

HOW SHORT-TERM BRIDGE AND PAVEMENT TARGETS COMPLEMENT THE LONG-TERM STATE OF GOOD REPAIR

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Glossary

Annual Consistency Determination Documents mean documents a State Department of Transportation (State DOT) uses to demonstrate development and implementation of a Transportation Asset Management Plan (TAMP) as described in 23 CFR 515.13(b).

Asset Management means, for purposes of title 23, U.S.C., a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair (SOGR) over the life cycle of the assets at minimum practicable cost. (23 U.S.C. 101(a)(2) and 23 CFR 515.5)

Baseline Performance Period Report refers to the Transportation Performance Management (TPM) report referenced in 23 CFR 490.107(b)(1) in which State DOTs shall submit baseline condition and performance information by October 1st of the first year in a performance period and every 4 years thereafter baseline.

Complete Streets are streets designed and operated to enable safe use and support mobility for all users.¹

Congestion Management Process means a systematic approach required in transportation management areas (TMAs) that provides for effective management and operation, based on a cooperatively developed and implemented metropolitan-wide strategy, of new and existing transportation facilities eligible for funding under titles 23 and 49, U.S.C., through the use of travel demand reduction and operational management strategies. (23 CFR 450.104)

Financial Plan means a long-term plan, prepared as part of the TAMP, spanning 10 years or longer, presenting a State DOT's estimates of projected available financial resources and predicted expenditures in major asset categories that can be used to achieve State DOT targets for asset condition during the plan period. The Financial Plan also highlights how resources are expected to be allocated based on asset strategies, needs, shortfalls, and agency policies. (complete definition is in 23 CFR 515.5)

Full Performance Period Progress Report means the TPM report referenced in 23 CFR 490.107(b)(3) in which State DOTs report by October 1st of the first year following the reference performance period, including a State DOT's discussion of its progress toward achieving the 4-year targets and the effectiveness of investment strategies in the State DOTs' TAMP.

Good, Fair, and Poor, when capitalized in this document, mean the conditions defined in 23 CFR 490.313 and 490.409 relating to assessing conditions for bridges and pavements on the National Highway System (NHS) in connection with TPM.

¹ U.S. Department of Transportation, Complete Streets, accessed at <https://www.transportation.gov/mis-sion/health/complete-streets#:~:text=Complete%20Streets%20are%20streets%20designed,bicy-clists%2C%20or%20public%20transportation%20riders>

Highway Safety Improvement Program (HSIP) is a core Federal-aid program to achieve a significant reduction in traffic fatalities and serious injuries on all public roads through the implementation of highway safety improvement projects. The specific provisions pertaining to the HSIP can be found in 23 U.S.C. 148. These requirements include the development of Strategic Highway Safety Plans (SHSPs), in consultation with other key State and local highway safety stakeholders, as well as a number of reporting requirements.²

Investment Strategy Discussion means the discussion in the TPM Mid and Full Performance Period Progress Reports on the effectiveness of the investment strategies developed and documented in a TAMP under 23 U.S.C. 119(e) and 23 CFR 515.9 and referenced in 23 CFR 490.107(b)(1)(ii)(C).

Life-cycle Planning (LCP) means a TAMP process to estimate the cost of managing an asset class, or asset sub-group over its whole life with consideration for minimizing cost while preserving or improving the condition. (23 CFR 515.5)

Long-Range Statewide Transportation Plan (LRSTP) means the official, statewide, multimodal, transportation plan covering a period of no less than 20 years developed through the federally required statewide transportation planning process. (23 U.S.C. 135 and 23 CFR 450.104)

Long-Range Statewide Transportation Plan System Performance Report means the element of the LRSTP that evaluates the condition and performance of the transportation system with respect to the performance targets described in 23 CFR 450.206(c) including progress achieved by the metropolitan planning organization(s) (MPO) in meeting the performance targets in comparison with system performance recorded in previous reports. (23 CFR 450.216(f)(2))

Management System means a systematic process, designed to assist decision makers in selecting cost effective strategies/actions to improve the efficiency or safety of, and protect the investment in the nation's infrastructure. A management system may include procedures for functions such as identification of performance measures; data collection and analysis; determination of needs; evaluation and selection of appropriate strategies/actions to address the needs; and evaluation of the effectiveness of the implemented strategies/actions. (*see, e.g.*, 23 CFR 450.104 and 23 CFR 515.17)

Metropolitan Transportation Plan (MTP) means the federally required official multimodal transportation plan addressing no less than a 20-year planning horizon that the MPO develops, adopts, and updates through the metropolitan transportation planning process. (23 U.S.C. 134(i) and 23 CFR 450.104)

Metropolitan Transportation Plan System Performance Report means the element of the MTP that evaluates the condition and performance of the transportation system with respect to the performance targets described in 23 CFR 450.306(d), including progress achieved by the MPO in meeting the performance targets in comparison with system performance recorded in previous reports, including baseline data. (23 CFR 450.324 (f)(4))

Mid Performance Period Progress Report means the TPM report referenced in 23 CFR 490.107(b)(2) in which State DOTs report by October 1st of the third year in a performance period.

² FHWA About Highway Safety Improvement Program (HSIP) accessed at <https://safety.fhwa.dot.gov/hsip/about.cfm>

The report includes a discussion of their progress toward achieving 2-year targets and the effectiveness of the investment strategies in the TAMP.

National Freight Strategic Plan (NFSP) was announced on Sept. 3, 2020, and defines the U.S. Department of Transportation's vision and goals for the national multimodal freight system, assesses the conditions and performance of the freight system and barriers to freight system performance, and defines strategies to achieve its vision and goals.³ (see Fixing America's Surface Transportation Act, section 8001, Public Law 114-94 (2015))

Performance-Based Planning and Programming (PBPP), as required under 23 U.S.C. 134 and 135, involves integrating performance management concepts into the existing federally required transportation planning and programming processes. PBPP involves using data to support long-range and short-range investment decision-making. <https://www.fhwa.dot.gov/planning/performance-based-planning/>

Performance Gap means, for the purposes of a TAMP, the gaps between the current asset condition and State DOT targets for asset condition, and the gaps in system performance effectiveness that are best addressed by improving the physical assets. (23 CFR 515.5)

Performance Period means, for the purposes of TPM, a determined time period during which condition/performance is measured and evaluated to: assess condition/performance with respect to baseline condition/performance; and track progress toward the achievement of the targets that represent the intended condition/performance level at the midpoint and at the end of that time period. (23 CFR 490.101). The time period for a Performance Period for the bridge and pavement national measures, is 4 calendar years, and the first Performance Period started on January 1, 2018, and ends on December 31, 2021. (23 CFR 490.105(e)(4) and 490.107(b)(1))

Performance of the NHS, for purposes of a TAMP, refers to the effectiveness of the NHS in providing for the safe and efficient movement of people and goods where that performance can be affected by physical assets. This term does not include the performance measures established for performance of the Interstate System and performance of the NHS (excluding the Interstate System) under 23 U.S.C. 150(c)(3)(ii)(A)(IV)-(V). (23 CFR 515.5)

Project Selection means the procedures followed by MPOs, States, and public transportation operators to advance projects from the first 4 years of an approved TIP or STIP to implementation, in accordance with agreed upon transportation planning procedures. (23 CFR 450.104)

Public Transportation Agency Safety Plan (PTASP) refers to the plan referenced in 49 U.S.C. 5329(d) that includes, among other elements, methods for identifying and evaluating safety risks throughout all elements of the public transportation system.⁴ (49 U.S.C. 5302(14).)

Risk Management, for purposes of a TAMP, means the processes and framework for managing potential risks, including identifying, analyzing, evaluating, and addressing the risks to assets and system performance. (23 CFR 515.5)

³ U.S. Department of Transportation National Freight Strategic Plan, accessed at https://www.transportation.gov/sites/dot.gov/files/2020-09/NFSP_fullplan_508_0.pdf

⁴ Federal Transit Administration, Scenario Planning, accessed at <https://www.transit.dot.gov/regulations-and-guidance/transportation-planning/scenario-planning>

Scenario Planning means a transportation planning process that evaluates the effects of alternative policies, plans and/or programs on the future of a community or region. This activity should provide information to decision makers as they develop the transportation plan. (23 CFR 450.104)

State Biennial Performance Report refers to all three State DOT TPM reports collectively required in 23 CFR 490.107(b). The three reports are Baseline Performance Period Report, Mid Performance Period Progress Report, and Full Performance Period Progress Report.

State Freight Plan means the plan developed by States under 49 U.S.C. 70202 that includes 10 required elements, including: identification of freight trends and needs; policies strategies, and performance measures; critical freight corridors; improvements that may be required to roadways traveled by heavy vehicles; facilities with freight mobility issues, such as bottlenecks; a freight investment plan; and consultation with a State freight advisory committee.

State Strategic Highway Safety Plan (SHSP) means a comprehensive, multiyear, data-driven plan developed by a State department of transportation (DOT) in accordance with 23 U.S.C. 148. (23 CFR 924.3)

Statewide Transportation Improvement Program (STIP) means a statewide prioritized listing/program of transportation projects, as required under 23 U.S.C. 135, covering a period of 4 years that is consistent with the long-range statewide transportation plan, metropolitan transportation plans, and TIPs, and required for projects to be eligible for funding under title 23 U.S.C. and title 49 U.S.C. Chapter 53. (23 CFR 450.104)

STIP Performance Discussion used in this document means a federally required discussion in the STIP of the anticipated effect of the STIP toward achieving the performance targets identified by the State in the statewide transportation plan or other State performance-based plan(s), linking investment priorities to those performance targets. (23 CFR 450.218(q))

System Performance Report is the section of the LRSTP and MTP that evaluates the condition and performance of the transportation system with respect to the performance targets described in 23 CFR 450.206(c) and 450.306(d), including progress achieved by the MPO(s) in meeting the performance targets in comparison with system performance recorded in previous reports. (23 CFR 450.216(f)(2) and 450.324(f)(4))

Target means, for purposes of TPM, transportation asset management under 23 U.S.C. 119(e), and transportation planning under 23 U.S.C. 134–135, a quantifiable level of performance or condition, expressed as a value for the measure, to be achieved within a time period required by the Federal Highway Administration (FHWA). (*see* 23 CFR 490.101 for definitions of “measure” and “target”)

Transit Asset Management Plan means a plan required under 49 U.S.C. 5325 that includes an inventory of transit capital assets, a condition assessment of inventoried assets, a decision support tool, and a prioritization of investments. (49 CFR 625.25(b))

Transportation Asset Management Plan (TAMP) means the risk-based asset management plan defined in 23 CFR 515.5 and required under 23 U.S.C. 119(e) and 23 CFR Part 515. The TAMP is intended to carry out asset management as defined in 23 U.S.C. 101(a)(2) for NHS pavements and bridges. The TAMP describes how the State DOT will make risk-based decisions relating to managing the physical assets in the TAMP, using information from long-term assessments of those assets. The TAMP lays out a set of investment strategies to address asset condition and system performance gaps. This document describes how the highway network system will be managed to achieve

State DOT targets for asset condition and system performance effectiveness while managing the risks, in a financially responsible manner, at a minimum practicable cost over the life cycle of its assets.

Transportation Improvement Program (TIP) means a prioritized listing/program of transportation projects required under 23 U.S.C. 134 and covering a period of 4 years that is developed and formally adopted by a metropolitan planning organization (MPO) as part of the metropolitan transportation planning process, consistent with the metropolitan transportation plan, and required for projects to be eligible for funding under title 23, U.S.C. and chapter 53 of title 49, U.S.C. (23 CFR 450.104)

TIP Performance Discussion, used in this document, means a federally required discussion in the TIP of the anticipated effect of the TIP toward achieving the performance targets identified in the metropolitan transportation plan, linking investment priorities to those performance targets per 23 CFR. 450.326(d).

Transportation Performance Management (TPM) is a strategic approach that uses system information to make investment and policy decisions to achieve national performance goals pursuant to 23 U.S.C. 150.⁵ (23 U.S.C. 150)

Update means, for purposes of transportation planning under 23 U.S.C. 134–135, making current an LRSTP, MTP, TIP, or STIP through a comprehensive review. Updates require public review and comment, a 20-year horizon for MTPs and LRSTPs, a 4-year program period for TIPs and STIPs, demonstration of fiscal constraint (except for LRSTPs), and a conformity determination (MTPs and TIPs in nonattainment and maintenance areas). (23 CFR 450.104)

Transportation Systems Management and Operations (TSMO) means, for purposes of title 23, U.S.C., integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system. (23 U.S.C. 101(a)(30))

Work Type, for purposes of a TAMP, means initial construction, maintenance, preservation, rehabilitation, and reconstruction. (23 CFR 515.5)

⁵ Federal Highway Administration Transportation Performance Management website accessed at <https://www.fhwa.dot.gov/tpm/about/tpm.cfm>

How Short-Term Targets Complement the State of Good Repair

Introduction and Background

The Moving Ahead for Progress in the 21st Century Act (MAP-21) amended Title 23 U.S.C. to emphasize achievement of National Highway System (NHS) bridge and pavement performance measures and targets, and the pursuit of the national infrastructure condition goal of achieving a state of good repair (SOGR).⁶

Short-term performance targets and the long-term SOGR work together to support the national infrastructure condition goal identified in 23 U.S.C 150(b)(2). The SOGR identifies the long-term end result that State departments of transportation (DOTs) seek to achieve with their asset management investment strategies (23 CFR 515.9(d)(1) and 515.9(f)(1)). The short-term 2-year and 4-year targets “need to be considered as interim conditions/ performance levels that lead toward the accomplishment of longer term performance expectations in the State DOT’s long-range statewide transportation plans and NHS asset management plans.”⁷

A target is defined as a quantifiable level of performance or condition, expressed as a value for the measure, to be achieved within a time period required by the Federal Highway Administration (FHWA).⁸ The FHWA decided not to define “desired SOGR” because FHWA believes “desired SOGR” is a concept tied closely to a State’s goals for its transportation system, and that each State should define its “desired SOGR” based on its own circumstances.⁹

This document discusses the interrelationships between short-term bridge and pavement condition targets described in 23 CFR Part 490 and the SOGR referenced in 23 U.S.C. 150(b) and 23 CFR Part 515.

Document Summary: Short-Term Targets and the SOGR Should Be Complementary

To achieve the national infrastructure goal, it is important that State DOTs and metropolitan planning organizations (MPOs) understand how targets and the SOGR interrelate. The short-term targets and the SOGR should be established in a way that complements, not impedes, each other.

For example, if NHS bridge and pavement conditions are in Poor condition as defined in 23 CFR 490.313 and 490.409, a short-term response could be to adopt “worst-first” treatments. These could include many thin pavement overlays or projects to replace Poor condition bridges. Thin

⁶ 23 U.S.C. 150.

⁷ Department of Transportation Federal Highway Administration 23 CFR Parts 515 and 667. Asset Management Plans and Periodic Evaluations of Facilities Repeatedly Requiring Repair and Reconstruction Due to Emergency Events, Federal Register/Vol. 81, No. 205/Monday, October 24, 2016/ p73234.

⁸ 23 CFR 490.101.

⁹ Federal Register/Vol. 81, No. 205/Monday, October 24, 2016, Department of Transportation Federal Highway Administration, 23 CFR Parts 515 and 667, Asset Management Plans and Periodic Evaluations of Facilities Repeatedly Requiring Repair and Reconstruction Due to Emergency Events, p73210.

overlays on Poor condition pavements will improve surface pavement conditions and extend service life of the pavement in the short-term, but typically will not provide long lasting structural benefits. Likewise, replacing a Poor bridge with a new bridge will improve the condition of the bridge inventory in the short run. However, the long-term network conditions are unlikely to improve unless Good condition bridges are preserved and Fair condition bridges rehabilitated.

Conversely, if current NHS bridges and pavements are in Good condition as defined in 23 CFR Part 490.313 and 490.409 and 2-year and 4-year targets are easily achievable, decision makers could face the temptation to reduce long-term and short-term bridge and pavement investments. In the first year or two, reducing investments may not result in a significant drop in bridge or pavement conditions, but the ability to achieve the SOGR could be significantly impaired by this short-term investment reduction if State DOTs are unable to perform a sufficient amount of maintenance and preservation. Moreover, forecasting by pavement management systems (PMS) or bridge management systems (BMS) probably would show a decline in bridge or pavement conditions in later years of the forecast period because of the funding reductions.

Similarly, when the strategy of relying on thin treatments on Poor pavements is modelled in the PMS, it is unlikely to be the best strategy for achieving the State DOT's long-term SOGR. Over a decade, the PMS scenarios are likely to show with a given level of investment that the worst-first strategy will lead to lower conditions compared to life-cycle-based strategies.^{10,11,12} Both bridge and pavement worst-first strategies commonly fail to provide the lowest life-cycle costs.

The State DOT's long-term SOGR objectives should temper the short-term thinking of relying on "worst-first" or reducing investments. Long-term forecasts that show future conditions declining because of reduced investments or because of an over-reliance on "worst-first" treatments should restrain State DOT's acceptance of strategies not based on life-cycle planning.

The State DOT's SOGR objectives keep the agency focused on the long-term, and what are the best life-cycle investments. The short-term targets act as interim conditions/ performance levels that indicate conditions in relation to performance expectations. The short-term targets and the SOGR should reinforce one another. Short-term strategies should position State DOTs to achieve their long-term objectives. The balancing of short-term and long-term strategies can temper, or mediate against, adopting short-sighted strategies that only address short-term conditions.

The targets and the SOGR are supported by several performance and progress reporting mechanisms that are discussed in the following pages. The targets and performance reports provide interim milestones indicating if investment strategies in the State DOT's TAMP are effective and whether the State DOT is on track to meet its SOGR objectives (see Figure 1). The journey to a SOGR can cover several years, or even decades. The strategies generally involve steady, sustained investments in a "mix of fixes" that stretch over several budget cycles. Asset management investment strategies reflect the "mix of fixes" by including at least 10 years of planned allocations for initial construction, maintenance, preservation, rehabilitation, and reconstruction. These reflect the State

¹⁰ Minnesota Department of Transportation 2019 Transportation Asset Management Plan pp 110,111

¹¹ New Jersey Department of Transportation 2019 Transportation Asset Management Plan p5-11

¹² Ohio Department of Transportation 2019 Transportation Asset Management Plan p36.

DOT's investment strategies within its available budget to address short-term targets, and to achieve and sustain a desired SOGR over the life cycle of the assets at minimum practicable cost.

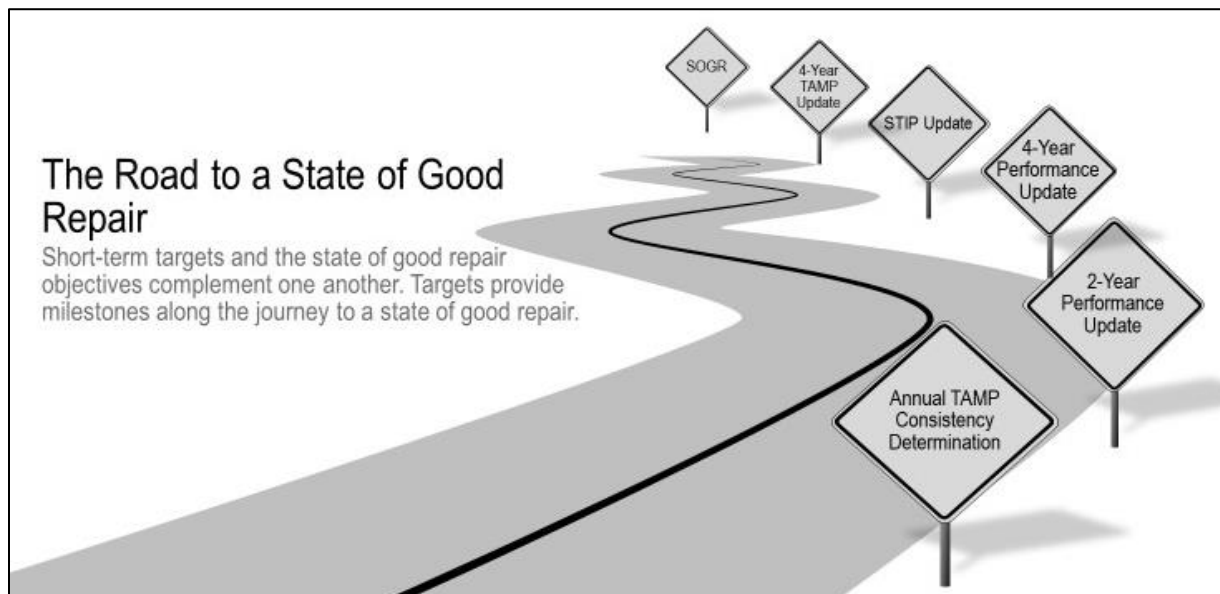


Figure 1 Short-term targets, performance reports, and Annual Consistency Determination Documents track progress to a state of good repair. Source: FHWA

Each review of short-term performance and target achievement provides another milestone to evaluate the DOT's long-term journey to a SOGR. The short-term targets, the State DOT's definition of SOGR, and the investment strategies work like a road map that tells an agency how to get from the current conditions to where the agency would like to be in the future. The SOGR objectives help to plot the life-cycle journey because to achieve the long-term objectives cost effectively typically means the State DOT will need to use a life-cycle investment approach.

Just as a routing application tells a traveler of the best way to reach a destination, the TAMP investment strategies can show the most effective path to achieve the SOGR objectives. Similarly, the short-term performance reports and targets should work like milestones to indicate how far a State DOT has come on its SOGR journey. Short-term performance reports tell an agency where it is, and the SOGR indicates where it wants to go. Investment strategies indicate how it plans to get there.

The Audience for This Document

The intended audience for this document is broad. State DOT asset managers, planners, and senior leadership are a primary audience.

A second audience includes members and staff of MPOs. MPOs also are focused upon achieving targets, linking programs to performance, and linking long-range plans to SOGR objectives.

A third audience is the elected officials interested in whether short-term performance targets and asset management are leading to a SOGR.

Alignment Between Short-Term Targets and the SOGR Is the Key to Progress

Short-term targets and the SOGR most effectively complement one another if progress toward improving conditions or sustaining good conditions is regularly monitored and investment strategies are aligned. If the investment strategies are intended to achieve short-term targets but not the SOGR, then the short-term performance reporting may not indicate that progress toward the long-term SOGR is being achieved.

The alignment between short-term targets and achieving the SOGR objectives can be seen in a series of performance management reports. These reports include the Baseline Performance Period Report, Mid Performance Period Progress Report, and the Full Performance Period Progress Report. These reports support the tracking of progress toward achieving both the short-term targets as well as the SOGR only if the short-term targets are linked to the strategies that will achieve the SOGR. If the investment strategies are based upon worst-first treatments to achieve only the short-term targets, then achievement of the targets may not accurately indicate whether progress is being made toward the long-term SOGR. Conversely, if the short-term target achievement results from the investment strategies developed to achieve the long-term SOGR, then the 2-year and 4-year conditions may indicate progress to the SOGR. Figure 2 illustrates how worst-first treatments lead to better short-term conditions but result in declining condition levels in the later years of the forecast period.

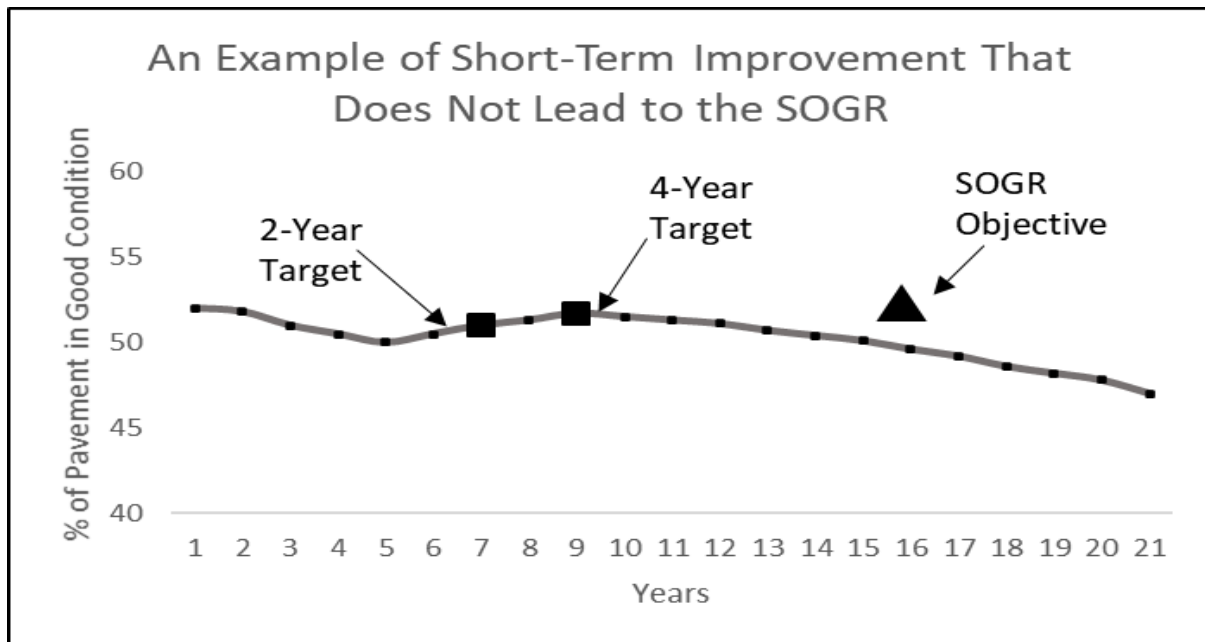


Figure 2 An example of reliance on worst-first treatments to maximize 2-year and 4-year conditions with the short-term strategies not linked to the long-term SOGR. The strategy improves conditions in the short term, but not the long term. Therefore, the investment strategies to achieve the short-term targets are not complementary to or supportive of the SOGR. Source: FHWA

In the Figure 2 example, the short-term performance reports indicate achievement of the 2-year and 4-year targets, but the achievement of the short-term target does not assure progress toward the SOGR after year 9.

State DOTs and MPOs can use a “plan, do, check” cycle as an effective approach fundamental to all performance-based programs to ensure that achievement of their short-term targets and use of their investment strategies result in progress toward the long-term, ultimate objective of achieving the DOT’s SOGR. Reports and updates or actions that either directly or indirectly support the tracking of progress toward achieving both the short-term targets and the SOGR are discussed under “Reports and Reviews Support Tracking of Progress” later in this document. Elements of a “plan, do, check” cycle can easily be extracted from these reports and updates as explained below:

- The deadline has passed for State DOTs to establish their bridge and pavement performance targets consistent with the NHS bridge and pavement performance measures requirements in 23 CFR Part 490 Subparts A, C and D. The State DOT’s 2-year and 4-year targets are integrated into the TAMP, which also identifies the long-term SOGR. The targets and SOGR are what the agency plans to achieve; together, they form the “plan” element of the “plan, do, check” cycle.
- The TAMP’s investment strategies and its life-cycle planning approach are the means to achieve or sustain the targets and the SOGR. The investment strategies and life-cycle plans serve as the “do” element of the “plan, do, check” cycle. They identify the expenditures and steps the DOT intends to take to achieve the targets and SOGR.
- Finally, the reports, documents, and LRSTP, MPT, STIP/TIP updates could serve as the “check” element. State DOTs and MPOs should use the reports, documents, and updates to assess if their investment strategies and achievement of their 2-year and 4-year NHS bridge and pavement targets are leading to their SOGR. The reports, documents, and updates describe the effectiveness of the investment strategies in the TAMP, as required in 23 U.S.C 150(e).

Reports and Reviews Support Tracking of Progress

The following reports and reviews that were mentioned earlier support the tracking of progress to both target achievement and the SOGR.

- Each year, State DOTs must submit to FHWA their Annual Consistency Determination Documents to demonstrate the development and implementation of their TAMPs per 23 CFR 515.13. Implementation is most evident when the submission shows the State DOT is using the investment strategies in its TAMP to make progress toward achievement of its targets for asset condition and performance of the NHS and to support progress toward the national goals identified in 23 U.S.C. 150(b) (23 CFR 515.13(b)(2)(i)). The Annual Consistency Determination Documents do not require asset condition discussion unless the TAMP is updated. State DOTs should use the Annual Consistency Determination Document to self-assess if they are delivering their initial construction, preservation, maintenance, rehabilitation, and reconstruction programs in a way that reflects their TAMP investment strategies. If a State DOT is not using its TAMP investment strategies, then it may not be progressing as planned for either its targets or its SOGR.

- Every two years, State DOTs will develop a Performance Period Progress Report. There are Mid Performance Period Progress Reports that include a discussion of the State DOT's progress toward achieving each established 2-year target and the effectiveness of TAMP investment strategies (23 CFR 490.107(b)(2). Then, the Full Performance Period Progress Report includes a discussion of the State DOT's progress toward achieving each established 4-year target and the effectiveness of TAMP investment strategies (23 CFR 490.107(b)(3).
- Further linkage of the short-term targets and SOGR occurs with the statewide transportation improvement program (STIP) and metropolitan transportation improvement program (TIP) Performance Discussion. This Performance Discussion included in the STIP is, to the maximum extent practicable, a discussion of the anticipated effect of the STIP toward achieving the performance targets identified by the State in the LRSTP, or other performance-based plan(s), linking investment priorities to those performance targets (23 CFR 450.218(q)). The TIP discussion describes, to the maximum extent practicable, the anticipated effect of the TIP toward achieving the performance targets identified in the metropolitan transportation plan, linking investment priorities to those performance targets (23 CFR 450.326(d)). Preparation of the 4-year STIP/TIP Performance Discussion should focus the State DOTs and MPOs on whether their programs of projects are achieving their targets for the U.S.C. Section 150(c)(3)(A)(ii) Interstate and NHS bridge and pavement measures and whether the program of projects aligns with the TAMP investment strategies.
- State DOTs or MPOs also update their long-range statewide transportation plan or the metropolitan transportation plan, respectively, to include System Performance Reports (23 CFR 450.216(f)(2) and 450.324(f)(4). Those evaluate the condition and performance of the transportation system with respect to the performance targets including progress achieved by the MPO(s) in meeting the performance targets in comparison with system performance recorded in previous reports.

Achieving a target is not enough to satisfy 23 CFR 515.13(b)(2) regarding TAMP implementation. The State DOT must demonstrate in its Annual Consistency Determination Document that it is implementing its TAMP. The best method is to show the State is using its investment strategies to make progress in achieving its targets and to support progress toward the national goals in 23 U.S.C. 150(b), including SOGR. Achievement of targets may or may not be indicative of using the investment strategies to progress toward SOGR. This concept is further discussed in later sections of this report.

Investment Strategies and Plan Updates as 'Pivot Points' to Shift Direction

State DOTs should use the Mid Performance and Full Performance Period Reports, the System Performance Reports, or the STIP Performance Discussion as input to their TAMP update. If the agency established its targets based on the investment strategies and is achieving its short-term targets while implementing its investment strategies, that information can confirm that the agency should continue implementing its investment strategies with no adjustments.

However, a State DOT or MPO region that established its targets based on the investment strategies in the State DOT TAMP but is not achieving its targets may want to re-evaluate its investment strategies. The agency could increase funding for the below-target asset sub-group, or the agency could change the work types. The agency should also consider reviewing the process used to establish the targets and consider making adjustments.

A formal demarcation in policy was seen in several 2019 TAMPs by State DOTs that indicated they were adopting asset management and life-cycle planning as official policy after years of reliance on worst-first approaches. Other TAMPs included investment strategies in which funding for and reliance upon preservation were notably emphasized.

An example of the TAMP as a “pivot point” was evident in the 2019 TAMP of the Illinois Department of Transportation (IDOT). The IDOT 2019 TAMP used the slogan “Raising the Bar” to summarize the agency’s pivot to asset management.¹³ The TAMP emphasized the agency is moving away from a “worst-first” approach that did not optimize the agency’s limited resources. The TAMP indicated IDOT intentionally adopted a new State-developed definition of acceptable conditions that encourages life-cycle strategies that will lead eventually to a SOGR. The State-developed acceptable condition levels were established so that pavements and bridges that would benefit from preservation would be prioritized for project selection. The acceptable pavement condition levels that drive selecting treatments were established using the State-developed Condition Rating Survey (CRS). Acceptable bridge condition levels were based upon National Bridge Inventory (NBI)-defined condition states. Those new acceptable condition levels replaced earlier levels that encouraged worst-first treatment strategies for improving already Poor pavements and bridges. IDOT’s TAMP indicated that it will produce its Baseline, Mid Performance, and Full Performance period reports using the 23 U.S.C. 150 targets. However, for project-level decisions, it will use its new preservation-oriented condition levels. In the IDOT example, the decisions that drive short-term project selection reinforce the life-cycle-based decisions to progress toward the SOGR.

Aligning Short-Term Targets to Point to the SOGR

When targets and the SOGR are properly aligned, the 2-year and 4-year targets should “point the way” to the SOGR. As seen in Figure 3, when aligned, the achievement of the 2-year and 4-year targets build the steps along the path to the SOGR. Accordingly, the TAMP 10-year investment strategies lead to a set of projects that support achievement of the 2-year and 4-year targets and SOGR simultaneously. If the strategies that achieve the 2-year and 4-year targets complement the strategies to achieve the SOGR, then the short-term targets represent milestones to the SOGR.

Long-term strategies are made up of a series of actions, taken mostly in short steps, addressing specific needs of assets at a certain time during their life cycle. These actions dictate the types of projects that should be programmed each year to implement the 10-year investment strategies. Two-year and four-year targets can serve as two monitoring instruments helping the asset managers to determine if the projects or maintenance treatments identified by asset management life-cycle planning strategies were indeed effective. They help asset managers to ensure the success of short-term steps taken toward the SOGR. Likewise, 2-year and 4-year targets can detect a deviation from the path to SOGR prompting the State DOT to take corrective actions.

Another reason the short-term targets should be aligned to the SOGR is so they lead to STIP projects that anticipate future asset investment needs. Programming decisions should not only be driven by short-term asset conditions but also be driven by strategies to achieve the SOGR. This reflects the alignment and ensures short-term targets point to the SOGR.

¹³ Illinois Department of Transportation 2019 Transportation Asset Management Plan pp ES-2,45.

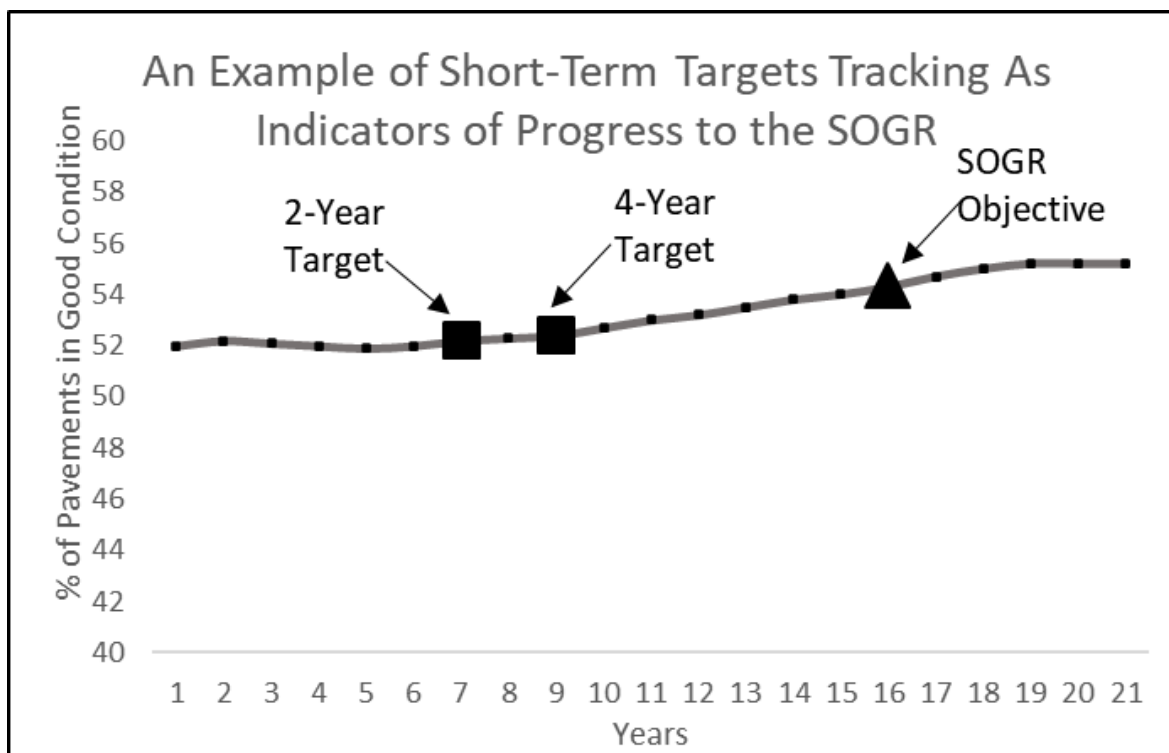


Figure 3 illustrates an example of a State DOT that has coordinated its short-term targets with its long-term strategy to improve conditions and reach its SOGR. In Figure 3, the achievement of 2-year and 4-year targets indicates the agency is progressing as planned to its SOGR. Source: FHWA

Several of the 2019 TAMPs noted that the agencies achieved then-current bridge condition targets, but that their bridge inventory was aging, many structures were reaching the mid-point of their lifespan and future deterioration rates may be steeper. In their TAMPs, the agencies communicated that despite current acceptable conditions they would need to increase future bridge investments to maintain their aging bridges in a SOGR. In these examples, reliance only on short-term conditions would not indicate the need for different investment levels to sustain the SOGR.

For example, many Interstate and NHS bridges are now 50 years old or older. To date, they may have performed well and helped a State DOT achieve past and current State-developed targets or desired condition levels. However, because of the structures' advanced age, the treatments they needed up to the present may not be the treatments needed to ensure their future SOGR. In their early decades, the structures may have required only steel repainting, or wearing surface replacement, or bearing and expansion joint replacement. However, for the structures to remain in good repair for the next 30 years, more extensive rehabilitation may be necessary. They may need new decks, parapets, or significant repairs to their superstructures.

Similarly, an NHS pavement on a high-volume freeway may have performed well for the first 20 years of its life with only periodic maintenance, preservation, or rehabilitation. Looking to the future SOGR, in its 30th year, the pavement may need reconstruction or even replacement. The treatments that kept the pavement in good condition to the present, may not be the treatments needed to sustain its SOGR. For the STIP to include the preliminary development phases for the needed

treatments for such a pavement, the STIP needs to be informed by the long-term investments required for the future SOGR of that pavement.

Aligning targets to complement the SOGR also is important because it is often necessary to develop a large project, such as the reconstruction of an Interstate bridge. It can take months to hire a planning and design consultant and several years to develop design plans and receive environmental approvals. Right of way acquisition could take another year. If the STIP projects are to support the SOGR, then the STIP should include the early project phases needed to deliver projects in years five, six, or seven of the TAMP. The STIP and the programming process should not only focus on what treatments are needed in the four years of the STIP to achieve short-term targets but also focus on project phases needed to achieve the long-term SOGR.

Because some assets such as the Interstates were built in the same decade or two, they represent “waves” that create peaks and valleys in investment needs over time. These needs are so great that the corresponding program-level funding increases can influence TAMP investment strategies for decades.

At the same time, the STIP projects also should be responsive to, and include treatments for, short-term needs. Short-term needs could include the timely application of pavement preservation, or the repair of assets damaged by extreme weather events that prevent the assets from achieving the State-developed targets or the 23 CFR Part 490 performance targets.

When the STIP and the TAMP investment strategies are aligned to both the short-term conditions and the long-term SOGR, the STIP is more likely to include the balanced “mix of fixes” needed to achieve and sustain a desired SOGR over the life cycle of the assets at minimum practicable cost.

Another way the short-term targets and the long-term SOGR can complement one another is when agencies adopt declining short-term targets because they lack the resources to sustain current condition levels. Forecasts of declining conditions notify legislators, governors, agency commissions and other decision makers that the State or region lacks the resources or investment strategies to sustain current conditions. A declining 4-year target can be a precursor of even greater declines predicted for 10-year conditions. The SOGR objectives and the multi-year condition forecasts complement the declining short-term targets by communicating future consequences. The Michigan Department of Transportation (MDOT) 2019 TAMP¹⁴ and the Pennsylvania Department of Transportation 2019 TAMP¹⁵ both indicated that acceptable 2019 conditions could not be sustained with then-current investment levels. Each TAMP quantified how much investment, in which years, would be needed to achieve and sustain the targets and achieve the SOGR.

The need to establish short-term declining targets should serve as a catalyst for analysis. In several of the TAMPs, the short-term investment gaps start small but increased rapidly after the first few years. Incremental investment increases in the early years can delay the gaps. Even if revenues are not adequate to address the long-term gaps, even modest investment increases in the first few years can substantially reduce short-term condition declines. Because deterioration curves become

¹⁴ Michigan Department of Transportation 2019 Transportation Asset Management Plan p 64.

¹⁵ Pennsylvania Department of Transportation 2019 Transportation Asset Management Plan pp 22,42.

steep once conditions decline to a certain point, postponing the “precipice” buys the State DOT several years of tolerable conditions. The modest investment increases postpone the decline in conditions and provide opportunities to seek additional investments in two, three, or four years.

Even if conditions are declining, a State DOT can document that without its asset management strategies, conditions would have been worse. If, after implementing asset management strategies, an asset condition continues to decline, but at a slower rate than prior to the implementation of those strategies, FHWA would consider this as an improvement.¹⁶

Management Systems Support Target Setting and SOGR Objectives

Bridge and pavement management systems are powerful tools that State DOTs must use to analyze the condition of NHS pavements and bridges for the purpose of developing and implementing the asset management plan.¹⁷ Management systems are key tools for long-term forecasting of scenarios to achieve the SOGR. They also should be used to help establish 2-year and 4-year targets that are in alignment with the SOGR and to represent steps along the way to the SOGR.

State DOTs should use their bridge and pavement management systems to forecast how quickly or how slowly conditions may change given the adopted investment strategies. When State DOTs understand the rate at which conditions change, they can establish more informed long-term, SOGR objectives, as well as more informed 2-year and 4-year targets. State DOTs should use their management systems to establish the trajectory of their asset conditions which are then reflected in the 2-year and 4-year targets. These targets establish the milestones on the path to the SOGR.

Management systems can help illustrate how long-term benefits can be achieved even with a strategic short-term decline in conditions. The management systems can help document how life-cycle strategies can produce the highest long-term asset conditions which support the SOGR, even if they do not result in improved conditions in the short-term.

Preservation treatments typically are an essential part of life-cycle planning. However, they may not produce short-term improvements in the network-wide conditions because preservation is applied to already Good-condition assets. Before and after the treatment, the assets are in Good condition. However, when the management systems extend the forecasts to later years, the preservation demonstrates a benefit. The assets that were preserved tend to have higher conditions in the latter years of the management system forecast than those which were not treated with preservation. Conversely, more expensive worst-first treatments may produce higher short-term conditions. Over time, however, management system forecasts are likely to demonstrate lower network-wide conditions when worst-first is the predominant treatment strategy. These lower future network-wide conditions are often attributable to a lack of preservation when worst-first treatments are prioritized.

A good long-term strategy could involve a decline in overall asset conditions in the short-term while striving for the best long-term life-cycle results (Figure 4). There can be times when a rational

¹⁶ Department of Transportation, Federal Highway Administration, 23 CFR Parts 515 and 667, Asset Management Plans and Periodic Evaluations of Facilities Repeatedly Requiring Repair and Reconstruction Due to Emergency Events, Federal Register/Vol. 81, No. 205/Monday, October 24, 2016, p73216.

¹⁷ 23 CFR 515.7(g)

SOCR strategy is to increase preservation and begin programming rehabilitation projects to restore assets that are too deteriorated to be preserved. Such a mix of short-term and long-term treatments may lead to declining network-wide conditions in the short-term. The rehabilitation projects may take several years to develop and in the meantime the assets that are in the queue for rehabilitation will continue to deteriorate. However, when the forecasts are extended, the management systems can demonstrate how such a strategy could be the best long-term approach. Good condition assets are preserved. Poor assets are restored, and the mix of projects could be an effective life-cycle approach.

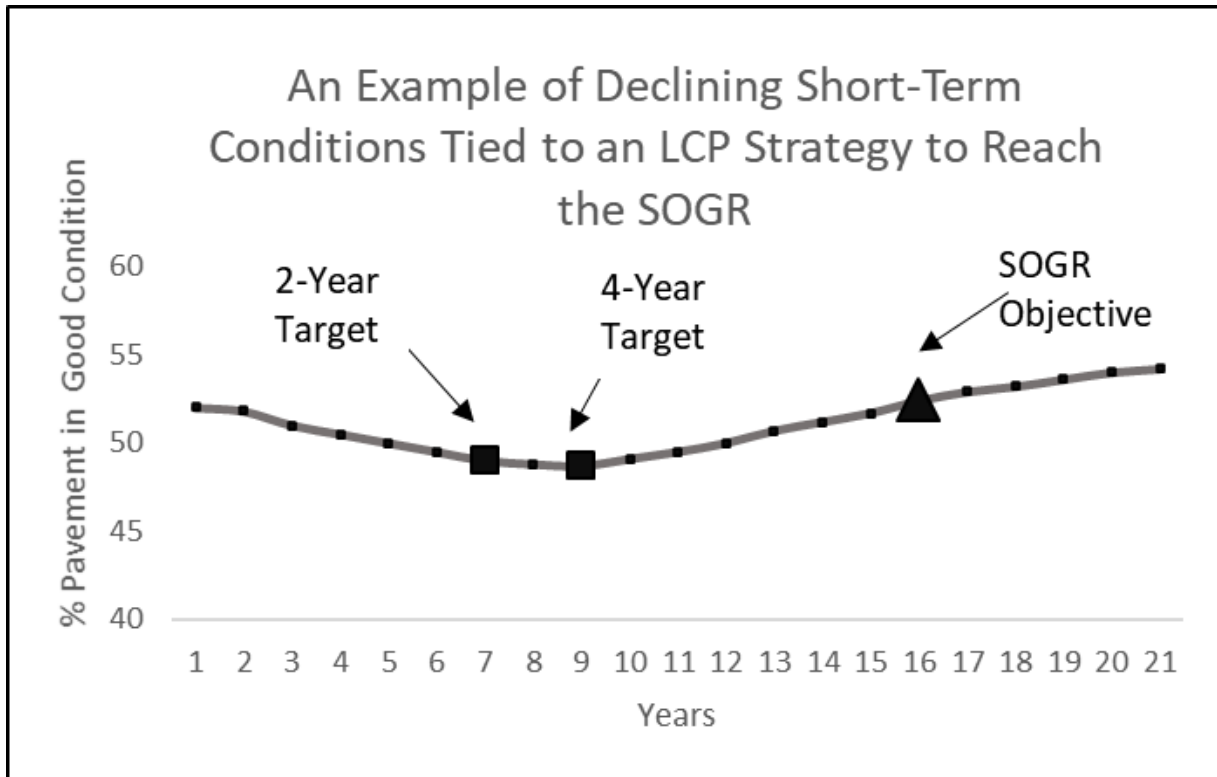


Figure 4 illustrates a strategy of relying on increased preservation of Good condition pavements and rehabilitation of Poor ones. The strategy tolerates 2-year and 4-year condition declines until the rehabilitation projects and the preservation treatments are in place and showing results. In this strategy, the declining 2-year and 4-year targets are tied to a SOGR strategy that shows results starting in year 10 and continuing through the forecast period. Source: FHWA

Bridge and pavement management systems can facilitate life-cycle planning and informed setting of short-term targets. Therefore, State DOTs should use their bridge and pavement management systems to analyze the linkages between their investment strategies and how they relate to 2-year targets, 4-year targets, and the SOGR.

Because resources are usually constrained, making tradeoffs necessary, State DOTs should use their management systems to refine bridge and pavement targets by highway system. Such differentiation supports making tradeoffs between investment levels, targets, and the importance of different functional classes. Many State DOTs established lower condition targets on the lower functional classes as part of risk-based tradeoffs. A robust pavement or bridge management system can differ-

entiate how conditions will change by the Interstate System, non-Interstate NHS, or by other functional classes. Management system scenarios support setting targets by network and help identify funding levels to achieve the targets and SOGR on each functional class system.

Agencies can improve the process of setting short-term targets and long-term SOGR objectives if they analyze the accuracy of their deterioration curves and compare them against observed results. Improving the accuracy of the bridge and pavement management systems forecasts is a continuous process. Agencies can refine their management systems' deterioration curves by comparing the forecasted conditions for each year to actual observed conditions for that year. As agencies gain more years of experience with their management systems, and as they continue to collect annual condition data, they can continually refine the accuracy of their deterioration curves. The more accurate the deterioration curves are, the more confidence the agency will have that its investment strategies are leading to the SOGR.

Short-Term Targets and the SOGR Influence STIPs and TIPs

The connection between short-term targets and the SOGR should become increasingly evident in their effect upon the STIPs and TIPs. The increasing connection is facilitated by steps within the processes for asset management, programming, and long-range planning included in 23 CFR Part 515, 23 CFR Part 450, and 23 CFR Part 490. Each step provides a reflection point in which State DOTs and MPOs consider if their performance is achieving the 2-year and 4-year targets and leading to the SOGR.

1. At the long-range planning level, the planning rule in 23 CFR Part 450 states that the statewide and nonmetropolitan transportation planning process, as well as the metropolitan planning process, must integrate into the planning processes directly or by reference the goals, objectives, performance measures, and targets in other State transportation plans including the TAMP.¹⁸ Also, State DOTs should apply asset management principles and techniques consistent with the TAMP in establishing planning goals, defining STIP priorities, and assessing transportation investment decisions.¹⁹ Additionally, the long-range statewide transportation plan and the metropolitan transportation plans must include a System Performance Report that evaluates the condition and performance of the transportation system with respect to the performance targets.²⁰
2. At the programming level, State DOTs and MPOs will describe in their STIP/TIP Performance Discussion how the program of projects contributes to achieving the performance targets (23 CFR 450.218(q) and 450.326(d)). This leads to linkages between the projects in the STIPs and TIPs and the performance targets and investment priorities. The TAMP does not include projects and FHWA does not approve projects as part of the TAMP consistency or certification processes. However, the allocation of funds in the STIP should inherently reflect the implementation of the TAMP investment strategies.
3. By increasing their focus upon the future SOGR, State DOTs should link their target establishment and STIP programming decisions to their long-term SOGR objectives and the in-

¹⁸ 23 CFR Part 450.206(c)(4) and 450.306(d)(4)

¹⁹ 23 CFR Part 450.208(e)

²⁰ 23 CFR 450.216(f)(2) and 23 CFR 450.324(f)(4)

vestment strategies that support them. STIPs and TIPs include project phases including preliminary engineering, environment/NEPA, right-of-way, design, or construction per 23 CFR 450.218(i) and 450.326(g). Complex reconstruction projects called for in the investment strategies can take years of development. The phases of development for those projects should be reflected in the STIP and TIP even if the construction phase extends beyond the four-years of the STIP per 23 CFR 450.218 (i) and 23 CFR 450.326(g). The inclusion of different project phases in the STIP can help show the linkage between the short-term actions and the long-term actions needed to develop complex projects that carry out the TAMP investment strategies for reconstruction or initial construction.

4. In the performance process, the Mid Performance Period Progress Report and Full Performance Period Progress Report will include a discussion of the State DOT's progress toward achieving its targets, and a discussion of the effectiveness of the TAMP investment strategies. (23 CFR 490.107(b)(2)(ii)(c) and (3)(C))
5. Each year for the annual asset management consistency determination, the State DOT must demonstrate development and implementation of a TAMP meeting requirements in 23 CFR part 515, including investment strategies. The best evidence for implementation is that for the 12 preceding months, State DOT funding allocations were reasonably consistent with the TAMP investment strategies (23 CFR 515.13(b)(2)(i)).

Increasing Clarity of Linkage Between Short-Term Targets and SOGR

To enhance their Annual Consistency Determination Documents, State DOTs may want to consider further “granularity” in how they report maintenance and preservation work in the STIP. The maintenance and preservation work types in TAMPs may not result in specific “projects” that appear individually in the STIPs/TIPs. The maintenance and preservation projects typically are low-cost, low-environmental-impact activities that are often grouped as one line item in the STIP/TIPs under provisions in 23 CFR 490.218(j) and 450.326(h) for projects that are not of appropriate scale for individual identification in a given program year. Those may be grouped by function, work type and/or geographic area. State DOTs could enhance the clarity of the linkages between their TAMP investment strategies and their STIPs if the amounts of maintenance and preservation in the TAMP investment strategies clearly relate to or influence the “grouped” line items in the STIP. Because the TAMP investment strategies and work types extend for 10 years, they provide a long-term estimate of how much should be allocated for preservation and maintenance. Those amounts could be correlated in the Annual Consistency Determination Document and noted in the STIP to show the linkage between the STIP, investment strategies, and the TAMP.

State DOTs also may see the need to coordinate their project-delivery tracking with their Annual Consistency Determination Documents. Outside of the federally mandated transportation performance management (TPM) process, many State DOTs produce annual performance reports that track the extent to which they delivered their planned construction program. State DOTs should consider if such reports can be useful as part of the Annual Consistency Determination Documents. Each State DOT may determine the most suitable approach for demonstrating implementation of its TAMP. However, the information must be current, documented, and verifiable (23 CFR 515.13(c)(2)). By aligning their State's annual project-delivery reports with the TAMP work types, State DOTs can further clarify the linkages between the STIP/TIPs and implementation of the TAMP investment strategies. By doing so, a State DOT would be able to show alignment between the amount of preservation, maintenance, rehabilitation, and reconstruction called for in the TAMP in-

vestment strategies and the projects the agency delivered in the past year. With a clear understanding of the delivery of investment plan work types, State DOTs could better assess if their investment strategies are achieving the intended targets and progressing to the SOGR).

The System Performance Reports, Mid Performance Period Progress Report, and Full Performance Period Progress Report, along with the updates to the TAMP, STIP, and TIP provide re-assessment points for whether programs and strategies are sustaining targeted condition levels and the SOGR. If targets are not achieved and the State DOT is not progressing to the SOGR, the State DOT should adjust its programs to better align with its TAMP investment strategies. Or, the State DOT could decide to update the TAMP early and adopt new investment strategies or change its targets and SOGR objectives.

SOGR and Life-Cycle Planning Influence Long-Range Plans

One particular influence on the long-range statewide transportation plan and the metropolitan transportation plans should be the TAMP life-cycle plans and investment strategies. The TAMP life-cycle plans should lead to planning strategies that emphasize life-cycle strategies over short-term worst-first ones. This is because each agency's identified SOGR is now the benchmark against forecasted future conditions, just as short-term conditions are compared against short-term targets.

SOGR objectives do not have to equate to a quantified point or metric. Each State DOT can define its own desired SOGR and decide if it should be a quantified point or a statement defining it. However, TAMPs are inherently long-term plans and setting long-term quantified points as benchmarks is inherent in an asset management plan.

State DOTs also should coordinate with MPOs about how the State's long-term investment strategies may influence other aspects of the statewide and metropolitan planning processes. Some 2019 asset management plans included long-term investment strategies that shifted funds into life-cycle strategies and left little or no money for initial construction of capacity projects. The lack of funds for capacity projects could reduce the number of capacity projects in an MPO planning area, which in turn can influence the MPOs' long-range planning, its congestion management process, and even its air-quality conformity determinations. In cases where State DOTs reduced capacity-addition construction projects to increase investments in preservation or rehabilitation, the SOGR investment strategies created influences that extended beyond the bridge and pavement programs. State DOTs and MPOs should incorporate those life-cycle planning influences into their long-range planning processes.

The short-term targets and TAMP investment strategies should inform the LRSTP and MTP updates which integrate the TAMP and other performance plans into the State and metropolitan planning process. An example of such linkages could come in commonalities between the TAMP financial plan and the required MPO financial plan and the optional State financial plan. The 10-year TAMP financial plan and investment strategies should provide input into the MPO's 20-year financial plan.

Not only may the TAMP linkages be seen in the STIP and TIP but they are also likely to be increasingly coordinated with other performance plans. Over time it is likely that TAMPs will become increasingly coordinated with the Strategic Highway Safety Plan (SHSP), the Highway Safety Improvement Program (HSIP), a State's Freight Plan, and congestion relief programs where applicable. The different plans may focus upon only one of the seven national goals, but all contribute to a larger, overarching long-term performance approach.

Collectively, the Annual Consistency Determination Documents, Mid Performance Period Progress Report and Full Performance Period Progress Report, STIP/TIP Performance Discussions, TAMP updates, and the statewide long-range transportation plan and metropolitan transportation plan System Performance Reports will create a continuous cycle of reviewing progress, adjusting strategies, and monitoring long-term achievement of all seven national goals.

Targets Bring Clarity to Investment Deliberations

State DOTs could use their performance management targets and the SOGR objectives to bring clarity and precision to discussions about conditions and needed investment levels. The 23 CFR Part 490 bridge and pavement measures, the State's targets based on those measures, the State DOT's definition of SOGR, and the State DOT's investment strategies all convey important information that contributes to the transparency and accountability of the Federal-aid transportation program. The 23 CFR Part 490.313 and 490.409 Interstate and NHS bridge and pavement regulations define what is meant by Good, Fair, and Poor condition pavements and bridges consistently across the entire NHS. Similarly, the National performance measures and State DOT/MPO targets for safety, travel delay, and freight mobility bring common frames of reference to those performance areas. State DOTs retain the ability to establish and use additional performance measures, but the National measures provide for the first time a uniform picture of the NHS conditions based upon quantified measures and targets.

State DOTs should use the TAMP to bring additional clarity to investment discussions of what is needed to achieve and sustain the SOGR. The 2-year and 4-year targets, the SOGR, life-cycle planning analysis, gap analysis, financial plans and the investment strategies all contribute to more detailed decision making. They allow State DOTs to specify how much additional investment is needed, in what types of projects, over what period to achieve a specific condition level. The 2019 Michigan DOT TAMP indicated that the State DOT needed an average of \$32 million more each year for 10 years to achieve its NHS bridge condition targets.²¹ The Michigan TAMP showed not only the 10-year average investment needed but the amount needed in each year to achieve its short-term targets and its SOGR. The Washington State Department of Transportation (WSDOT) TAMP showed at the time of its 2019 publication a 10-year bridge investment gap of \$852 million. The investment gap started at \$69 million the first year and steadily increased for the next 10 years. An additional \$687 million was needed to achieve State pavement targets.²² These examples illustrate how State DOTs used the TAMP performance gap analysis to provide clarity to programming discussions about achieving the 2-year and 4-year targets and the SOGR.

State DOTs should use the gaps between actual conditions and 2-year and 4-year targets and forecasted conditions and the SOGR to reveal any significant gaps in conditions within States. It was common in many 2019 TAMPs for the conditions of locally managed NHS bridges and pavements to be lower than State-managed NHS bridges and pavements. Also common was that tolled turnpikes frequently had higher condition levels than did the State DOT-managed routes. These variations in conditions within States were evident from comparing conditions across the State with the targets, and against conditions statewide. The different conditions appear to reveal the results of different

²¹ Michigan Department of Transportation 2019 Transportation Asset Management Plan p 64.

²² Washington State Department of Transportation 2019 Transportation Asset Management Plan pp 61,62.

investment levels on the NHS. State DOTs should use these identified differences for further analysis of what types of investments, on what parts of the highway system are needed to achieve its targets and the SOGR across all networks.

The lower conditions of locally owned NHS assets may benefit from further collaboration between State DOTs and their local partners. State DOTs should consider strategies of increased data collection, collaboration, and scenario analysis to help local NHS owners improve investment decisions. State DOTs should leverage these analyses to help MPOs better understand the strategies needed to achieve both the short-term targets and the SOGR.

Performance Reports and Investment Strategies Can Be Communication Tools

State DOTs and MPOs can use the cyclical TAMP, TPM, planning activities, and reports to bring to legislators, governors, agency commissioners, and other decision makers' attention the need to achieve targets and to strive for the SOGR objectives. These reports may include the State and MPO System Performance Reports, Annual Consistency Determination Document, the Mid Performance Period Progress Report and Full Performance Period Progress Report. Each of these documents will involve formal action by a State DOT or MPO. Staff can use these documents and reports to reinforce to decision makers the need to "stay the course" toward the SOGR. Often, an MPO's bylaws require the MPO Board to formally review and vote on reports such as the STIP Performance Discussion. Each such submittal allows the MPO staff an opportunity to inform its board of progress made towards achieving the SOGR. Similarly, the Annual Consistency Determination Document or Mid Performance Period Progress Report and Full Performance Period Progress Report provide State DOT staffers an opportunity to brief their director or commission. State DOTs and MPOs could consider using these reports as opportunities to brief decision makers about the benefits of the TAMP investment strategies. The reports can enhance institutional knowledge as leaders and staff change and as new staff are trained and new leaders briefed.

SOGR objectives and TAMP investment strategies also can be communication tools to ensure that short-term budget decisions support long-term life-cycle planning strategies. Managing long-lived assets with economical life-cycle strategies requires planning with long horizons to provide the appropriate treatments at the appropriate points of an asset's life. However, many State budget line items and programming decisions are approved on a biennial or annual basis. These short horizons do not always encourage a long-term perspective of which investments provide the greatest benefit over the long term.

The TAMP Annual Consistency Determination Document, SOGR objectives, and TAMP investment strategies can contribute to decisions about annual or biennial programming. In the short-term programming or budgeting process, it could be tempting to reduce preservation and maintenance budgets because the cuts may not produce immediate and visible impacts. With such a short timeline, the effects of reduced preservation and maintenance may not be apparent. However, the 2019 TAMPs' long-term SOGR scenarios demonstrated repeatedly that preservation, maintenance, and other low-cost strategies were critical to lowering costs and improving asset conditions. The long horizons associated with SOGR objectives made it apparent in many 2019 TAMPs that preservation and maintenance are among the most important investments a State DOT can make to achieve its

life-cycle objectives.^{23,24,25,26,27,28,29,30,31,32} The SOGR perspective may shift decision makers' thinking from only short-term conditions to life-cycle planning strategies that are best suited to sustain long-term conditions while minimizing costs.

The Ohio Department of Transportation (ODOT) 2019 TAMP reported that ODOT's chip seal program helped it achieve \$300 million in efficiencies and improve an additional 1,700 lane miles while achieving its targets.³³ ODOT also forecasted \$50 million in potential savings through improved bridge preservation. The WSDOT estimated it was saving \$40 million annually by the frequent use of chip seals on low-volume routes compared to overlays.³⁴

The Wyoming Department of Transportation 2019 TAMP indicated that without the work of its maintenance forces, its pavement deterioration curves would be much steeper and its costs higher to achieve its SOGR.³⁵ Consequently, the TAMP emphasized that protecting the maintenance budget was critical. These TAMPs, with their focus on the future SOGR, demonstrated maintenance activities to be essential. They highlighted the funding of preservation and maintenance to be on the critical path of achieving their SOGR.

TAMPs and their SOGR and life-cycle planning analysis can demonstrate the consequences of adopting "worst-first" or "run to failure" strategies. The 2019 TAMPs of the Kentucky Transportation Cabinet³⁶ and IDOT³⁷ demonstrated that worst-first strategies resulted over the long term in higher costs, lower conditions, or both. These analyses allowed the State DOTs to make the case for protecting funds for preservation and maintenance by showing they often had the highest return on investment.

State DOTs can use the short-term TPM targets and the long-term SOGR to develop annual trajectories of how they plan to manage assets each year over a decade or more. These analyses can then be informative not only to the TAMP investment strategies but also to State programming and budgeting decisions to protect investments in preservation and maintenance.

Future Implications of Short-Term Targets and Long-Term Objectives

The integration of both short-term TPM targets and long-term SOGR objectives has the potential to spur State DOTs to continually evolve their planning and programming processes. State DOTs

²³ New Jersey Department of Transportation 2019 Transportation Asset Management Plan, p 5-12

²⁴ Washington State Department of Transportation 2019 Transportation Asset Management Plan, p 31

²⁵ Ohio Department of Transportation 2019 Transportation Asset Management Plan p 66

²⁶ Illinois Department of Transportation 2019 Transportation Asset Management Plan, p ES-3

²⁷ Wyoming Department of Transportation 2019 Transportation Asset Management plan, p 30

²⁸ Minnesota Department of Transportation 2019 Transportation Asset Management Plan pp 97-137

²⁹ Indiana Department of Transportation 2019 Transportation Asset Management Plan, pp 2-7 and 4-6

³⁰ Kentucky Transportation Cabinet 2019 Transportation Asset Management Plan, pp 43-44

³¹ Connecticut Department of Transportation 2019 Transportation Asset Management Plan, pp 5-2 to 5-22

³² New York State Department of Transportation 2019 Transportation Asset Management plan pp 5-1 to 5-5

³³ The Ohio Department of Transportation 2019 Transportation Asset Management Plan p 85.

³⁴ WSDOT TAMP p 30.

³⁵ Wyoming Department of Transportation 2019 Transportation Asset Management Plan p 16.

³⁶ Kentucky Transportation Cabinet 2019 Transportation Asset Management Plan p 43.

³⁷ Illinois DOT 2019 TAMP p ES-3.

should consider ways to more firmly integrate the 2-year and 4-year targets and SOGR into their planning processes, into their programming, and into their communication of investment priorities.

A focus upon the SOGR reinforces State DOTs' and MPOs' prioritization of investments that support life-cycle planning strategies. These investments could come in the form of increased bridge preservation programs, or increased investments in chip seals or crack sealing. Or if certain asset sub-groups such as large aging bridges or deteriorating concrete pavements create the largest gaps for the SOGR, investments to improve those sub-groups could be emphasized in the investment strategies.

Evolving the MPOs' and State DOTs' planning processes to emphasize the sustaining of targeted asset condition levels and achieving the SOGR also reflect the focus on aligning short and long-term objectives. Although maintaining conditions always has been a priority, TPM and the TAMPs bring increased precision and formality to how a State DOT defines the SOGR. The achievement of these precise conditions and documented objectives should become a prominent part of State and MPO plans. These fully evolved plans will note the bridge and pavement targets and objectives, cite them as decision drivers, and report upon how they influence investment decisions.

State DOTs and MPOs should view the incorporation of TPM targets and SOGR objectives as another advancement in the evolving 23 CFR Part 450 planning process. In years past, issues such as public involvement, environmental justice, and air quality conformity have been introduced and then embraced by the planning process. The planning processes of State DOTs and MPOs should strongly emphasize achieving TPM targets and progressing toward SOGR objectives as major influences and priorities.

State DOTs can use the TPM and asset management documents, reports, and discussions to make the managing of assets more transparent. Not only will targets and objectives be clear, so will be the strategies for achieving them. This will also help interested stakeholders such as MPOs and the public better understand the bridge and pavement conditions, how those assets are being managed, and whether the investment strategies are succeeding. Understanding can be further enhanced by State DOTs ensuring that iterations of these reports produce trendlines and frequent comparisons between desired and actual results.

State DOTs also should use the need for robust 2-year and 4-year targets and the SOGR progress analysis as incentives to ensure their bridge and pavement management systems fulfill the functionality described in 23 CFR 515.17. As State DOTs and MPOs become more interested in analyzing SOGR scenarios, they will need to increasingly rely on such management systems. This reliance should spur investments in bridge and pavement management systems, staff to operate them, additional investment in data analytics expertise, in enhanced data collection, and in the review of multiple scenarios to optimize investments. Travel demand models have long been a major tool for State DOTs and MPO planners. Now, State DOTs and MPOs also should view bridge and pavement deterioration and forecasting models as essential to the planning process.

Summary: The Complementary Role of Targets and SOGR

The main message of this document is that short-term targets and the SOGR objectives should complement one another. If they are established independently of one another, performance reports may not inform decisions makers of whether progress is being made to achieve the SOGR.

If short-term targets are developed as interim points to the SOGR, then short-term targets may help decision makers and the public to understand several important facts. First, what condition levels does the agency expect in the near term? Second, how do those conditions relate to desired long-term SOGR conditions? Third, do the Baseline Performance Period Report, the Mid Performance Period Progress Report, and the Full Performance Period Progress Report indicate that the conditions of the agency's assets are trending as intended, to achieve the desired long-term condition? Similarly, the Annual Consistency Determination Documents will show if the State DOT is using the TAMP investment strategies to make progress toward achievement of its TPM targets for asset condition and performance and to support the National goals in 23 U.S.C. 150(b).

Providing timely performance information to legislators and the public involves frequent briefings that coincide with budget cycles, STIP updates, and other relatively short-term events. At the same time, long-lived assets require long-term strategies if they are to be managed for reasonable life-cycle costs. If only short-term targets were considered, then short-term "worst-first" strategies might look attractive. However, when the timeline for achieving the SOGR is extended, then life-cycle strategies are revealed to be the best, most economical investments. Investments in preservation or maintenance may not show short-term benefit/cost returns, but when viewed over the long term they become essential. The alignment of short-term TPM targets and the long-term SOGR objectives can result in the achievement of the short-term targets, while also ensuring progress toward the long-term SOGR.

Both the short-term TPM targets and the SOGR objectives should become increasingly important parts of the statewide and metropolitan planning and programming processes. The Annual Consistency Determination Documents and the Mid Performance Period Progress Report and Full Performance Period Progress Report coincide with annual and biennial amendments to programs of projects that are common to internal State DOT processes.³⁸ Each Annual Consistency Determination Document should prompt a State DOT review of whether its short-term program of projects is advancing its long-range investment strategies. Each Mid Performance Period Progress Report and Full Performance Period Progress Report should reinforce analysis of whether asset conditions are trending as expected. As State DOTs and MPOs update their STIPs and TIPs, their Performance Discussions should describe the anticipated effect of their programs toward achieving the TPM performance targets and linking investment priorities to those TPM targets. Then, when long-range statewide transportation plans and metropolitan transportation plans are updated, they can incorporate the targets, objectives, and investment strategies of the TAMP. The results of these reports and updates can be a nearly continuous review of whether plans and programs are achieving targets and progressing toward the SOGR. These steps reflect the "plan, do, check" cycle foundational to nearly all performance programs.

As stated in U.S.C 150(b)(2), the National goal for infrastructure condition is "to maintain the highway infrastructure asset system in a SOGR." The short-term TPM targets and the SOGR objectives need to be coordinated to identify the path to the National goal.

³⁸ State DOTs usually allow the programming of new projects on an annual or biennial basis as described by the State's programming policies. These annual or biennial milestones may also be the time when changes are formally accepted to project schedules, budgets, or scopes. These annual or biennial program amendments often coincide with the start of fiscal years.