettes have been held to inform the public of design progress and to solicit project input regarding design features of SML.

3. GRANT FUNDS AND SOURCES/USES OF PROJECT FUNDS

3.1 Capital Costs and Funding Agreement

Current project cost targets and those costs attributable to the rail portion of the project are provided in Table 5 below.

Table 5. Summary of Capital Costs

Item	Total Cost	Rail Portion
Pre-TIGER Expenditures		
Preliminary Engineering	$ 13,000,000	N.A.
Right-of-Way	$ 500,000[1]	N.A.
Subtotal	$ 13,500,000	N.A.
Construction		
Lift Span	$ 57,000,000	$ 10,000,000
Vessel Collision System	$ 6,000,000	$ 0
Electrical/Mechanical	$ 23,000,000	$ 1,500,000
Approach Structure	$ 48,000,000	$ 11,500,000
Rail Components	$ 2,000,000	$ 2,000,000
Highway Items	$ 3,000,000	$ 0
Demolition	$ 6,500,000	$ 0
Access	$ 5,000,000	$ 0
Subtotal - Construction	$150,500,000	$ 25,000,000
Construction Engineering	$ 8,000,000	N.A.
Subtotal	**$158,500,000**	**$ 25,000,000**
Total All Project Costs	**$172,000,000**	**$ 25,000,000**

[1] Does not include betterments to New Hampshire Port facilities.

The TIGER Grant request for the rail portion of SML is therefore $25 million.

Preliminary Engineering and Right-of-Way acquisition are under way and are not included in derivation of the construction portion of the project, but Construction Engineering is included. The overall amount for TIGER Grant funding purposes is therefore $158.5 million.

The state shares for Maine and New Hampshire for construction plus construction engineering costs are shared equally between the two states. Their individual and total cost shares are provided in Table 6 below.

Table 6. Maine – New Hampshire Costs Shares by Fund Source				
Fund Source (Construction + CE Only)	**Maine**	**New Hampshire**	**Total**	**Percentage of Total**
TIGER	$12,500,000	$12,500,000	$ 25,000,000	16%
Other Federal	$36,750,000	$61,750,000	$ 98,500,000	62%
Non-Federal	$30,000,000	$ 5,000,000	$ 35,000,000	22%
Total[1]	**$79,250,000**	**$79,250,000**	**$158,500,000**	**100%**

[1] Costs exclude PE and Right-of-Way per TIGER NOFA 2014

3.2 Maintenance and Operations

The Bi-State Bridge Funding Task Force Final Report (December 15, 2010) provided the following recommendations to ensure adequate financial resources would be available to properly operate and maintain both the I-95 High Level Bridge and SML. Highlights of the recommendations follow:

- Create a sinking fund with annual contributions from each State
- Revitalize the Interstate Bridge Authority (IBA) to
  - Extend the IBAs authority to include the I-95 High Level Bridge
  - Serve as the administrator to oversee, manage and distribute monies from a sinking fund for the capital repair and rehabilitation of SML and I-95 High Level Bridge
- IBA members will be selected by each State

Sinking fund amounts will be determined at a later date. To date, Maine has enacted legislation to secure a $30 million non-federal share from the Maine Turnpike Authority. Both states continue to work toward legislation that will implement the IBA sinking fund concept.

Custodial maintenance and operations for all three Portsmouth-Kittery bridges will be performed by the New Hampshire and Maine Departments of Transportation.

4. SELECTION CRITERIA

The following information summarizes the project's ability to meet the TIGER 2014 primary and secondary selection criteria and the results of the benefit-cost analysis. The project is currently in the design phase and construction is expected to begin in late 2014 or early 2015.

4.1. Primary Selection Criteria

The SML replacement project is consistent with all applicable state, regional and local plans that address transportation facilities. SML is Maine's highest priority bridge and New Hampshire's Number 1 "Red List" Bridge. SML will improve the state of good repair, will address important rail, highway and navigational needs and will improve national security. With the exception of the rail portion of SML, all capital funding is in place and mechanisms have been established to ensure the long-term operations and maintenance costs of the bridge will be provided. Additionally, SML will provide an important alternate route to Maine's only interstate connection in the event the I-95 High Level Bridge must be closed for maintenance, accidents, incidents and threats to security of the interstate bridge.

4.1.1. State of Good Repair.

The proposed project will replace the 74-year old Fracture-Critical SML that is classified as structurally deficient and is rated in Poor to Serious Condition. If left unimproved, the bridge will soon have to be closed, even with significantly increased maintenance. The project meets the long-term security needs of the nation by providing necessary rail access to the submarine servicing and repair facility located at the Portsmouth Naval Shipyard (PNS). This important rail connection is critical to national security in that it provides the only rail connection to the national railway system. PNS uses the rail connection to transport spent nuclear fuel from servicing the U.S. Navy's nuclear submarine fleet. PNS employs over 5,300 workers and its estimated economic impact to the region is $1.6 billion per year. The Port of Portsmouth yields an additional $300 million in economic impacts to the region.

SML also serves as the emergency alternate bridge crossing for the I-95/Piscataqua River Bridge (I-95 High Level Bridge). The I-95 High Level Bridge provides the only interstate highway connection between Maine and New Hampshire and is Maine's largest border crossing for trucks. The I-95 High Level Bridge periodically closes due to road incidents, ice, fog and other severe weather conditions, and for suicide and security threats. When the I-95 High-Level Bridge is closed, SML serves as the principal detour route for trucks, as Memorial Bridge cannot efficiently service large commercial vehicles because it is located in downtown Portsmouth and Kittery. Both communities have congested narrow streets with on-street parking and geometrically restrictive intersections that would substantially impede tractor trailer movements. Without SML, the capacity of the I-95 High Level Bridge would be adversely impacted and congestion would increase, especially on summer weekends and holidays. The next nearest alternative detour route for commercial vehicles is 21 miles. Combined, the I-95 High Level Bridge and SML carry 62 percent of Maine's large trucks crossing its State borders and provide over $8.4 billion per year to Maine's economy.

New Hampshire's Piscataqua River businesses rely on marine deliveries of fuel oil, LNG and other materials upstream of SML. The new bridge will provide a safer, wider opening to accommodate existing commercial navigation and the upcoming generation of wider ships. The U.S. Coast Guard requires ship access to be maintained at all times, so in times of bridge lift failures, SML must be left in the open position. This results in major traffic disruptions and delays, and at times adds to congestion on the I-95 High Level Bridge. The added congestion will add vehicle delays on I-95 by 791,000 Vehicle Hours Traveled (VHT) per year by 2035.

The new bridge will dramatically reduce maintenance, power and congestion costs, and air quality will be improved due to a 64 percent reduction in the number of bridge lifts. Navigational safety and efficiency will also improve as a result of the dramatically wider and higher bridge opening clearances. Additionally, the bridge skew to the navigational alignment will be reduced from the existing 25 degrees to 15 degrees. The proposed project will feature redundancy and will be constructed primarily of concrete and metalized steel, thereby essentially eliminating future painting and reducing overall maintenance costs.

The project provides the lowest life-cycle cost of the feasible alternatives available. The ME-NH Connections Study identified three alternatives for SML: (1) bridge rehabilitation with complete replacement of all approach structures, (2) complete replacement and (3) complete replacement with a hybrid bridge set at a higher elevation. Rehabilitation was shown at that time to have the lowest life-cycle cost. However, that alternative would continue to present major safety concerns to navigation. Piscataqua River tidal currents are the 6th highest in the lower 48 states. Also, the current bridge skew to the river channel reduces the effective opening width of the current SML to only 175 feet. These factors present a significant challenge to navigation. At present, the "steering" tugboats at the front of barges and other large ships must disengage because the vessels cannot all fit through the narrow bridge opening. This presents significant potential for large ships to strike the bridge's support towers. Further, there currently is no fender protection system. Bridge rehabilitation would not provide the level of reliability of a new bridge and future maintenance costs would be much higher than the replacement hybrid bridge.

In 2010, the Governors of Maine and New Hampshire established a Bi-State Bridge Funding Task Force to evaluate funding options. That group's Final Report supported the Connections Study recommendations. However, discussions with the U.S. Coast Guard made it clear they did not support maintaining the existing narrow bridge opening due to its hazard to navigation. Additionally, the State of New Hampshire Legislature enacted NH RSA 193:9 requiring a wider bridge opening. Both States have therefore agreed the rehabilitation alternative is not practicable and that a new bridge must be constructed to provide improved navigational clearances.

The Design Team has determined the new SML hybrid will result in reduced operating costs due to a 64 percent reduction in bridge lifts and the hybrid bridge provides the lowest Life-Cycle Cost. Maine and New Hampshire agree the hybrid bridge provides the best overall alternative.

4.1.2. Economic Competitiveness

The proposed project will improve multimodal long-term efficiency, reliability and cost-competitiveness of goods. It will allow for the continued delivery and improved reliability of rail

service needed by the Portsmouth Naval Shipyard to conduct its mission-critical work in servicing and repairing the U.S. Navy's nuclear submarine fleet. It will also improve economic competitiveness of goods shipped both by sea and by commercial vehicles by providing markedly wider and taller bridge opening widths and the 64% reduction in required bridge lifts.

The project will also ensure the economic well-being of the Port of Portsmouth and the upstream businesses utilizing this important shipping lane. The wider bridge lift opening will better support marine traffic to the NH Port of Portsmouth and will increase the Port's competitiveness. According to the Port of Portsmouth Economic Impacts Study Report published by the University of New Hampshire and University of Southern Maine, the total regional impacts of the port-related activities include 2,357 jobs (2,078 in NH and 280 in ME) paying $156 million in income and $274.5 million in value added. In addition, $25 million in state and local taxes are generated as a result of these activities.

As stated previously, the improved rail access will help ensure the viability of PNS, which has an overall economic impact of $1.6 billion per year to the region. PNS alone provides over 5,300 jobs to the regions, most of which are blue-collar jobs, many of which likely would be lost if SML were to close.

The project will yield a benefit-to-cost ratio of 2.5 (at a 3 percent discount rate) and 1.2 (at a 7 percent discount rate). Refer to Section 4.3 for benefit-cost analysis results. The project will provide on average about 100 direct on-project jobs over the 42-month project duration and will yield 1,900 job-years (per the 2011 Council of Economic Advisors estimate of the creation of one job-year for each $76,923 in transportation infrastructure spending).

Table 7. Number of Project On-Site Workers Added

Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
2014				50
2015	100	100	100	150
2016	150	150	150	130
2017	130	120	100	100
2018	60			

4.1.3. Quality of Life

Kittery and Portsmouth have shared a long, historic relationship since the first English settlers arrived in the early 1600s. The Piscataqua River is a tidal estuary with the 6th swiftest current in the lower 48 states, but forms a good natural harbor. The Port of Portsmouth, NH services many ships passing through SML and PNS services the U.S. Navy's nuclear submarine fleet. In addition to its long naval history, the area is also renowned for its outlet stores and shopping malls. Kittery and Portsmouth are closely tied historically, economically and culturally.

The project will improve multimodal access between Kittery and Portsmouth and surrounding communities by providing improved highway, rail and marine transportation opportunities. The new SML will also offer new bicycle access between Maine and New Hampshire along the U.S.

Route 1 Bypass, known for its restaurants, outlet malls and other commercial enterprises. As a result of the new bridge construction, the Town of Kittery is considering adding amenities along the corridor to make it more attractive to businesses and travelers alike. The City of Portsmouth similarly has improvement plans for a riverside park along Market Street in the vicinity of SML.

If SML were permanently closed, the viability of PNS would be threatened, along with its over 5,300 employees. A significant negative regional impact to the regional and local quality of life would likely occur. Highway traffic would divert primarily to the I-95 High Level Bridge and would push traffic demand on I-95 over capacity on certain days, especially in the summer. The redistribution of traffic would increase vehicle-miles traveled (VMT) by over 8.4 million per year and increase vehicle-hours traveled (VHT) by over 1.0 million per year by 2035. Air emissions also would increase. Combined these changes would negatively affect the quality of life for local and regional residents and businesses and continue to do so into the future.

4.1.4. Environmental Sustainability

Substantial savings in energy use and an improvement in air quality will occur with the new bridge. There will be a 64 percent reduction in bridge lifts, resulting in a 68 percent reduction in vehicle delays and associated vehicle idle times. Savings in energy use will also be achieved through the use of LED bridge lighting, more efficient bridge lift equipment and the reduction in the number of required bridge lifts.

Replacement of SML is expected to result in substantial avoided air emissions when compared to the closure of the bridge and the loss of this crossing location. Closure of SML would result in increases in VMT and vehicle idling due to congestion on I-95. SML replacement will save over 4,100 metric tons of carbon dioxide (CO2), 4.0 metric tons of nitrogen oxides (NOX) and 4.0 metric tons of volatile organic compounds (VOCs).

A reduction in the potential for hazardous material spills will also result with SML replacement due the much wider bridge opening width and protective fender systems.

4.1.5. Safety

The new bridge will yield substantial improvements in navigational and highway safety. Navigational safety will be improved by the wider bridge opening and protective fender systems, thereby reducing not only the threat of ships colliding with the bridge support structure, but also in the reduction of potential hazardous material spills that might otherwise occur from a ship striking the rigid piers or bridge lift towers. Highway safety will be improved as a result of the reduced number of bridge lifts, thereby reducing the potential for accidents to occur when traffic stops due to a bridge lift to allow ship passage.

The shoulders on the new bridge will improve safety for vehicular traffic and will allow cyclists to use SML. Bicyclists currently are restricted from using SML.

In comparison to the No-Build alternative, which results in the loss of SML, the new bridge will allow motorists to avoid the additional VMT that would otherwise result. The additional VMT

would add 15 to 17 additional crashes per year, based on MaineDOT's statewide crash rate of 2.01 crashes per Hundred Million Vehicle (HMV) Miles Traveled for the period 2008 through 2010. The estimated annual increased crash costs are $528,425 in 2015, based on MaineDOT's average crash cost rate of $0.072 per VMT.

4.2. Secondary Selection Criteria

4.2.1. Innovation

MaineDOT is utilizing a project delivery method known as the Construction Manager/General Contractor (CM/GC) process, under the provisions of Special Experimental Project No. 14 (SEP-14) for the use of innovative contracting practices. MaineDOT has traditionally used the design-bid-build and the design-build method for constructing highways and bridges. The CM/GC project delivery method has been used for two emergency projects in the past, including the award-winning Penobscot Narrows Bridge which received SEP-14 approval in 2003 under the procurement method moniker "Owner-Facilitated Design-Build". Most recently MaineDOT used CM/GC for the 81-day emergency replacement of two bridges in Carrabassett Valley.

MaineDOT has received the Governor's approval to use CM/GC for the SML project. The CM/GC process allows an owner (represented by MaineDOT) to engage a contractor, known as a Construction Manager, to provide constructability input during the design process. The intent is to form a partnership among the Owner, the Construction Manager, and the Design Consultant. The "Stakeholders Group" is also an integral partner to ensure the bridge design reflects the interests, personality and aesthetics of the community whenever practicable.

Although accelerated project delivery is one of the expected benefits of this contracting method, it is the cost-reduction, cost-containment and cost-certainty advantages that make CM/CG the most attractive procurement option for this project. As a result of early contractor involvement in design, the major elements of cost reduction with CM/GC are:

- Reduces bidding risk, including material cost speculation
- Reduces the potential for design/specification interpretations
- Incorporates the builder's experience (up-front value engineering)
- Allows for discussion of specific construction means and methods with environmental agencies, and expressed environmental concerns can be addressed by adjusting the contractor means and methods to be used
- Allows for an interactive public process to occur by providing opportunities to share up-to-date renderings and allows the design team to estimate the costs of the public's desires with a contractor
- Allows project sequencing to be tailored to the contractor's means and methods
- Allows for consideration of evolving technologies and use of the most cost-effective materials and components as dictated by market conditions
- Reduces the likelihood of claims related to misinterpretations of contract documents
- Allows for contingency reductions through collaboration and negotiation
- Yields a lower design cost due to a reduction in the level of details required

Bridge innovation features include:

- Hybrid Lift Span: The lift span deck is designed to carry both vehicular and rail traffic on one deck surface. Under normal conditions the lift span will rest on a retractable bridge seat at an intermediate height to serve vehicular traffic. When necessary to accommodate passage of a large vessel (over 56' air draft) the lift span will be raised up to a height of 135 feet. When a rail movement is required, the lift span will be lowered to a bottom bridge seat elevation at rail level. The hybrid lift span design will result in approximately 64% fewer bridge movements, significantly reducing power use, machinery wear and delays to vehicular and marine traffic.
- Steel Orthotropic Box Lift Span: The lift span structure will be a steel orthotropic plate box girder. This selection is not typical for lift span structures but will enhance maintainability by exposing less surface area to the elements and providing fewer areas for salt, sand and debris to accumulate. The Design team has taken full advantage of the CM/GC process meeting with fabricators and erectors to discuss efficiency and constructability of the structural steel design details.
- Lift Span Drive: A modified tower drive system will move the span between the three positions (raised, normal, and lower). This concept combines the benefits of traditional span-drive and tower-drive systems. It also provides for ease of maintenance and protection from the elements by locating sensitive bridge machinery within the base of the concrete towers. This innovative technology has been utilized at the Bordeaux Bridge in France and is being refined for the new SML.
- Roadway, Maintenance, and Aesthetic Lighting: Energy efficient LED lighting will be utilized for the project, largely reducing the overall power requirements.

4.2.2. Partnership

Section 2 identifies the Project Parties and stakeholders. This diverse group includes Maine and New Hampshire Departments of Transportation, local Maine and New Hampshire Metropolitan Planning Organizations and Regional Planning Commissions, Town of Kittery, City of Portsmouth, Portsmouth Naval Shipyard, Port of Portsmouth, Portsmouth Pilots Association, Maine and New Hampshire FHWA Division Offices, Maine and New Hampshire environmental and historic agencies, marine-based and other local businesses, interest groups from both states, the Design Consultant/General Contractor and others. This diverse, well-informed group will ensure the project meets the multi-modal transportation needs of both the region and the States.

Maine and New Hampshire are joint applicants. The Maine Department of Transportation is the lead agency and the New Hampshire Department of Transportation is a partnering agency. Each is working with its own State regulators.

4.3. Results of Benefit-Cost Analysis

A benefit-cost analysis was conducted on replacing SML. The analysis looks at the project from the standpoint of society as a whole, and accounts for the net benefits and net costs based on the criteria described in the TIGER 2014 Grant NOFA. The analysis presented here addresses benefits from travel time savings, user costs, crash reduction costs, and emissions reduction. Other non-quantified benefits are discussed qualitatively. The full Benefit-Cost Analysis (BCA)

Narrative can be found in the Appendix together with the Benefit-Cost Analysis spreadsheet. The matrix below summarizes key factors for the analysis.

Table 8. Benefit-Cost Analysis Summary					
Current Status	**Replacement Hybrid Bridge**	**Type of Impacts**	**Population Affected**	**BCA Factors**	**Page Reference in BCA**
The existing bridge is structurally deficient, fracture critical, functionally obsolete, currently posted at 20 tons.	Replace bridge with an innovative structure serving both highway and rail. It will accommodate river navigational concerns by allowing wider ships and having 56 feet of navigational clearance as well as a lift span.	Without the bridge at this location the public would experience detours, delays, increased travel costs and air quality impacts. Necessary rail service to the nearby Naval Shipyard would terminate, cutting its necessary connection to the national rail system to dispose of spent nuclear fuel.	The bridge serves U.S. Route 1 Bypass, a principal arterial serving the regional population. It also serves as the emergency alternate highway route when I-95 must be closed The rail line serves the nearby Portsmouth Naval Shipyard.	Estimated dollar value of increased VMT, VHT.	Page 2
				Crash cost reduction.	Page 3
				Cost of avoided air emissions.	Page 4
				Estimated cost of avoided maintenance.	Page 4

The proposed project is complete replacement with a two-lane hybrid lift span bridge located upstream from the existing bridge costing approximately $172 million.

The annual benefits and costs values were discounted at 3 percent and 7 percent over a 50-year time horizon. Three percent is the most appropriate rate for the analysis because bridges have a very long life, and in addition, the alternate use of funds would be a public expenditure as opposed to a private investment. Refer to the Benefit-Cost Narrative for further details. A summary of the present value of the benefits and costs are listed below. All benefits and costs are based on a 50-year analysis period and are presented as present worth values for a 3 percent and a 7 percent discount rate.

3 percent Discount Rate (all in present worth values)

- Total Benefits of $403.4 million (excludes $1.6 billion/year economic impact of PNS)
- Avoided Air Quality Impacts valued at $7.6 million
- Reduced User Costs estimated at $377.8 million
- Avoided Crash Costs of $15.0 million

- Avoided Maintenance Costs of $15.1 million
- Total Costs of $163.5 million
- Benefit-Cost ratio of 2.5

When discounted at 7 percent, the benefits and costs are lower. A larger discount rate implies that time preference for future amounts are preferentially discounted more severely. The amounts are show below.

7 percent Discount Rate (all in present worth values)

- Total Benefits of $184.1 million
- Avoided Air Quality Impacts valued at $3.7 million
- Reduced User Costs estimated at $177.2 million
- Avoided Crash Costs of $7.9 million
- Avoided Maintenance Costs of $8.1 million
- Total Costs of $153.4 million
- Benefit-Cost ratio of 1.2

5. PROJECT READINESS

MaineDOT and NHDOT are prepared to meet all local, State and federal requirements by fall 2014 and to obligate funds well in advance of June 30, 2016 in accordance with the TIGER 2014 NOFA.

As currently envisioned and subject to permitting agency final approvals, work is expected to begin with two early work packages; (1) Kittery intersection work needed to free up a project lay-down area, and (2) procurement of the counterweight sheaves.

5.1. Technical Feasibility.

The technical feasibility of the project has been considered since the onset of the 2009-2011 ME-NH Connections Study. The project will consist of the removal and complete replacement of all bridge approaches, rail approaches and the Sarah Mildred Long Bridge. Some portions of underwater pier foundations will remain in place as allowed by the U.S. Army Corps of Engineers and U.S. Coast Guard. The bridge is being designed for a 100-year service life. The bridge supports and bridge structure will be constructed of concrete and the bridge lift will be either metalized steel truss or steel box girders. The approach grades will provide a higher lift section elevation to provide 56 feet of vertical clearance. The rail portion will be incorporated into the highway deck at the bridge lift, thereby providing a "hybrid' lift deck. In the normally closed position, the bridge will provide unimpeded vehicular flow. The bridge will lift for larger ships (over 56 feet in above-water height) and will drop for rail service to PNS. The bridge opening will be increased to provide an effective width for ships of at least 250 feet. A fender protection system will be provided at the bridge tower supports. The bridge deck will provide 5-foot shoulders on both sides of the bridge. The shoulders will provide improved vehicular safety as well as bicycle access.

5.2. Financial Feasibility.

MaineDOT and NHDOT have identified each state's capital fund sources and will be ready to obligate federal funds well in advance of the June 30, 2016 date required by the TIGER 2014 NOFA. Each state has successfully administered TIGER Grants and both states have adequate resources to expend TIGER funds effectively and expeditiously in accordance with all Grant requirements.

Basic capital funding categories and fund sources are provided in Section 3. Contingency plans due to project overruns or funding shortfalls will be addressed by each State. Replacement of SML is both Maine's and New Hampshire's highest bridge priority and funding will be obligated to complete the project once TIGER funding is obtained for the as-yet unfunded rail portion of the project.

For further project design details, refer to the complete Design Schedule and Construction Schedule.

5.3. Project Schedule.

MaineDOT has an excellent performance record in maintaining large projects on schedule. Maine was the first State to obligate all American Recovery & Reinvestment Act of 2009 (ARRA) funds. MaineDOT has also completed two large Design/Build projects on schedule and on budget. The proposed project milestones are as follows.

Table 9. Project Milestones	
PDR Report Approved	July 8, 2013
NEPA Complete	May 30, 2014
Obligate Funding (TIGER NOFA 2013)	June 30, 2014
PS&E Complete	June 30, 2014
Right-of-Way Complete	August 29, 2014
Secure All Permits	September 5, 2014
Begin Construction	November 15, 2014
Bridge Open to Traffic	August 1, 2018
Project Complete	December 31, 2018

Upon receipt of TIGER grant notification, MaineDOT and NHDOT will proceed quickly with securing all remaining permits needed prior to construction and funding to ensure any unexpected delays will not put TIGER Discretionary Grant funds at risk of expiring before they are obligated. MaineDOT and NHDOT will ensure TIGER funds are expended steadily and expeditiously once construction begins.

5.4. Assessment of Project Risks and Mitigation Strategies.

Under the CM/GC agreement, the Designer and Contractor are both required to assist MaineDOT in building a risk register. Potential issues have been identified and have already been or are being addressed by the design team and project partners. Conversations have been held with environmental agencies, the U.S. Navy, the U.S. Coast Guard, the U.S. Army Corps of Engineers, Town of Kittery, City of Portsmouth, Port of Portsmouth, Portsmouth Naval Shipyard and other facility users and the general public as part of the current Design Team effort. Design charettes have been held to help guide the innovative bridge design. All of these communication efforts will help minimize the potential for substantial project delays.

By utilizing the Construction Manager/General Contractor (CM/GC) process, the contractor most likely to construct the project has been assisting in the project design to conduct constructability reviews, evaluate innovative materials and methods and share in cost-savings approaches.

5.5. Environmental Approvals

Communication with environmental agencies and interested parties are under way. Following is status of the environmental approvals and permits required for the project.

Table 10. Environmental Approvals and Permits			
Task	**Proposed Submittal**	**Anticipated Approval**	**Actual Approval**
Section 106 effects determination	6/15/2013	8/1/13	3/10/14
Section 106 MOA	9/01/2013	5/30/14	
Section 4(f)	7/1/2013	5/30/14	
Section 7	6/01/2013	9/1/13	9/5/13
Essential Fisheries Habitat	4/30/2014	5/20/14	
NEPA (ME FHWA)	10/1/2013	5/30/14	
U.S. ACOE and State Permits	5/7/2014	9/5/2014	
U.S. Coast Guard Permit	7/16/2014	9/5/2014	

5.5.1 National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) process, including historic and archeological reviews, has been incorporated by FHWA into the Preliminary Design Report process. The project has been classified as a Categorical Exclusion in accordance with 23 CFR 771.117(d)(3). The FHWA Maine Division is the lead on NEPA. NEPA is already under way and no major issues have arisen or are expected to arise. Should any issues come up, both States will work directly with their respective agencies to quickly resolve them. The NEPA process is expected be completed by May 30, 2014. Should any issues arise, there will be ample time for them to be addressed prior to the required TIGER Discretionary Grant obligation date.

5.5.2 U.S. Coast Guard Permit

A U.S. Coast Guard permit will be required to remove existing structures and also to install new structures within the navigable waterway. The permit application is in development and will be submitted soon. The Portsmouth Pilots Association and the U.S. Coast Guard are highly supportive of the proposed project, given that it will dramatically improve navigational safety and efficiency. The Portsmouth Naval Shipyard is also very supportive of the project due to its reliance on the rail connection. The permit application was submitted on August 12, 2013.

5.5.3 Other Federal and State Environmental Permits

A U.S. Army Corps of Engineers permit will be required for work being conducted within waters of the United States. Maine Department of Environmental Protection and New Hampshire Department of Environmental Services permits will also be required. All permit approvals are expected to be received by September 5, 2014.

5.5.4 Historic and Archeological

Section 106 consultation is currently being conducted. National Register eligibility within the Area of Potential Effect (APE) has reached concurrence by both the Maine and New Hampshire State Historic Preservation Officers (SHPOs). The Bridge is eligible for the National Register of Historic Places along with other properties in Maine and New Hampshire. Native American

tribes have been consulted and they have expressed no concerns. Section 106 concurrence and signed Memorandum of Agreements (MOAs) are anticipated from both Maine and New Hampshire SHPOs by May 30, 2014. Any adverse impacts to affected resources will be addressed in coordination with the applicable review agencies.

5.5.5 Section 4(f) of the Department of Transportation Act

Approval under Section 4(f) is currently in progress. SML and several other proximate properties are Section 4(f) resources. Documentation will be provided to the FHWA Maine Division for approval. Approval is anticipated by May 30, 2014.

5.5.6 Endangered Species and Essential Fisheries Habitat

Consultation under Section 7 of the Endangered Species Act is in process with NOAA for the listed Atlantic sturgeon and short-nose sturgeon. The project area is also mapped as Essential Fishery Habitat under Magnusson-Stevens Sustainable Fisheries Act for numerous species. Section 7 was approved on September 5, 2013. The Essential Fish Habitat process is expected to be complete by May 20, 2014.

5.6. Legislative Approvals

5.6.1 State of Maine

The proposed project is currently fully funded for preliminary engineering and right-of-way acquisition, and is partially funded for construction. Upon receipt of a TIGER 2014 Grant, the remaining funding needed to complete Maine's project funding package will be obligated well in advance of June 30, 2016.

5.6.2 State of New Hampshire

The $5 million non-federal portion of the project budget being provided by the State of New Hampshire has been included in the State's approved 2014-2015 Capital Budget. The $61,750,000 is fully funded and programmed in the current update of the state's Ten Year Transportation Improvement Plan. The funding will be obligated well in advance of June 30, 2016.

5.7. State and Local Planning Approvals

The proposed project is included in the applicable Maine and New Hampshire Metropolitan Planning Organizations (MPOs) Transportation Improvement Plans (TIPs) and both Maine and New Hampshire State Transportation Improvement Plans (STIPs). Construction funding will be included in the STIPs prior to August 29, 2014.

5.8. Project Partnership and Implementation Agreements

In addition to the legislative and other written and ongoing commitments and partnership between Lead Applicant MaineDOT and Partnering Agency NHDOT, other project parties are also working in partnership to achieve this important project. An example of these other

partnerships is one between the U.S. Navy and MaineDOT. PNS has offered to provide work and storage facilities, including approximately five acres of real estate for manufacturing bridge components for the SML Bridge replacement project. This partnership will reduce construction costs, offset added costs to the state for including a train rail on the bridge, and reduce future risk to the Navy of executing its critical mission. The existence of this partnership demonstrates the importance of the success of this project to the Navy, the Portsmouth Naval Shipyard and both states.

5.9. Federal Wage Rate Determinations

Maine and New Hampshire Federal Wage Rate Certifications are included in Appendix A.