United States Government Accountability Office

GAO

Report to Congressional Requesters

August 2007

RAILROAD BRIDGES AND TUNNELS

Federal Role in Providing Safety Oversight and Freight Infrastructure Investment Could Be Better Targeted

GAO-07-770

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GAO Accountability · Integrity · Reliability

Highlights

Highlights of GAO-07-770, a report to congressional requesters

Why GAO Did This Study

Freight railroads account for over 40 percent (by weight) of the nation's freight on a privately owned network that was largely built almost 100 years ago and includes over 76,000 railroad bridges and over 800 tunnels. As requested, GAO provides information on this infrastructure, addressing (1) the information that is available on the condition of railroad bridges and tunnels and on their contribution to railroad congestion, (2) the federal role in overseeing railroad bridge and tunnel safety, (3) the current uses of public funds for railroad infrastructure investments, and (4) criteria and a framework for guiding any future federal role in freight infrastructure investments. GAO reviewed federal bridge safety guidelines and reports, conducted site visits, and interviewed federal, state, railroad, and other officials.

What GAO Recommends

GAO recommends that DOT (1) develop a systematic, risk-based methodology for selecting railroads for bridge safety surveys and (2) ensure that its *Framework for a National Freight Policy* identifies national goals, stakeholder roles, and funding mechanisms and revenue sources to maximize the national public benefits of federal freight infrastructure investments. DOT agreed with the first recommendation and said that it would consider the second recommendation.

www.gao.gov/cgi-bin/getrpt?GAO-07-770.

To view the full product, including the scope and methodology, click on the link above. For more information, contact JayEtta Z. Hecker at (202) 512-2834 or heckerj@gao.gov.

What GAO Found

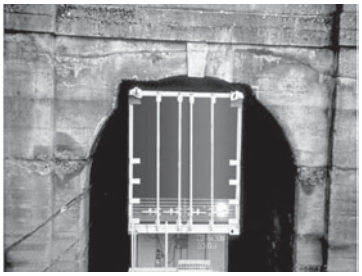
Little information is publicly available on the condition of railroad bridges and tunnels and on their contribution to congestion because the railroads consider this information proprietary and share it with the federal government selectively. Major (Class I) railroads maintain detailed repair and inspection information, while other (Class II and III) railroads vary, from keeping detailed records, to lacking basic condition information. Despite their age, bridges and tunnels are not the main cause of congestion, although some do constrain capacity. Because bridge and tunnel work is costly, railroads typically make other investments to improve mobility first.

The federal role in overseeing the safety of railroad bridges and tunnels is limited because FRA has determined that most railroads are sufficiently ensuring safe conditions. FRA has issued bridge management guidelines, makes structural observations, and may take enforcement actions to address structural problems. However, FRA bridge specialists use their own, not a systematic, consistent, risk-based, methodology to select smaller railroads for safety surveys and therefore may not target the greatest safety threats.

Federal funds are used to meet many different goals, but are not invested under any comprehensive national freight strategy, nor are the public benefits they generate aligned with any such strategy. Some state investments are structured to produce state and local economic and safety benefits, and public-private partnerships have facilitated investments designed to produce public and private benefits.

GAO has identified critical questions that can serve as criteria for reexamining the federal role in freight investments—including railroad bridge and tunnel investments—and a framework for implementing that role that includes identifying national goals, clarifying stakeholder roles, and ensuring that revenue sources and funding mechanisms achieve maximum national public benefits. The Department of Transportation's draft *Framework for a National Freight Policy* takes a step forward, but more is needed to guide the implementation of a federal role in freight transportation investments.

FRA Bridge Safety Survey and Double-Stack Train in Modified Tunnel



Sources: left to right: GAO and BNSF Railway (used with permission).

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Abbreviations

AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ASLRRA	American Short Line and Regional Railroad Association
CBO	Congressional Budget Office
CREATE	Chicago Region Environmental and Transportation Efficiency program
DHS	Department of Homeland Security
DOD	Department of Defense
DOT	Department of Transportation
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
RRIF	Railroad Rehabilitation and Improvement Financing
STRACNET	Strategic Rail Corridor Network
TSA	Transportation Security Administration

GAO
Accountability * Integrity * Reliability

United States Government Accountability Office
Washington, DC 20548

August 6, 2007

The Honorable James L. Oberstar
Chairman
The Honorable John L. Mica
Ranking Republican Member
Committee on Transportation and Infrastructure
House of Representatives

The Honorable Bennie G. Thompson
Chairman
Committee on Homeland Security
House of Representatives

The Honorable Elijah E. Cummings
House of Representatives

Freight railroads have been an important part of the U.S. transportation network for over 150 years and account for over 40 percent of the ton-miles[1] of the intercity freight transported in the United States. Much of the current U.S. freight railroad network was originally built by private corporations in the late 1800s and early 1900s and is still privately owned, including most of the nation's over 76,000 railroad bridges and over 800 railroad tunnels. While many parts of the railroad infrastructure, such as signals and track, have been replaced and upgraded, bridges and tunnels, which are the single most expensive railroad infrastructure components, have not been replaced and are still being used, some long after their originally predicted useful life. In the future, however, with projected increases in railroad traffic and further aging, these expensive components may need replacement, presenting funding challenges to private railroads.

This report responds to your request for information on issues related to bridges and tunnels on the national freight railroad network. Specifically, this report addresses the following questions:

[1]A ton-mile is a standard industry measure that represents 1 ton of freight transported 1 mile.

(1) What information is available on the condition of railroad bridges and tunnels and on the contribution of this infrastructure to railroad network congestion?

(2) What is the federal role in overseeing railroad bridge and tunnel safety?

(3) How are public funds currently used for freight railroad infrastructure capital investments, including those for bridges and tunnels?

(4) What criteria and framework could be used to guide the future federal role, if any, in freight-related capital investments, including those for railroad bridges and tunnels?

Our overall approach to addressing these topics was to (1) review federal legislation, regulations, and guidance; transportation planning literature; and forecasts of future freight railroad demand and capacity from private railroads, public agencies, and industry organizations; (2) interview a wide variety of representatives; and (3) review pertinent documentation from railroads of various sizes; federal, regional, state, and local governments; and industry groups. In particular, we interviewed representatives from six Class I railroads, two Class II railroads, and nine Class III railroads.[2] At the federal and state levels, we interviewed officials from six federal agencies that have some relationship dealing with railroad bridges and tunnels on the freight railroad network—including officials in the Department of Transportation's (DOT) Federal Railroad Administration (FRA), which has primary responsibility for overseeing the safety of the nation's freight railroad network—as well as officials in nine state DOTs. We selected the railroads and the state and local government agencies for interviews to include a cross section of characteristics, including geographic diversity, the presence of noteworthy public-private partnerships between the railroads and government agencies, and state DOTs that actively participated in planning or funding railroad infrastructure projects. We conducted our review from June 2006 through July 2007 in accordance

[2]For 2006, the Surface Transportation Board, a bipartisan, independent adjudicatory agency administratively housed within DOT responsible for resolving railroad rate issues, has defined Class I railroads as railroads earning adjusted annual operating revenues of $319.3 million or more. Class II railroads are those earning between $25.5 million and $319.3 million, and Class III railroads are those earning less than $25.5 million. The scope of this report covers freight railroads of all classes.

with generally accepted government auditing standards. See appendix I for further details about our scope and methodology.

Results in Brief

Little information is publicly available on the condition of railroad bridges and tunnels, and on their contribution to congestion, but private freight railroads collect and maintain this information to varying degrees and use it to set investment priorities. This information will be increasingly important to the railroads as the demand for freight transportation grows, aggravating existing freight railroad congestion problems and further straining the railroads' infrastructure, which includes aging and expensive bridges and tunnels. Class I freight railroads collect and maintain detailed information on the condition of their bridges and tunnels—including inspection reports, condition information, structural ratings, design drawings, and maintenance and repair histories—and on the extent to which these structures contribute to network congestion. Class II and III railroads vary in the amount of information they collect and maintain on their bridges and tunnels, with some maintaining the same level of detailed information as the Class I railroads and others lacking the information needed to produce a complete list of their bridges, having no maintenance records, and keeping inaccurate or incomplete records of inspection, according to our review of FRA records. Freight railroads of all classes view condition and congestion information as proprietary and share it with the federal government selectively; and the government plays a limited role in collecting such information because there are no FRA regulations governing railroad bridges and tunnels. Furthermore, according to FRA's Chief Structural Engineer, the expense of collecting and maintaining the information may not be justified by the potential safety benefits. While most bridges and tunnels are not the main cause of freight railroad congestion, some structures are chokepoints and do constrain capacity. For example, opening a movable bridge operated by a Class I railroad over the Mississippi River for more than an hour during peak periods can delay that railroad's traffic all the way to the West Coast. Freight railroads use bridge and tunnel condition and network congestion information, along with other information, to set investment priorities to generate the greatest private return on their investment. According to several Class I railroad representatives, railroad bridge replacement typically has a lower rate of return on investment, making it more likely that railroads would invest in other enhancements before rehabilitation or replacement of railroad bridges.

The federal role in overseeing railroad bridge and tunnel safety is limited because FRA has determined that railroads responsible for bridges and

tunnels are sufficiently ensuring these structures' stability. Historically, FRA track personnel have provided bridge and tunnel safety oversight. Under the authority originally granted by the Federal Railroad Safety Act of 1970, FRA has the authority to enforce railroad safety; and in the 1970s and early 1980s, FRA had considered issuing bridge safety regulations. However, FRA determined that railroads were already inspecting bridges using industry standards. As a result, in 1995 FRA decided to issue guidelines instead of regulations to guide railroad bridge management programs, and hired bridge specialists to make observations about bridge and tunnel conditions under these guidelines. If FRA identifies a structural concern, it attempts to work cooperatively with the railroad and takes enforcement action only if there is an immediate concern for safety. Other federal agencies, including the Department of Homeland Security's (DHS) Transportation Security Administration (TSA) and the U.S. Coast Guard, also have limited roles in railroad bridge and tunnel safety related to their particular missions. FRA bridge specialists have conducted safety surveys of all seven Class I railroads' bridge management programs and assessed those programs using FRA guidelines. These specialists also conduct 25 to 35 safety surveys per year of Class II and III railroads, covering a small portion of the nation's 549 Class II and III railroads. The specialists use their own criteria to select these railroads. FRA has not established a systematic, consistent risk-based methodology for selecting the Class II and III railroads for bridge safety surveys; and as a result, FRA may not be targeting those whose bridges or tunnels are most likely to present safety risks. We are therefore recommending that FRA implement such a methodology for selecting Class II and III railroads for bridge safety surveys. In commenting on a draft of this report, DOT and FRA officials agreed with the need for a consistent, risk-based selection methodology; and FRA officials noted that it had already begun to implement our recommendation.

Public funds may currently be used for a variety of capital investments in freight railroad infrastructure, including bridges and tunnels, but federal investments are typically not targeted to maximize national public benefits, whereas some state and public-private partnership investments are strategically targeted to achieve specific state, local, and private benefits. Overall, the current federal investment in freight railroad infrastructure is small compared with the railroads' own investment. For example, in calendar year 2006, Class I, II, and III railroads invested an estimated $9 billion in freight railroad infrastructure while the federal government provided an estimated $263 million during fiscal year 2006. A number of federal agencies make federal funding available for freight-related infrastructure projects through different funding mechanisms to

achieve certain transportation goals. However, the extent to which these mechanisms have been used for freight railroad infrastructure is generally limited, and much of the funding has gone for projects that primarily benefit localities or regions, such as railroad-highway grade crossing improvements or infrastructure improvements for Class II and III railroads, rather than projects that would maximize national public benefits, such as capacity-enhancing improvements to bridges and tunnels on major freight routes. DOT has taken an important step toward targeting federal freight-related transportation investments by issuing a draft *Framework for a National Freight Policy*;[3] however, the objectives of this framework are not always clear, and the document does not explicitly identify criteria for federal investment, opportunities to incentivize more private investment, or opportunities to leverage private and other public funds to add freight transportation capacity. At the state level, some states target investments in freight railroad infrastructure to produce various state and local benefits. For example, the Kansas DOT administers a loan program for short line[4] railroads in the state that haul locally produced agricultural products. Public-private partnerships have also facilitated investments designed to produce both public and private benefits. Although the current federal investment in freight railroad infrastructure is relatively small, growing congestion—resulting from the aging of the nation's freight transportation infrastructure and projected increases in demand for freight transportation—is expected to spur calls for a greater federal role in freight transportation, especially greater federal funding for freight-related infrastructure such as expensive railroad bridges and tunnels that constrain capacity on key freight routes. Federal funding is, however, constrained by the nation's long-term fiscal imbalance; and, as we have reported, federal funding mechanisms favor truck and marine transport over railroad transport and distort competition in freight transportation.

In our past work reexamining the federal role in transportation and other policy areas, we identified a number of critical factors and questions—involving the relevance and purpose of the federal role, performance measurement, targeting of benefits, affordability, and cost effectiveness—

[3]DOT, *Framework for a National Freight Policy (Draft)*, (Washington, D.C.: Apr. 10, 2006).

[4]According to the American Short Line and Regional Railroad Association (ASLRRA), short line railroads are generally Class III railroads that are less than 350 miles long or provide switching and/or terminal services.

that could be used as criteria to examine the future federal role in freight-related transportation investments, including investments in railroad bridges and tunnels.[5] These factors underscore the need for a federal role that promotes equitable, mode-neutral investments of scarce federal funds in projects designed to achieve national goals and produce national benefits. While DOT's draft *Framework* represents an important step toward determining the federal role in freight transportation, it lacks several components that we have identified as key to such an approach, including setting national goals for federal investment in freight-related infrastructure across all modes; clearly defining federal and other stakeholder roles; and identifying cost-effective revenue sources and funding mechanisms that can be applied to maximize the national benefits of federal investments.[6] Accordingly, we are recommending that DOT ensure that its draft *Framework* includes clear national goals, establishes roles, and identifies funding mechanisms for federal freight-related infrastructure investments, including freight railroad investments. In commenting on a draft of this report, DOT officials said they are considering this recommendation.

Background

Currently, seven Class I railroads own and maintain over 61,000 bridges and over 800 tunnels, and 40 Class II and 509 Class III railroads own and maintain over 15,000 bridges.[7] According to FRA documents, in 2002, the U.S. railroad network contained approximately one bridge for every 1.4 miles of track. Class I railroads operate on approximately 70 percent of the total route miles in the United States and generate 90 percent of total railroad revenues. Class II and III railroads also play a critical role in the national freight railroad network, serving as feeders to Class I main lines. According to the American Short Line and Regional Railroad Association

[5]GAO, *21st Century Challenges: Reexamining the Base of the Federal Government*, GAO-05-325SP (Washington, D.C.: Feb. 1, 2005) and GAO, *Intercity Passenger Rail: National Policy and Strategies Needed to Maximize Public Benefits from Federal Expenditures*, GAO-07-15 (Washington, D.C.: Nov. 13, 2006).

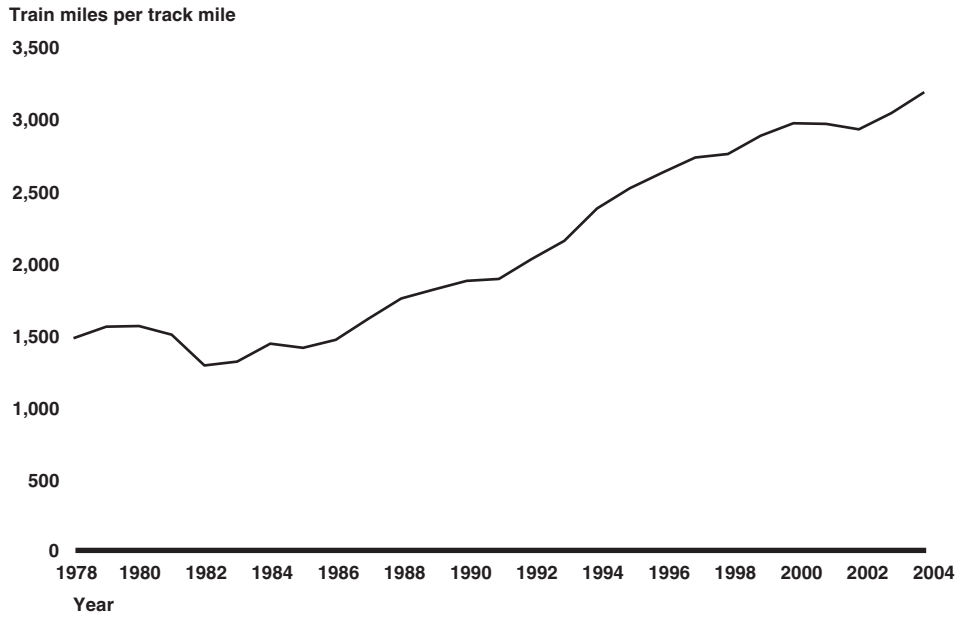
[6]GAO-07-15. GAO, *Intermodal Transportation: Potential Strategies Would Redefine Federal Role in Developing Airport Intermodal Capabilities*, GAO-05-727 (Washington, D.C.: July 26, 2005), pp. 26-27; and GAO, *Marine Transportation: Federal Financing and a Framework for Infrastructure Investments*, GAO-02-1033 (Washington, D.C.: Sept. 9, 2002), p. 17.

[7]ASLRRA does not maintain a precise count of the number of tunnels on Class II and III railroads. The association's General Superintendent of Safety and Operating Practices estimates that there are at least 30 tunnels of or over 100 feet in length on these railroads.

(ASLRRA), Class II and III railroads handle one out of every four carloads moved on the U.S. freight railroad system.

Between 1978 and 2004, railroad traffic on Class I railroads increased dramatically while the number of railroad track miles decreased, as evidenced by an increase in the ratio of train-miles to track-miles (see fig. 1).[8] In addition, freight volumes increased, as evidenced by a 105 percent increase in ton-miles per route-mile[9] since 1990, from 8.63 million in 1990 to 17.70 million in 2005 (see fig. 2). These changes have focused more and heavier traffic over fewer core lines, thereby increasing both the strain on and the importance of key bridges and tunnels, such as those over the Mississippi River and underneath Baltimore.

Figure 1: Annual Train-Miles per Track-Mile for Class I Railroads, 1978 to 2004

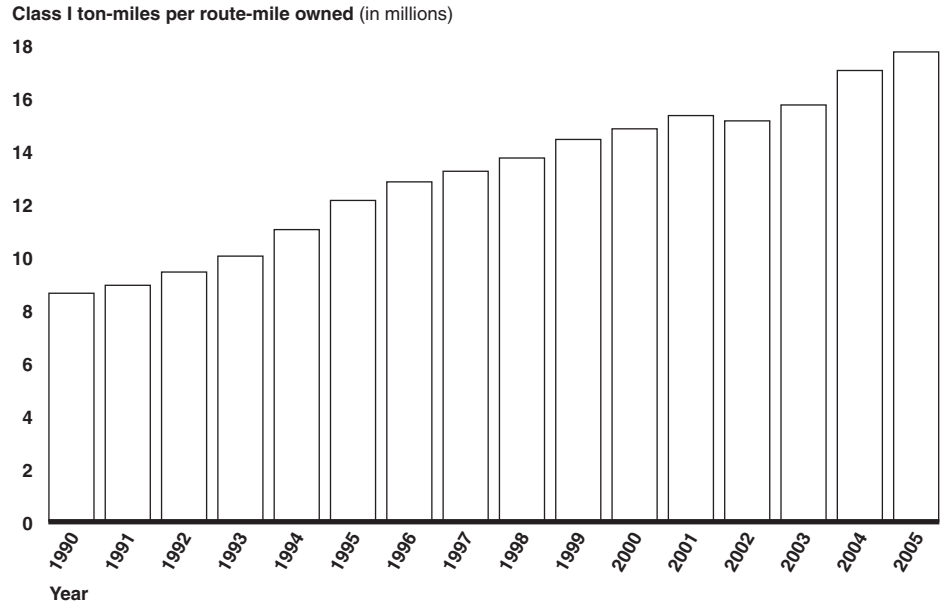


Source: Congressional Budget Office.

[8]A track-mile is equivalent to 1 mile of track, which includes main track, yard tracks, and sidings. A train-mile refers to a train traveling a distance of 1 mile.

[9]A route-mile is the measure of 1 mile of aggregate roadway, which excludes yard tracks and sidings, and does not consider that a mile of roadway may include parallel tracks.

Figure 2: Class I Railroad Annual Ton-Miles per Route-Mile Owned



Source: Association of American Railroads (AAR).

Bridges and tunnels on the freight railroad network are aging and are susceptible to a variety of conditions that may cause wear or deterioration. Railroad bridges are constructed from timber, steel, masonry or concrete, or a combination of these materials. According to an FRA bridge survey completed in 1993, more than half of the nation's railroad bridges were built before 1920.[10] This survey, which FRA's Chief Structural Engineer told us is largely applicable today, found that 36 percent of railroad bridges were made of timber, 32 percent of steel, and 20 percent of masonry; the remaining 12 percent of bridges were not identified by bridge type. Increased weight and traffic can cause fatigue in timber and steel bridges. Timber bridges are also susceptible to decay from weather and insects, and steel bridges near salt water may be susceptible to high rates of corrosion. Masonry bridges are more vulnerable to the effects of time and nature than to the weight of traffic, but reinforced concrete bridges are susceptible to the effects of traffic loads. According to FRA, from 1998

[10]FRA survey results were reported in DOT, Office of Inspector General, *Audit Report: FRA's Interim Statement of Policy on the Safety of Railroad Bridges*, TR-1999-077 (Washington, D.C.: Mar. 31, 1999).

through 2006 a total of 22 train accidents, involving one injury and no fatalities, were attributed to bridge structural failures. The most recent fatality resulting from a bridge structural failure occurred in 1957. Likewise, very few major railroad tunnels have been built within the last 50 years, according to FRA's Chief Structural Engineer, although some have undergone maintenance or capacity expansion in recent years. Some tunnels are driven directly through rock; some are lined with brick or stone masonry, concrete, or timber; and many tunnels include two or more types of construction. Tunnels do not take stress from train traffic in the same way that bridges do, but they are susceptible to drainage issues, and timber-lined tunnels are particularly susceptible to fires. According to FRA, from 1982 through 2006 there were five reportable train accidents whose cause could have been related to the tunnel structure. One of these accidents resulted in two injuries, and none of the accidents resulted in a fatality.

Many railroad bridges and tunnels were designed to have long useful life-spans, but were built for use by different types of trains. Until recent years, stress from locomotives and cars did not exceed the original design loads for bridges. For example, steel bridges built between 1895 and 1916 were engineered for steam locomotives that inflicted greater stress on bridges than today's locomotives. However, because of their increased weight, freight cars are approaching the design load limits of older bridges. Railcar weight standards have increased from 263,000 pounds to 286,000 pounds, and some cars now weigh as much as 315,000 pounds; however, approximately 45 percent of Class II and III railroad lines are not equipped with track capable of handling 286,000 pound cars, according to ASLRRA. In addition, freight cars have increased in height as increased intermodal freight traffic has led to double-stacking intermodal containers on railroad cars. Some bridges and tunnels do not have the clearance needed to accommodate these double-stack intermodal trains.

The majority of the freight railroad network is privately owned, and federal economic regulation of freight railroads has decreased since the federal government deregulated the railroad industry in 1980. All seven Class I railroads are privately owned, and according to ASLRRA, approximately 95 percent of Class II and III railroads are privately owned, with the rest owned by government entities. Private railroads have an incentive to maintain their infrastructure in order to maintain business operations, and most railroads privately finance their infrastructure maintenance and improvement projects.

Railroads invest large amounts in fixed assets such as track, signals, bridges, and tunnels. The Association of American Railroads (AAR) estimates that in calendar year 2006 Class I railroads alone invested over $8 billion in "capital commitments," that is, expenditures for capital projects and operating leases. Compared with other industries, railroads invest a higher percentage of revenue in their infrastructure. For example, in 2000, the average U.S. manufacturer spent 3.7 percent of revenue on capital spending, while railroads spent 17.8 percent—almost five times as much, according to an analysis of U.S. Census data prepared by the American Association of State Highway and Transportation Officials (AASHTO).[11] As railroads take steps to increase their capacity—by increasing the size or weight of railroad cars or by adding track—some of their bridges and tunnels may require alterations. A bridge's configuration and condition dictates weight restrictions, and most bridges and tunnels cannot accommodate the additional track, if needed, without replacement or significant reconstruction. Similarly, the dimensions of some bridges and tunnels restrict railroad car height and width. Because bridges and tunnels are the most expensive pieces of railroad infrastructure, with replacement and construction costs ranging from 11 to 550 times as much per linear foot as regular track, capacity expansion projects involving bridge and tunnel work require significant capital investment.

While the freight railroad industry is projected to grow substantially with expected increases in freight traffic, the industry's ability to fund this projected growth, including making needed capital infrastructure investments in railroad bridges and tunnels, is largely uncertain. For private companies seeking to maximize returns to stakeholders, railroad investment poses a substantial risk. A railroad contemplating an infrastructure investment must be confident that the market demand for that infrastructure will hold up for 30 to 50 years. Furthermore, while railroads own and maintain their own infrastructure, some other modes of transportation, such as the trucking and maritime barge industries, use infrastructure that is owned and maintained by the government, providing them with a competitive price advantage over railroads. We have previously reported that railroad investment is critical to freight mobility and economic growth, and investments in railroad projects can produce public benefits, such as (1) reducing highway congestion, (2) strengthening intermodal connections and the efficiency of the publicly

[11]AASHTO, *Transportation—Invest in America: Freight-Rail Bottom Line Report*, (Washington, D.C.: Jan. 16, 2003).

owned transportation system, and (3) enhancing public safety and the environment.[12] (See the list of related GAO products at the end of this report.) However, even when the public benefits of freight projects may be sufficient to warrant public funding, federal funding mechanisms may not be well tailored to freight projects. Whereas freight projects are frequently intermodal, most federal funding mechanisms are focused on one mode. In addition, freight projects generate private benefits, raising questions about whether and how to provide public support for them.

Little Information Is Publicly Available on Bridge and Tunnel Conditions and Congestion, Although Major Railroads Collect, Maintain, and Use This Information to Prioritize Investments

Major railroads[13] collect and maintain detailed information on the condition of their bridges and tunnels and on the extent to which these structures contribute to network congestion, but less is known about how much information Class II and III railroads collect. Freight railroads generally consider this information proprietary, citing concerns over security and liability, and they selectively share bridge and tunnel information with the government. Meanwhile, the federal government plays a limited role in collecting information on railroad bridges and tunnels because they are privately owned and maintained. In addition, FRA has no regulations or standards for railroad bridges and tunnels; and, in FRA's view, the safety benefits that might accrue from collecting and maintaining information on their condition would not justify the expense. Various other federal agencies collect some information on railroad bridges and tunnels that pertain to their mission. While most bridges and tunnels are not the main cause of freight railroad congestion, some structures are chokepoints and do constrain capacity. Freight railroads set maintenance and investment priorities by considering bridge and tunnel information, together with comparable information on other components of their network infrastructure, and identify those repairs and improvements that will improve safety, provide the highest return on investment, and increase capacity. A bridge or tunnel is likely to cost more to repair—and much more to replace—than other components of railroad infrastructure networks, such as track or signals. As a result, railroads of all classes are more likely to invest in other components sooner and to consider extensive bridge or tunnel repair or replacement as one of their last investment options.

[12]GAO, *High-Risk Series: An Update*, GAO-07-310 (Washington, D.C.: Jan. 31, 2007), pp. 18-19.

[13]Major railroads refers to Class I railroads.

Railroads Collect and Maintain Information on the Condition of Their Bridges and Tunnels to Varying Degrees

Class I railroads, which own over 75 percent of U.S. railroad bridges and over 800 tunnels, maintain detailed information on the condition of their bridges and tunnels and generally have the resources to invest in a robust maintenance and inspection regime; however, less is known about the information Class II and III railroads collect on bridge and tunnel conditions, according to FRA's Chief Structural Engineer. Officials from five of six Class I railroads with whom we spoke said they maintain bridge and tunnel information electronically in databases—including data on location, age, and other characteristics of the structures; inspection reports; condition information, maintenance histories, design drawings or construction documents; and other pertinent information.[14] While Class I railroad bridge departments vary in size, these departments all have in-house bridge inspectors, engineers, and maintenance-of-way crews that conduct inspections, carry out maintenance and repair activities, and may also design and construct bridges. Class I railroads use in-house bridge inspectors to conduct inspections at least once a year on all bridges and tunnels to monitor safety and assess current conditions.[15] For example, one Class I railroad we interviewed has over 100 personnel dedicated to bridge inspections on their network.

According to the limited data we have, Class II and III railroads collect and maintain less information on their bridges and tunnels, and the reliability of the data collected may be poor. Based on our discussions with two Class II and nine Class III railroads, and on the documentation of 43 bridge safety surveys of Class II and III railroads that FRA completed from January 2004 through March 2007,[16] Class II and III railroads collect less information on the condition of their bridges and tunnels, generally contract out bridge and tunnel inspection and repair work, and have less in-house bridge expertise. For example, 18 of the 43 Class II and III railroads reviewed by FRA since January 2004 could not produce some critical documentation related to the safety of their bridges, including past

[14]Officials with whom we spoke from the other Class I railroad said the railroad is converting its paper inspection materials to an online database.

[15]Some Class I railroads inspect a subset of bridges and tunnels more frequently—based on condition, structure type, bridge type, age, or traffic levels—such as requiring an inspection every 6 months for timber trestle bridges and pin-connected steel bridges, because of their increased potential for deterioration.

[16]FRA officials told us that they conduct, on average, about 25 to 35 bridge safety surveys per year of Class II and III railroads, but they retained documentation on only 43 completed bridge safety surveys of Class II and III railroads that they conducted from January 2004 to March 2007.

bridge inspection reports, design documents, or complete bridge inventories. Furthermore, only 16 of 43 Class II and III railroads, surveyed by the FRA inspect their bridges at least once a year. Also, according to FRA officials, many Class II and III railroads lack the in-house bridge expertise to conduct their own bridge inspections and rely instead on outside consultants. For example, according to the 43 FRA bridge safety surveys of Class II and III railroads, 26 of the railroads contracted out bridge inspections, 7 did not conduct bridge inspections, 4 did not mention who conducted the railroad's bridge inspections, 4 conducted inspections in-house, 1 had an informal inspection arrangement, and 1 was found to have no bridges. In addition, 8 bridge safety surveys provided to us by FRA either found inconsistencies between bridge inspection reports and actual bridge conditions or found insufficient detail in inspection reports.

One Class III railroad representative with whom we spoke stated that the true condition of that railroad's bridges, all of which were built by railroads not in existence today, is unknown because the railroad does not have design or construction documents, lacks past maintenance and inspection records, and has never conducted a complete engineering study to determine its bridges' load-carrying capacity. FRA officials stated that, based on the limited data they have, they believe that some Class III railroads do not have the training or experience needed to recognize critical structural deficiencies or even understand the severity and urgency of identified bridge or tunnel defects. However, FRA officials also stated that some Class II and III railroads have very good bridge management practices because they use qualified outside consultants to perform safety and inspection processes.

The Federal Government Does Not Have Comprehensive Data on the Nation's Railroad Bridges and Tunnels

The federal government's efforts to collect data on railroad bridges and tunnels are limited in scope, and the data are not updated regularly. FRA collects railroad traffic information and maintains geographic data on U.S. freight railroad lines; however, this information does not show the location of bridges or tunnels on these routes. FRA maintains records of railroad accident and incident reports, some involving bridges and tunnels, dating back to 1982, but the information collected is limited to accident descriptions, repair costs, structure locations, and information about the train, crew, and track involved in the accidents and does not show bridge or tunnel condition, age, structure type, or design documents. In addition, as part of the Railroad Rehabilitation and Improvement Financing (RRIF)

loan application process,[17] FRA's Office of Railroad Development hires independent engineering firms to verify the condition of the infrastructure and the feasibility of proposed infrastructure improvements. These assessments may provide detailed information on specific railroad infrastructure, including bridges and tunnels; however, the data are limited to the projects submitted in the RRIF loan application process. Furthermore, while FRA collects and updates data on track defects from its track inspections, it collects less information on bridges and tunnels, because the FRA has regulations detailing track standards but only guidelines for bridges.

Although FRA has authority to obtain records related to the safety of railroad operations, including those involving bridges and tunnels, FRA officials expressed concern about the agency becoming a repository for railroad bridge and tunnel data. In addition, FRA's Chief Structural Engineer stated that the expense of collecting and maintaining a comprehensive railroad bridge and tunnel inventory could not be justified from a safety standpoint because railroads already maintain inventories of their own bridges and tunnels, which FRA officials review.

No comprehensive inventory exists on the nation's railroad bridges and tunnels; however, through unrelated initiatives over the years, FRA has obtained some information on bridges and tunnels, although, in some cases, this information has not been updated regularly. For example, in 1993, FRA compiled a list of railroad bridges over navigable waterways based on data from the U.S. Coast Guard. However, the list has not been regularly updated. Other federal agencies collect some information on railroad infrastructure as it pertains to their mission, but this information is not comprehensive or exclusive to railroad structures. This information is mainly collected by Department of Defense (DOD), DHS, TSA, the Coast Guard, the Army Corps of Engineers, and the Environmental Protection Agency and centers on either security or construction permitting functions.

[17]The RRIF program was established by the Transportation Equity Act for the 21st Century (TEA-21) and amended by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users. Under this program, FRA is authorized to provide direct loans and loan guarantees for the acquisition, improvement, or rehabilitation of intermodal or railroad equipment or facilities, including track, rail, bridges, yards, and buildings.

Railroad Bridges and Tunnels Are Aging but Are Not Generally the Main Cause of Freight Railroad Congestion, Although Some Are Chokepoints

While railroad bridges and tunnels are aging, their condition is not the main cause of freight railroad congestion; however, some critical bridges and tunnels are chokepoints on the freight railroad network.[18] According to FRA officials and railroad representatives with whom we spoke, many of these structures are reaching or have exceeded their originally estimated useful life. For example, an FRA bridge survey completed in 1993 found that more than half of the nation's railroad bridges were built before 1920 and, according to FRA's Chief Structural Engineer, very few railroad tunnels have been built within the last 50 years. As a bridge ages, it undergoes natural deterioration, including corrosion, and weather-related stresses. In addition, fatigue may occur in some components of older bridges because of stress resulting from repeated heavy freight train operations. FRA's Chief Structural Engineer told us that, as bridges and other components of railroad infrastructure age and their condition worsens, the railroads may need to increase their investment in inspection, maintenance, and replacement to keep existing railroad lines serviceable. One Class I railroad representative said his railroad has a growing inventory of about 300 to 400 older bridges that are deteriorating and therefore need additional inspections and assessments. Quantifying the future maintenance and replacement needs of the freight railroad network is difficult, since private railroads do not make information on the condition of railroad bridges and tunnels publicly available because of concerns over sharing proprietary information and losing competitive advantage. However, the American Society of Civil Engineers gave railroad infrastructure a "C-" grade in its 2005 assessment of the nation's infrastructure, noting that limited capacity on the freight railroad network has created significant chokepoints and delays.[19]

Although officials at a few railroads with whom we spoke expressed some concerns about the effect of aging bridges on congestion, they were more concerned about the effect of increased train traffic on congestion. Demand for freight railroad capacity has increased over the last decade with some Class I railroads reaching record traffic levels, especially in ethanol, coal, and intermodal traffic. The demand for such capacity is expected to continue increasing. For example, the DOT has projected a 55 percent increase in freight railroad traffic from 2000 to 2020. Increased train traffic places additional stress on existing infrastructure, especially

[18]A chokepoint is a place where there is recurring congestion or delay.

[19]American Society of Civil Engineers, *2005 Report Card for America's Infrastructure* (Washington, D.C.: 2005).

railroad bridges; requires capacity expansion investments in rolling stock, infrastructure, and personnel; and increases congestion on the railroad network.

Class I railroads consider congestion a networkwide problem whereas officials of the Class II and III railroads with whom we spoke said they generally experience congestion around crossings, yards, and interchanges with Class I railroads. Although officials from four of the nine Class II and III railroads with whom we spoke said they currently experience congestion on their entire networks, generally, those railroads were more concerned about upgrading existing infrastructure to handle the heavier railcars and longer trains being demanded by Class I railroads than they were with increasing capacity. The American Short Line and Regional Railroad Association estimates that out of the 48,000 miles of track owned by Class II and III railroads, 20,000 to 25,000 miles need to be upgraded to handle the heavier railcars that are becoming the industry standard. ASLRRA estimated these upgrades would cost $7 billion to $11 billion. Officials at seven of the nine Class II and III railroads with whom we spoke said the railroads had completed or needed to complete track or bridge upgrades to accommodate heavier railcars.

Several factors contribute to congestion on freight railroad networks, including grade crossings and passenger trains, both of which can decrease freight railroad capacity and cause freight train delays. Bridges or tunnels may also cause network congestion. For example, single-track bridges and tunnels constrain capacity on double-track lines, as do low clearances that do not accommodate double-stack intermodal trains, bridges that open for marine traffic,[20] and other structural characteristics such as sharp curves and steep grades that require slower train speeds. Deteriorated bridge and tunnel conditions can also contribute to congestion by requiring reduced train speeds, closures, and increased time out of service for maintenance. Where repairs or improvements to bridges and tunnels may not be financially viable or sufficiently profitable, railroads may institute slow orders or shut down lines and reroute traffic. In some cases, especially for Class III railroads, a bridge or tunnel closure can isolate a shipper and cripple a railroad's entire network.

[20]33 C.F.R. Ch. 1, Part 117. Railroad bridges over navigable waterways are required by law to open for marine traffic.

Although FRA officials estimated that 10 percent or less of freight railroad congestion is attributable to capacity constraints caused by railroad bridges and tunnels, railroad officials whom we spoke with identified some key bridges and tunnels as chokepoints on their networks. For example, one chokepoint is a moveable bridge that is one of only a few bridges across the Mississippi River owned by a Class I railroad. According to railroad officials, during peak periods, the bridge must open up to 15 times per day for river traffic while accommodating between 65 and 70 trains per day. Each opening for river traffic generally takes an average of 25 to 30 minutes, although the bridge is sometimes open for more than an hour, causing train delays as far as the West Coast. In addition, this bridge is closed for routine maintenance for over an hour several times a week. Another chokepoint is the 1.7 mile Howard Street Tunnel (see fig. 3), constructed in 1895 under downtown Baltimore, Maryland, which is the largest and most expensive obstacle to transporting double-stack railcars from Baltimore to Chicago. The tunnel regularly causes passenger and freight train delays in the Baltimore area and beyond because it is a single-track tunnel with insufficient clearance for double-stack railcars on a double-track main line. Grades in and curves near the Howard Street tunnel also contribute to congestion, constraining freight traffic to 25 miles per hour through the tunnel. In addition, during a fire in the tunnel in 2001, freight traffic was rerouted, resulting in 18- to 36-hour delays.

Figure 3: Howard Street Tunnel (Baltimore, Maryland) West entrance (left) and East entrance

Source: GAO.

Railroads Use Condition and Congestion Information with Other Information to Prioritize Investment, Including Projects Designed to Address Deterioration and Congestion

Freight railroad officials with whom we spoke consider information on bridge and tunnel conditions and congestion, along with information on demand, cost, and other factors, to set infrastructure maintenance and investment priorities. According to all of the Class I railroad officials with whom we spoke, maintaining or increasing safety is one of their highest investment priorities, along with return on investment. Hence, most Class I railroad officials with whom we spoke said the railroads consider immediate safety concerns first, ongoing maintenance and asset replacement next, and capacity expansion last when prioritizing bridge and tunnel projects.

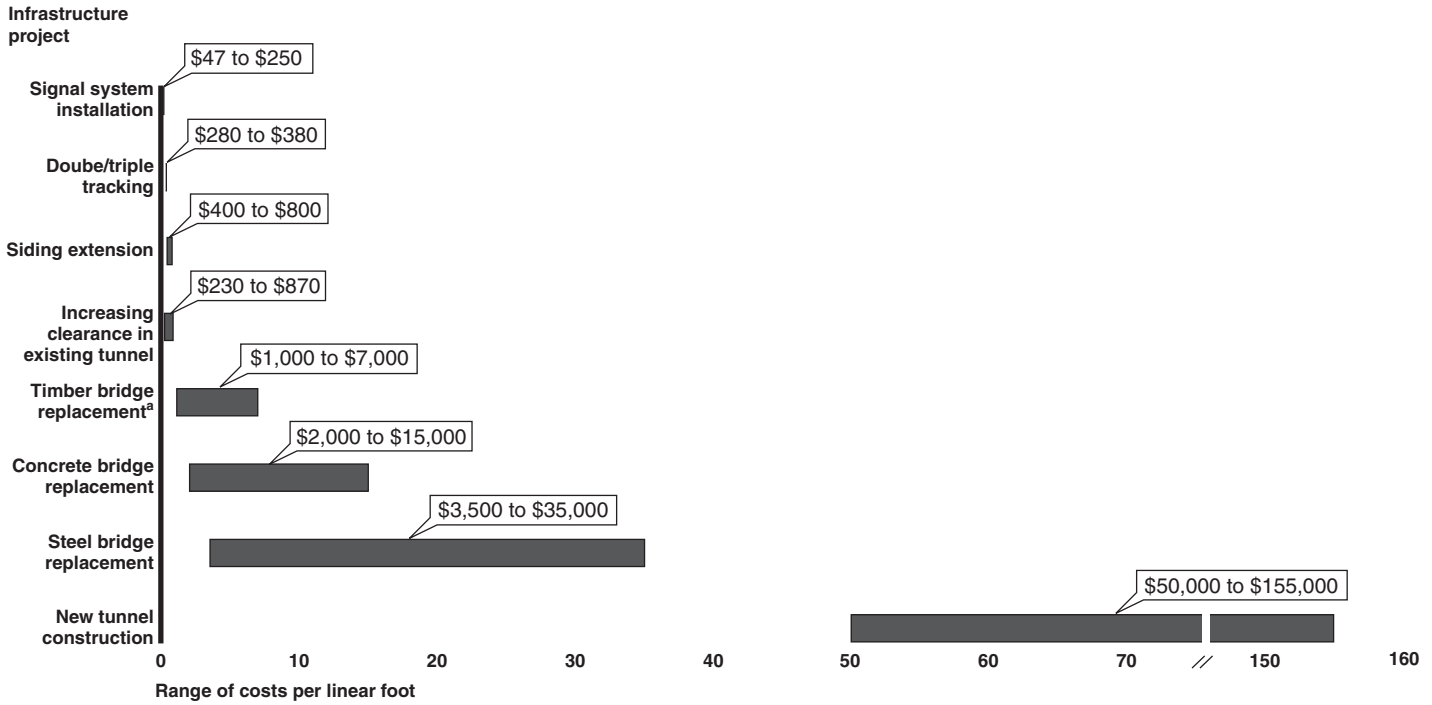
Bridge and tunnel rehabilitation or replacement is expensive, and the costs are highly variable, depending on the complexity of the structure's design, the length and location of the structure, the construction materials, and the type of replacement structure. The cost of replacing a bridge can range from $600,000 for a small timber trestle bridge on a lightly trafficked Class III railroad line to $100 million to replace a large steel bridge with a 2,500-foot moveable span located on a Class I railroad's main line. See appendix II for more examples of railroad bridge and tunnel costs. Because replacement costs are high, railroads prefer to use asset extension programs and replace components rather than replacing entire structures to address deterioration and extend the useful life of their bridges and

tunnels. Often, an individual component of a bridge may deteriorate faster than other components; therefore, replacing the component could significantly extend the life of the entire bridge.

Bridge and tunnel replacement is typically one of the last options railroads choose to address infrastructure deterioration and mitigate congestion. Railroads typically try to improve their processes before enhancing infrastructure to mitigate congestion. Process improvements and other strategies generally cost less and are more cost effective than infrastructure enhancements. Class I railroads have used a number of process improvements to mitigate congestion, including updating their operating plans to reflect changes in business volume and traffic mix, increasing train lengths and the number of fully loaded cars per train, double-stacking trains, decreasing car cycle times, increasing service, hiring more train crews, and using pricing strategies to shape demand.

When process improvements can no longer reduce congestion, railroads use infrastructure enhancements to expand the capacity of their networks. Infrastructure enhancements include adding sidings or track, expanding yards and terminals, upgrading signal systems, and rehabilitating or replacing bridges and tunnels. Per linear foot, bridge and tunnel replacement costs more than other infrastructure improvements, as shown in figure 4. Moreover, according to several Class I railroad representatives with whom we spoke, bridge replacement typically has a lower return on investment than other infrastructure improvements. Consequently, railroads invest in other enhancements before rehabilitating or replacing bridges.

Figure 4: Range of Railroad Infrastructure Improvement Costs (Dollars in thousands per linear foot)



Source: GAO analysis based on interviews with railroad and industry association officials and estimates from other rail infrastructure studies.

[a]Generally timber bridges are not being replaced with another timber bridge, but rather they are being replaced by either culverts or bridges with concrete and steel components. The low-end example represents a timber bridge replaced by a culvert and the high-end example represents a timber bridge replaced by a steel and concrete structure.

While bridge and tunnel work is expensive for all freight railroads, railroads vary in their ability to make these investments. Class I railroads generally have more resources than Class II and III railroads to invest in bridge and tunnel inspection, maintenance, rehabilitation, and replacement. According to AAR, in 2006, the seven Class I railroads spent an average of $1.2 billion each for capital investments, while all the Class II and III railroads surveyed by ASLRRA spent an average of over $795,000 each in 2004. Class II and, to a greater extent, Class III railroads face challenges in funding bridge and tunnel rehabilitation or replacement efforts because they may have limited funds, lack in-house bridge and tunnel expertise, and own bridges and tunnels purchased from Class I railroads on lines that those railroads had disinvested in. When repairs or improvements to bridges or tunnels are not financially feasible for Class II or III railroads, the railroads may instead modify their operations—by, for

example, reducing train speeds over bridges or in tunnels. According to ASLRRA, some railroads may even stop operating on routes when bridge or tunnel repairs are both unavoidable and unaffordable. As a result, according to FRA officials, fewer serious problems are found on bridges and in tunnels owned by Class I railroads than on bridges or in tunnels owned by smaller railroads. Nonetheless, in response to several accidents caused by bridge failures, near accidents involving bridges, and results from its bridge safety surveys, FRA is developing a formal rail safety advisory on railroad bridges, to be released in late 2007, that will urge all railroads to increase their attention on bridge safety and bridge management programs.

The Federal Role in Overseeing Railroad Bridge and Tunnel Safety Is Limited

Freight railroads are responsible for the structural safety of their bridges and tunnels; moreover, the federal government does not regulate railroad bridge and tunnel inspection requirements or conditions. In 1995, after determining that railroads were already inspecting bridges according to detailed industry standards, FRA decided to issue advisory guidelines for railroad bridge management instead of regulations. Because FRA has general authority over railroad infrastructure safety, it may make observations of and assess bridge and tunnel conditions, but it does not routinely inspect these structures to monitor their condition. FRA bridge specialists may make observations while investigating complaints, following up on track inspectors' concerns, and conducting bridge safety surveys. If an FRA bridge specialist determines that there is a safety problem, FRA attempts to work cooperatively with the railroad to correct the problem rather than shut down the railroad's operations. FRA has taken enforcement action to protect public safety when there is a documented problem of immediate concern over a structure's stability. Other federal agencies also have limited roles in railroad bridge and tunnel safety. FRA's bridge safety oversight has evolved; however, bridge specialists individually apply different criteria in their selection of railroads for bridge safety surveys. FRA has not established a systematic, consistent risk-based approach to selecting Class II and III railroads for bridge safety surveys. As a result, FRA may not be selecting the railroads whose bridges or tunnels are most likely to present safety issues.

Federal Railroad Bridge and Tunnel Safety Efforts Are Limited Because FRA Has Determined That Railroads Are Sufficiently Ensuring Structural Stability

Historically, the federal role in railroad bridge and tunnel safety has been narrow. The federal government does not routinely inspect railroad bridges or tunnels and does not regulate their condition. After a highway bridge collapsed in 1967, Congress debated instituting bridge inspection standards that would apply to railroad bridges, but railroads were already inspecting their bridges according to their established industry standards. In 1968, Congress required national inspection standards for highway bridges; however, current law does not regulate railroad bridge conditions or establish inspection standards. Under the authority originally granted to it by the Railroad Safety Act of 1970[21] to issue safety regulations as necessary, from 1975 to 1981 FRA considered establishing bridge safety regulations based on industry standards created by the American Railway Engineering and Maintenance of Way Association. However, according to FRA, these standards are actually recommendations for a thorough bridge management program, including very detailed specifications for particular types of bridges, rather than minimum inspection standards. In light of the industry's detailed safety standards and the low frequency of accidents caused by structural conditions on bridges or in tunnels, FRA determined that regulating bridge or tunnel structural conditions or requiring inspections would not be cost-effective to FRA when considering the cost of implementation and enforcement. Additionally, while establishing minimum standards might improve some railroads' structural management policies and procedures, it could also influence some railroads to reduce the frequency or effectiveness of their inspections.

FRA observes and assesses bridge and tunnel conditions, but does not inspect these structures to regulate their condition. Although FRA does not regulate bridge and tunnel conditions, it does regulate track conditions, and it uses track inspectors, as well as bridge specialists, to identify potential bridge and tunnel safety issues. Historically, FRA track personnel have overseen bridge and tunnel safety.[22] Under the authority originally granted by the Federal Railroad Safety Act of 1970, an FRA track inspector may take action to address a structural concern identified on a bridge or in a tunnel, such as a visible crack in a steel beam, to ensure the

[21]The Federal Railroad Safety Act of 1970 has been codified at 49 U.S.C. Chapter 201. Applicable civil and criminal penalties are found at 49 U.S.C. Chapter 213.

[22]Prior to 1981, regional track engineers oversaw bridges and tunnels, but by 1982 FRA had reclassified these employees as safety specialists. Engineering qualifications are not required for this revised role, and incoming safety specialists sometimes lacked the bridge and tunnel knowledge of the previous regional track engineers.

safety of the public and railroad employees. Additionally, in 1992, FRA's Office of Safety established the position of Bridge Engineer (currently filled by FRA's Chief Structural Engineer) to assist track personnel in identifying and resolving issues of bridge structural integrity and to oversee standards regulating the safety of railroad bridge workers.[23] After completing a bridge survey in 1993, FRA concluded that most railroads were inspecting bridges to a higher standard than would be required by any FRA-issued minimum standards, which prompted FRA to issue guidelines for bridge management rather than regulations. In 1995, FRA began implementing these guidelines as part of its Bridge Safety Assurance Program. FRA has hired five full-time bridge specialists since 2000 to implement this program.[24] These specialists provide expertise to track personnel and work with them to relieve some of the track personnel's inspection workload related to railroad structures as well as carry out other activities to promote bridge safety. Besides the Chief Structural Engineer, the program now includes one bridge specialist at FRA headquarters[25] and four bridge specialists in the field. Each field bridge specialist is responsible for all of the passenger and freight railroad infrastructure in two FRA regions and one or two Class I railroads (whose infrastructure usually spans multiple FRA regions). In addition to addressing bridge structural concerns, FRA bridge specialists address tunnel structural concerns. However, FRA's involvement in tunnels is not as extensive as its involvement in bridges, since bridges are more affected by stress from trains moving over them than tunnels are from trains moving through them.[26] In addition, there are many more railroad bridges in the United States than there are tunnels.

[23]49 C.F.R. §§214.101-214.117. Bridge worker safety regulations include provisions such as requirements for railroads to provide personal protective equipment and for railroad workers to use fall protection systems when necessary.

[24]FRA also has a position for a second Structural Engineer in the Office of Safety Headquarters. The position has been vacant for several months, and FRA is presently recruiting a successor.

[25]The bridge specialist at FRA headquarters is not assigned to particular railroads or regions. The specialist works with field specialists on larger investigations that require two or more persons. The specialist also coordinates complaint investigations and other issues that come through FRA headquarters, and conducts training for bridge specialists and FRA track and signal inspectors.

[26]The forces caused by the weight and movement of a train through a tunnel are distributed through the supporting bedrock or stable ground. By contrast, individual bridge components experience direct stress from a passing train. Therefore, bridges are more subject to degradation from heavier loads than are tunnels.

In observing bridge conditions, FRA bridge specialists use FRA advisory guidelines for railroad bridge management programs.[27] These guidelines recommend, among other things, that organizations responsible for the safety of a bridge ensure that a qualified engineer determines the weight-bearing capability of a bridge; collect bridge design, construction, maintenance, and repair records; and have a competent inspector periodically inspect structures. The guidelines do not pertain to tunnels or other types of structures on railroad property. FRA encourages, but does not require, that railroads comply with these guidelines because the railroads are responsible for inspecting, maintaining, and ensuring the safety of bridges and tunnels that carry their track. However, when a bridge or tunnel owner fails to resolve a structural problem, FRA can use legal means, including emergency orders, to ensure safety.[28]

Federal Enforcement of Bridge and Tunnel Structural Safety Is Primarily Limited to Addressing Immediate Safety Concerns

FRA is the primary federal agency responsible for overseeing the safety and structural integrity of railroad bridges and tunnels. FRA bridge specialists perform both enforcement and nonregulatory activities aimed at ensuring the safety of railroad structures. Other federal agencies have more limited roles in railroad bridge and tunnel safety related to their particular missions.

FRA bridge specialists play a number of roles[29] intended to promote bridge and tunnel safety, most of which involve responding to identified safety issues. One of their principal roles is to alert FRA's Chief Structural Engineer when they encounter an immediate bridge or tunnel safety concern so that an emergency order may be issued if necessary. These safety concerns may be identified in response to a track inspector's findings, in response to an accident or a complaint, or through independent observation of a railroad's bridges or tunnels. Each bridge specialist has numerous safety responsibilities as part of the Bridge Safety Assurance Program. In particular, the FRA bridge specialists are involved in the following activities:

[27]FRA's bridge inspection guidelines, issued in 2000, can be found in the Statement of Agency Policy on the Safety of Railroad Bridges 49 C.F.R. §213, app. C.

[28]49 C.F.R. §§216.21 – 216.27.

[29]FRA bridge specialists also have the authority to enforce FRA track safety standards and bridge worker safety regulations.

- *Enforcement*. If a bridge specialist notices a track defect on or near a bridge or tunnel, the specialist typically first recommends remedial actions, such as a reduction in train speeds over the affected track segment. If conditions warrant, the FRA Administrator may issue an emergency order. However, FRA prefers to seek cooperative solutions with railroads and has issued only three emergency orders for bridges and none for tunnels since 1970.

- *Accident Investigation*. When an accident occurs on a bridge or in a tunnel, one or more bridge specialists may conduct an on-site investigation. In the case of a bridge or tunnel structural failure, the bridge specialist may identify the individual component that caused the failure, although the entire structure may need to be replaced after the accident (see fig. 5).

Figure 5: Structural Failure of a Bridge in Mississippi

Source: FRA.

- *Complaint Investigation*. Bridge specialists are responsible for addressing and investigating almost all formal complaints concerning bridges and tunnels filed by the general public, Members of Congress, and railroad employees. According to FRA, most formal bridge complaints from the public are related to aesthetic issues rather than the stability or safety of a structure. Bridge specialists may also conduct structural evaluations in response to

concerns identified by FRA track personnel or as part of a complaint investigation.

- *Monitoring Compliance Agreements*. In response to systemic safety concerns that FRA identifies on a railroad through the bridge specialists' or track personnel's activities, FRA may work with the railroad to implement a compliance agreement to improve safety across the entire railroad. FRA often initiates a compliance agreement to avoid issuing an emergency order for the railroad to cease operations on a bridge. FRA has found that compliance agreements can be an effective tool to address systemic weaknesses in a railroad's bridge management practices, while emergency orders usually address serious safety problems on specific bridge structures.

- *Training*. At FRA conferences, the bridge specialists teach FRA track inspectors about bridge conditions. This training supports communication between FRA track staff and bridge specialists and is designed to increase the number of FRA personnel that can detect immediate safety concerns on bridges.

- *Conducting Bridge Safety Surveys*. During a bridge safety survey, a bridge specialist interviews railroad bridge staff and uses FRA guidelines as criteria for reviewing a railroad's bridge management policies, procedures, and records. After reviewing the railroad's records and policies, the bridge specialist observes a sample of the railroad's bridges and compares the results of the sample observation with the railroad's bridge inspection reports to determine the inspection reports' reliability. The bridge specialist documents the findings and follows up with the railroad to document any necessary repairs to structures or improvements to bridge management procedures.

Besides FRA, several federal agencies have responsibilities related to railroad bridges and tunnels in areas such as security and clearance for maritime traffic. Within DHS, TSA has issued freight railroad security action items in cooperation with the railroad industry, but compliance with these action items is voluntary. Much as FRA monitors compliance with its guidelines, TSA security inspectors assess a railroad's compliance with TSA's action items and may make recommendations if the railroad does not comply with certain items. Additionally, TSA issued a proposed rule in December 2006 that would require freight railroads and other transportation entities to allow TSA and DHS to enter, inspect, and test property, facilities, and records relevant to railroad security. Also within

DHS, the U.S. Coast Guard is responsible for overseeing all bridges over navigable waterways and for assessing obstructions to maritime traffic. The Coast Guard regulates movable bridge schedules and prescribes bridge lighting for navigational safety. Within the DOD, the Transportation Engineering Agency designates STRACNET, a network of railroad lines that form the minimum railroad network required to meet the transportation needs of the military. The Transportation Engineering Agency does not directly oversee the condition of bridges or tunnels on this network.

FRA Is Not Using a Systematic, Consistent, Risk-Based Methodology to Target Bridge Safety Surveys to Class II and III Railroads

FRA's field bridge specialists monitor bridges and tunnels in a large area and have not been able to assess the bridge policies or the bridges and tunnels of many of the Class II or Class III railroads in the specialists' assigned areas. Furthermore, as previously discussed, the railroads share information on the condition of their bridges and tunnels with the federal government selectively. As a result, the structural conditions of some bridges and tunnels and the practices used to inspect and maintain them, particularly on Class III railroads, are largely unknown to the federal government. According to ASLRRA, there are 549 Class II and III railroads in the United States. Although FRA has conducted bridge safety surveys on all of the Class I railroads, FRA officials estimate that they have conducted, on average, approximately 25 to 35 bridge safety surveys per year on Class II and III railroads since the introduction of the field bridge specialists in 2004. As we mentioned earlier, our analysis of FRA's completed bridge safety surveys during this period showed that some of the surveyed Class II and III railroads had sound bridge management practices and records, but most did not. The limited number of bridge safety surveys that the FRA bridge specialists have been able to accomplish relative to the number of Class II and III railroads could indicate potential bridge and tunnel safety concerns on railroads that FRA has not surveyed.

According to FRA, the goal of the Bridge Safety Assurance Program is not to monitor all railroads, but rather to identify railroads whose bridge management policies and bridge conditions may lead to safety threats. However, the FRA bridge specialists do not select Class II and III railroads for bridge safety surveys using a consistent methodology based on a comprehensive, prioritized assessment of safety issues that could focus FRA's inspection and enforcement resources on those railroads that could have the greatest safety risks. Each field bridge specialist uses individually developed criteria, based on personal experience and other available information--such as whether a railroad's bridges carry passenger traffic--

to help identify Class II and III railroads as candidates for bridge safety surveys. This is in contrast to how FRA implements its National Inspection Plan to target inspections of other railroad safety areas. This plan provides guidance to each FRA regional office on how its inspectors should divide their work, by railroad and by state, on the basis of trend analyses of available accident, inspection, and other data. Before implementing this plan, FRA had a less structured, less consistent, and less data driven approach to planning inspections, under which each region prepared its own inspection plan, on the basis of judgments and available data. The use of data was not consistent from region to region, and individual inspectors had greater discretion to select sites for inspection using their own knowledge of their inspection territories.

In our previous work, we have noted that risk management can help to improve safety by systematically identifying and assessing risks associated with various safety hazards, prioritizing them so that resources may be allocated to address the highest risk first, and ensuring that the most appropriate alternatives to prevent or mitigate the effects of hazards are designed and implemented.[30] FRA's safety oversight role in other areas, such as operating practices and track, includes inspections that focus on compliance with minimum standards; however, these inspections do not attempt to determine how well railroads are managing safety risks on their systems. In contrast, by examining how railroads manage safety risks during its bridge safety surveys, FRA is, in part, addressing risk-management issues, even though it has not established a systematic, risk-based methodology to select Class II and III railroads that may need additional oversight. For example, one bridge specialist is contacting all Class III railroads in one region to obtain specific information on their bridge management policies, such as whether a railroad has regular inspections by a qualified civil engineer and how the railroad records and uses the bridge inspection data, to better identify railroads for bridge safety surveys. Additionally, FRA's Chief Structural Engineer is considering a research project that would use new technology to measure the stress trains inflict on timber bridges. If this project were implemented, FRA would analyze stress data that might indicate bridge problems and a need for monitoring problematic bridges.

[30]GAO, *Rail Safety: The Federal Railroad Administration Is Taking Steps to Better Target Its Oversight, but Assessment of Results Is Needed to Determine Impact*, GAO-07-149 (Washington, D.C.: Jan. 26, 2007), p. 35.

Federal Investments in Freight Railroad Infrastructure Are Typically Not Targeted to Maximize National Benefits, Whereas Some State and Private Investments Are Strategically Targeted

Federal, state, and local governments make limited investments in freight railroad infrastructure, including bridges and tunnels, in an effort to enhance the public benefits associated with freight and passenger transportation. However, federal investments in all modes of freight-related infrastructure are not aligned with a national freight policy or with a strategic federal freight transportation plan. DOT has developed a draft *Framework for a National Freight Policy*, but it lacks a strategic federal component that specifies federal goals, roles, and revenue sources and funding mechanisms. In contrast, some states structure their investments in freight railroad infrastructure to produce public benefits at the state and local levels, and some public-private partnerships have facilitated investments designed to produce public and private benefits. Freight congestion and demand are expected to increase, and given the highly constrained fiscal environment, the federal government may be challenged to increase the efficiency of the national multimodal freight transportation system.

Federal Funding for Freight Railroad Infrastructure Is Not Guided by a National Freight Strategy and Is Generally Not Targeted to Maximize National Benefits

While the private sector is largely responsible for investing in the freight railroad infrastructure that it owns and maintains—an estimated $9 billion during calendar year 2006—the federal government invests some public funds in this infrastructure as well—an estimated $263 million during fiscal year 2006. The federal government funds freight railroad infrastructure investments through the General Fund and the Highway Trust Fund, and funding mechanisms include loans, grants (such as formula grants and legislative earmarks), and tax expenditures (such as tax credits). However, these funding mechanisms are (1) targeted toward individual transportation modes and address different transportation safety and economic issues, (2) are administered by different agencies that have different missions, and (3) are not coordinated by a strategic federal multimodal freight transportation policy to maximize specific national public freight transportation benefits[31] (see table 1). For example, in accordance with its mission to protect maritime economic interests, the U.S. Coast Guard administers the Truman-Hobbs program to alter railroad

[31]Potential public benefits of public investment in freight railroad transportation include supporting economic development, enhancing transportation system efficiency, improving mobility and decreasing congestion, improving the environment and air quality, and enhancing safety and security. On a national scale, these benefits could accrue to regions of national interest whose freight flows impact multiple states, large urban areas, and international gateways.

and highway bridges that obstruct maritime traffic (see fig. 6).[32] While this program can enhance maritime, railroad, and highway freight mobility, it is targeted toward maritime traffic and is not coordinated with other DOT freight mobility investments.

Table 1: Examples of Federal Funding Mechanisms That Support Freight Railroad Infrastructure

Funding mechanism	Revenue source	Example	Federal agency
Loan	General Fund	RRIF loans can be used by railroads, state and local governments, and other entities to finance certain activities such as track and bridge rehabilitation.	FRA
Grant[a]	General Fund	The Truman-Hobbs program funds the alteration of railroad and highway bridges that are deemed hazards to maritime navigation.	U.S. Coast Guard
	Highway Trust Fund	Legislative earmarks have been used to fund federally designated Projects of National and Regional Significance that include railroad components, such as the Heartland Corridor Project, which will increase tunnel clearances to accommodate double-stacked trains.	Federal Highway Administration
Tax expenditure	General Fund revenue forgone	The Railroad Track Maintenance Credit is available to Class II and III railroads for 50 percent of their qualified track maintenance expenses during a taxable year.	Internal Revenue Service

Source: GAO analysis of programmatic and fiscal year 2006 financial data from FHWA, FRA, U.S. Coast Guard, and the Joint Committee on Taxation.

[a]Examples of other federal grant programs that also fund, to some extent, freight railroad infrastructure investments include High Priority Projects, Congestion Mitigation and Air Quality, Transportation Improvements, Public Lands Highways, and Railway-Highway Crossings (Section 130).

[32]33 C.F.R. §§116.01. Alterations may include structural changes, replacement, or removal of a bridge.

Figure 6: Barge Navigating through the Narrow Channel of a Moveable Railroad Bridge Eligible for Truman-Hobbs Funding on the Mississippi River in Iowa

Source: GAO.

Today's federal investments in freight railroad infrastructure are not guided by a clear federal freight strategy. In 2006, DOT attempted to move beyond the traditional modal approach to freight transportation by developing a draft *Framework for a National Freight Policy*, which, among other things, incorporates some previously established federal freight railroad infrastructure funding mechanisms. Although this draft *Framework* represents an important step toward developing a national intermodal freight transportation policy, it does not go far enough, in our view, toward delineating a clear federal role and strategy for carrying out that policy. DOT describes its draft *Framework* as a living document and emphasizes that the nation's freight transportation challenges are of such a nature and magnitude that governments at all levels and the private sector must work together to address them. We agree, and we note that as the draft *Framework* evolves, DOT and other stakeholders will have an opportunity to clarify their respective freight strategies.

As we have reported, the federal approach to a given transportation strategy should include clearly and consistently defined goals, roles, revenue sources, and funding mechanisms to ensure that federal

investments in the nation's intermodal freight transportation infrastructure will maximize national public benefits.[33] DOT's draft *Framework* sets forth some "objectives" for freight transportation, together with strategies and tactics for achieving them; acknowledges that a variety of public and private stakeholders play important roles in freight transportation; and identifies some funding mechanisms and other tools that the federal government can use to support freight infrastructure. However, in some instances, these objectives are vague, and federal and other stakeholders' roles and funding mechanisms are not clearly and consistently defined. For example, one DOT draft *Framework* objective is to "add physical capacity to the freight transportation system in places where investment makes economic sense," with supporting strategies and tactics that include focusing on facilitating regionally based solutions for freight gateways and projects of national or regional significance and utilizing and promoting new and expanded financing tools, such as RRIF, to incentivize private sector investment. To implement this objective, DOT would need to define "economic sense" and develop criteria—as the draft *Framework* says—to identify specific freight gateways and projects of national or regional significance; and determine whether federal revenues should be used to help subsidize any project components and, if so, which federal funding mechanisms would be most appropriate.

As we have also reported, federal investments should be directed to maximize national public benefits. Allocating benefits and their costs among beneficiaries is difficult[34] and may be subject to interpretation. Hence, it will be important for DOT to define national benefits and to establish criteria for determining whether federal investments are warranted. DOT's draft *Framework* suggests, but does not explicitly identify as such, certain criteria for federal investment, such as a project's national or regional significance, opportunities to incentivize more private investment in transportation infrastructure, and opportunities to leverage private and other public funds to add freight transportation capacity.

Without a federal freight strategy, the existing federal freight funding mechanisms are not designed to maximize national public benefits. For example, although all railroads may apply for RRIF loans, the only freight

[33]GAO-02-1033, p. 17 and GAO-07-15, p. 90.

[34]GAO, *Highway and Transit Investments: Options for Improving Information on Projects' Benefits and Costs and Increasing Accountability for Results*, GAO-05-172 (Washington, D.C.: Jan. 24, 2005).

railroads that have been awarded loans have been Class II and III railroads, whose operations tend to be more regional and local. Also, the Federal Highway Administration's (FHWA) Section 130 grant program mainly benefits localities by improving or eliminating railroad-highway grade crossings and the public safety benefits of the program are more local than national. Benefits from the Truman-Hobbs program's investments directly accrue primarily to private maritime shipping and secondarily to railroad companies by improving each mode's infrastructure, thereby enhancing the efficiency of freight transportation. On the other hand, depending on the project, legislative earmarks can generate public and private benefits that could be national, regional, and local in scope; however, these projects do not compete for funding against other alternatives. For example, through the Projects of National and Regional Significance program, Congress earmarked funds to support the Chicago Region Environmental and Transportation Efficiency (CREATE) project, which is mainly designed to reduce railroad congestion in the nation's largest railroad hub[35]—the effects of which, among other things, could improve the mobility of the national freight railroad network, improve local commuter railroad service, and reduce railroad-highway grade crossing hazards and congestion. Finally, Class II and III railroads can use the Railroad Track Maintenance Credit—a tax credit—to offset capital investment expenditures, but as previously stated, individual Class II and III railroad operations tend to benefit the private and local sectors more than the nation as a whole.

Some State Investments in Freight Railroad Infrastructure Are Targeted to Achieve State and Local Benefits

In contrast to the federal government, some states that invest in freight railroads administer various goal-oriented and criteria-based programs that are funded through a mixture of state and federal resources specifically to produce anticipated state and local benefits. Some states have been helping short line railroads maintain track in their jurisdictions for almost 20 years. For example, the Tennessee DOT provides approximately $8 million in grants annually to 18 of 20 Class III railroads in the state to fund track and bridge work, including bridge inspections and rehabilitation projects. As we have previously reported, governments at all levels—including states—have increasingly been providing support for freight railroad improvement projects that offer potential public benefits, and over 30 states have published freight plans that describe their

[35]One-third of all freight railroad traffic in the United States originates, terminates, or passes through the Chicago area.

goals and approach to freight-related investments.[36] The scope of state-administered freight railroad programs includes railroad infrastructure improvements, construction of intermodal facilities, elimination of public railroad-highway grade crossings, and inspection of bridges. For example, the Pennsylvania DOT administers a matching grant program—funded at $10.5 million as of October 2006—to support freight railroad maintenance and construction costs; and eligible recipients include freight railroads, transportation organizations, municipalities, municipal authorities, and other eligible users of freight railroad infrastructure.

Officials from three of the nine state DOTs whom we interviewed are developing and implementing multimodal freight policies. However, such initiatives may be limited by state and federal funding criteria that restrict most state transportation spending to highway infrastructure. As we have reported, efforts to improve freight mobility are hampered by the highly compartmentalized structure and funding of federal transportation programs—often by transportation mode—that gives state and local transportation agencies little incentive to systematically compare the trade-offs between investing in different transportation alternatives to meet mobility needs because funding is tied to certain programs or types of projects.[37] Officials from several state agencies and oversight organizations whom we interviewed stated that funding available for freight projects, regardless of mode, would be more useful than "stovepiped" funding that would be available only for investment in certain transportation modes.

Officials at six of the state agencies and oversight organizations whom we interviewed administer freight railroad programs that have identified programmatic goals, eligibility criteria, and funding sources aimed at generating state and local benefits. For example, officials from the Kansas DOT told us that the goals of its loan program for local and regional railroads are to improve railroad lines, enhance railroads' customer service to shippers, limit the number of trucks on highways, and increase

[36]GAO, *Freight Railroads: Industry Health Has Improved, but Concerns about Competition and Capacity Should Be Addressed*, GAO-07-94 (Washington, D.C.: Oct. 6, 2006), p. 59.

[37]For example, while passenger and freight travel occurs on all modes, federal funding and planning requirements focus largely on highways and transit, making it difficult for freight projects to be integrated into the transportation system. See GAO, *Freight Transportation: Short Sea Shipping Option Shows Importance of Systematic Approach to Public Investment Decisions*, GAO-05-768 (Washington, D.C.: July 29, 2005), p. 35.

state and local economic vitality by transporting local agricultural products. While officials from some state agencies that we interviewed acknowledged that public benefits are difficult to quantify for any public investments, six state agencies and oversight organizations we interviewed were trying to quantify them. For example, the Kansas DOT sponsored a study which found that the short line railroad system saves the state an estimated $49 million annually in pavement damage costs.

The scope of state freight railroad programs may be either broad, including infrastructure investments of all kinds for railroads of all sizes, or narrow, focusing on eligible projects and award recipients. For example, the Pennsylvania DOT has two broad grant programs for freight railroads and shippers, both of which may be used to fund maintenance and new construction projects. In contrast, the Tennessee DOT makes funds available specifically to Class III railroads by allocating funds for track and bridge rehabilitation. State freight railroad initiatives have supported investments in track rehabilitation and other infrastructure improvements, railroad acquisition and line preservation assistance, intermodal facility construction and increased industrial access to railroads, and road and railroad-highway crossing safety enhancements.

Some of the state entities we interviewed reported using a number of funding mechanisms for their freight railroad programs. Specifically, 6 of the 12 said they provide grants and long-term below-market rate loans, and one state reported issuing tax-exempt bonds. Some of these states require that entities applying for loans or grants secure matching funds. States fund freight railroad programs through state general funds, user fees, federal Section 130 and other grants, and other sources. Some states have taken an innovative approach to funding freight railroad infrastructure. For example, Tennessee created a user-fee based Transportation Equity Fund to support investments in nonhighway infrastructure, including short line freight railroad track and bridge rehabilitation. The fund is financed through the revenue from state sales taxes on diesel fuel paid by railroad, air, and water transportation modes; and the portion available for the Tennessee Short Line Railroad Rehabilitation Track and Bridge grant program is typically $7 million to $8 million annually. The program's purpose is to preserve freight railroad service and thereby contribute to the state's economic development. Construction grants are funded at a 90 percent state and 10 percent local (nonstate) matching share. Each grant can be matched with in-kind work, cash contributions or both.

Public-Private Partnerships Have Supported Some Freight Railroad Investments Designed to Produce Both Public and Private Benefits

States, localities, and railroads have used public-private partnerships as a strategic approach to develop freight-related transportation solutions that benefit both sectors.[38] In using this approach to resolve freight issues, public and private participants of the partnerships we reviewed identified common goals, individual roles, and funding sources and mechanisms, which have affected partnership outcomes. In some cases, these partnerships have supported railroad bridge and tunnel projects. A well-structured partnership balances the various strengths, limitations, and respective contributions of both the public sector—federal, state, local, and regional—and private sector participants in order to secure specific public and private freight-related benefits.

Both the public and the private sectors have initiated freight railroad public-private partnerships. For example, according to AASHTO representatives we interviewed, in 2002 the Delaware DOT approached a Class I railroad to reopen the Shellpot Bridge, which had been out of service since 1994. The state associated the abandonment of this bridge with increased congestion on the Northeast Corridor and saw it as a threat to the competitiveness of the Port of Wilmington in attracting freight traffic. The state and the railroad jointly developed the project's goals, roles, and funding mechanisms. The state agreed to finance the approximately $13.5 million cost of restoring the bridge by contributing $5 million in state grant appropriations and funding the remainder by issuing tax-exempt bonds. The railroad agreed to compensate the state over a 20-year period by paying a fee for each train car that uses the bridge. In another public-private partnership, members of the Kansas City Terminal Railway Company[39]and their project designer approached the state of Missouri and the Unified Government of Kansas City/Wyandotte County, Kansas, to propose assisting in financing the construction of two flyovers and the rehabilitation of a bridge. The purpose of these three infrastructure improvement projects was to separate freight trains from different railroads at several points where they came together to form what amounted to four-way stops for trains in the Kansas City region and caused a significant chokepoint on the U.S. freight railroad network (see

[38]For purposes of this report, a public-private partnership is a strategy that public and private entities mutually agree to use to implement a specific freight railroad project or group of projects. Some representatives of state DOTs and railroads told us that they consider any investment that is supported by public and private funds, such as a grade crossing or siding project, to be a public-private partnership.

[39]The Kansas City Terminal Railway Company is made up of four Class I and one Class II railroads that meet in Kansas City, Missouri.

fig. 7). The railroads had already determined the goals of their proposed public-private partnership and came to the bargaining table with proposed roles and funding mechanisms. The railroads acknowledged that they could pursue the project using strictly private market resources; however, a wholly private project would have taken longer to complete. The state and county saw value in relieving their communities of the grade-crossing congestion this chokepoint caused, determined the project risk was acceptable, and each agreed to issue tax-exempt bonds that totaled over $190 million, which will be repaid by the railroads through user fees. In both the Delaware and Kansas City cases, the entities that initiated the partnership brought well-defined goals, identified stakeholder roles, and guaranteed a set amount of funding to the public-private partnership over a period of years.

Figure 7: Kansas City Flyovers

Sources: BNSF (used with permission) and GAO (digitally altered).

Public-private partnerships can make funds available and define goals and roles for all stakeholders for large, expensive freight railroad projects when it is difficult for a public or private entity to fund the entire project on its own, or when a project is not part of a railroad's strategic plan, but would be beneficial to a locality's or a region's quality of life. For example,

public and private players bring various strengths and limitations to the partnerships. The private sector often can bring a more global view of freight needs to the project planning process, help identify and implement projects, contribute significant funds, and promote efficient use of infrastructure. The public sector can offer various public financing tools, such as low-interest loans and private activity bonds,[40] to create incentives for private investments in freight railroads that would not otherwise be made and to generate anticipated public benefits.

Public-private partnerships also present certain challenges. As we heard from both public and private freight railroad stakeholders, the extent to which the public sector can engage the private sector, identify anticipated public benefits from railroad investments, and provide funding that is commensurate with those benefits, affects partnership outcomes. Our past work has shown that an integral part of public-private partnerships is ensuring that sound analytical approaches are being applied locally and meaningful data are available, not only to evaluate and prioritize infrastructure investments but also to determine whether public support is justified in light of a wide array of social and economic costs and benefits.[41] Moreover, as private entities that own most of the nation's railroad infrastructure, freight railroads typically have not worked with the public sector because of concerns about the requirements and regulations associated with federal funding.[42] These railroads need to be convinced that a proposed infrastructure project will yield financial returns for the company. Still another challenge is to reconcile the lengthy planning and construction time associated with public infrastructure projects with the shorter planning and investment horizons of private companies.

[40]Qualified private activity bonds are tax-exempt bonds issued by a state or local government, the proceeds of which are used for a defined qualified purpose by an entity other than the government issuing the bonds.

[41]GAO, *Freight Transportation: Strategies Needed to Address Planning and Financing Limitations*, GAO-04-165 (Washington, D.C.: Dec. 19, 2003), p. 5.

[42]GAO, *Surface Transportation: Many Factors Affect Investment Decisions*, GAO-04-744 (Washington, D.C.: June 30, 2004), p. 32.

Growing Freight Congestion and Demands May Challenge the Federal Government to Strategically Invest Limited Funds to Maximize National Public Benefits

Overcoming congestion and improving mobility is one of the biggest transportation challenges facing the nation. Congestion increases delays and creates economic losses that cost Americans roughly $200 billion a year, according to DOT estimates.[43] As we have previously reported, increases in freight traffic on all modes over the next 10 to 15 years are expected to put greater strain on ports, highways, airports, and railroads.[44] In addition, we have found that this increase in freight transportation demand seems to be particularly acute on highways, since trucks transport over 70 percent of all freight tonnage nationally and freight truck traffic on urban highways more than doubled from 1993 through 2001. The increased congestion, coupled with long lead times for completing infrastructure projects (5 to 15 years), may put pressure on all stakeholders, including the federal government, to find other more effective investments to increase freight mobility.

Increasing the capacity of the nation's freight railroad network could be one way to meet future growth in freight transportation demand. However, as mentioned previously, aging railroad bridges and tunnels present physical constraints to meeting this projected increased demand for freight railroad transportation on key routes, thereby constraining capacity. For example, as we previously mentioned, 100-year-old bridges and tunnels that are currently in use—such as the moveable bridge over the Mississippi River and the Howard Street Tunnel in Baltimore—create chokepoints on the freight railroad network due to their operating conditions or outdated design. Currently, freight railroads are investing billions of dollars in freight railroad infrastructure to increase capacity, but because they invest in projects that will maintain or increase safety or provide the highest return on its investment, other investments may take priority over their most expensive pieces of infrastructure, bridges and tunnels. In addition, we have found that the railroads' long-term ability to meet the projected growth in demand for freight railroad transportation is uncertain, which may increase pressure for public investment in private railroad infrastructure.

As we have previously reported, Congress is likely to receive further requests for funding and face additional decisions about how to invest in

[43]GAO, *Performance and Accountability: Transportation Challenges Facing Congress and the DOT*, GAO-07-545T (Washington, D.C.: Mar. 6, 2007), p. 7.

[44]GAO-07-545T, p. 11.

the nation's freight railroad infrastructure.[45] However, Congress's ability to respond to these requests may be limited by (1) federal funding constraints and increased demand for infrastructure investment in other transportation modes, (2) differences in federal funding for different transportation modes, and (3) the lack of a strategic federal freight transportation plan to guide federal investments in freight transportation infrastructure.

Revenue from current federal transportation sources may not be sustainable. Because revenue from traditional transportation funding mechanisms such as the Highway Trust Fund may not keep pace with the increase in transportation demand, we designated transportation financing as a high-risk area in January 2007.[46] The recently enacted transportation funding authorization, the Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU), is expected to outstrip the growth in trust fund receipts. As a result, the Department of the Treasury and the Congressional Budget Office (CBO) are forecasting that the trust fund balance will steadily decline and be negative by the end of fiscal year 2011. In addition, the nation's long-term fiscal challenges will constrain decision makers' ability to use other funding mechanisms, such as grants and tax expenditures, for transportation needs.

Differences in federal funding for different transportation modes have created a competitive disadvantage for freight railroads. Because the federal government has an interest in an efficient national freight transportation system, the federal role in freight transportation needs to recognize that the freight transportation system encompasses many modes that operate in a competitive marketplace and are owned, funded, and operated by both the private and the public sectors. However, current federal transportation policy treats each freight transportation mode differently, thereby creating competitive advantages for some modes over others. For example, trucking companies and barges use infrastructure that is owned and maintained by the government, while railroads use infrastructure that they pay taxes on, own, and maintain. Trucking and barge companies pay fees and taxes for the government-funded infrastructure they use, but their payments generally do not cover the costs they impose on highways and waterways. The federal subsidy that

[45]GAO-07-94, p. 5.

[46]GAO-07-310, p. 16.

makes up the difference between the government's costs and users' payments gives trucking and barge companies a competitive advantage over the railroads.[47] CBO has observed that if all modes do not pay their full costs, the result is inefficient use of roads and waterways and greater government spending than otherwise would be necessary if capacity investments are made in anticipation of demand that does not occur.

Examining Critical Questions and Implementing a Framework That Identifies Goals, Stakeholder Roles, Revenue Sources, and Funding Mechanisms Could Guide a Federal Role in Freight-Related Infrastructure Investments

As noted earlier in this report, the federal government lacks a strategic freight transportation plan to guide its involvement in freight-related capital infrastructure investments. DOT's draft *Framework for a National Freight Policy* represents an initial step toward such a plan, but it assumes a federal role without indicating whether federal involvement is appropriate or, when appropriate, what the goals of federal investment should be, what specific roles the federal government and other stakeholders should play, and what federal revenue sources and funding mechanisms should be used to support freight-related investments. As we have previously reported, critical factors and questions can be used as criteria for determining the appropriateness of a federal role and a framework with components that we believe would be helpful in guiding any future federal freight-related investments. Implementing this GAO framework would include setting national goals for federal investment in freight-related infrastructure, clearly defining federal and other stakeholder roles, and identifying sustainable revenue sources and cost-effective funding mechanisms that can be applied to maximize the national public benefits of federal investments.

GAO's Critical Questions and Framework Could Guide Future Federal Investment in Freight-Related Infrastructure

In light of the federal government's long-term fiscal imbalance, it is important for federal policy makers to determine how the federal government can support efficient, mode-neutral, transparent, and sustainable investments in freight-related infrastructure. In our report on 21st century challenges facing the federal government, we defined critical factors and questions that are useful as criteria for determining the appropriate federal role in a government program, policy, function, or

[47] GAO-07-94, p. 62.

activity.[48] These critical factors and questions are designed to address the legislative basis for a program, its purpose and continued relevance, its effectiveness in achieving goals and outcomes, its efficiency and targeting, its affordability and sustainability, and its management. The factors and questions can be used as criteria for determining the appropriateness of federal involvement in freight-related transportation, including freight railroad projects, as shown in table 2.

Table 2: GAO's Critical Factors and Questions for Determining the Appropriateness of a Federal Role in Freight-Related Transportation

Factors	Questions
Relevance and purpose of the federal role	Are some freight transportation issues of nationwide interest? If so, is a federal role warranted based on the likely failure of private markets or state and local governments to address underlying freight problems or concerns? Does current federal involvement in freight infrastructure encourage or discourage the private and other public sectors from investing their own resources to address the problem?
Measuring success	Do current federal funding mechanisms and programs for freight-related infrastructure have outcome-based performance measures and are all applicable costs and benefits considered?
Targeting benefits	Are current funding mechanisms for freight-related infrastructure targeted to generate national benefits in areas with the greatest needs and the least capacity to meet those needs?
Affordability and cost effectiveness	Do current revenue sources and funding mechanisms for federal freight-related infrastructure encourage state and local governments and the private sector to invest their own resources? Are these revenue sources sustainable and are the funding mechanisms affordable in the long term? Do these funding mechanisms use the most cost-effective or net beneficial approaches when compared with other tools and program designs?

Source: GAO.

If federal policy makers determine that there is an appropriate role for the federal government in freight infrastructure investments, including those related to railroads, the implementation of that role should have several components. From our past work on transportation investment—in such areas as intercity passenger rail, intermodal transportation, and marine transportation—we have defined a systematic framework that can also guide the implementation of any future federal role in freight-related infrastructure investments.[49] Our framework's components include setting

[48]GAO, *21st Century Challenges: Reexamining the Base of the Federal Government*, GAO-05-325SP (Washington, D.C.: Feb. 1, 2005), p. 14.

[49]See GAO-07-15, p. 90; GAO-05-727, pp. 26-27; and GAO-02-1033, p. 17.

national goals, establishing clear stakeholder roles, and providing sustainable funding (see table 3).

Table 3: Three Components of GAO's Framework Applied to Federal Involvement in Freight-Related Infrastructure Investments

Component	Description
Set national *goals*.	These goals, which would establish what federal participation in the freight transportation system is designed to accomplish, should be specific, measurable, achievable, and outcome-based.
Establish and clearly define stakeholder *roles*, especially the federal role relative to the roles of state and local governments and private railroads.	The federal government is one of many stakeholders involved in freight-related investments, including those involving freight railroads. Others include state and local governments, port authorities, shippers, and the railroads themselves. Given the broad range of beneficiaries, it is important to gain consensus on what the transportation system is to achieve and to help ensure that the federal role does not negatively affect the participation or role of other stakeholders.
Determine which *revenue sources* and *funding mechanisms* will maximize the impact of any federal expenditures and investment.	This component can help expand the ability to provide funding resources and to promote cost-sharing responsibilities. Given the current budgetary environment and the long-range fiscal challenges confronting the nation, federal funding for future freight-related transportation projects, including those involving freight railroads, will require a high level of justification and should be prioritized to maximize national public benefits.

Source: GAO.

In conjunction with GAO's framework, it would also be important to evaluate freight investments periodically to determine the extent to which expected benefits are being realized. Evaluations also create opportunities for periodically reexamining established goals, stakeholder roles, and funding approaches, and provide a basis for modifying them as necessary.[50] In addition, evaluations help to ensure accountability and provide incentives for achieving results. Encouraging or requiring the identification of all project costs and of all parties who will bear the costs can help ensure that the costs are apportioned among all stakeholders equitably.[51] Leading private and public organizations that we have studied

[50]GAO-07-15, p. 90.

[51]One commonly used definition of the term "equitable" is the principle that beneficiaries should pay for project costs, commensurate with the benefits they receive from projects. However, in some cases, the combined private and public benefits may substantially exceed the combined costs. For example, if the cost of a project is $100 million, and private benefits are $80 million and public benefits are $80 million, then in this case, an equitable public sharing of the cost could be 80 percent private and 20 percent public, which would not displace private investments that would have occurred in the absence of public funding. See GAO-05-768, p. 31.

in the past have stressed the importance of developing performance measures and then linking investment decisions and their expected outcomes to overall strategic goals and objectives.[52]

Goals of a Future Federal Role in Freight-Related Infrastructure Investment Should Be Structured to Maximize National Benefits

The first component of GAO's framework for guiding the federal role in freight-related infrastructure investment is a set of clearly defined national goals.[53] Such goals can help chart a clear direction, establish priorities among competing demands, and specify the desired results of any federal investment. Since many stakeholders are involved in the freight transportation system, the achievement of national goals for the system hinges on the federal government's ability to forge effective partnerships with nonfederal entities. Decision makers need to balance national goals with the unique needs and interests of all nonfederal stakeholders in order to leverage the resources and capabilities of state and local governments and the private sector. National goals should be structured in a way that allows for reliably estimating and comparing national public benefits and national public costs. As we have previously reported,[54] quantifying public benefits can be difficult, yet an effort should be made to determine that the anticipated public benefits are sufficient to justify the proposed levels of public investment.[55] For example, at the state level, the Pennsylvania DOT evaluates and justifies freight railroad investments, in part, by estimating the wear and tear imposed by trucks on highways.

The primary goal of federal investments in freight infrastructure should be to maximize the national public benefits of the investments. One way to focus these goals could be through federally designated Projects of National and Regional Significance, a program that has been designed to address critical national economic and transportation needs and has funded highway and railroad infrastructure projects. For example, one goal could be to improve intermodal freight mobility—which encompasses air, railroad, water, and highway facilities and infrastructure—at designated ports of national significance that serve multistate regions and/or large populations.

[52]GAO-07-15, p. 90.

[53]GAO, *Marine Transportation: Federal Financing and a Framework for Infrastructure Investments*, GAO-02-1033 (Washington, D.C.: Sept. 9, 2002), p. 18.

[54]GAO-04-744, p. 22.

[55]GAO-04-165, p. 40.

Federal policy makers and other stakeholders could define their respective roles in many different ways once the goals for the federal role in freight transportation infrastructure have been established. However, the key elements in defining the federal and other stakeholder roles would be to create incentives for collaboration, secure benefits, and promote equity for all stakeholders, both public and private, that invest in freight-related infrastructure projects. Defining these elements is especially important for the federal role in freight railroad infrastructure investments because, while most of that infrastructure is privately owned, investments to improve safety and increase capacity may benefit stakeholders at all levels (national, regional, state, local and private sector).

Public and Private Stakeholder Roles for Future Involvement in Freight-Related Infrastructure Investments Should Be Clearly Defined

In our prior work, we have found that, in defining stakeholder roles, it is important to match capabilities and resources with appropriate goals.[56] This is important for federal participation because other stakeholders may want to emphasize other priorities and use federal funds in ways that may not achieve national public benefits. This can happen if other stakeholders seek to (1) transfer a previously local function to the federal arena or (2) use federal funds to reduce their traditional levels of commitment. One aim of federal participation in infrastructure investments is to promote or supplement expenditures that would not occur without federal funding—to avoid substituting federal funding for funding that would otherwise have been provided by private or other public investors.[57]

Further refinements to DOT's draft *Framework* could help to define stakeholder roles in two ways, first by acknowledging that the interests of federal, state, and local entities may compete, and second by recognizing where public and private sector interests meet and diverge. When the federal government invests in freight railroad infrastructure, it could justify its involvement by establishing criteria for projects that (1) are based on national freight goals, (2) are designed to capture national freight transportation benefits, and (3) direct funds to state, local, and private entities that would spend the funds in accordance with the national goals. For example, the federal government might justify its investment in a project that had national goals of improving interstate freight mobility, reducing pollution and congestion, and enhancing safety on a multistate railroad and highway transportation corridor. In contrast, states and

[56]GAO-02-1033, p. 22.

[57]Ibid.

localities seek public benefits that accrue within their jurisdictions, such as improved automobile safety at grade crossings and reduced air pollution within a regional attainment area, and are able to channel state, local, and discretionary federal funds accordingly. When examining public versus private interests, public stakeholders must recognize that railroads are privately owned and invest resources to maximize shareholder returns and enhance the efficiency and capacity of their operations. Some railroad infrastructure projects have spillover effects that produce public benefits, such as more efficient goods movement. Yet other railroad infrastructure projects that could benefit the public do not meet railroads' internal return-on-investment criteria, and therefore the railroads would not invest in them, and the public would not realize the benefits.

One possible way of defining stakeholder roles could be through public-private partnerships. As we have stated earlier, public-private partnerships create a forum for bringing diverse stakeholders together around an issue of mutual interest to determine how best to share resources, identify stakeholder responsibilities, and achieve public and private benefits. Encouraging public-private partnerships to provide efficient solutions to freight transportation needs could increase the likelihood that the most worthwhile improvements would be implemented and that projects would be operated and maintained efficiently.[58] One example of a public-private partnership that addresses various private and public stakeholder interests in railroad infrastructure is the CREATE project in the Chicago area. The drive to make significant investments in the Chicago area's railroad infrastructure came from public and private railroad stakeholders because of their concern over the heavy railroad congestion in that area.[59] Under the CREATE project, stakeholders established individual roles that included owning and managing specific projects and assuming joint financial obligations. The railroads initially invested $100 million to begin addressing their interests, the federal government has added $100 million by designating CREATE as a Project of National or Regional Significance, and the state of Illinois and the city of Chicago have pledged $100 million and $30 million, respectively, to begin addressing passenger railroad projects. CREATE stakeholders also plan to leverage other federal, state, and private funds over the lifetime of the project. The Alameda Corridor Program in the Los Angeles area provides another example of how

[58]GAO-05-768, p. 31.

[59]The Chicago area is the largest railroad hub in the nation, with one-third of all railroad traffic originating, terminating, or passing through the area.

effective partnering allowed the capabilities of the various stakeholders to be more fully utilized. Called the Alameda Corridor because of the street it parallels, the program created a 20-mile, $2.4 billion railroad express line connecting the ports of Los Angeles and Long Beach to the transcontinental railroad network east of downtown Los Angeles. The express line eliminates approximately 200 street-level railroad crossings, relieving congestion and improving freight mobility for cargo. This project made substantial use of local stakeholders' ability to raise funds. While the federal government participated in the cost, its share was about 20 percent of the total. In addition, about 80 percent of the federal assistance is in the form of a loan rather than a grant.

Future Federal Role in Freight-Related Infrastructure Investments Should Meet Federal Goals While Recognizing Federal Financial Constraints

A well-designed and strategic national freight transportation policy—of which there is a federal component—can help encourage investment by other public and private stakeholders and maximize the application of limited federal dollars for freight-related infrastructure.[60] While it is important to ensure that such a policy promotes federal investments in freight infrastructure that generate national public benefits, especially when those investments are in privately owned and operated freight railroad infrastructure, it is also important to note that any federal investments will face federal financial constraints. Although federal investments could be crucial to securing the national public benefits of certain freight-related infrastructure projects that would not otherwise proceed, the scarcity of federal funds puts a premium on justifying and targeting the use of federal funds for these projects to address critical needs and maximize benefits.

As we have previously reported, determining the scope of government involvement in transportation investments entails three major steps: (1) determining that the project is worthwhile by applying a rigorous cost-benefit analysis or similar study; (2) justifying government involvement on the basis of known criteria; and (3) deciding on the level of public subsidy consistent with local, state, regional, or national interests and benefits.[61] Currently, most federal freight investments come from the fiscally constrained General Fund and Highway Trust Fund; and typically these investments are not subject to a thorough benefit-cost analysis or to the consistent application of project criteria, nor are they funded with the

[60]GAO-02-1033, p. 22.

[61]GAO-04-165, p. 42.

assurance that the funding provided by public and private beneficiaries is commensurate with the benefits these parties receive.

Federal investments in freight infrastructure must be justified and meet objective criteria to maximize the impact of federal funds. Justifying government involvement in freight infrastructure projects involves identifying and quantifying project costs and public and private benefits, and having clear guidelines specifying the conditions under which public involvement is warranted. Given constraints on federal, state, and local funding, we have advocated that public entities implement project justification tools such as benefit-cost analysis to better assess proposed transportation investments and accordingly target limited funds.[62] Results-oriented assessments can be used to determine what is needed to obtain specific national outcomes.[63] In October 2006, we recommended that DOT, as it continues to draft the *Framework for a National Freight Policy*, consider strategies to create a level playing field for all freight modes and recognize the highly constrained federal fiscal environment by developing mechanisms to assess and maximize public benefits from federally financed freight transportation investments.[64] Furthermore, as we testified in March 2007, the federal government should make ensuring accountability for results, as well as maximizing benefits, high priorities in deciding on federal investments in transportation infrastructure.[65] Unfortunately, we have found that formal analyses are not often used in deciding among alternative projects, evaluations of outcomes are not typically conducted, and the evaluations that are done show that projects often do not produce anticipated outcomes. The public sector faces many challenges in quantifying national, regional, state, and local benefits, while railroads are more able to determine the monetary and operational benefits of proposed infrastructure projects and can invest accordingly. For example, railroads can assess how much each hour of train delay costs them, but public entities cannot easily quantify the environmental benefits of faster freight railroad transport and less truck traffic.[66]

[62]GAO-07-94, pp. 61 and 63.

[63]GAO-02-1033, pp. 19-20.

[64]GAO-07-94, p. 62.

[65]GAO-07-545T, p. 14.

[66]In an attempt to address this issue, in March 2005, DOT publicly released the Intermodal Transportation and Inventory Cost software model that enables users to identify the effects of traffic diverted from trucks to railroads.

Representatives of three state DOTs we interviewed acknowledged the difficulty of quantifying public benefits, which may make it difficult to judiciously allocate scarce transportation funds to those projects that may accrue the highest public benefits.

According to the Transportation Research Board (TRB), public support for freight infrastructure projects must be established on a project-by-project basis to determine if a project produces certain benefits, such as reductions in the external costs of transportation, efficiencies in the transportation system beyond those recognized by the private sector, or improvements in public safety.[67] TRB stated that if government involvement cannot be justified on one of these grounds, the private sector should undertake the project. One federal program that awards funds using project justification criteria is the Federal Transit Administration's discretionary New Starts program. This program is the federal government's primary source of funds for capital investment in locally planned, implemented, and operated transit. Potential New Starts projects must meet certain project justification criteria (e.g., mobility improvements and operating efficiencies) and demonstrate adequate local financial support (e.g., the ability of the sponsoring agency to fund the operation and maintenance of the entire system once the project is built). A comparable approach could be designed so that freight railroad infrastructure investments—proposed by state or local governments, private railroads, or public-private partnerships—meet appropriate project justification criteria, demonstrate public and private support, and provide the lowest cost to the federal government. Different funding mechanisms and revenue sources could also be used to implement any future federal role in freight infrastructure investments. See appendix III for a more complete discussion of these revenue sources and funding mechanisms.

Conclusions

Projected increases in freight transportation demand will likely increase the importance of the nation's freight railroad infrastructure. Bridges and tunnels are critical and expensive parts of infrastructure. Because most of

[67]According to TRB, external costs are borne by nonshippers or the general public. Examples of external costs include health and other damages caused by air pollution; noise generated by trucks, towboats, and locomotives; and the traffic delays and congestion that an additional truck or barge imposes on other users of roadways and waterways. See Transportation Research Board, *Special Report 252*: *Policy Options for Intermodal Freight Transportation* (Washington, D.C.: 1998) and Transportation Research Board, *Special Report 271: Freight Capacity for the 21st Century* (Washington, D.C.: 2002).

the freight railroad network is privately owned, the railroads have a keen financial interest in maintaining and investing in their bridges and tunnels. The federal role in overseeing the public safety of these structures, and in funding improvements to them, has been limited.

Concerning the safety area, we have found in our prior work that a risk-management approach to oversight of companies' overall management of safety risks provides an additional assurance of safety in conjunction with inspections. FRA has adopted this risk-management approach in applying its guidelines for bridge management during its bridge safety surveys of individual railroads. However, a more consistent and systematic approach in selecting railroads for bridge safety surveys based on data about railroads' bridge management programs, such as whether or not the railroads have regular inspections by a qualified civil engineer and how they record and use that bridge inspection data, could enhance the effectiveness of the FRA's limited resources available for bridge and tunnel safety. This approach could help target FRA's limited bridge inspection resources toward railroads that present the greatest safety risk, especially numerous short lines that may have more deteriorated infrastructure and less technical and financial resources to maintain their bridges and tunnels.

With respect to the federal role in freight-related infrastructure, including railroad bridges and tunnels, the federal approach to such investments needs to be better structured to maximize achieving national public benefits such as increased freight mobility, reduced congestion, and improved environmental quality. Although the current federal structure of loans, credits, and grants administered by different agencies with different missions from disparate funding sources may attain some national public benefits, that structure is not guided by a national freight strategy and may miss opportunities for an even higher return of national public benefits for federal expenditures. DOT has taken a first step in the direction of articulating such a strategy by developing its *Framework for a National Freight Policy*, but we believe that the agency needs to go further in developing a true national freight transportation strategy that can help organize and unify the current structure to achieve that higher return. Our past work on public investments in transportation has found that such a strategy should focus on national freight transportation related goals, involve all public and private stakeholders, and distribute costs equitably across all public and private beneficiaries.

Recommendations for Executive Action

- To enhance the effectiveness of its bridge and tunnel safety oversight function, we recommend that the Secretary of Transportation direct the Administrator of the Federal Railroad Administration to devise a systematic, consistent, risk-based methodology for selecting railroads for its bridge safety surveys to ensure that it includes railroads that are at higher risk of not following the FRA's bridge safety guidelines and of having bridge and tunnel safety issues.

- To help better focus limited federal resources, we recommend that the Secretary of Transportation ensure that its draft *Framework for a National Freight Policy* :

  - includes clear national goals for federal involvement in freight-related infrastructure investments across all modes, including freight railroad investments;

  - establishes and clearly defines roles for all public and private stakeholders; and

  - identifies funding mechanisms for federal freight-related infrastructure investments, including freight railroad investments, which provide the highest return in national public benefits for limited federal expenditures.

Agency Comments

We provided a draft of this report to DOT for review and comment prior to finalizing the report. DOT and FRA officials—including FRA's Associate Administrator for Safety— generally agreed with the information in this report, and they provided technical clarifications, which we have incorporated in this report as appropriate. These officials agreed with the recommendation related to the methodology for selecting railroads for bridge safety surveys and said that they are already taking steps to implement it, and DOT officials said that they would consider the recommendation concerning changes to DOT's draft *Framework for a National Freight Policy*.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. We will then send copies of this report to the appropriate congressional committees and to the Secretary of Transportation. We will

also make copies available to others upon request. In addition, this report will be available at no charge on the GAO Web Site at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or heckerj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff that made key contributions to this report are listed in appendix IV.

JayEtta Z. Hecker
Director, Physical Infrastructure Issues

Appendix I: Scope and Methodology

To determine what information is maintained by railroads on the condition of their bridges and tunnels, and the contribution of this infrastructure to congestion, we reviewed documentation from railroads on bridge and tunnel data management policies, inspection procedures, sample inspection reports, and capital improvement plans. We also determined the federal role in collecting and reporting information on railroad bridges and tunnels by interviewing officials from federal agencies, state agencies, freight railroads, and industry associations (see table 4), and by reviewing bridge and tunnel data collected and maintained by these federal agencies. To determine to what extent bridges and tunnels contribute to freight railroad congestion, we reviewed literature on freight railroad congestion, railroad corridor plans, and freight demand studies to identify current levels of freight railroad congestion, major factors contributing to congestion, and proposed solutions. We also interviewed representatives from industry associations and railroads to understand how this information is used, what challenges railroads face in maintaining and replacing railroad bridges and tunnels, and what strategies railroads use to enhance capacity and alleviate congestion. We did not independently verify the accuracy of public or private bridge and tunnel condition information, inspection reports, or congestion information. In addition, we did not independently assess the conditions of bridges and tunnels.

To identify the federal role in overseeing railroad bridge and tunnel safety, we reviewed public laws and interviewed officials from the public agencies and railroads listed in table 4. In particular, we discussed the Federal Railroad Administration's (FRA) structural safety oversight role with FRA's Chief Structural Engineer, all five FRA bridge specialists, and one FRA regional track specialist, and asked railroads about their interactions with FRA. We reviewed examples of FRA's bridge safety survey documentation to determine the content of these surveys and what actions FRA takes after assessing a railroad's bridge conditions. We also accompanied an FRA bridge specialist on a bridge safety survey and other informal bridge and tunnel observations. We reviewed examples of FRA emergency orders, compliance agreements, and structural observation reports to determine how FRA enforces its oversight role. Because there are more bridges than tunnels in the United States and because FRA has established a policy on bridge safety, we reviewed more information on railroad bridges than on tunnels. Moreover, because we used FRA's records to understand FRA processes and actions, we did not independently verify the reliability of the data in this sample of FRA's observation records.

To determine how public funds are currently used for railroad infrastructure investments, including those for bridges and tunnels, we interviewed the entities included in table 4 and synthesized relevant information from these entities, as well as from the Federal Highway Administration and the Joint Committee on Taxation. We did not independently verify the accuracy of the self-reported cost information provided by the railroads, public agencies, and professional associations. We reviewed Department of Transportation's (DOT) draft *Framework for a National Freight Policy*. We also analyzed pertinent legislation and analyzed and synthesized relevant information from our reports and other ongoing work.

To determine what criteria and framework could be used to guide the future federal role in freight-related infrastructure investments, including those for railroad bridges and tunnels, we relied extensively on perspectives gained from our past work in transportation and infrastructure systems and federal investment strategies. We also reviewed DOT's *Draft Framework for a National Freight Policy*. We used our prior work and conventional economic reasoning to identify key considerations regarding possible revenue sources and funding mechanisms for federal government support for freight-related infrastructure investment and to evaluate potential revenue sources and funding mechanisms on the basis of those considerations.

In addressing all of our objectives, we conducted five site visits to

- observe the conditions of selected bridges and tunnels on Class I, II, and III railroads;
- understand maintenance and deterioration issues inherent in different geographies and structure types;
- interview railroad and state agency personnel who manage, inspect, and maintain these structures;
- interview railroad operations personnel who monitor traffic capacity and congestion and finance personnel who determine capital investment priorities and allocations; and
- meet with state and local transportation agency officials.

For a complete list of all entities interviewed, including those interviewed as part of our site visits, see table 4. We selected our site visit locations—

Baltimore, Maryland and Washington, D.C.; Illinois and Iowa; Kansas and Missouri; Ohio and West Virginia; and Oregon—based on geographic distribution and the presence of large and small railroads, private-public partnership stakeholders, and state DOTs involved in freight railroad or large freight railroad public-private partnerships.

In addition to interviews conducted as part of our site visits, we interviewed representatives from the six largest Class I freight railroads in the United States;[1] Amtrak; industry associations; federal, state, and local transportation officials; and federal agencies involved with collecting information on, overseeing, or providing funding for railroad bridges and tunnels. We also interviewed additional state agencies based on their involvement in railroad bridge and tunnel oversight, freight railroad funding, or major freight railroad public-private partnerships. Table 4 lists the names and locations of all railroads; federal, state, and local agencies; industry associations; and transportation, engineering, and academic experts we interviewed as part of our review.

Table 4: Names and Headquarters Locations of Entities Contacted

Name	Headquarters location
Class I freight railroads	
BNSF Railway Company[a]	Fort Worth, TX
Canadian National Railway[a]	Montreal, Quebec
CSX Transportation[a]	Jacksonville, FL
Kansas City Southern Railway[a]	Kansas City, MO
Norfolk Southern[a]	Norfolk, VA
Union Pacific Railroad Company[a]	Omaha, NE
Class I passenger railroads	
National Railroad Passenger Corporation (Amtrak)[a]	Washington, D.C.
Class II freight railroads	
Iowa Interstate Railroad[a]	Cedar Rapids, IA
Wheeling and Lake Erie Railway Co.[a]	Brewster, OH
Class III freight railroads	
Albany and Eastern Railroad Company[a]	Lebanon, OR
Belt Railway Company of Chicago[a]	Bedford Park, IL

[1]We did not interview Canadian Pacific, whose railroad lines in the United States comprise the smallest Class I freight railroad.

Cedar Rapids and Iowa City Railway Co. (CRANDIC)[a]	Cedar Rapids, IA
Iowa Northern Railway Company[a]	Cedar Rapids, IA
Kansas City Terminal Railway Co.[a]	Kansas City, KS
Ohio Central Railroad Company[a]	Coshocton, OH
Port of Tillamook Bay Railroad[a]	Tillamook, OR
SEMO Port Railroad[a]	Scott City, MO
Watco Companies, Inc.[a]	Pittsburg, KS
Federal agencies	
U.S. Army Corps of Engineers	Washington, D.C.
U.S. Department of Defense Surface Deployment and Distribution Command: Transportation Engineering Agency	Newport News, VA
U.S. Department of Energy	Washington, D.C.
U.S. Department of Homeland Security United States Coast Guard Transportation Security Administration	Washington, D.C. Washington, D.C. Arlington, VA
U.S. DOT Federal Highway Administration Federal Railroad Administration Office of Safety and Compliance[a] Office of Railroad Development Office of Policy and Program Development	Washington, D.C.
U.S. Environmental Protection Agency	Washington, D.C.
State agencies and oversight organizations	
Illinois DOT[a]	Springfield, IL
Kansas DOT[a]	Topeka, KS
Louisiana DOT and Development	Baton Rouge, LA
Maryland DOT[a]	Hanover, MD
Missouri DOT[a]	Jefferson City, MO
Ohio DOT[a]	Columbus, OH
Ohio Rail Development Commission[a]	Columbus, OH
Oregon DOT[a]	Salem, OR
Pennsylvania DOT	Harrisburg, PA
Pennsylvania Public Utilities Commission	Harrisburg, PA
Public Utilities Commission of Ohio[a]	Columbus, OH
Tennessee DOT	Nashville, TN
Local agencies	
Chicago DOT[a]	Chicago, IL
Columbus Regional Airport Authority[a]	Columbus, OH
Unified Government of Wyandotte County and Kansas City, Kansas[a]	Kansas City, KS

Industry associations	
The American Association of State Highway and Transportation Officials	Washington, D.C.
American Short Line and Regional Railroad Association	Washington, D.C.
The Association of American Railroads	Washington, D.C.
Transportation, engineering, and academic experts	
Dr. Kazuya Kawamura, University of Illinois at Chicago	Chicago, IL
National Academy of Railroad Sciences[a]	Overland Park, KS
TranSystems[a]	Kansas City, MO
URS Corporation[a]	San Francisco, CA

Source: GAO.

[a]Indicates representatives were included in a site-visit.

Appendix II: Examples of Bridge and Tunnel Maintenance, Component and Structural Replacement Costs on Selected Railroads

Bridge type	Description of work	Cost estimates
Maintenance		
Bridge ties	Replacing a bridge tie	$450 per tie
Moveable steel bridge	Moveable bridge annual maintenance	$50,000 to $1 million
Component replacement or repair		
Timber bridge	Replaced several timber components	$40,000 to $50,000
Timber bridge	Replacing timber approach span	$239,000
Timber bridge	Replacing timber substructure and deck with steel and concrete components	$3 - $3.5 million
Concrete bridge	Concrete bridge pier replacement	$225,000
Concrete bridge	Abutment replacement	$75,000
Concrete bridge	Replacing stone arches with culverts	$50,000
Steel bridge	Upgrade steel to handle 286,000-lbs. railcars	$100,000
Moveable steel bridge	Replacement of several steel components	$1 million
Moveable steel bridge	Fender system replacement caused by barge strike	$200,000 to $600,000
Tunnel	Replacing timber lining in tunnel with concrete lining	$800,000
Tunnel	Upgrading ventilation system	$3.5 million
Tunnel	Opening or “day-lighting” tunnel	$3 million
Replacement		
Timber bridge	Timber bridge replacement	$600,000 to $700,000
Steel bridge	Steel bridge replacement	$22 - $44 million
Moveable steel bridge	Moveable swing span replacement	$25 - $40 million
Moveable steel bridge	Replacement of a moveable swing span bridge with a lift span bridge	$100 million

Source: GAO analysis of interviews with railroad officials.

Appendix III: Considerations of Funding Sources and Mechanisms Available for Federal Funding of Freight-Related Infrastructure

Different funding mechanisms and revenue sources can be used to implement any future federal role in freight infrastructure investments. Two main revenue sources are available to the federal government in financing freight infrastructure investments: (1) general revenue, which comes primarily from broad-based personal and business income taxes and (2) beneficiary financing revenue (such as user fees or fuel taxes), which comes from taxes or fees assessed to specific groups that would benefit from the federal investment. Revenue from both of these sources could be used to increase investment in freight railroad infrastructure beyond the level that the railroads would provide without federal support. We note, however, that all revenue sources do have opportunity costs, that is, the costs of any benefits forgone from alternative investments that could have been made with that revenue.

As discussed earlier in this report, the federal government currently uses three main funding mechanisms to support freight railroad infrastructure: grants, loans, and tax credits.[1] Each funding mechanism has its own advantages and limitations, but some implications would apply to each. For example, while the three mechanisms may make federal subsidies available for freight infrastructure investments, they may not necessarily increase the total amount of funding provided for those investments. Instead, these subsidies might result in the substitution of federal funds for the railroads' own funds for investments that they would have made themselves, even without federal support. Revenue sources and potential funding mechanisms need to be evaluated in terms of several key considerations—including equity, sustainability, and efficiency for revenue sources, and efficiency and transparency for funding mechanisms—as discussed below.

- *Equity* - Equity is often assessed according to two principles: the benefit principle and the ability-to-pay principle. Equity occurs according to the benefit principle when those who pay for a service are the same as those who benefit from the service. Under the ability-to-pay principle, those who are more capable of bearing the burden of taxes or fees pay more in taxes and fees than those with less ability to pay, and a tax or fee structure is generally considered more equitable if that is the case. The use of general revenues is most equitable according to the benefit principle when the benefits are diffused across all taxpayers. Benefit financing sources (per-container or per-railroad-car fees or commodity-specific taxes) can be a

[1]Tax credits are reductions in tax liabilities based on preferential provisions of the tax code, resulting in forgone tax revenue for the federal government.

more equitable funding source when the benefits are more focused on a locality or set of users and it is possible to collect the additional revenues from beneficiaries through higher fees or taxes. Either approach could be consistent with the ability-to-pay principle depending on how the revenue source is structured. A combination of beneficiary financing, federal general revenue, and local matching funds could also be used to enhance equity in order to link the amount of payment for an infrastructure investment to the anticipated amount of private, national, and local benefits gained, although these benefits may be hard to quantify.

- *Sustainability* - Sustainability can be defined as the ability of a revenue source to maintain a given level of federal expenditure for an investment over time. Technological change or inflation could affect the sustainability of some beneficiary financing revenue sources by influencing revenue levels or their purchasing power. But these sources can be more sustainable if they have the flexibility to respond to reductions in demand or consumption and can be indexed to inflation or otherwise periodically adjusted. The sustainability of general revenue could be affected by the federal government's long-term structural fiscal imbalance.

- *Efficiency* - Efficiency implications exist for both the choice of revenue source and the choice of funding mechanism. For revenue sources, efficiency can be assessed based on the impact of economic behavioral changes likely to result from use of each source and by how much accountability[2] is provided. Using general revenue rather than beneficiary financing revenue sources is likely to cause smaller behavioral changes than using beneficiary financing. Beneficiary financing is likely to cause larger behavioral changes in raising a given amount of revenue because the impacts of a revenue increase would be more concentrated in a geographic location (for example, a user fee assessed for using a specific bridge or other structure) or on a group of beneficiaries (for example, a diesel fuel tax assessed only on railroads). However, these behavioral changes can have either negative or positive consequences on economic efficiency, such that in different circumstances increasing revenues from either funding source could be less efficient or more inefficient. In terms of accountability, the efficiency of a revenue source can be enhanced by

[2]Accountability can be defined as ensuring that the beneficiaries of a service pay the full social cost of that service. Although this concept is similar to the benefit principle for assessing equity, in discussing the effects of accountability on efficiency, we are concerned with the accountability it provides rather than the fairness. For example, if the beneficiaries do not pay the full social cost of a benefit, they may seek to have more of the service provided by the government even when the additional amounts of that service cost more than their actual value to provide.

collecting funds from the groups that are benefiting from federal investments in freight infrastructure. For funding mechanisms, efficiency can be defined as the amount of benefit gained for the amount of federal resources provided. Grants may generally be more efficient than loans in that their administrative costs may be lower. For tax credits, efficiency—or the benefits gained for the forgone tax revenue—is both difficult to calculate and difficult to control, because private firms often control the use of the credited funds rather than the government. Therefore, the government may have less opportunity to direct the funds toward generating specified national public benefits than it does for grants or loans.[3] To increase the efficiency of grants, maintenance of effort provisions[4] could be incorporated to decrease the likelihood that the funding provided through them will be substituted for other funds, rather than combined with other funds to increase the total investment. Although tax credits do not involve outlays of federal funds, they do have analogous costs in forgone tax revenue that would have to be considered in evaluating their efficiency.

- *Transparency* - Transparency can be defined as the extent to which the costs of federal infrastructure investments are visible when using a funding mechanism. The commitment of federal resources is visible if there is a direct appropriation for a federal grant or loan program. With a

[3]In some cases, the government controls the allocation of funds for certain tax credits. For example, officials from the Department of the Treasury (and a group of external reviewers) review and score New Markets Tax Credit applications and then make specific allocations of the Credit itself to qualified applicants. See GAO, *Tax Policy: New Markets Tax Credit Appears to Increase Investment by Investors in Low-Income Communities, but Opportunities Exist to Better Monitor Compliance*, GAO-07-296 (Washington, D.C.: Jan. 31, 2007) p. 7.

[4]Maintenance of effort provisions would require the entity receiving the grant to maintain a certain level of spending over the duration of the grant in order to receive the grant.

grant or a loan, the federal government can readily demonstrate how much money was invested in what infrastructure. These funding mechanisms can also be guided by objective, transparent criteria in conjunction with congressional control over annual funding levels. With tax credits for railroad infrastructure investment, however, it is less visible how much the investment is costing the government through forgone revenue, and it is harder for Congress to make trade-offs with other discretionary spending programs.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

In addition to the contact named above, Rita Grieco (Assistant Director); Jay Cherlow; Steve Cohen; Elizabeth Eisenstadt; Alana Finley; Greg Hanna; Carol Henn; Bert Japikse; Richard Jorgenson; Denise McCabe; Elizabeth McNally; Sara Ann Moessbauer; Josh Ormond; Laura Shumway; Ryan Siegel; and James Wozny made key contributions to this report.

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