



Tools for a Smoother Ride:

Managing Rail Assets and Leveraging Competition

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Executive Summary

Public transit maintenance is not often headline news. Yet with high profile closures and disruptions to rail systems in major metropolitan areas like New York, Baltimore, and Washington, the condition of this infrastructure is very much in the public eye. These systems all need major track maintenance overhauls, but the real overhaul needs to be in how agencies conduct their asset management and maintenance programs.

Together, major rail systems in U.S. cities move millions of people every day, and the lack of regular maintenance and upkeep has direct effects on the efficiency of personal mobility and regional economies. While local elected officials and voters time and again approve proposals to raise revenues for new projects, reinvesting in existing systems is too often ignored. But the more maintenance is deferred, the more it will cost to return to a state of good repair in the future, and the less reliable the service will become for riders.

This study examines rail maintenance program needs and practices through dozens of interviews with public and private stakeholders and experts around the country. The consensus was that asset management practices in the United States are inadequate to meet today's maintenance challenges. The first step that agencies need to take in their efforts to run a consistently well-maintained system is to dramatically improve their transit asset management. While the federal government has stepped in to require transit agencies to pay better attention to maintenance, the industry still lags international best practices.

True plans and processes based on the actual observed condition of the infrastructure—predictively repairing or replacing them when conditions and timing warrant—is needed. Such an approach requires structural and cultural change, and significantly more initial investment to coordinate data from sensors, monitoring devices, and human observation. Track inspectors and front line workers are the most keenly aware of the long term problems with deferred maintenance, but face legacy work rules and limited budgets to invest in modern asset management systems. Agency leadership and boards prioritize system expansion over the needs to keep the system in a state of good repair.

The paper also explores the use of private contractors for some or all of track maintenance, which is often proposed as a solution to maintenance challenges. Older rail systems in the United States rely almost exclusively on in-house staff to conduct basic infrastructure maintenance and upkeep. But when there are extraordinary needs, they will also contract with private firms for that work. New systems are turning to private contractors for even the most basic of needs.

Once agencies have a firm grasp on asset management, they can consider alternative approaches to rail maintenance, including whether the agency uses in house staff for a particular project or contracts it out to private companies. Contracting out does not necessarily offer a better approach to rail maintenance but, if done carefully, it may create a different set of incentives and accountability than some agencies rely on today. If considering a contracted approach, an agency must act to minimize negative effects on the existing workforce. When contracting, agencies need to carry out a fair and functional procurement process, write an effective contract, and manage it effectively.

There is no single “cure-all” policy or mechanism that will fix all the problems that are resulting in the infrastructure failures and deferred maintenance that plague many U.S. transit systems today. However, agencies must start by creating a culture of maintenance prioritization through effective asset management. The goal must be to go beyond complying with baseline federal rules and put in place state of the art practices in condition-based and life-cycle maintenance. Contracting represents a way for agencies to test alternative methods, but they need to publicly track, test, and benchmark the alternative approaches for transparency and accountability, which in turn also aid in garnering and maintaining public trust.

1. Introduction

Public transit in the United States is in a maintenance crisis. The condition of many rail transit systems is alarmingly poor. Partly as a result, ridership is declining, budgets are strained, and public opinion of rail transit is wavering. In 2015, the U.S. Department of Transportation reported to Congress that the poor condition of the nation’s rail systems (subway, light rail, streetcars, and commuter trains) represents a “major challenge” and pegged investment needs to bring them to a state-of-good-repair at \$140 billion.¹

These crises are not just an inconvenience for travelers and workers in metropolitan America, but also threaten the economic health and very functionality of our global cities. After a derailment last year at New York’s Penn Station, the governor of New York warned of a “summer of hell” for rail riders on one side of Manhattan while on the other side, a century-old subway line would close for 15 months for major repairs.² In Washington, the entire subway was shut down suddenly one weekday when officials there deemed the system unsafe for passengers due to its poor condition.³ Baltimore’s subway system was completely shut down for weeks after safety inspections determined that parts of track “deteriorated to the point where no train movement is allowed.”⁴ Outside the Northeast, the San Francisco Bay Area Rapid Transit (BART) rail system suffered major delays after a 2017 derailment on the line connecting downtown San Francisco to the airport.⁵

The maintenance of rail infrastructure is an expensive and complex endeavor.⁶ As new rail systems have proliferated and agencies continue to defer maintenance, the total that U.S. transit agencies spent on rail maintenance more than tripled from 1991 to 2016 (\$13.2 billion to \$45.1 billion), far outstripping the rate of inflation, the increase in track mileage, and ridership growth during that period.⁷ Yet systems continue to fall behind: needs for new maintenance dollars include \$9 billion for the Metropolitan Transportation Authority (MTA) subways in New York and \$15.5 billion for the Washington Metropolitan Area Transportation (WMATA), both of which far exceed the resources available.⁸

Defining Maintenance

In this report, “maintenance” refers to any activity required to keep rail transit infrastructure in a state of good repair. It includes both capital and operating expenses for rebuilds, rehabilitations, inspections, as well as routine day-to-day fixes to make transit trains run reliably for the traveling public.

Part of the problem is the lack of long-term accountability for maintenance. Many agencies' board members are appointed by local elected officials and lack in-depth knowledge of rail maintenance.⁹ Top-level management and leadership priorities are often affected by the outcomes of state and local elections.¹⁰ A greater emphasis on reinvesting in the existing system—an inherently political challenge—is a first and necessary step to solving the problem of deferring and compounding maintenance costs. In New York, one investigation recently found that “officials knew for years ... [about] sections of deteriorating track,” yet the efforts to maintain them were delayed “to give work time to a nearby passenger hall renovation” backed by the governor.¹¹ Maryland officials contend the transit agency knew its rail infrastructure was substandard more than a year before its recent closure.¹²

These examples highlight a pervasive problem: agency leadership often prioritizes capital expansion and other improvements over track maintenance.¹³ These challenges have given rise to concerns about the lack of an institutional “culture” for state-of-good-repair at several transit agencies.¹⁴ A series of industry roundtables convened by the federal government pointed to the need to make the upkeep and management of existing assets a core agency process.¹⁵

Given the fiscal, political, and institutional challenges agencies are facing, public transit needs a wholesale reform in the way it monitors, plans for, and executes maintenance. The goal of this report is to explore how public transit agencies can be more cost-effective, improve outcomes, and increase accountability for upkeep, maintenance, and modernization of their existing rail systems. Using existing data sources and off-the-record interviews with dozens of stakeholders, it also examines how different agencies perform maintenance work now, including the role of private contractors in public transportation maintenance. The report concludes with recommendations for better track maintenance with constrained resources.

Methods and Limitations

To conduct this research we reviewed existing literature and conducted dozens of interviews with a wide range of representatives and stakeholders in the transit track maintenance industry, including transit agencies, private contractors, labor unions, and industry experts. Interviews included representatives from regions where maintenance is mostly in house, and regions where the entire system is contracted. These were held off-the-record to enable interviewees to speak candidly. Three problems were encountered in collecting data:

- 1. Limited uniform data sources.** Aside from the National Transit Database (NTD) and some information gathered by APTA, data on rail maintenance at public agencies is notoriously difficult to find. Agencies do not report data uniformly and different accounting and governance practices make it difficult to compare organizations and approaches equally. The U.S. Department of Transportation's Conditions and Performance report highlighted the problem with data consistency: "Although maintaining [rail] assets is among the largest expenses associated with operating rail transit, FTA does not collect detailed data on these elements, in part because the elements are difficult to categorize into discrete sections having common life expectancies. Service life for track, for example, highly depends on the amount of use it receives and its location."
- 2. Undesired data disaggregation.** Maintenance is part of both operational budgets and capital budgets. In the United States, most public agencies have one budget for routine operations, such as running trains and buses, and another for capital improvements, such as constructing track or buildings. Maintenance of rail systems often falls in both of those categories. Preventive and corrective, day-to-day maintenance is typically part of operational budgets, while large planned overhauls or predictive maintenance are part of capital budgets. Both are equally important in maintaining a well-run rail transit system. However, not all agencies categorize their maintenance expenses the same way.
- 3. The outlier that is New York City.** New York City Transit's (NYCT, a division of the New York MTA) annual ridership is 92 times the national average and the agency operates over 2,223 more track miles than the national average and 1,483 more than the next largest system by track mileage (MBTA). Since the MTA does the vast majority of its track maintenance in-house, and has a much larger workforce than other transit agencies, some figures that include the MTA are likely to be skewed towards in-house track maintenance in a way that may not accurately reflect the actual balance between maintenance regimes across the country.

2. Rail Maintenance: Current Policy and Practice

Multiple complex features factor into determining the cost, approach, and challenges of maintaining rail transit track. All elements of the infrastructure over which trains operate fall under a category referred to as “maintenance of way” or MOW. Components of the “way” include rails, crossties, substructure, bridges, tunnels, and signal system, along with the control of vegetation, litter, and graffiti alongside the tracks.¹⁶

MOW can be **corrective** (after a flaw or deficiency is detected), **preventive** (regularly scheduled maintenance that decreases the chances of necessary corrective maintenance) or **predictive** (using measurements that determine when a component may fail). MOW can also be divided between two basic types: day-to-day and planned.

Day-to-day work encompasses repairs and replacements that are generally performed often, small in scale, localized, and relatively inexpensive. This includes inspecting tracks and substructure at regular intervals and correcting any uncovered deficiencies; grinding, brushing, and polishing to ensure an even surface between a train’s wheels and the rail below; ensuring that rails are securely fastened to crossties or other sub-surfaces; and refining the track geometry to an alignment that allows trains to travel safely at a designed maximum speed.

Beyond these routine tasks, proper maintenance involves the complete replacement of components once they reach the end of their service lives. Such **planned** work includes more significant replacements and rebuilds of infrastructure, such as laying new track and replacing switches, that are larger in scale and more expensive.

Importantly, MOW tasks must be performed while working alongside an operating railroad. Inspections and repairs occur at prescribed intervals while still allowing for scheduled train movements, which often means conducting work at night when trains are not running. The demands of MOW work require public agency and/or private contractor personnel to be “on call” at all times and be able to respond immediately to any condition adversely affecting the line. Track crews must also contend with the unpredictable nature of replacing underperforming components installed during original track construction, often decades old.

The complexity and limited timeframes of maintaining a passenger rail network adds to the cost. Most agencies report average work windows of only four hours nightly, of which crews may spend half their time traveling to and from a worksite. Workers must start, stop, clean up, remember where they left off, and start up again the following night. Other factors that influence track maintenance challenges include the cost of materials, access to the site, and specific workforce rules in the agency’s labor agreement.¹⁷

Maintaining rail assets requires agencies to have detailed information about the condition of their track and a plan to ensure that resources are allocated to the most pressing areas. Asset management—the process of documenting, monitoring, and prioritizing maintenance—is vital to any approach to rail maintenance, and is as essential for older rail operators as it is for newer and smaller transit systems.¹⁸

Transit asset management—or, TAM—in the United States falls short of international best practices. A recent report from the U.S. Government Accountability Office (GAO) found that while most transit agencies can quantify their maintenance backlog and have inventories that provide accessible, consistent, and comprehensive information about their assets, the actual condition of the assets is “generally not measured.”¹⁹ In fact, none of the 18 agencies that the U.S. GAO researched at the time measure how maintenance decisions affect future ridership. Several agencies reported challenges collecting data and monitoring assets’ condition and performance.

For example, as recently as 2013, Boston’s Massachusetts Bay Transportation Authority (MBTA) submitted data into a state-of-good-repair database manually, resulting in poor quality and reliability of the data.²⁰ In that same year, Washington, D.C. region’s WMATA was found to rely solely on the expected useful life of an asset, rather than including its *actual* condition in the field, which would cover both predictive and corrective maintenance.²¹

With technologies available today, asset management should rely on extensive use of automated data, engineering life cycle analyses, and a sophisticated prioritization for current and future assets. Transit agencies must prioritize their investments in existing capital assets and better communicate the predicted impacts of rehabilitation and replacement investments.²² Public agencies also need considerable organizational and cultural change to implement new strategies, including rail system asset management and maintenance plans and policies.²³

Part of the problem is that there are not national standards for transit asset management. Even the definition of “state of good repair” (SOGR) has no consensus.²⁴ The primary model used by the Federal Transit Administration (FTA) for its reports to Congress on transit investment needs is the Transit Economic Requirements Model (TERM) that ranks assets on a scale of 1 (poor) to 5 (excellent). Based on TERM, an asset is in a state of good repair if its condition rating is 2.5 or greater.²⁵

Table 1. Rail transit general condition assessment rating scale

Rating	Condition	Description
1	Excellent	No visible defects, new or near new condition, may still be under warranty if applicable
2	Good	Good condition, but no longer new, may have some slightly defective or deteriorated component(s), but is overall functional
3	Adequate	Moderately deteriorated or defective components; but has not exceeded useful life
4	Marginal	Defective or deteriorated component(s) in need of replacement; exceeded useful life
5	Poor	Critically damaged component(s) or in need of immediate repair; well past useful life

Source: Facility Condition Assessment Guidebook, Federal Transit Administration

Recent changes to federal law are aimed at improving the state of asset management at transit agencies. Under 2012’s Moving Ahead for Progress in the 21st Century Act (MAP-21), agencies are now required to have a TAM plan.²⁶ The final rule issued by the FTA in 2016 has five main components:

1. *Define state of good repair.* According to the final rule, a capital asset (such as the system’s track) is in a SOGR as long as it is able to perform its intended function, there is no unacceptable safety risk, and the life cycle investment needs (scheduled maintenance, rehabilitation, and replacement) have all been met.
2. *Require TAM plans for all recipients of federal transit dollars.* Every TAM plan must include an inventory of the number and type of all assets, a condition assessment of each asset with enough detail to monitor and predict its performance, a description of the analytical processes to inform capital decision making, and how the agency intends to implement the plan for at least the next four years.
3. *Establish state of good repair performance measures.* As it pertains to fixed guideway, track, signals, and systems, the indicator is the percentage of track segments with performance restrictions (such as slow zones). The agency must set its own target for that measure and report its ability to meet that target to the FTA.
4. *Report data to the National Transit Database.* To be held accountable, agencies are now required to report their current performance measure as well as the target they set internally. Agencies that set targets that are too low or that do not meet their targets will now do so publicly.
5. *Receive technical assistance from FTA.* To help agencies meet the requirements of the new rule, FTA now provides workshops and guidebooks on how to perform proper asset management.

To be sure, public transit agencies—especially those with rail assets—have always had some form of asset management approach. But the new federal rule is helpful in standardizing those approaches, increasing transparency through the performance measure reporting, and requiring that the plans be part of the capital prioritization process.

However, many large agencies interviewed as part of this research report that the final rule is not demanding enough. Managers of large rail assets prefer to be required to have more robust performance metrics, longer time horizons for asset life cycles, and an approach that is fully risk-based. While agencies could technically implement their own rigorous plan, given budgetary pressures many large properties do only the minimum to meet the federal requirements.

The most recent surface transportation law—the 2015 Fixing America’s Surface Transportation (FAST) Act—reauthorized a SOGR grant program with an 80 percent federal share for “the maintenance, replacement, and rehabilitation of [rail and high-intensity bus transit agencies] capital assets, along with the development and implementation of transit asset management plans.”²⁷ Congress has fully funded the SOGR grant program every fiscal year since 2013.

Today, the FTA oversees and regulates all heavy rail (subway/metro), light rail, and streetcar systems in the United States. However, there are no overarching, mandatory federal track maintenance and safety standards.²⁸ The complexity and variety of system design among transit agencies makes it difficult to assign a totally uniform approach.²⁹ Instead, the FTA created the State Safety Oversight (SSO) program to provide funding for states with rail transit systems to create governance bodies to oversee the maintenance of the infrastructure.³⁰

Most agencies with these types of rail services adhere to maintenance and quality standards established by two trade associations: the American Public Transportation Association (APTA) and the American Railway Engineering and Maintenance Association (AREMA).³¹ APTA and AREMA both define track safety standards and “recommended practices,” but neither is binding or enforceable. The National Transportation Safety Board (NTSB) is empowered to investigate serious crashes and make recommendations but it also has no enforcement powers.

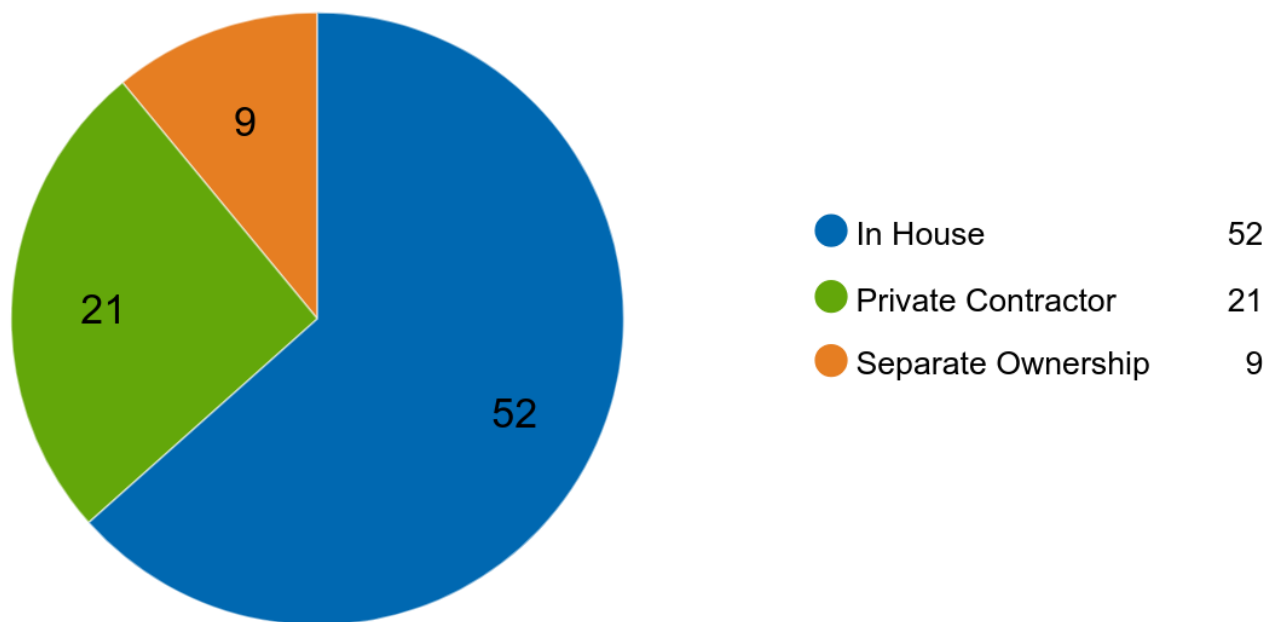
The Federal Railroad Administration (FRA) oversees and regulates the safety of commuter rail systems. Due to the fact that many commuter trains share tracks with freight trains, the FRA sets specific and mandatory rules on how and when commuter rail systems perform upkeep on their system. FRA can fine the commuter railroads it regulates for failing to maintain their track to the designated standard.

2.1 Rail Modes and Maintenance Approaches

American transit agencies take one of three broad approaches to staffing their track maintenance.

Figure 1 shows that nearly two-thirds of the 82 rail systems use **in-house staff** for the majority of their needs. One-quarter use **private contractors** to conduct all of their maintenance, and in some cases operate their trains as well. The remaining are commuter rail agencies that operate on **separately owned** private freight rail tracks and pay access fees directly to the host railroad that maintains the track for their own trains. In those cases, there is no formal track maintenance on the part of the agency.

Figure 1. Method of maintenance of way (MOW) provision for U.S. rail systems



Source: National Transit Database 2015 Contract Relationships, individual agency websites when NTD data was insufficient. Includes New York MTA.

Since ridership is concentrated on older systems that primarily use in house maintenance crews, over 84 percent of transit passengers travel over tracks maintained this way. Conversely, separate track ownership is common on long commuter rail routes. These only account for 3 percent of transit riders but 22 percent of total track mileage.³²

Engaging with contractors is not an all or nothing choice. In many cases, agencies rely on in-house staff for routine infrastructure maintenance while contracting out specific projects or portions of the network, for specific short-term capital improvement projects. A 2013 survey of 25 rail transit agencies that primarily use in-house staff found that 15 engage

subcontractors for a portion of the work.³³ Of those, however, only three contract more than 10 percent of their maintenance needs. Most of the contracting is for high tech inspection equipment, such as the use of a geometry car and rail flaw detectors.³⁴

Note on Table 2:

The following tables show all rail transit systems in the United States, their respective mode, and their primary MOW regime. The table includes data from commuter rail, heavy rail, light rail, streetcar rail, and hybrid rail, as classified by the FTA. For simplification, “hybrid rail” is classified as “commuter rail” in this report. We do not include people movers or monorail systems.

The table is for illustration purposes, and readers must examine each system in its appropriate context. Some differences in costs have to do with system age: New Orleans started operation on their Charles Street line in 1935, and Atlanta’s streetcar system opened in 2014. But we did not include the system age because there is no consistent way to measure it. New York, for example, is maintaining track built in 1904 along with new segments that opened in 2017, and much of the system has been completely rebuilt at some point. Older systems with very tight turns, regions with a history of deferred maintenance, electric versus diesel-powered trains, and varying types of signal systems can all affect the overall cost of maintenance. New York’s system has high volumes of trains that run 24 hours daily, exacerbating costs on a per-mile basis but reducing them on a passenger mile basis.

Table 2. Annual maintenance expenses on U.S. rail transit systems, by system type and method of MOW provision

STREETCAR				
System	Primary Method of MOW Provision	Average Annual Non-Vehicle Maintenance Expense and Capital Expense Per Mile (2012-2016)	Average Annual Expense by Method	Streetcar Average Annual Expense
North Little Rock Streetcar	In House	66,189	218,514	185,934
Tacoma Link	In House	301,162		
Atlanta Streetcar	In House	19,005*		
Portland Streetcar	In House	949,442		
Tampa TECO Line	In House	85,370		
Seattle South Lake Union & First Hill Streetcars	In House	97,661		
Dallas McKinney Avenue Trolley	In House	48,029*		
San Francisco Muni F Line	In House	279,686		
Philadelphia SEPTA Trolleys	In House	120,104		
Tucson SunLink	Private Contractor	38,652*	112,629	
DC Streetcar	Private Contractor	194,350*		
Kenosha Trolley	Private Contractor	13,736		
New Orleans Streetcar	Private Contractor	203,777		

HEAVY RAIL				
System	Primary Method of MOW Provision	Average Annual Non-Vehicle Maintenance Expense and Capital Expense Per Mile (2012-2016)	Average Annual Expense by Method	Heavy Rail Average Annual Expense
Chicago L (CTA)	In House	1,624,036	1,700,747	1,587,437
Los Angeles Purple and Red Lines	In House	1,778,703		
Baltimore Subway	In House	1,426,165		
Boston T Subway	In House	2,293,837		
Atlanta MARTA	In House	1,588,732		
Miami Metrorail	In House	963,880		
New York City Subway	In House	3,950,034		
PATCO (Philadelphia-NJ)	In House	887,092		
San Francisco BART	In House	1,461,547		
Philadelphia Subway	In House	1,070,399		
Staten Island Railway	In House	1,287,527		
Cleveland Red Line Rapid	In House	1,016,377		
Washington Metro	In House	2,761,379		
San Juan Tren Urbano	Private Contractor	114,404	114,404	

COMMUTER RAIL					
System	Primary Method of MOW Provision	Average Annual Non-Vehicle Maintenance Expense and Capital Expense Per Mile (2012-2016)	Average Annual Expense by Method	Commuter Rail Average Annual Expense	
Metro-North (New York)	In House	713,660	534,013	292,096	
Long Island Rail Road	In House	908,104			
New Jersey Transit Commuter Rail	In House	474,770			
Chicago South Shore Line	In House	178,686			
SEPTA Regional Rail (Philadelphia)	In House	394,845			
Orlando SunRail	Private Contractor	539,738*	298,910		
Trinity Railway Express (Dallas-Fort Worth)	Private Contractor	275,268			
MARC (Baltimore-Washington)	Private Contractor	219,459			
MBTA Commuter Rail (Boston)	Private Contractor	454,199			
San Diego COASTER	Private Contractor	610,251			
San Francisco Caltrain	Private Contractor	854,273			
New Mexico Rail Runner Express	Private Contractor	79,574			
Miami Tri-Rail	Private Contractor	308,081			
Los Angeles Metrolink	Private Contractor	99,353			
Austin Capital MetroRail	Private Contractor	180,321			
A-Train (Denton, TX)	Private Contractor	156,491*			
New Jersey Transit River-LINE	Private Contractor	37,882			
Denver RTD	Private Contractor	70,946*			
ACE (San Jose-Stockton)	Separate Ownership	278,470			127,642
Seattle Sounder	Separate Ownership	276,689			
Connecticut Shore Line East	Separate Ownership	39,924			
Minneapolis Northstar	Separate Ownership	63,434			
Music City Star (Nashville)	Separate Ownership	49,079			
Salt Lake City FrontRunner	Separate Ownership	104,552			
Virginia Railway Express	Separate Ownership	155,322			
Portland Westside Express (WES)	Separate Ownership	53,670			
Chicago Metra	Separate Ownership / In House	309,548	309,548		

LIGHT RAIL				
System	Primary Method of MOW Provision	Average Annual Non-Vehicle Maintenance Expense and Capital Expense Per Mile (2012-2016)	Average Annual Expense by Method	Light Rail Average Annual Expense
St. Louis MetroLink	In House	370,540	730,330	745,993
Seattle Central Link	In House	474,636		
Charlotte LYNX Blue Line	In House	1,008,492*		
DART (Dallas)	In House	219,201		
Denver RTD Light Rail	In House	239,023		
Los Angeles Blue, Expo, Green, Gold Lines	In House	848,302		
Baltimore Light Rail	In House	722,977		
Boston Green Line	In House	1,565,991		
Minneapolis-St. Paul Metro Light Rail	In House	438,160		
Houston METRO Light Rail	In House	654,825		
Newark Light Rail	In House	2,065,724		
Buffalo Metro Rail	In House	1,158,950		
Pittsburgh T Light Rail	In House	569,329		
Sacramento Light Rail	In House	183,543		
San Diego Trolley	In House	1,641,912		
San Francisco Muni	In House	1,761,272		
San Jose Light Rail	In House	900,763		
Cleveland Blue and Green Line Rapid	In House	346,656		
The Tide (Norfolk, VA)	In House	178,177		
Portland MAX	In House	236,392		
Salt Lake City TRAX and S Line	In House	309,480		
Phoenix Valley Metro Rail	In House	172,915		
Hudson-Bergen Line (NJ)	Private Contractor	1,709,294	918,282	
San Diego SPRINTER	Private Contractor	127,271		

* These data include only the years where data was available.

Source: National Transit Database 2016 – 2012, Time Series Op Expense and Capital Use Tables. Includes “non-vehicle maintenance expense and capital expenses on existing segments. Note that rail systems that began operation in 2016 or later are not included.

These tables offer important insights. The first is that heavy rail systems are by far the most expensive to maintain. Their average annual upkeep cost of nearly \$1.6 million per mile is far greater than light rail (\$746,000 per mile), commuter rail (\$292,000 per mile) and streetcar (\$186,000 per mile). This is understandable since heavy rail systems carry a greater number of passengers, making the per-passenger cost lower than other modes. Some of the higher cost of heavy rail is associated with the fact that these systems run underground with greater frequency and span of service than other types of rail transit, making maintenance much more complex.

The data also show that maintenance is on average less expensive with a contracted approach, with a notable exception being the New Jersey Hudson-Bergen line (which has maintenance expenses similar to its in-house peers). Commuter rail systems that operate on Amtrak or freight railroad-owned tracks appear to have the lowest maintenance costs, as they only pay for use of the tracks rather than maintaining them directly, but commuter rail agencies' payments to track owners may not cover their full share of maintenance costs. The streetcar systems have the lowest maintenance costs on average, but this is likely due to the fact that several (e.g., Dallas, Tucson, Washington, Atlanta) are new and have not yet needed a significant infusion of maintenance dollars to keep a SOGR.

The approach to and cost of maintenance is also highly correlated to the age of the system. Most of the "legacy" rail transit systems in the United States have been maintained by public-sector agencies for 40 to 50 years. Beginning in the late 1980s, persuaded in part by domestic and international interest in private-sector engagement, some opted to use private contractors for the maintenance of their new rail systems. Since then, over half of new systems have used competitive contracts instead of developing in-house expertise from scratch. If a transit system is expanded or extended, under the status quo the agency will maintain that track using their established method.

Of the 15 heavy rail systems in the United States, all but one maintains their track primarily with in-house staff. The lone exception is the newest system in San Juan, Puerto Rico, which contracted out all maintenance functions since it opened in 2004. Otherwise, the tendency towards in-house maintenance of heavy rail systems is due the historical fact that many have long used public-sector labor.

Though streetcars and electric interurban railways were prevalent in American cities up until around 1950, most cities removed or discontinued them. While cities like Philadelphia, Boston, New Orleans, and San Francisco kept portions of their legacy light rail and streetcar networks, most such systems were built in the past 30 years. Since 1980, 31 light rail and streetcar systems began operation. These systems are not standardized and many have components and design aspects that are unique. Of the new systems, the approach to maintenance is divided almost evenly between contracted and in-house MOW.

Unlike light rail and heavy rail, commuter rail systems are more uniform and standardized. They all run on standard-gauge track and most commuter rail systems share track with freight and intercity passenger trains. The main factor affecting whether commuter rail agencies contract out MOW competitively or not is who owns the infrastructure. Of the 18 new commuter rail services that have started service since 1980, none conduct infrastructure maintenance in-house. Ten of these systems competitively bid track maintenance, while eight rely on the host railroad (either a freight company or Amtrak) to maintain the track and pay the host an access fee.

By contrast, most older legacy commuter railroad systems (such as New Jersey Transit, Philadelphia's SEPTA, New York's Metro-North and Long Island Rail Road and Chicago's Metra) that own some (or all) of their own track perform maintenance in-house. The exception is the MBTA in Boston, which competitively contracts out all operations and maintenance (O&M) tasks. MBTA at first relied on freight railroads to maintain the track that it consolidated between 1967 and 1987, and then began contracting noncompetitively with Amtrak in 1987.³⁵ The agency awarded its first competitive bid for O&M in 2003 to a Massachusetts Bay Commuter Rail, a consortium. Keolis Commuter Services won the contract rebid in 2014.

Approaches to maintaining rail infrastructure vary from project to project. The roles of the public and private sectors in maintenance fall into one of six approaches:

Approach A: All public-sector maintenance

Examples: Routine maintenance for New York (MTA), Washington (WMATA), Chicago (CTA), Philadelphia (SEPTA)

Under this approach, all system maintenance staff and managers are direct employees of the transit agency and no private contractors are used. Older and larger agencies use this arrangement more often than newer and smaller ones. Subway and light rail systems are more likely to use it than commuter rail and streetcar. This is due in part to the structural uniqueness and lack of uniform federal requirements for light rail and metro systems, making it more difficult for contractors to transfer expertise gained on one system to another.

Most of the legacy transit systems use Approach A for their routine maintenance, but have private sector roots. Over the course of the 20th century, the provision of urban public transit in the United States underwent a conversion from complete private sector ownership to public sector ownership and operation. In the early half of the twentieth century, transit was a for-profit enterprise provided by investor-owned firms that operated trains, streetcars, subways, and buses with the intention of providing a financial return.³⁶ While their routes and fares were often subject to public franchise or other regulation, their investment capital and operating funds were often privately generated, the latter primarily from fares and sometimes from property revenues. Gradually, these for-profit firms proved to be financially unviable, and transit ultimately became a service provided and funded by the public sector.

Under Approach A, maintenance teams are directly accountable to the public agency and directly answerable to its management team. In-house workers gain intense familiarity with all of the system's features and how they work together. However, if there are failures of track segments related to maintenance, the agency is accountable only to itself. For example, in 1997, WMATA fired 21 people following a derailment claiming the

employees filled out inspection reports without proper inspection of the railway.³⁷ The firings left WMATA in the middle of a lawsuit, with the employees suing the agency for discrimination and a hostile work environment, and WMATA defending its management.³⁸ After a derailment in Chicago in 2006, a review by the NTSB found widespread falsification of safety inspection reports by CTA employees, leading the replacement of “some top management.”³⁹

Approach B: Contracted private-sector companies to supplement public-sector staff

Examples: WMATA’s SafeTrack program

This approach entails competitively bidding out the opportunity to assist an agency’s workforce, usually for a specific project or “maintenance blitz,” but sometimes to remain on-call for a period of time as defined in the RFP and contract. Approach B allows public agencies to cost-effectively “staff up” to tackle a major short-term workload without assuming any ongoing responsibility for hiring additional in-house workers. Agencies thereby bring in knowledge gained from other systems and give in-house maintenance staff the opportunity to learn from experiences elsewhere.

For example, during its year-plus-long capital renewal program known as SafeTrack, WMATA signed an ongoing contract with G.W. Peoples to supplement its in-house workers.⁴⁰ Because WMATA did not know the exact plan for the maintenance needs, they bid out the work as an “indefinite delivery, indefinite quantity” (IDIQ), whereby the contractor was on call to perform work requested by the agency. The solicitation for this three-year contract stipulated that the vast majority of the work would be paid by production, not hours.⁴¹ In other words, rather than the amount of work, WMATA included defined quantities of fasteners, crossties and insulators, instead of the total number of hours worked, with WMATA inspectors verifying that the work was done properly.

Information on how many agencies actually use Approach B is difficult to assemble, but anecdotal evidence points to only occasional use. The contractors interviewed for this study try to avoid Approach B contracts given the risks of down time. And working on small projects like the replacement of crossties and insulators means that once those components are replaced and approved by the agency, the contractor relinquishes its role in the long-term performance of the components, thus eliminating the possibility for longer-term accountability. While contractors admitted that the profits are reliable, they found that there was actually no incentive for them to increase productivity, add value, or innovate. They prefer the added challenge, risks, and potential rewards of Approach C and D contracts.

Approach C: Contracted private sector companies for discrete, one-time projects

Examples: Signal systems on MBTA's subway and light rail system, PATCO interlocking replacement project

Under Approach C, a public agency retains all maintenance work with its own in-house staff, but may hire a private contractor on a short contract to handle certain projects such as track replacement work within a defined section. For example, an agency could contract the complete replacement of its system's switches as part of a major capital renewal program. The contractor's management team devises and implements a plan for how the work is to be carried out within the time and space restrictions given by the agency. The contract articulates, with varying degrees of specificity, the goals and parameters for the work as well as performance metrics for satisfactory completion of the work. The contractor generally brings its own equipment and personnel.

From 2008 to 2009, the Port Authority Transit Corporation (PATCO), a bi-state agency that owns a heavy rail line in metropolitan Philadelphia, replaced all 28 of its interlockings using this approach.⁴² PATCO's contract awarded the contractor a bonus of \$70,000 for each day the scheduled work was completed early. The selected contractor, Railroad Construction Company Inc. (RCC), completed the project ahead of time and under both the agency and the company's budget, leaving PATCO with a surplus of \$2 million. RCC credits this achievement to having a financial incentive to do the job faster, cheaper, and with better quality in order to earn a greater profit.

Using Approach C, a private contractor can use its best judgment, based on prior experience, to determine the most efficient and cost-effective way to carry out an agency's broadly-defined objective for a major renewal and replacement of assets. The public agency allows access to the track, the contractor performs the work, and the agency makes a final inspection upon completion. If the contractor does not perform the work to the contract's standard, they are required to correct it before payment. However, once the agency approves the work, then future problems with the track are solely the responsibility of the agency, relieving the contractor of any long term accountability for the work performed.

Approach D: Contracted long-term maintenance

Examples: Caltrain, Tri-Rail, MARC

Approach D gives an agency's contractor complete responsibility for the maintenance of all or part of its system for a period ranging from five to 20 years, often with the option of renewing the contract at the expiration of the initial term. The contractor plans and carries out work with its own equipment and personnel, and must meet agency goals for both routine maintenance and capital improvements. Long-term MOW is often bundled with train operations, vehicle maintenance, and dispatching, giving the same contractor complete control over—and providing a single point of accountability for—all operational aspects of the transit service. Under this approach, agencies must decide whether to bundle multiple services into one RFP or procure a separate contract for each service.

Caltrain, located in the San Francisco Bay Area, uses Approach D.⁴³ The Peninsula Corridor Joint Powers Board (PCJPB) assumed ownership of the rail line from San Francisco's 4th & King Streets terminal south to San Jose when Southern Pacific sold it in 1992. Since then, it bundled the MOW of this segment it owns with operations and equipment maintenance for the entire service.⁴⁴ Amtrak was Caltrain's initial O&M provider, until it lost a competitive bid to TransitAmerica Services Inc. (TASI) in 2012. TASI, a division of Herzog, is responsible for operating trains and maintaining the track for the duration of the contract.

Tri-Rail, a commuter railroad in South Florida, has tried bundled and unbundled maintenance contracts. When Tri-Rail began, it operated over tracks that CSX maintained, and used a single bundled contract for everything else. When the agency assumed track maintenance duties from CSX, it decided to bid out four separate contracts for maintenance, train operations, station maintenance, and dispatch services. With four contracts to manage, the agency found it difficult to hold one of the contractors accountable for train delays and cancellations. This is because the contractors tried to blame the others for contributing to the problem, leaving it to the agency to determine how to assign penalties. In the 2016 round of re-bidding, Tri-Rail reverted to one bundled contract for all O&M services and required bidders to present a single, fixed bid for the entire package. Herzog Transit Services won the \$500 million, 10-year contract for operations, dispatch, and track maintenance.

Approach D provides a single point of accountability for the system's state of repair, allows the contractor to maximize its nimbleness and responsiveness to agency performance standards, and gives the contractor more control and opportunity to utilize their own expertise. From the transit agency's perspective, this approach gives agencies less control over the details of how their systems are run. It also lacks the advantages of in-house workforces and can make it more difficult to change direction during the contract term. Success under this approach relies on a well-written contract and a good contractor-owner relationship.

Approach E: Public-private partnership (P3)

Example: Denver RTD's Eagle P3 Commuter Rail

In a P3, a private consortium is awarded a concession and is responsible for designing, building, financing, operating, and maintaining a rail system over a period of 30 or more years. The only current American example of this arrangement for public transit is the Eagle P3 commuter rail lines in Denver that opened in 2016.⁴⁵ However, a second (the Maryland Transportation Authority's Purple Line light rail) began construction in late 2017.⁴⁶ Given that a P3 arrangement applies mainly to new services, and the track maintenance problem in the United States is primarily one of existing services, this report does not cover Approach E.

Approach F: Full Privatization

Example: BrightLine in Florida

Under Approach F, no public agency is involved and a private company carries out track maintenance responsibilities and manages every aspect of the service. While freight railroads in the United States are privatized, aside from a few tourist, scenic, or historic railroads, there is only one fully privatized rail line in current operation: the Brightline in southeastern Florida.⁴⁷ Given its uniqueness, it is not covered in this report.

2.2 Track Maintenance and Labor

All public-sector in-house maintenance workers are represented by labor unions that have collective bargaining agreements with transit agencies. Most private MOW contracting firms also use unionized workers, but those employees bargain with the private firm rather than the public agency. The largest organization representing transit employees, on both rail and other modes, is the Amalgamated Transit Union (ATU), an AFL-CIO affiliate.⁴⁸ The second largest is the Transport Workers Union Transit Division, also an AFL-CIO affiliate.⁴⁹ For FRA-regulated

commuter rail, where private-sector employers dominate, the majority of track maintenance workers are represented by the Brotherhood of Maintenance of Way Employees Division (BMWED) of the International Brotherhood of Teamsters. FRA-regulated signal system maintenance workers are represented by the Brotherhood of Railway Signalmen (BRS).⁵⁰

Determining whether the public sector or private sector offers better compensation is not straightforward. Differences in job titles, overtime, tenure, and benefits obscure and inhibit direct national comparisons. An examination of wages for MOW workers in two public agencies in the San Francisco Bay Area with overlapping job markets found that contractor workers are paid roughly commensurate with agency employees with the same levels of experience and similar job titles and descriptions (Table 3). The union contracts listed dozens of positions but none lined up directly with another. The two jobs listed below were the most comparable in terms of title and scope.

Workforce Definitions

For the purposes of this report, “in house” labor refers to full time and part time workers that are employed directly by the public agency. “Contracted” workforce is employed directly by a private entity, regardless of whether the job is long-term or temporary.

Table 3: Comparison of private and public-sector workers in the San Francisco Bay Area

Agency	Bay Area Rapid Transit (BART)	Caltrain
Primary Approach	In-house	Contracted
Union	Service Employees International	Brotherhood of Maintenance of Way Employees Division
First year hourly rate/ job title	\$24.11/Maintenance Worker I	\$27.36/Track Worker
First year hourly rate/ job title	\$33.52/Inspector	\$33.48/Track Inspector
Cost of Living Adjustment (COLA)	0.4 percent	0 percent

Source: Bay Area Rapid Transit District and Service Employees International Union Local 1021, "Labor Agreement," 2013; Brotherhood of Maintenance of Way Employees Division—Unified System Division, "2016 T.A.S.I. Pay Rates," 2016.

The differences in compensation tends to come from benefits. Public agencies often provide defined benefit pension plans, which promise a set amount of money after retirement until death, many of which are not fully funded.⁵¹ Private companies rarely offer such benefits, instead opting for defined contribution plans—such as a 401(k)—to which the company contributes until employment ends.⁵² In addition, some public agencies grapple with expensive overtime costs, skewing the difference in total compensation between public and private sector workers and sometimes spiking final pension payouts.⁵³

In terms of cost differentials between public and private sector workers, a 2013 U.S. GAO report noted that public-sector union rules often prohibit private contractors' ability to have their employees split their time between different tasks, learn multiple skills, or fill in as needed. Contractors also tend to have a greater number of employees in part-time positions, resulting in decreased average wage and benefit costs.⁵⁴

Federal law plays an important role in governing how agencies interact with their labor unions. The most relevant aspects that apply to contracting for maintenance are the 13(c) labor protection requirements (named for the section number in the Urban Mass Transit Act where the provision was found from 1966 to 1994).⁵⁵ All transit agencies that receive federal financial aid are subject to 13(c).

The laws were first enacted in 1964, under the opposite labor situation that exists today, but with goals that are still applicable. At that time, most urban transit companies were privately owned, and their employees usually had good benefits and strong union

representation. Public employees, meanwhile, were rarely unionized.⁵⁶ The purpose of section 13(c) was to protect the benefits, working conditions, and collective bargaining rights of the unionized employees of the private-sector transit companies as they were absorbed by cities and counties (who gave their own employees no such unionization rights). Today, the situation is quite different, as public employees often have strong and powerful union representation.

However, the core purpose of section 13(c) has not changed. The provision requires all grants for federal mass transit funding assistance to include provisions protecting “the interests of employees affected by the assistance” that are determined by the Secretary of Labor to be “fair and equitable.” The law also provides that the labor protection provisions in a grant agreement “shall provide benefits at least equal to benefits established under” the Railway Labor Act used in railroad mergers.⁵⁷

The statute says that if an agency merges or staff is shifted from public sector to private sector (or vice-versa), the protections written into transit agreements shall include:

- A. The preservation of rights, privileges, and benefits (including continuation of pension rights and benefits) under existing collective bargaining agreements or otherwise;
- B. The continuation of collective bargaining rights;
- C. The protection of individual employees against a worsening of their positions related to employment;
- D. Assurances of employment to employees of acquired public transportation systems;
- E. Assurances of priority of reemployment of employees whose employment is ended or who are laid off; and
- F. Paid training or retraining programs.

The U.S. Department of Labor (DOL) developed a standard protective arrangement for inclusion in most mass transit grant agreements and has promulgated regulations explaining its procedures for assessing individual agreements to be negotiated between labor and transit agencies.⁵⁸ Since 1989, DOL has generally held that if 13(c) obligations are binding on a given transit agency, they are also binding on any of its contractors that are involved in operating and maintaining the system.⁵⁹

Another legal provision that affects the difference between in-house and contracted workforces is the 1931 Davis-Bacon Act, stipulating that employers must pay workers the “prevailing wage,” including fringe benefits, in a given region for a given type of work.⁶⁰ Private maintenance contractors, whether or not their employees are unionized, pay their workers, at a minimum, the region’s prevailing wage and fringe benefits in accordance with the law.

Federal grants for public transit are also subject to local, state, and federal rules that require agencies to make efforts to pay a meaningful percentage of the contract's value to Disadvantaged Business Enterprises (DBEs) and Small Business Enterprises (SBEs).⁶¹ In practice, major contracting firms often meet these requirements by subcontracting portions of the scope of work to qualified DBE and SBE firms. Businesses owned by women or minorities and small businesses may have more trouble breaking into established industries. DBE and SBE requirements can be advantageous to the DBE/SBE contractors and help promote public goals of inclusion, but they can create increased costs as few DBE-qualified contractors exist in the rail maintenance industry.

2.3 Track Maintenance and Procurement

In its broadest sense, public sector agencies use contracting (also called competitive tendering) to procure the services of a private firm through a competitive bid process.⁶² Agencies that do so adhere to federal, state, and local procurement rules, largely intended to avoid waste, fraud, and abuse of public dollars when working with private entities. These rules differ but in a typical procurement, an agency first releases a Request for Qualifications (RFQ) and circulates it to firms known to have the requisite skills and expertise, to trade associations, and via other means of publicity. RFQs describe the services sought in general terms and ask only for companies to describe their experience performing similar jobs (known as Statements of Qualification (SOQs)). Agencies evaluate the SOQs and determine which firms will be invited to advance to the next step. Agencies maintain open dialogue with all respondents during the qualification process, in contrast with the subsequent proposal process.

The firms selected through the qualification process receive a Request for Proposals (RFP). The agency may opt to send RFPs to all respondents to the RFQ.⁶³ Once an RFP is released the agency must not communicate with any current or potential bidder (a period known as the "Cone of Silence") except through the formal question and answer process laid out in the RFP, where all proposers may view all questions and answers.⁶⁴ It is best practice for RFPs to invite proposers to offer their own innovative methods for achieving the agency's overall goals in the most cost-effective manner, such as by using their own software to track metrics and progress toward goals that allow the agency to have real-time access to this information. On the other hand, prescriptive RFPs do not give as much flexibility to solve the overarching problem, potentially restricting the bidders' ability to bring new ideas to the table.

After the evaluation of proposals a preferred bidder is selected. Alternatively, two or three preferred bidders may be invited to submit “best and final offers” which result in the selection of a winning bidder. Once a winner is selected the company and agency create a formal contract outlining their respective responsibilities and payment terms.⁶⁵ Contracting can be applied to various transit agency functions, such as operations, maintenance, or administration.⁶⁶ Contracts generally address provisions such as performance metrics, form of payment, and labor agreements.⁶⁷

3. Recommendations: Steps to Better Rail Maintenance

No easy solutions exist to improve the condition of rail transit infrastructure in the United States. While this paper is about rail maintenance broadly, the industry today is routinely asking about greater use of contracting as a quick way to bring about greater efficiencies and accountability. But this study finds that agencies must undergo an internal culture change to even consider the use of outside contractors for some or all of the work. Good practice, coupled with robust funding, is vital to restoring the condition of rail networks.

Below are five broad recommendations that agencies can and should take to improve the condition of their rail infrastructure, including how to engage with private contractors when appropriate. They are presented as “steps” because they are linear in nature: agencies cannot consider step 3, for example, before it completes steps 1 and 2. Of all, the first is the most important.

Step 1: Design and Implement an Effective Asset Management Plan

During the course of this research, it became apparent that few agencies have a complete understanding of what rail assets they maintain and how to prioritize that maintenance. Consistent anecdotal evidence from stakeholders finds that agencies’ approaches to maintenance often lacks consistency, neglects the use of data, and relies on outdated, prescriptive approaches. The asset management plans or capital needs documents that agencies do publish are either insufficient or not transparent enough for the agency and the public to truly understand the current and future state of the system. Before an agency considers altering its maintenance approach or engaging with a contractor, it must have a very clear understanding of its maintenance needs.

Agencies need to go above and beyond current federal rules to implement a condition-based TAM plan that includes the following key components:

- Complete digital asset inventory
- Regularly-updated condition assessments of inventoried assets
- Prioritized list of investments to improve the SOGR
- Transparent and understandable metrics to gauge performance

These components need to include the full spectrum of maintenance management and be codified into a clear, transparent data ecosystem. The prioritization of needs must balance SOGR with system expansion and other capital investments.

American rail transit agencies are now required by the FTA and FRA to have such a plan. But this requirement dates to only 2016, and existing practice indicates that the current state of TAMs needs improvement.⁶⁸ Plans should include condition-based maintenance, which involves maintaining assets based on actual observance of their condition and repairing or replacing them when conditions warrant.⁶⁹ This approach is complex and requires significantly more initial investment to coordinate data inputs from sensors and monitoring devices.

Agency TAM plans should enable public-sector managers to better utilize internal staff as well as prepare for scenarios where contracting might be appropriate. Field workers and contractors should be able to seamlessly use the TAM data to estimate timelines and costs. Transit agencies do not need to develop their own in-house system from scratch. The federal government has guidebooks for TAM plans, and a number of private-sector contractors and consultants have off-the-shelf, fully customizable TAM software that they sell to transit agencies.

For its part, the federal government needs to strengthen its requirements for TAM plans. The 2016 federal rule takes important steps in establishing a consistent framework and definition for SOGR and asset management. But because of limited annual budgets, agencies are most likely to do the minimum required by the federal rule. The rule should be strengthened by including additional performance measures (currently there is only one performance metric: the percentage of track with operational restrictions) and requiring a condition-based plan. Mandating more stringent rules would require more initial startup costs, but the long-term benefits of having state-of-the-art asset management is likely to far exceed those expenses.

Taxpayers and the riding public care whether public transit infrastructure is maintained efficiently and effectively, but the current TERM model does not mean much to people outside the agency's maintenance department. A rider does not care whether the section of track is maintained at a TERM level 3 (adequate) or level 4 (good). A rider does care if the

train is slowed or cancelled because of poor upkeep. Agencies should introduce performance metrics that directly relate to the priorities that matter to the riders in order to build a rider constituency to improve maintenance. The following are sample metrics based on interviews and discussions that informed this paper:

- **Percent uptime.** The total amount of time that revenue trains run without maintenance delays. Agencies can set monthly targets and improve on them. Agencies should communicate to riders that sometimes maintenance does mean additional delays to passengers in order to have track access, but investment in this time can mean better performance in the long run.
- **Percent of track with slow zones.** This is the only metric that the 2016 FTA guidance requires. Agencies should aim to have this metric at zero, and have a plan to keep it at zero, before any capital funds are diverted to system expansion.
- **Total minutes of passenger delay related to track maintenance.** This includes delays for passengers due to unexpected track problems as well as time lost for additional track shutdowns, slow orders, single tracking, and lost ridership.

With these (or similar) metrics, maintenance departments, agency leadership, and the general public can monitor how agencies are performing over time and in relation to other agencies across the country.

Designing and implementing an effective asset management plan will undoubtedly be a costly, long-term endeavour that requires strong leadership and a wholesale culture change at the agency. The change will require front line management training, better use of technology, better use of the information and data collected, and better communication to agency boards about the importance of prioritizing maintenance of the system.

Step 2: Do Not Negatively Affect the Compensation of the Existing Workforce

For both practical and legal reasons, agencies should not and cannot cut base compensation or head count and expect improved results. Research shows that agencies or governments pursuing contracting as a means to undermine labor or exclusively cut costs will be left with worse service than before.⁷⁰ Legally, the federal 13(c) labor law all but prohibits agencies from reducing base compensation as they contract out work.

For agencies that have established in-house asset maintenance workforces, any change to the existing labor arrangement, including any consideration of using contractors, must be done in a way that keeps the existing workforce whole. Any approach that is perceived as unfair or detrimental to existing workers will encounter strong opposition and is likely to be costly in terms of money, political capital, and public goodwill, and is at a high risk of failure. Managers and front-line workers take pride in their work, and a consistent, well-

trained workforce is important for the agency and the community it serves.

However, interviewees for this report gave consistent anecdotal evidence of inefficient work practices throughout the industry at both in-house and contracted maintenance facilities. Under the overarching goal of workplace safety, agencies should work with staff to revise outdated work rules to drive productivity, with a particular emphasis on maximizing the time that maintenance teams have to actually work on the track within their limited time. Agencies can and should use transparent performance metrics to hold both public and private sector maintenance teams accountable.

Fair statistics that measure productivity (such as ties replaced per day) as well as costs (that account for labor, equipment, and materials) tracked over time can demonstrate to the Board and the general public that the agency is updating and improving their maintenance work. These same measures can be applied to contracted workforces, to ensure that they are good stewards of public dollars. These measures should be weighed against the full cost of maintenance, including pensions, overtime, and unfunded benefits (where applicable). But the culture of prioritizing maintenance needs to start at the CEO and board level.

Step 3: Track and Test Alternative Methods for Infrastructure Maintenance

An agency that conducts its maintenance primarily in house should address Steps 1 and 2, reforming and measuring the performance of their maintenance program. This can enable agencies to pilot new techniques to see if they can improve on them. If an agency is considering contracting for a portion of its system, it can design a program that allows the performance of the contractor to be measured against its internal staff, thus gauging the value, risk transfer, and accountability of using contractors. There are two approaches agencies can utilize.

Using Approach C (contracted private sector companies for discrete, one-time projects), the public agency would hire a company for a discrete project on a particular stretch of track and monitor it closely. The agency would simultaneously have its in-house staff perform similar work on another part of the system. The agency can then gauge the effectiveness of each approach in terms of time, cost, and quality in a quasi controlled experiment. The agency would use the same in-house track inspectors to examine both sections of track upon completion, checking for safety and quality.

Using Approach D (contracted long-term maintenance), the agency would give a contractor full responsibility for a section of track. For example, if a subway network has ten lines, one complete line could be contracted for a term of three to five years. The private entity would be responsible for all maintenance on that line for a predetermined cost. While the contractor would have complete control over its upkeep, they would be required to cooperate

with agency oversight and regular safety inspections, and to meet or exceed specific performance metrics. Agencies can use this to compare the quality and cost of that work to that of in-house employees maintaining other track segments at the same time. This approach could be particularly useful when opening a new or extended line. Additionally, the full maintenance of that asset could be contracted and compared with the performance of similar assets.⁷¹

The agency must perform proper oversight (see Step 5) in order to ensure that both in-house and contracted work is safe and effective. Maintenance project teams should have performance metrics related to the amount of down time required to complete the work, with penalties for exceeding time constraints, and bonuses for less down time than expected. Agencies should also measure the total hard cost of operational and capital maintenance per mile of track. Costs should include wages, benefits, materials, and equipment for in-house maintenance departments and contract and management costs for contracted maintenance agreements.

From the time a competitive procurement experiment is first proposed to completion of such an experiment, the agency must do all it can to manage the public's perception of this undertaking. Agencies should be clear to riders, workers, and the general public that the pilot is aimed at improving the effectiveness and accountability of the track maintenance, and not being pursued as a way to cut corners, trim costs, or absolve agency management of responsibility for the system's state of repair. Nor should it be considered an effort to short-change workers or circumvent labor unions.

Step 4: Carry Out a Fair and Functional Procurement Process and Write an Effective Contract

Agencies should follow Steps 4 and 5 if they have determined, after thorough review, that engaging with a private contractor makes sense.

An agency's success with maintenance contracting relies on its dedication to achieving the highest overall quality, and not merely the lowest cost. Steps to reach this goal must be incorporated into every part of the process from internal agency policy to RFP creation. Mutually agreed upon metrics are necessary in assessing whether goals have been met. A shift towards emphasizing quality must begin at the top of the organization, with all the senior leadership, including the governing board, focused on quality.

Evaluating bids based on quality requires an ability to define and assess them fairly and objectively. For example, RFPs require proposers to detail projects and properties they have worked on previously and the respective owners' assessments of their performance. However, there are rarely objective criteria for evaluating one proposer's experience against another.

RFPs must be both specific and comprehensive. It can be challenging to write a scope of work that avoids future costly change orders, particularly with regard to the maintenance of components—such as the signal system—that are multifaceted and intertwined with other components and services. The more an agency asks a contractor to do, the higher the bids will be, to the point that bidders either cut corners to lower their cost, or propose excessively high costs that the agency cannot afford. One possible alternative is for the agency to set a budget and ask bidders to propose what they can do within that budget.⁷²

Contracting may or may not save money compared to in-house maintenance work. However it does give the agency additional legal and managerial tools and leverage to correct poor performance and reward outstanding work. These tools include leveraging the private sector’s profit motive through liquidated damages or bonus payments.

There are many complicating factors when it comes to balancing incentives and disincentives, particularly in the case of older rail systems where it is not as easy to identify the responsible party for a failure or the party to be credited for exceeding performance goals. Most agencies incentivize their maintenance contractor using liquidated damages or penalties. During the winter of 2015, Boston’s MBTA fined the contractor responsible for the maintenance and operation of its commuter rail system \$1.6 million for late and dirty trains.⁷³ While this helps maintain minimum standards and discourages contractors from making mistakes, it does not positively incentivize good performance.

Other agencies allow their contractors to “buy” downtime in advance (typically over weekends) based on how long they think they will need access to sections of track to complete their assigned tasks. If the firms do not get the work done within the original time they purchased, they need to purchase additional time, which adds to the total cost and takes away from the firm’s bottom line. The PATCO example discussed in Section 2.1 demonstrated how an agency offered its contractor \$70,000 for each day it finished a major

A Bid for Better Transit

A 2017 TransitCenter/Eno report presented key operational and strategic insights from transit agencies that use contractors to operate their service.⁶⁸ While the report did not include contracting for the maintenance of rail systems, it confirmed that, when implemented carefully, competitive contracting for operations can yield improved transit service and other innovations that benefit the public.

However, those benefits are only fully realized when elected leaders, transit officials, and other stakeholders work to understand and implement contracting in a strategic, context-appropriate way.

project early, resulting in savings for the agency and greater profits for the company as the project came in ahead of schedule and under budget.

Other financial incentives could relate to the operation of the transit service. The goal of transit maintenance is to ensure that trains can operate efficiently without delay. A contract could assign penalties for every minute that a train is delayed due to a malfunction of track, and bonuses for exceeding minimum standards of time between track condition-related delays. The United Kingdom's Network Rail, a public corporation that maintains intercity rail tracks, must pay franchise operators a set amount for every minute of delay that maintenance issues cause to their trains.⁷⁴

The best kind of performance benefits and penalties are ones that are indisputable. Contractual metrics of impact on service due to track and infrastructure maintenance must be meaningful, specific, measurable, and accountable. Additionally, the simpler a metric is, the easier it is to comply with.

A public agency would contract with a private firm for maintenance in order to ensure the highest quality of track condition for the best price. However, since transit agencies rely on public dollars to fund maintenance and must adhere to a range of public policy priorities, it is appropriate to incorporate broader public goals to achieve more with available dollars.

For example, states and localities have laws that require agencies using private contractors to provide publicly-funded services to make efforts to pay a meaningful percentage of the contract's value to DBEs and SBEs.⁷⁵ Bidders can also be incentivized through the awarding of bonus points in bid evaluation to use less harmful or sustainably sourced materials and to employ state-of-the-art practices to make the most efficient use of energy, water, and for minimizing emissions of greenhouse gases.

Similar mechanisms in RFPs can be used to compel bidders to abide by high labor and employment standards. Contractors can be required to give ex-offenders help in re-entering society, for example, by forbidding employers from asking job applicants for their criminal backgrounds. They can also be incentivized to procure U.S.-made or locally made components and materials to the greatest extent possible. Additionally, bidders can be asked to assist agencies in their public education efforts regarding the benefits of riding transit, the positive impacts transit has on the economy and community, and how to use the transit system.

Before incorporating such mechanisms, agencies should evaluate how likely they are to affect pricing and decide how much more the agency is willing to pay a contractor to perform better from a labor, social, or environmental standpoint.

Step 5: Administer Contracts Effectively

Oversight of a contractor's track maintenance is vital to ensure wise expenditure of public dollars and passenger safety. But effective contract management is not easy, and agencies that are not accustomed to managing contractors often miss important steps.

Managing a contract requires a different set of skills from managing a maintenance crew. Inexperienced agencies often default to "man matching" where the agency duplicates contractor management staff. Instead, agencies need to create and train a whole different set of skills within their management teams to ensure that the work is properly executed while allowing the contractor to work without too much interference.

The optimal contractual arrangement is one where key managers on both agency and contractor staffs feel no need to refer to the contract with any regularity. This requires mutual understanding of the other's needs, desires, and capabilities. Open and honest communication is paramount in achieving this goal, as are good personal relationships forged over time in a variety of settings.

Too many agencies think that contractor management is about assigning penalties for poor performance. Oversight needs to be strong enough to be able to see into the contractor's operation and verify that they are spending money and allocating priorities as promised, but not so strong that the agency spends excessive time and resources. Contractor staff should not see the agency as overbearing or feel bogged down in paperwork or duplicative accounting and recordkeeping.

A contractor is only engaged for a limited time. Other crews, either in-house or via another contract, will have to maintain the track long after a given contract expires. Agencies need to demand and ensure that contractors provide thorough and accurate data and asset management program logs, both to meet federal requirements and so that the next contractor or in-house staff can seamlessly transition.

4. Conclusion

To move transit systems into the future, the current approach to maintenance needs a wholesale culture change. Agencies will undoubtedly need to dedicate more funding to maintenance, but the long-term effectiveness of that money relies on ways to improve cost efficiency and redeploy resources to the most pressing problems. Understanding, documenting, and prioritizing the condition and rehabilitation of the rail system has to be a priority of the agency from the staff to the board of directors. While maintenance is not the most exciting of priorities, it needs to be top of mind and top of the list for transit. Riders are counting on it.

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