



INVEST

ECONOMIC • SOCIAL • ENVIRONMENTAL

Version 1.3

Sustainable Highways Self-Evaluation Tool



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INVEST Version 1.3

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Introduction to the Compendium

INVEST (Infrastructure Voluntary Evaluation Sustainability Tool) was developed by FHWA as a practical, web-based, collection of voluntary best practices, called criteria, designed to help transportation agencies integrate sustainability into their programs (policies, processes, procedures, and practices) and projects. This compendium includes user selected criteria from INVEST 1.2 as of September 2015. It includes System Planning for States (SPS), System Planning for Regions (SPR), Project Development (PD), and Operations and Maintenance (OM) criteria. It is not intended to be an instructional manual or guidebook; the website, located at www.sustainablehighways.org, provides thorough information and instruction on how to use INVEST.

Short excerpts from the website are featured in this compendium. For more information, visit the INVEST website.

INVEST Version 1.0

INVEST Version 1.0 (v1.0) was the first full release of the INVEST tool and criteria in October 2012. It was developed through research and analysis of sustainability best practices in the transportation field. The original Beta Version criteria, released in the fall of 2010, were written by subject matter experts, and then were reviewed, modified, and vetted through valuable stakeholder feedback. After revising based on this feedback, the Pilot Test Version was released in the spring of 2011 for testing and evaluation across a broad spectrum of agencies, projects, programs, and geographies. INVEST 1.0 reflects substantial revisions made to the criteria and web-based tool based on the pilot testing.

INVEST Versions 1.1, 1.2, and 1.3

Development of Version 1.1

After the release of INVEST v1.0, the Federal Highway Administration (FHWA) launched an implementation program that provided grants to teams from DOTs, MPOs, and a Tollway desiring to implement INVEST v1.0. These teams used INVEST to evaluate a project or program, and in some cases, their entire portfolio of projects. Each provided a final report to FHWA that included comments and suggestions for the online tool and the criteria. These comments were combined with comments received during the development of version 1.0 that were deferred for consideration in future versions of INVEST. After reviewing the comments, it was decided to make two updates to INVEST, Version 1.1 and 1.2.

The release of Version 1.1 in January 2015 introduced minor edits, formatting changes, and tool enhancements that did not affect scoring of projects or programs. That is, in terms of scoring projects and programs, Version 1.0 = Version 1.1 and no translation was required.

Modifications Included in Version 1.2

With the release of Version 1.2 in September 2015, FHWA completed the responses to comments that required more substantial changes than Version 1.1. Version 1.2 included significant changes to criteria, scorecards, modules, and scoring in INVEST and did significantly affect the scoring of all existing projects and programs. The changes introduced include the following:

Changes to Criteria

- Adding an Innovative Criterion to all modules that users can define to take credit for sustainable innovations and emerging technologies not already included in INVEST.

- Adding five new criteria to the Project Development module, including: Low-Impact Development (separated from Stormwater), Infrastructure Resiliency in Planning and Design, Permeable Pavement, Light Pollution, and Noise Abatement.
- Removing the Contractor Warranty criterion and adding similar concepts to the Long-Life Pavement criterion.
- Modifying existing criteria to clarify scoring, adding new methods of achieving credit, and adding more opportunities to earn partial credit.

Other Changes

- Separating the System Planning module into two modules: System Planning for States (or infrastructure owners), and System Planning for Regions (and MPOs). This allows modifications to the criteria to make each module more applicable to the types of activities that the respective types of organizations perform.
- Adding a Recreational/Scenic scorecard to better represent criteria applicable to projects such as those designed by Federal Lands.
- Linking Case Studies to online criteria write-ups, making the case-studies searchable and adding the ability to share user examples of Innovative Criteria.
- Introducing a new guide to applying INVEST in the real world called *Using INVEST to Accomplish Your Goals*.
- Reorganizing the website and renaming tabs to aid in navigation.
- Launching scoring tool enhancements that include streamlined Program/ Project Registration Fields, new sortable fields in My Workspace, consolidation of actions in My Workspace into graphical icons, display of status and rating of evaluations in My Workspace, improved tools to manage collaborators, scoring status icons and the ability to lock criteria already scored, and an improved process to customize a scorecard.

The website includes a page under ABOUT called [Version 1.2](#) that describes changes made to INVEST in Version 1.2.

Modifications Included in Version 1.3

After 2-1/2 years of continued testing and use of Version 1.2, FHWA launched another set of updates to INVEST including Version 1.3 (this version) and an upcoming update, Version 2.0 (expected early 2019). Version 1.3 includes minor edits, criteria clarifications, and fixes to broken resource hyperlinks. Version 1.3 **does not affect scoring**, and therefore replaces Version 1.2.

Project and Program Scoring in Version 1.3

New Projects and Programs

All new project and program evaluations started will be in Version 1.3 and it is no longer possible to start a new project or program evaluation using Version 1.1 of INVEST.

Existing Projects and Programs

Existing evaluations (prior to the launch of Versions 1.2 and 1.3) remain in Version 1.1 until the user makes the decision to translate them to Version 1.3, which can be done when scoring the project by selecting the option and confirming the user's intent.

Users choosing to leave their existing scorecards in Version 1.1 will be able to continue scoring and will have access to the Version 1.1 scoring tool by selecting to continue scoring the existing project or program. It is anticipated that this

access will be available for several years. Users will be notified when this option is phased out before changes are made.

Translating a Project or Program to Version 1.3

When choosing to translate a project or program to Version 1.3, all relevant scores will be maintained (that is, response to questions that have not changed will remain unchanged). In addition, all notes, collaborators, and uploads will remain. The user will need to rescore items in many of the existing criteria to reflect changes included in Version 1.3 and will need to score new criteria; a matrix describing the changes to each of the criteria and necessary scoring updates is available for download at <http://www.sustainablehighways.com/1811/version-12.html>.

INVEST Background

Transportation and Sustainability

Transportation projects and programs serve many different, and sometimes competing, objectives. “Sustainability” is a concept that enables decision-makers to make balanced choices around these objectives. The three principles of the “triple bottom line” upon which sustainability is based—social, economic, and environmental—capture the broad range of transportation goals and objectives. Highway project development (including project planning, design, and construction) should seek to apply these principles. These principles are useful because they begin to define specific results that can be achieved by improving highway sustainability. They begin to provide distinct reasons for highway project development to incorporate such diverse concepts as climate change, environmental protection, judicious use of funds, regional air quality improvement, construction quality incentives, recycling promotion, social equity, and environmental management system use. If done effectively, the result should be more sustainable highways. Using sustainable approaches in transportation infrastructure will help us to continue to enhance quality of life and serve the transportation needs of the present without compromising the ability of future generations to meet their needs.

What is the Purpose and Intent of this Tool?

FHWA's INVEST is designed to provide information and techniques to help agencies integrate sustainability best practices into their projects and programs. INVEST is intended to provide guidance for practitioners to evaluate the sustainability of their transportation projects and programs and to encourage sustainability progress within the field of transportation. **It is not required and it is not intended to encourage comparisons** between transportation agencies. INVEST was developed with input from state and local transportation agency officials and staff and professional organizations such as AASHTO and ASCE. FHWA will continue to update INVEST as the transportation sustainability field continues to advance. While the use of INVEST is voluntary, it can be used by transportation agencies, such as DOTs, MPOs, Council of Governments, public works departments, and their consultants and partners, to evaluate and aid the integration of sustainability into their programs and projects.

Modules and Scorecards

INVEST considers the full lifecycle of projects and has four modules to self-evaluate the entire lifecycle of transportation services, including System Planning for States or Regions (SPS or SPR), Project Development (PD), and Operations and Maintenance (OM). Each of these modules is based on a separate collection of criteria and can be evaluated separately. INVEST 1.3 includes a total of eighty-one criteria organized into these four modules.

1. **System Planning for States (SPS) and System Planning for Regions (SPR)** cover the first step in the lifecycle of a transportation project. This is where an agency's system-wide network is analyzed and assessed to identify projects that will improve the safety, capacity, access, operations, or other key features of the system. The SP module includes sixteen criteria and one bonus criteria that agencies are eligible for based on their scores on

the first three criteria. There is one scorecard for each of the System Planning modules that includes all of the criteria.

2. **Project Development (PD)** is the second step in the lifecycle of a transportation project. This is where specific projects conceptualized and programmed in the System Planning processes are planned, designed, and constructed. The PD module includes a total of thirty-three criteria that are generally organized from planning to design to construction. The criteria are further organized into seven scorecards for the evaluation of projects. The scorecards are designed to identify applicable criteria based on the project type and location. Six of these scorecards pre-identify criteria that are most likely to be applicable for the project type and location. The seventh scorecard is a custom scorecard option, which is a dynamic scorecard that allows the user to select criteria:

- Paving – for projects that are devoted exclusively to pavement preservation; restoration projects that extend the service life of existing facilities and enhance safety; or pavement restoration projects that restore pavement structure, ride quality, and spot safety. Use this scorecard for paving projects in both rural and urban locations.
- Basic Rural – for small, rural reconstruction or rural bridge replacement projects that do not expand capacity of the roadway.
- Basic Urban – for small urban reconstruction or urban bridge replacement projects that do not expand capacity of the roadway.
- Extended Rural – for rural projects for a new roadway facility; structure projects where nothing of its type currently exists; and major reconstruction projects that add travel lanes to an existing roadway or bridge.
- Extended Urban – for urban projects for a new roadway facility; structure projects where nothing of its type currently exists; and major reconstruction projects that add travel lanes to an existing roadway or bridge.
- Scenic and Recreational – for typically rural scenic and recreational projects, such as those developed by Federal Lands.
- Custom - for projects that do not fit any of the pre-defined scorecard options or that want to use the self-defined Innovative Criterion, the Custom Scorecard will allow the user to develop a unique set of criteria that is most appropriate for the project being evaluated. The Custom Scorecard starts with a core set of 11 criteria that must be included as part of the score. There are not achievement levels associated with the custom scorecard.

Table 1 on the next page shows the criteria included in each of the PD scorecards. Each PD scorecard includes a different combination of the thirty-three PD criteria based on the type project. The custom scorecard includes eleven core criteria plus user-selected criteria to make a custom self-evaluation for projects that don't fit well into the six defined scorecards.

Table 1 - Project Development Criteria by Scorecard

Project Development by Criteria Scorecard							
	Paving	Urban Basic	Urban Extended	Rural Basic	Rural Extended	Scenic and Recreational	Custom Core Criteria ¹
PD-01: Economic Analyses			✓		✓		
PD-02: Life-Cycle Cost Analyses	✓	✓	✓	✓	✓		✓
PD-03: Context Sensitive Project Development		✓	✓	✓	✓	✓	
PD-04: Highway and Traffic Safety	✓	✓	✓	✓	✓	✓	✓
PD-05: Educational Outreach		✓	✓	✓	✓	✓	
PD-06: Tracking Environmental Commitments	✓	✓	✓	✓	✓	✓	✓
PD-07: Habitat Restoration		✓	✓	✓	✓	✓	
PD-08: Stormwater Quality and Flow Control		✓	✓	✓	✓	✓	
PD-09: Ecological Connectivity			✓	✓	✓	✓	
PD-10: Pedestrian Facilities		✓	✓			✓	
PD-11: Bicycle Facilities		✓	✓			✓	
PD-12: Transit and HOV Facilities		✓	✓			✓	
PD-13: Freight Mobility			✓		✓		
PD-14: ITS for System Operations		✓	✓		✓		
PD-15: Historic, Archaeological, and Cultural Preservation		✓	✓	✓	✓	✓	
PD-16: Scenic, Natural, or Recreational Qualities			✓	✓	✓	✓	
PD-17: Energy Efficiency		✓	✓	✓	✓		
PD-18: Site Vegetation, Maintenance and Irrigation		✓	✓	✓	✓	✓	
PD-19: Reduce, Reuse, and Repurpose Materials	✓	✓	✓	✓	✓	✓	✓
PD-20: Recycle Materials	✓	✓	✓	✓	✓	✓	✓
PD-21: Earthwork Balance			✓		✓	✓	
PD-22: Long-Life Pavement	✓	✓	✓	✓	✓	✓	✓
PD-23: Reduced Energy and Emissions in Pavement Materials	✓	✓	✓	✓	✓	✓	✓
PD-24: Permeable Pavement	✓	✓	✓	✓	✓	✓	✓
PD-25: Construction Environmental Training		✓	✓	✓	✓	✓	
PD-26: Construction Equipment Emission Reduction	✓	✓	✓	✓	✓	✓	✓
PD-27: Construction Noise Mitigation		✓	✓			✓	
PD-28: Construction Quality Control Plan	✓	✓	✓	✓	✓	✓	✓
PD-29: Construction Waste Management	✓	✓	✓	✓	✓	✓	✓
PD-30: Low Impact Development		✓	✓	✓	✓	✓	
PD-31: Infrastructure Resiliency Planning and Design			✓		✓	✓	
PD-32: Light Pollution		✓	✓	✓	✓		
PD-33: Noise Abatement		✓	✓				
Total Number of Criteria in Scorecard	11	27	34	23	29	27	11

¹ – Indicates the core criteria that must be included in the custom scorecard. The user may choose as many additional criteria as desired.

3. **Operations & Maintenance (OM)** is the third step in the lifecycle of a transportation project. This is where infrastructure planned, designed, and constructed in prior steps is operated and maintained, data is collected, and new project needs identified are passed back to the System Planning step to complete the lifecycle of projects. The OM module includes fourteen criteria including four aimed at internal operations and ten focused on maintenance and operations of the highway system. There is one scorecard for the OM module that includes all of the criteria.

Website and Tool

Website Organization

The INVEST website, at www.sustainablehighways.org is the primary source of INVEST information and contains the self-assessment scoring tool. The site is organized into the following three primary sections, which are described in more detail below:

- **ABOUT** – Provides background information about INVEST and its goals and benefits
- **LEARN** – Provides a guided tour through the INVEST website to learn about sustainable highways and integrating sustainability best practices into projects and programs.
- **CRITERIA** – Provides an interface to browse the complete set of criteria that can be used to evaluate the sustainability of projects and programs.
- **SCORE** – Is the self-evaluation tool that allows users to evaluate the sustainability of projects and programs. One of the key pages under
- **RESOURCES** – Consolidates resources including a library, case studies and cost narratives, and other links and support documents that provide valuable information for users.

In addition to these primary sections, the website also contains a links to **My Workspace** in the header of each page.

About

The **ABOUT** section provides background information on the following topics:

- **Goals** – INVEST Goals
- **History** – Development and history of INVEST
- **Benefits** – The benefits of using INVEST
- **Version 1.1** – A summary of revisions made in Version 1.1.
- **Version 1.2** – A summary of revisions made in Version 1.2.
- **Version 1.3** – A summary of revisions made in Version 1.3.

Learn

The **LEARN** section contains more information on multiple sustainability topics as well as more information about INVEST and using it to evaluate projects and programs. The following topics are covered:

- **Sustainability and Highways** –discusses definitions of sustainability, sustainable highways, and why and how to measure sustainability
 - When Does INVEST Measure Sustainability?
 - What is Sustainability?
 - What is a Sustainable Highway?
 - Why Measure Sustainability?
 - How is Sustainability Measured?

- **Getting to Know INVEST** – defines sustainability, the triple bottom line, and the need to measure sustainability were all elements that contributed to the structure and organization of INVEST
 - What is INVEST?
 - How Does INVEST Measure Sustainability?
 - How are the Criteria Organized?
 - How are the Criteria Presented?
 - Are the Criteria Weighted?
- **System Planning** – discusses the basics of the System Planning modules.
 - About the System Planning Module
 - Why and When would I Score a System Planning Program?
 - Who Can Use the System Planning Modules?
 - How Do I Use INVEST to Score a System Planning Program?
 - What Does the System Planning Score Mean?
- **Project Development** – discusses the basics of the Project Development module.
 - About the Project Development Module– discusses the basics of the Project Development module.
 - Why and When would I Score a Project?
 - Who Can Use the Project Development Module?
 - Which Scorecard Should I Use?
 - Understanding the Context of a Project
 - How Do I Use INVEST to Score a Project?
 - What Does the Project Development Score Mean?
- **Operations and Maintenance** – discusses the basics of the Operations and Maintenance module.
 - About the Operations and Maintenance Module
 - Why and When Would I Score an Operations and Maintenance Program?
 - Who Can Use the Operations and Maintenance Module?
 - How Do I Use INVEST to Score an Operations and Maintenance Program?
 - What Does the Operations and Maintenance Score Mean?
- **Using INVEST to Accomplish Your Goals** –includes examples of how transportation agencies are using INVEST.
 - Advance Better Business Practices
 - Integrate Sustainability into Projects and Programs
 - Improve Education and Understanding of Sustainability
 - Facilitate Internal and External Communication and Outreach
 - INVESTing Time
 - Relating INVEST to other Sustainability Tools

Criteria

The **CRITERIA** section is essentially an online compendium. Users start by selecting a module to explore and can then select individual criteria to review and/or download. The Project Development criteria can be filtered to show only the criteria included in each scorecard.

Score

There are 2 operations under the **SCORE** section, including:

- **My Workspace** – this is where all scoring begins and can also be launched from the top menu bar on any page
- **Translate to Version 1.2** – this is an information page that explains the basics of the translation and how to proceed

Resources

The **RESOURCES** section provides additional information useful to INVEST users, including:

- **INVEST Library** – provides downloadable copies of compendia and printed portions of *Using INVEST to Accomplish Your Goals* from **LEARN**
- **Case Studies and Examples** – provides searchable database of case studies and Innovative Criterion examples
- **Cost Savings** – provides cost narratives that explore building a business case for implementing some practices of the INVEST tool
- **Innovative Criterion** – interface for developing and submitting an Innovative Criterion for use in the Project Development custom scorecard
- **FHWA Sustainability Highways Initiative** – link to FHWA’s website
- **Webinars & Events** – provides current and past INVEST webinar and other event information
- **FAQ** – Frequently Asked Questions
- **Provide Comments** – interface tool for users to submit questions and comments to the INVEST team
- **Privacy** – FHWA’s privacy notice

My Workspace

My Workspace is the primary interface to begin all project and program scoring. From this page you can launch the following services:

- **Scoring Tutorial** – this is an illustrated guide to using the scoring functions
- **Start a New Project or Program** – to create a project or program to score, you begin here to enter the basic information
- **Continue Working on an Existing Project or Program** – contains a sortable list, organized by module of all of your existing project and programs that are being scored, provides basic information about each, and allows you to quick launch the following actions:
 - Edit – editing existing project or program Information, including the scorecard being used
 - Duplicate – to duplicate a project or program
 - Print – to print a copy of the current score
 - Score – launches the scoring tool for the project or program
 - Delete – requires confirmation to delete a project or program
 - Collaborate – allows you to add or remove other users that can help score a project

Criteria

The remainder of this document contains the criteria write-ups for all eighty (80) criteria contained in the System Planning (for States and Regions), Project Development, and Operations & Maintenance modules of INVEST v1.2. However, if users download the compendium from the library, this may contain only the modules selected.

Project Development

PD-01: Economic Analysis	PD-01
PD-02: Life-Cycle Cost Analyses	PD-02
PD-03: Context Sensitive Project Delivery.....	PD-03
PD-04: Highway and Traffic Safety	PD-04
PD-05: Educational Outreach	PD-05
PD-06: Tracking Environmental Commitments	PD-06
PD-07: Habitat Restoration.....	PD-07
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PD-09: Ecological Connectivity.....	PD-09
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PD-24: Permeable Pavement	PD-24
PD-25: Construction Environmental Training	PD-25

Project Development (continued)

PD-26: Construction Equipment Emission Reduction.....	PD-26
PD-27: Construction Noise Mitigation	PD-27
PD-28: Construction Quality Control Plan	PD-28
PD-29: Construction Waste Management.....	PD-29
PD-30: Low Impact Development.....	PD-29
PD-31: Infrastructure Resiliency Planning and Design	PD-29
PD-32: Light Pollution.....	PD-29
PD-33: Noise Abatement.....	PD-29

PD-01: Economic Analyses

2-5 points

Goal: Using the principles of benefit-cost analysis (BCA) or economic impact analysis (EIA), provide evidence that the user benefits, including environmental, economic, and social benefits, and justify the full life-cycle costs.

Sustainability Linkage

Conducting an economic analysis supports all of the triple bottom line sustainability principles by ensuring that agencies consider improvements where user benefits exceed the investment costs for the project through analysis of impacts to local businesses, emissions, safety, and others.



Background and Scoring Requirements

Background

For the purpose of this criterion, the key terms are defined as follows:

- **“Benefit-Cost Analysis”** – A BCA assesses the benefits of projects and programs in comparison to their costs. It normally includes all direct user and agency costs and benefits that the agency is able to estimate, including operating costs, travel time costs, and often other impacts such as crash and pollution costs, but broader economic impacts are excluded in traditional BCA. Benefit-cost analysis is typically applied in transportation studies to identify the NPV of the societal benefits that can be associated with a project or program, net of the investment costs. This includes benefits that are not reflected in any monetary transaction.
- **“Broader economic impacts”** – Broader economic impacts include: (1) indirect impacts, which occur when industries that are directly affected by goods and services from other industries, and (2) induced impacts, which occur from increased household spending due to higher regional wages. Impacts (1) and (2) are considered “follow-on” impacts, and while they are typically included in an EIA, they are explicitly excluded from a BCA.
- **“Economic Impact Analysis”** – An EIA is concerned with the monetary transactions that affect the generation of income in an area’s economy due to the investment in the program or project. It does not include the travel time or other costs or benefits for which money is not exchanged; however, it includes indirect and induced impacts on business growth that are not included in benefit-cost analysis. However, it does include much broader estimates of impacts than direct impacts. It asks the question: “What does the economy of interest look like with or without a project or program?” as measured by the quantity of and the types of transactions that are forecasted to occur under each scenario. Impacts are shown by the change in the number of disenfranchised communities, jobs, in worker income, and in gross domestic product (GDP) or gross state product (GSP) that results in future years as a consequence of the transportation programs or projects. For more information, review the FHWA’s SHRP2 [Solutions Easier to Use Tools for Improved Economic Analysis website](#)¹.

Scoring Requirements

Requirement PD-01.1

2-5 points. Perform Economic Analyses

Scoring is based on the following, cumulative elements.

- **Requirement PD-01.1a**

2 points. Benefit-Cost Analysis

A BCA for the project must be completed using minimum acceptable industry practices. U.S. DOT provides guidance on developing a BCA under the TIGER Grant Federal Register notices (see <http://www.dot.gov/tiger/application-resources>). In addition, FHWA has developed two project-level BCA tools including: (1) BCA.Net, which is a web-based BCA tool designed to support the highway project decision-making process; and (2) STEAM, which is a corridor and system-wide analysis tool that computes the net value of mobility and safety benefits attributable to regionally important transportation projects. If using the analysis to compare alternatives, one alternative that may be included is a no-build option. Performing a BCA for a project facilitates justification that the environmental, economic, and social benefits expected justify the investment costs for the project. A BCA should not be confused with life-cycle cost analyses, which are leveraged to compare different alternatives (see PD-02) and are the starting point for a BCA.

- **Requirement PD-01.1b**

3 additional points. Economic Impact Analysis

Perform an EIA, which includes the following (if relevant):

- Forecasting and quantification of revenues and costs of the project;
- Quantification of benefits, including social, environmental, and economic factors; and
- Quantification of impacts to regions, land values, and businesses.

Resources

The following resources are referenced in this criterion and consolidated here:

1. FHWA, SHRP2 Solutions Easier to Use Tools for Improved Economic Analysis website, http://www.fhwa.dot.gov/goshp2/solutions/capacity/c03_c11/economic_analysis_tools
2. U.S. DOT, TIGER BCA Resource Guide (2014), <http://www.dot.gov/policy-initiatives/tiger/tiger-bca-resource-guide-2014>

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Results from a Benefit-Cost and/or Economic Impact Analyses.
2. Documentation of techniques and underlying assumptions for any economic model(s) used to generate results.

PD-02: Life-Cycle Cost Analyses

1-3 points

Goal: Reduce life-cycle costs and resource consumption through the informed use of life-cycle cost analyses of key project features during the decision-making process for the project.

Sustainability Linkage

Conducting a life-cycle cost analysis supports the environmental and economic principles by promoting efficient use of materials and resources.



Background and Scoring Requirements

Background

Life-Cycle Cost Analysis (LCCA) is an engineering economic analysis tool that allows transportation officials to quantify the differential costs of alternative investment options for a given project. LCCA can be used to study either new construction projects or to examine preservation strategies for existing transportation assets. LCCA considers all agency expenditures (including planning, engineering, design, construction, maintenance, operations, and administration costs) and user costs (including time, safety, fuel, and other vehicle operating costs associated with normal operations and work zone delays) throughout the life of an alternative, not only initial investments. More than a simple cost comparison, LCCA offers sophisticated methods to determine and demonstrate the economic merits of the selected alternative in an analytical and fact-based manner.

Scoring Requirements

Requirement PD-02.1

1-3 points. Complete Life-Cycle Cost Analysis/Analyses

Complete calculations for LCCA of key project features in accordance with generally accepted engineering economics practices. Comparing multiple design alternatives is encouraged but not required. Scoring is based on the following, cumulative elements.

- **Requirement PD-02.1a**

1 point. Perform LCCA for Pavement Structures Alternatives

Perform an LCCA of all pavement structure alternatives considered in accordance with the method described in the FHWA's Technical bulletin for Life-Cycle Cost Analysis. This may be completed manually, or by using the FHWA's free RealCost software, which can be found at <http://www.fhwa.dot.gov/infrastructure/asstmgmt/lccasoft.cfm> or any equivalent software. This requirement may also be accomplished by using pre-determined pavement designs based on context-specific best practices that are part of a formal Pavement Management System if the pavement design was established based on LCCA analyses (e.g., if within a specific region it has been determined through LCCA analyses that a specific pavement type/mix is most appropriate for bus lanes).

- **Requirement PD-02.1b**

1 point. Perform LCCA for Stormwater Infrastructure Alternatives

Perform an LCCA of all stormwater infrastructure alternatives considered. This analysis should include costs for planning, design, initial construction, maintenance (including appropriate BMP maintenance), and operations. With respect to BMPs, careful consideration should be given to factors such as frequency of scheduled maintenance, chronic maintenance problems (e.g., clogging), and failure rates that add to the overall cost of BMP implementation.

- **Requirement PD-02.1c**

1 point. Perform LCCA for Major Features

Perform an LCCA of the project's major feature (bridges, tunnels, retaining walls, or other items not listed in the preceding options) for each of the alternatives considered. For bridges, perform an LCCA in accordance with the guidance in the National Cooperative Highway Research Program (NCHRP) Report 483 (Hawk, 2003). The report provides standard input values for a wide range of potential bridge projects and referenced sources for other input data. LCCA software may be used, including RealCost, with some minor adjustments to the spreadsheet or a bridge LCCA may also be completed by hand.

Resources

The following resources are referenced in this criterion and consolidated here:

1. FHWA, Life-Cycle Cost Analysis Primer (2002) at <https://www.fhwa.dot.gov/asset/lcca/010621.pdf>
2. FHWA, Life-Cycle Cost Analysis in Pavement Design - Interim Technical Bulletin (1998), Publication No. FHWA-SA-98-079 at http://www.wsdot.wa.gov/NR/rdonlyres/7A7CC34A-6336-4223-9F4A-22336DD26BC8/0/LCCA_TB.pdf
3. FHWA, RealCost software, at <http://www.fhwa.dot.gov/infrastructure/asstmgmt/lccasoft.cfm>
4. NCHRP, Report 483 – Bridge Life-Cycle Cost Analysis (2003) at http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_483.pdf

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one of the following documentation sources (or equal where not available):

1. Calculations for the LCCA, including a summary of inputs and outputs.
2. A copy of the owner-agency policy on LCCA if one exists.
3. Calculations for the LCCA performed as part of a Pavement Management System process to set best practice pavement designs.

PD-03: Context Sensitive Project Development

1-10 points

Goal: Deliver projects that harmonize transportation requirements and community values through effective decision-making and thoughtful design.

Sustainability Linkage

Implementing Context Sensitive Solutions supports all of the triple bottom line sustainability principles by ensuring that environmental resources, community values, and economic context of a project are all considered during project development.



Background and Scoring Requirements

Background

Context Sensitive Solutions (CSS) is incorporated in both a project development and public involvement process and the outcomes of using that process in design (per FHWA's [Context Sensitive Solutions website](#)¹). The outcomes are referred to as Context Sensitive Design (CSD) in this document.

Definitions

For the purposes of this criterion, the key terms are defined as follows:

- **“Context Sensitive Solutions (CSS)”** is defined as a collaborative, interdisciplinary approach that involves all stakeholders to provide a transportation facility that fits its setting. It is an approach that leads to preserving and enhancing scenic, aesthetic, historic, community, and environmental resources, while improving or maintaining safety, mobility, and infrastructure conditions. Some of the key principles of a CSS process are that it:
 - Engages stakeholders (not just involves them),
 - Embraces a multimodal approach (this is not mentioned anywhere in the article and is key to CSS/CSD),
 - Serves and respects the environmental and social context of the transportation network, and
 - Applies to all of the activities of the transportation agency.

The FHWA office of Office of Project Development & Environmental Review develops and implements programs and activities that advance environmental stewardship and streamlining for FHWA-funded projects, through the application of National Environmental Policy Act (NEPA) principles and the NEPA process. CSS/D is a part of those principles and processes.

- **Context Sensitive Design (CSD)”** is a model for transportation project development. Proposed transportation projects must be planned not only for its physical aspects as a facility serving specific transportation objectives, but also for their effects on the aesthetic, social, economic and environmental values, needs, constraints and opportunities in a larger community setting. Projects designed using this model:
 - Are in harmony with the community and preserve the environmental, scenic, aesthetic, historic, and natural resource values of the area.
 - Are safe for all users.
 - Solve problems that are agreed upon by a full range of stakeholders.

- Meet or exceed the expectations of both designers and stakeholders, thereby adding lasting value to the community, the environment, and the transportation system.
- Demonstrate effective and efficient use of resources (people, time, budget,) among all parties.
- **“Context Sensitive Project Development”** in this document, refers to the development of a project, from planning through design using the process of CSS and resulting in CSD outcomes. The FHWA NEPA project development process is an approach to balanced transportation decision-making that takes into account the potential impacts on the human and natural environment and the public’s need for safe and efficient transportation. The use of CSS with a CSD outcome can be an integral part of this process.
- **“Objectionable views”** are defined as views from the project that are unpleasant or offensive and that arouse distaste or opposition from the community. These views should be defined through a CSS process by community stakeholders.

Relationship with Other Criteria

Several key outcomes of a CSD process are covered in other criteria and are not repeated here. Please refer to the following criteria in addition to PD-03:

- PD-07: Habitat Restoration
- PD-09: Ecological Connectivity
- PD-10: Pedestrian Facilities
- PD-11: Bicycle Facilities
- PD-12: Transit and HOV Facilities
- PD- 15: Historic, Archeological, and Cultural Preservation
- PD-16: Scenic, Natural, or Recreational Qualities
- PD-18: Site Vegetation, Maintenance and Irrigation
- PD-32: Light Pollution
- PD-33: Noise Abatement

Scoring Requirements

Requirement PD-03.1

2 points. Six Step Process for CSS-based Project Development

Evidence exists that the following principles of CSS were applied in the project development process through a formal CSS program or equivalent process that accomplishes the same principles. A public involvement process does not necessarily meet this criterion unless the public and other stakeholders are engaged in two-way communications that ultimately influence the vision and design of the project. For smaller projects that typically do not require involvement of many people, the six-step process defined below should be scaled accordingly.

A NEPA-based project development process generally follows the six-step CSS framework described in National Cooperative Highway Research Program (NCHRP) *Report 480: A Guide to Best Practices for Achieving Context Sensitive Solutions*² and *NCHRP Report 642: Quantifying the Benefits of Context Sensitive Solutions*³, or an equivalent process. *NCHRP Report 480: A Guide to Best Practices for Achieving Context Sensitive Solutions*² describes a general six-step process for incorporating CSS at a project level:

1. Develop a decision-making process and management structure;
2. Define the problem;
3. Develop the project and the evaluation framework for the project;
4. Determine alternatives;
5. Screen the alternatives; and
6. Evaluate and select an alternative.

Requirement PD-03.2

1 point. Deploy a Multi-disciplinary Team

Project Development features a “cradle-to-grave,” project team that includes planners, traffic engineers, public involvement specialists, design engineers, environmental experts, safety specialists, landscape architects, right-of-way staff, freight experts, construction engineers, and others to work on projects throughout project development and who work together to achieve the desired CSS-based vision for the project.

Requirement PD-03.3

1 point. Create Public “Champions”

As a result of CSS performed during the project development process, external “champions” for the project are created in the affected community who are engaged and proactive in supporting the project and who advocate for the project.

Requirement PD-03.4

1 point. Leverage Visualization Tools

Visualization techniques, ranging from project alternative renderings to photo-simulations, are used to assist in the decision regarding design choices.

Requirement PD-03.5

1 point. Design to the Scale of the Project

The appropriate scale of the project is considered and features that adjust the scale of the roadway to the context are incorporated, such as median islands, pedestrian refuge islands, curb bump-outs, bus pull-outs, or other similar features.

Requirement PD-03.6

1-2 points. Obstruct Objectionable or Distracting Views

Points are achieved by removing or obstructing objectionable or distracting views. This may be accomplished through the use of construction screening, vegetative screens, fences, or other similar means. Points shall be achieved per the Table PD-03.6.A. Points are **not** cumulative; rather the highest point value should be used.

TABLE PD-03.6.A. AVAILABLE POINTS FOR OBSTRUCTING OBJECTIONABLE OR DISTRACTING VIEWS

Requirement	No. Points	Requirement Description
PD-03.6a	1	Enhance Features. Obstruct objectionable views during construction.
PD-03.6b	2	Enhance Features. Obstruct objectionable views permanently.

Requirement PD-03.7

1 point. Incorporate Appropriate Context Design Features

Credit is achieved by integrating context sensitive aesthetic treatments, as determined by participating stakeholders, into the design of transportation facilities. Examples may include street furniture, signage, community identifiers, lighting, or appurtenances. Community murals identified as part of a roadway project by the local community that are incorporated into the project would also qualify.

Requirement PD-03.8

1 point. Bridge and Structural Element Aesthetics

Points are achieved if aesthetics for these structural items are incorporated into the design. Structural elements include bridges, sound walls, box culverts, large headwalls, guard rails, and retaining walls. Elements that should be considered when evaluating the structure's aesthetics include Visual Design Elements and Aesthetic Design Qualities. Visual Design Elements include: line, shape, form, color, and texture. Aesthetic Design Qualities include: order, proportion, rhythm, harmony, balance, contrast, scale, illusion, and unity.

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. FHWA, Context Sensitive Solutions website, <http://contextsensitivesolutions.org/>
2. NCHRP, Report 480: *A Guide to Best Practices for Achieving Context Sensitive Solutions* (2002), http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_480a.pdf
3. NCHRP, Report 642: *Quantifying the Benefits of Context Sensitive Solutions* (2009), http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_642.pdf

Additional Resources

The following resources provide information on this criterion topic in addition to the sources directly referenced:

4. FHWA, Environmental Review Toolkit website, <https://www.environment.fhwa.dot.gov/index.asp>

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Documentation of the CSS or equivalent process applied on the project.
2. Contract Documents.
3. Technical Memoranda and Reports.

PD-04: Highway and Traffic Safety

1-10 points

Goal: Safeguard human health and reduce social and economic impacts from crashes by incorporating science-based quantitative safety analysis processes within project development that will reduce serious injuries and fatalities within the project footprint.

Sustainability Linkage

Reducing fatal and serious injuries contributes to the social and economic principles by reducing the impacts associated with personal and public property damage, injury, and loss of life.



Background and Scoring Requirements

Background

For the purpose of this criterion, the key terms are defined as follows:

- **“Nominal safety”** – Refers to the extent to which a site (corridor, intersection, segment, or area) meets currently applicable design standards and guidelines. *Substantive* safety refers to actual or anticipated safety performance as defined by crash frequency and crash severity. Substantive safety reflects the science of safety: objective knowledge built on science-based discoveries of data-driven assessments of the safety impacts of road design, road user actions or behaviors, and vehicle attributes.
- **“Road Safety Audits” or “Road Safety Assessments”** – The formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team. RSAs *qualitatively* report on potential road safety issues and identify opportunities for improvements in safety for all road users based on input from designers, traffic engineers, maintenance experts, law enforcement, and human factors experts. RSAs are particularly beneficial at the planning and design stages of project development. Guidance on RSAs can be found on the [FHWA website](#)¹.

Scoring Requirements

Requirement PD-04.1

2 points. Incorporate Human Factors Considerations into RSA

One of the following scores applies:

- **0 points.** Rely solely on published design and operational performance standards during the project development process.
- **2 points.** Evaluate, document, and incorporate interactions between road users and the roadway using fundamentals captured in Chapter 2 of the [Highway Safety Manual](#)² and the [Human Factors Guideline for Road Systems](#)³. Road Safety Audits (RSA)/Assessments are completed in accordance with FHWA’s Road Safety Audit Guidelines and include human factors principles (from Chapter 2 of the [Highway Safety Manual](#)² and the [Human Factors Guideline for Road Systems](#)³).

Requirement PD-04.2

1 point. Build Awareness among the Public Regarding Contributing Factors to Crashes

Use media, for example the agency website or flyers, to raise awareness among the public about contributing factors to crashes on the existing facility or similar facilities on the network in a manner that is easy to understand. The purpose of these awareness efforts would be to support an improved understanding of road users about their personal responsibility in preventing crashes and to improve overall safety culture.

Requirement PD-04.3

1-6 points. Explicit Consideration of Safety using Quantitative, Scientifically Proven Methods

Best practices for using quantitative safety methods and measures to identify and evaluate, for example, safety improvements or actions, are presented in the advanced approaches in the HSM that account for regression to the mean (RTM), the impact of countermeasures presented in Part D of the HSM, and highly rated CMFs in the FHWA CMF Clearinghouse. Predictive methods for evaluation of quantitative safety refers to analytical approaches that result in a calculation of the predicted and/or expected frequency and/or severity of crashes for a given site or set of conditions. Such methods are described in the [AASHTO Highway Safety Manual](#)². They incorporate the use of safety performance functions, crash modification factors that meet the HSM inclusion rules, and local or state-specific calibration.

Tools that can be used in this process include AASHTO [SafetyAnalyst](#)⁴, the Interactive Highway Safety Design Model (IHSDM), spreadsheet tools developed to apply the predictive methods in the HSM, and analytical tools that use substantive safety as the basis of the analysis. While crash rates have been in use for many years, these (and other methods that do not account for the characteristics of crash data and the impact of, for example, RTM) do not represent state of the practice.

The [Integrating the HSM into the Highway Project Development Process](#)⁵ guide describes examples of the application of the HSM in the project development process.

Incorporate substantive safety performance into project development decision-making through the use of scientifically proven and statistically reliable predictive methods for evaluation of quantitative safety. Significant project decisions include establishment of project type and design criteria, selection of project design alternatives, and development of preliminary and final design details, including the use of design exceptions as necessary.

No credit is given for using design and operational performance standards and guidelines to assess nominal safety of the project throughout the project development process; or using less reliable quantitative safety methods such as crash rates to forecast future anticipated safety performance; or conducting RSAs that only assess nominal safety performance to describe safety (for example, assessing and documenting whether design standards and guidelines are met).

Scoring for this requirement is based on the following, cumulative requirements:

- **Requirement PD-04.3a**

1 point. Establish the Project Type as Defined in the HSM

Establish the project type, as defined in the HSM, during scoping of project alternatives through a quantitative and statistically reliable process. This process includes consideration of historic safety performance of the existing facility or similar facilities.

- **Requirement PD-04.3b**

2 points. Develop and Evaluate the Project Design and/or Operational Alternatives

Develop and evaluate project design and/or operational alternatives using explicit consideration of substantive safety through quantitative, statistically reliable methods.

- **Requirement PD-04.3c**

3 points. Use Quantitative and Statistically Reliable Methods and Knowledge

Use quantitative and statistically reliable methods and knowledge to assess substantive safety performance in the development of preliminary and final design details. Where a project includes design exceptions, evaluate the safety impact of the design exception(s) with these methods, and identify potential mitigating actions to improve safety performance. Note: if the project has no design exceptions, the agency can earn 3 points by documenting that their policies and processes for evaluation and documentation of design exceptions incorporate substantive safety principles described above.

Requirement PD-04.4

1 point. Evaluate Safety Performance of the Project after Implementation

Given the relative rarity of crashes, a statistically reliable post-evaluation period may take several years. As agencies may wish to complete a sustainability assessment sooner than that, earning one credit for this step is possible by documenting that agencies (a) have formal safety project evaluation policy and process in place that are statistically reliable, and (b) indicating that the agency intends to apply such process to this project.

A statistically reliable evaluation process includes at least the following elements:

- Collection and recording of the traffic volumes, roadway, and crash data for the three years prior to implementation for use after implementation.
- Keeping record of the implementation date (i.e., actual start of construction work and completion date of construction (last day before official opening) is recorded for use after implementation).
- The agency is able to retrieve the abovementioned information for a post-implementation safety performance review.

- The method used in the evaluation process is advanced enough to account for regression to the mean (RTM). The Empirical Bayes (EB) before-after study (with or without comparison sites) method is considered the most appropriate means assessing the safety effectiveness of a treatment. The EB method accounts for regression to the mean (RTM) effects which are common to highway and traffic safety studies and applications. The HSM provides details on how to conduct post-implementation evaluations to demonstrate statistically valid safety effects. The evaluation shall assess three to five years of before and after data in determining the effect of the project on crashes and crash severity. The EB methods rely on predictive methods, for example, the use of safety performance functions, crash modification factors that meet the HSM inclusion rules, and local or state-specific calibration. If such models do not exist or calibrations of the HSM models have not been completed, the naive before-after study approach is acceptable.

One of the following scores applies:

- **0 points.** Perform no post-evaluation of the project, or use only less reliable methods such as crash rates to evaluate the safety performance of the project after implementation.
- **1 point.** Use a statistically reliable, science-based method to evaluate the safety effectiveness of the implemented project.

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. FHWA, Safety website, <http://safety.fhwa.dot.gov/rsa>
2. AASHTO, Highway Safety Manual, <http://www.highwaysafetymanual.org> and https://bookstore.transportation.org/collection_detail.aspx?ID=135
3. NCHRP, Human Factors Guideline for Road Systems (NCHRP Report 600 series), http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_600Second.pdf
4. AASHTO, SafetyAnalyst, <http://safetyanalyst.org/>
5. FHWA, Integrating the HSM into the Highway Project Development Process (2012), https://safety.fhwa.dot.gov/hsm/hsm_integration/hsm_integration.pdf

Additional Resources

The following resources provide information on this criterion topic in addition to the sources directly referenced:

6. FHWA, *Road Safety Audit Guidelines*, 2006, http://safety.fhwa.dot.gov/rsa/guidelines/documents/FHWA_SA_06_06.pdf

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more following documentation sources (or equal where not available):

1. Documentation of examples where human factors were considered in the project development process; or, if an RSA took place, documentation of the RSA, which may include resumes or biographies of RSA team members demonstrating their experience and qualifications to conduct RSAs. The documentation needs to include evidence that the fundamentals of human factors were applied (reflect knowledge and application of Chapter 2 of the HSM and the *Human Factors Guideline for Road Systems* (NCHRP 600 series).
2. Documentation of public awareness or information presented to the public to support a change in safety culture. These will include information (quantitative) on contributing factors, for example, speeding, drinking and driving, and distracted driving based on historic crash performance.
3. Documentation of the project scoping process, including data and analysis describing how the existing facility's safety performance was used to make decisions on scope of project improvements.
4. Project reports, technical memos, or other supporting documentation that demonstrate application of HSM-quality evaluations of the project and alternatives considered. These include documentation of the existing safety performance (frequency, crash type, severity) and comparison with an appropriate benchmark. Include analysis of the expected safety performance of alternatives considered (with specific reference to SPFs and CMFs used), as well as how quantitative safety was considered as part of overall project decision-making.
5. Design exception review and evaluation reports approved by the appropriate agency authority that include quantitative estimates of the expected safety performance of the design exception, specific mitigation measures, and estimates of the quantitative safety performance of the proposed mitigation measures. Where no design exceptions were required, documentation of the agency's processes and procedures for design exceptions that cite reference to and use of substantive, science-based crash analyses and methods.
6. Documentation of the post-implementation effectiveness evaluation of the project, including a collection of crash data before and after implementation, and shall follow the Empirical Bayes process or advanced methods that account for RTM. Where post-evaluation requires a lengthy period beyond project implementation, documentation of the agency's formal process for evaluation with a statement of intent or policy regarding post-evaluation can be submitted.

PD-05: Educational Outreach

2 points

Goal: Increase public, agency, and stakeholder awareness of the integration of the principles of sustainability into roadway planning, design, and construction.

Sustainability Linkage

Educational outreach supports all of the triple bottom line principles by communicating to the public how social, environmental, and economic issues relate to roadway projects.



Affected Triple Bottom Line Principles

Background and Scoring Requirements

Background

This criterion awards points for incorporating public educational outreach that promotes and educates the public about sustainability including social, environmental, and economic principles. Specifically, this criterion requires communicating how sustainability principles are being integrated into the planning, design, construction, and operational phases of the roadway project. Credit can be achieved by leveraging public involvement processes where possible.

Note that performing a routine public involvement process does not accomplish this criterion unless it includes specific efforts to educate the audience about the sustainability of the project. Also note that the word “sustainability” does not have to be used specifically, and that terminology should be appropriate to the audience.

Scoring Requirements

Requirement PD-05.1

2 points. Install Educational Elements or Perform Educational Activities

Install or perform a minimum of two different educational elements from the Table PD-05.1.A.

TABLE PD-05.1.A. REQUIREMENTS FOR EDUCATIONAL ELEMENTS (CONTINUED ON NEXT PAGE)

Requirement	Educational Element	Recommended Requirements
PD-05.1a	Include sustainability in a Project Development Process	Specifically include sustainability as a consideration in a project development process that harmonizes transportation requirements and community values through effective decision-making and thoughtful design. Examples of this type of development process include complete streets, context sensitive solutions, neighborhood-aware design, and similar.
PD-05.1b	Include sustainability in Public Involvement	Specifically include sustainability education and promotion of sustainability as a project element throughout the public involvement process for the project.

Requirement	Educational Element	Recommended Requirements
PD-05.1c	Install point-of-interest	Install and maintain off-road point-of-interest kiosk(s) that display(s) information about the project and its sustainability features, as appropriate.
PD-05.1d	Project website	Provide a publicly available and maintained informational project website with capacity for submitting feedback and comments.
PD-05.1e	Stakeholder guide	Include sustainability and how it is being applied to the project in agency and/or stakeholder guide, specification, or policies, as appropriate.
PD-05.1f	School presentations	Perform presentation(s) about the project and its sustainability features for primary and secondary schools.
PD-05.1g	Professional presentations	Perform professional technical presentation(s) about the project and its sustainability features.

Resources

None referenced.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Public Involvement and Outreach materials showing sustainability was specifically included.
2. Text or printed copy of the information offered at the kiosk (i.e., brochure or static installation).
3. Website address and/or screen captures.
4. An agency guide, specification, or policy.
5. A copy of school or professional presentations and the date of the presentation.

PD-06: Tracking Environmental Commitments

2-5 points

Goal: Ensure that environmental commitments made by the project are completed and documented in accordance with all applicable laws, regulations, and issued permits.

Sustainability Linkage

Tracking commitments supports the environmental and social principles by ensuring that adherence to commitments made to stakeholders and the environment are consistently met throughout project development.



Background and Scoring Requirements

Scoring Requirements

Requirement PD-06.1

2-3 points. Use Formal Compliance Tracking System

Agencies are responsible for meeting commitments made throughout the project to regulatory agencies, property owners, tenants, the community, and other stakeholders. This criterion requires the project owner to facilitate the tracking and compliance of commitments through a formal environmental compliance tracking system. Scoring for this requirement is based on the following, cumulative requirements. The first requirement must be accomplished to earn the second.

- **Requirement PD-06.1a**

2 points. Use an Environmental Compliance Tracking System (ECTS)

Beginning in project development, use a comprehensive ECTS for the project and related facilities to identify how environmental commitments will be identified, tracked, fulfilled, and verified throughout planning, design, construction, and operations and maintenance. The ECTS should include all regulatory and non-regulatory commitments that apply to the development work and additional properties, including surveys, borings, batch plants, staging, equipment storage, employee parking, and field offices, as well as land that is purchased, leased, occupied, or used for the work.

At a minimum, the system should: identify commitments in a single list; identify an environmental compliance manager; ensure that environmental commitments are communicated from one phase of a project to another; leverage tracking mechanisms (such as databases, forms, or lists); identify training needed for necessary design and construction staff; and provide periodic reports verifying the commitments have been fulfilled. The tracking system should be updated and maintained throughout the project development and any monitoring period.

For more information on environmental compliance tracking systems, see AASHTO's [Center for Environmental Excellence website](#)¹.

- **Requirement PD-06.1b**

1 additional point. ECTS has Mechanism to Communicate from Planning to Maintenance

The environmental compliance tracking system has a formal mechanism to communicate commitments from transportation planning through operations and maintenance. To earn credit, this ECTS must be used on this project from planning through construction and handed off to maintenance and operations.

Requirement PD-06.2

2 points. Assign Independent Environmental Compliance Monitor

The Owner shall require that the principal project constructor assigns an *independent* environmental compliance monitor who will provide quality assurance services and report directly to and make recommendations to the regulatory and Lead Agencies. The Independent Environmental Monitor should be a recognized expert or persons knowledgeable about natural resources protection and construction, and should report directly to regulatory agencies about problems observed during design review and construction phases, including, but not limited to, erosion and sediment control problems.

Resources

The following resources are referenced in this criterion and consolidated here:

1. AASHTO, Center for Environmental Excellence website, <http://environment.transportation.org/>

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of the following documentation sources (or equal where not available):

1. Documentation of environmental tracking system, including instructions on what is to be included and how the chain of documentation flows throughout the phases of projects.
2. Contact documents requiring the construction contractor to assign an independent environmental compliance manager.

PD-07: Habitat Restoration

1-7 points

Goal: Avoid, minimize, rectify, reduce, and compensate the loss and alteration of natural (stream and terrestrial) habitat caused by project construction and/or restore, preserve, and protect natural habitat beyond regulatory requirements.

Sustainability Linkage

Minimizing or avoiding impacts to habitat and restoring habitat beyond required regulations enhances the ecosystem and therefore supports the environmental principle of the triple bottom line.



Background and Scoring Requirements

Background

For the purposes of this criterion, the key terms are defined as follows:

- **“Traditional Alternative”** – The traditional alternative is the alternative that would most likely be approached without consideration of impacts to habitat. For new alignments, this is typically the alignment that is most geometrically fitting given the beginning and end points. For reconstruction, this is typically the alignment option that widens the cross-section in-place without shifting alignments.

In no case should the traditional alternative be exaggerated beyond alignments that would be considered appropriate for the context in order to inflate the perceived reduction in impacts to habitats for this criterion.

- **“Mitigation”** – Per the Council on Environmental Quality (CEQ)’s *NEPA Act, Part 1508 Terminology and Definitions*¹, mitigation includes:
 - Avoiding the impact altogether by not taking a certain action or parts of an action.
 - Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
 - Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
 - Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
 - Compensating for the impact by replacing or providing substitute resources or environments.

Credit for enhancement can be obtained for this criterion through project-specific mitigation or through the use of mitigation banking.

Scoring Requirements

Requirement PD-07.1

1-3 points. Avoid or Minimize Impacts to Habitats or Enhance Features

Points shall be achieved per table PD-07.1.A on the next page. Points are **not** cumulative; rather the highest point value earned should be used.

TABLE PD-07.1.A. POINTS AND REQUIREMENTS FOR HABITAT RESTORATION

Requirement	Points	Method
PD-07.1a	1	Minimize Impacts to Habitat. Show that an effort has been made to modify the alignment and/or project cross-sections to significantly minimize impacts to habitat as compared to a traditional alternative and above and beyond what was required by regulations. To qualify, the area of impact must be reduced by 50% or more as compared to the traditional alternative.
PD-07.1b	2	Avoid or Eliminate Impacts to Habitat. Show that an effort has been made to modify the alignment and/or project cross-sections to significantly avoid impacts to habitat as compared to a traditional alternative and above and beyond what was required by regulations. To qualify, the area of impact must be reduced by 75% or more as compared to the traditional alternative. Alternatively, the project can eliminate the impacts to habitat as part of the project.
PD-07.1c	2	Relocate Species. For project required to mitigate habitat impacts through relocation, selectively relocate impacted species prior to construction where doing so has been documented in surveys, to prevent loss of species.
PD-07.1d	3	Rectify or Compensate Habitat Features. For projects required to mitigate habitat impacts through restorative practices, implement a restoration/preservation approach that restores and/or preserves an upland buffer area surrounding the required stream or wetland mitigation site. The amount of buffer must be an appropriate amount so it improves the habitat quality of the wetland or stream it is protecting.
PD-07.1e	3	Rectify or Compensate Habitat Features. For projects not required to mitigate habitat impacts, implement a habitat restoration effort that mitigates for the habitat of non-listed, Candidate species under the Federal Endangered Species Act (see the Federal Register's Recovery Crediting Guidance ²). For example, provide nesting locations for birds or other wildlife.

Requirement PD-07.2

1-2 points. Avoid or Minimize Impacts to High Quality Aquatic Resources (HQAR)

Points shall be achieved per the table PD-07.1.A. Points are **not** cumulative; rather the highest point value earned should be used.

TABLE PD-07.2.A. POINTS AND REQUIREMENTS FOR HABITAT RESTORATION

Requirement	Points	Method
PD-07.2a	1	Minimize Impacts to HQAR. Completely avoid HQAR as defined by the US Army Corp of Engineers <u>and</u> provide a buffer less than 100-feet.
PD-07.2b	2	Avoid Impacts to HQAR. Completely avoid HQAR as defined by the US Army Corp of Engineers <u>and</u> provide a buffer of at least 100-feet.

Requirement PD-07.3

1-2 points. Avoid or Minimize Impacts to High Quality Environmental Resources

Points shall be achieved per the table PD-07.1.A on the next page. Points are **not** cumulative; rather the highest point value earned should be used.

TABLE PD-07.3.A. POINTS AND REQUIREMENTS FOR HABITAT RESTORATION

Requirement	Points	Method
PD-07.3a	1	Minimize Impacts to High Quality Environmental Resources. Show that an effort has been made to modify the alignment and/or project cross-sections to significantly minimize the impacts to high quality environmental resources, such as sites with threatened or endangered species, as compared to a traditional alternative and above and beyond what was required by regulations. To qualify, the area of impact must be reduced by 50% or more as compared to the traditional alternative. Potential methods of avoidance include the use of retaining wall, berms, plantings, and reducing right of way footprint.
PD-07.3b	2	Avoid Impacts to High Quality Environmental Resources. Show that an effort has been made to modify the alignment and/or project cross-sections to significantly minimize the impacts to high quality environmental resources, such as sites with threatened or endangered species, as compared to a traditional alternative and above and beyond what was required by regulations. To qualify, the area of impact must be reduced by 75% or more as compared to the traditional alternative. Potential methods of avoidance include re-routing of the alignment, using retaining wall to minimize right of way takes, or bridging of the resource.

Resources

The following resources are referenced in this criterion and consolidated here:

1. CEQ, *NEPA Act, Part 1508 Terminology and Definitions*, <https://www.fws.gov/r9esnepa/CEQNEPARegs/1508.pdf>
2. Federal Register, *Recovery Crediting Guidance*, 73 Fed Reg. 44761, (2008), <http://www.gpo.gov/fdsys/pkg/FR-2008-07-31/pdf/E8-17579.pdf>

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one of the following documentation sources (or equal where not available):

1. Contract documents showing the baseline conditions of the site (including existing habitat quality) and improvements to be constructed and planted.
2. Technical reports or permitting documentation that describes the species which are intended to benefit from the site and the value of the habitat lift (above and beyond requirements) that is satisfying this criterion.
3. Technical report that describes minimization that occurred throughout the project development process.

PD-08: Stormwater Quality and Flow Control

1-6 points

Goal: Improve stormwater quality from the impacts of the project and control flow to minimize their erosive effects on receiving water bodies and related water resources, using management methods and practices that reduce the impacts associated with development and redevelopment.

Sustainability Linkage

Implementing more sustainable stormwater management practices supports the environmental principle by improving water quality, managing runoff, and using technology that mimics natural hydrology.



Background and Scoring Requirements

Background

See PD-30: Low Impact Development for scoring of BMPs used on the project.

Scoring Requirements

To calculate the total number of points achieved for this criterion, follow the directions in each of the scoring sections below for Water Quality, Flow Control, and Low-Impact Development (LID), and add the points achieved in each of the three areas up to a maximum of six points total.

Requirement PD-08.1

1-3 points. Water Quality Treatment

Treat target pollutants from at least 80 percent of the total annual runoff volume. To calculate the points earned for this scoring requirement, follow Steps 1 through 4 below:

- Step 1** Calculate the Amount of Runoff Treated (as a percentage of annual volume).
- Step 2** Determine which target pollutants the project's water quality treatment system is designed to treat (sediments or sediments, metals and other basin-specific pollutants).
- Step 3** Calculate the Target Impervious Surface Area Treated as a percentage of added impervious surface area). For retrofit projects, use Table PD-08.1.A on the next page to calculate the equivalent value to use for Target Impervious Surface Area.

See Next Page

TABLE PD-08.1.A. RETROFIT PROJECTS – CALCULATING EQUIVALENT TARGET IMPERVIOUS SURFACE AREA

Existing Impervious on Project (acres)	% of Existing Impervious Area Treated	Equivalent Target Impervious Surface Area Treated (% of Added)
0–1.0	0–50%	101%–125%
	50.1%–100%	>125%
1.1–5.0	0–40%	101%–125%
	40.1%–100%	>125%
5.1–10.0	0–30%	101%–125%
	30.1%–100%	>125%
>10.0	0–20%	101%–125%
	20.1%–100%	>125%

Step 4 Use the Amount of Runoff Treated from Step 1, the Target Pollutants from Step 2, and the Target Impervious Surface Area Treated from Step 3 in Table PD-08.1.B to calculate the points earned for water quality treatment.

TABLE PD-08.1.B. POINTS EARNED FOR WATER QUALITY TREATMENT

(Step 1)	(Step 2)	(Step 3)	Step (4)
Amount of Runoff Treated (% of Annual Volume)	Target Pollutant	Target Imp. Surface Area Treated (% of Added)	Points Earned
80–89%	Sediment	101%–125%	0
		>125%	1
	Sediment, and Metals or Other ¹	101%–125%	1
		>125%	2
90% +	Sediment	101%–125%	1
		>125%	2
	Sediment, and Metals or Other ¹	101%–125%	2
		>125%	3

¹ – Other basin-specific pollutant of concern is targeted

Requirement PD-08.2

1-3 points. Flow Control

Manage the flow from at least 80 percent of the total annual runoff volume. To calculate the points earned for this scoring requirement, follow Steps 5 through 8 below (the steps for this scoring requirement start at 5 to avoid confusion with scoring requirement PD-08.1).

Step 5 Calculate the Amount of Runoff Managed through flow control (as a percentage of total volume).

Step 6 Determine if the flow control standard used is based on peak rates or flow durations.

Step 7 Calculate the Target Impervious Surface Area Managed (as a percent of Added Impervious Surface Area). For retrofit projects, use Table PD-08.2.A to calculate the equivalent value to use for Target Impervious Surface Area.

TABLE PD-08.2.A. RETROFIT PROJECTS – CALCULATING EQUIVALENT TARGET IMPERVIOUS SURFACE AREA

Existing Impervious on Project (acres)	% of Existing Impervious Area Managed	Equivalent Target Impervious Surface Area Managed (% of Added)
0–1.0	0–50%	101%–125%
	50.1%–100%	>125%
1.1–5.0	0–40%	101%–125%
	40.1%–100%	>125%
5.1–10.0	0–30%	101%–125%
	30.1%–100%	>125%
>10.0	0–20%	101%–125%
	20.1%–100%	>125%

Step 8 Use the Amount of Runoff Managed from Step 5, the Flow Control Standard Used from Step 6, and the Target Impervious Surface Area Treated from Step 7 in Table PD-08.2.B to calculate the points earned for flow control management.

TABLE PD-08.2.B. POINTS EARNED FOR FLOW CONTROL MANAGED

(Step 5)	(Step 6)	(Step 7)	(Step 8)
Amount of Runoff Managed (% of Total Volume)	Flow Control Standard Used	Target Imp. Surface Area Managed (% of Added)	Points
80–89%	Peak Rate	101%–125%	0
		>125%	1
	Flow Durations	101%–125%	1
		>125%	2
90% +	Peak Rate	101%–125%	1
		>125%	2
	Flow Durations	101%–125%	2
		>125%	3

Resources

None referenced.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Project Drainage Report or other relevant calculations and studies.
2. Project Contract Documents.

PD-09: Ecological Connectivity

1-4 points

Goal: Avoid, minimize, or enhance wildlife, amphibian, and aquatic species passage access, and mobility, and reduce vehicle-wildlife collisions and related accidents.

Sustainability Linkage

Improving ecological connectivity supports all of the triple bottom line sustainability principles by improving habitat for species while reducing accidents, therefore preventing the impacts associated with personal and public property damage, injury, and the loss of life.



Background and Scoring Requirements

Background

For the purpose of this criterion, the key terms are defined as follows:

- **“Traditional Alternative”** – The traditional alternative is the alternative that would most likely be approached without consideration of impacts to habitat. For new alignments, this is typically the alignment that is most geometrically fitting given the beginning and end points. For reconstruction, this is typically the alignment option that widens the cross-section in-place without shifting alignments. In no case, should the traditional alternative be exaggerated beyond alignments that would be considered appropriate for the context in order to inflate the perceived reduction in impacts to habitats for this criterion.

Credit for enhancement can be obtained for this criterion through project-specific mitigation or through the use of mitigation banking.

Scoring Requirements

In order to achieve points for this criterion, the following prerequisite must be met.

Prerequisite PD-09.1P

0 points. Conduct Ecological Assessment

Conduct a site-specific ecological assessment of the roadway project using GIS data or regional expertise. Report the resulting impacts that the roadway has on the major ecosystems, according to the best scientific knowledge available. A project or resource agency biologist should be involved with the assessment. The ecological assessment should be consistent with the State-approved wildlife action plans, if available.

Requirement PD-09.1

1-3 points. Avoid or Minimize Impacts to Ecological Connectivity or Enhance Features

Points shall be achieved per Table PD-09.1.A on the following page. Points are **not** cumulative; rather the highest point value earned should be used. Note that more points are available for enhancing features on new alignments than existing alignments because more opportunities typically exist to improve ecological connectivity on new alignments.

TABLE PD-09.1.A. POINTS AND METHODS TO MINIMIZE IMPACTS TO AND ECOLOGICAL CONNECTIVITY

Requirement	Points	Method
PD-09.1a	1	Minimize Impacts. Show that an effort has been made to modify the alignment and/or project cross-sections to significantly minimize impacts to ecological connectivity as compared to a traditional alternative and above and beyond what was required by regulations. To qualify, the area of impact must be reduced by 50% or more as compared to the traditional alternative.
PD-09.1b	2	Avoid Impacts. Show that an effort has been made to modify the alignment and/or project cross-sections to significantly avoid impacts to ecological connectivity as compared to a traditional alternative and above and beyond what was required by regulations. To qualify, the area of impact must be reduced by 75% or more as compared to the traditional alternative.
PD-09.1c	2	Enhance features. For existing alignments only. Replace in-kind, retrofit, or upgrade any and all existing culverts and wildlife fencing structures or planting deemed structurally deficient, damaged, obsolete, insufficiently sized, or otherwise inadequate. Actions must be approved by the project ecologist, resource/regulatory biologist, or other appropriate staff.
PD-09.1d	3	Enhance features. For new alignments only. Install new dedicated or multi-use wildlife crossing structures and protective fencing (if needed) or planting as recommended by the wildlife assessment. Actions must be approved by the project ecologist, resource/regulatory biologist, or other appropriate staff.
PD-09.1e	3	Restore features. Re-establish past habitats, infrastructure, or add connectivity to re-establish corridors and habitats. Actions must be approved by the project ecologist, resource/regulatory biologist, or other appropriate staff. Some examples of restorative features include: <ul style="list-style-type: none"> • Construction of fish ladders. • Acquisition of parcels within the watershed or parcels identified by resource agencies that provide special protection and enhancement of these habitats.

Dedicated wildlife crossings are structural features of the roadway that are not used by motorized vehicles. Where deemed appropriate by an ecologist, crossings may be shared by non-motorized modes of transport. No points will be awarded in the following conditions:

1. For projects that maintain or rehabilitate existing ecological connections to out-of-date or current standards (i.e., routine maintenance of drainage culverts does not qualify).
2. Pre-existing ecological connectivity features: all new features or upgrades must be due to and completed as part of the roadway project.
3. Projects that add wildlife connectivity features where such features are clearly outside of the project context.
4. Projects located in a network that is systematically inadequate. However, points could be awarded for such projects where it is demonstrated that a program is in place at the owner agency for systematic improvements on that network, and that this project fits this program.

Requirement PD-09.2

1 point. Advanced Consultation and Integration with Broader Ecological Plans

The project team went above and beyond current consultant requirements by engaging natural resource and regulatory agencies throughout the planning process and by ensuring consistency with broader (metropolitan or statewide) planning goals and objectives.

Resources

None referenced.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one of the following documentation sources (or equal where not available):

1. Ecological study performed for the project provided in NEPA documentation. State permitting documentation that includes an ecological connectivity element.
2. Contract documents showing wildlife crossing improvements.
3. Technical report that describes minimization that occurred throughout the project development process.

PD-10: Pedestrian Facilities

1-3 points

Goal: Provide safe, comfortable, convenient, and connected pedestrian facilities for people of all ages and abilities within the project footprint.

Sustainability Linkage

Planning and designing for increased pedestrian activity supports all of the triple bottom line sustainability principles by improving the safety for all users, enhancing livability and quality of life in communities, improving access to economic and educational opportunities and essential services, supporting local businesses and economic development, promoting physical activity and public health, and reducing vehicle emissions.



Background and Scoring Requirements

Background

To receive credit for this criterion, the project must enhance existing pedestrian facilities or provide new pedestrian facilities that are context-sensitive and appropriate. Reconstruction of pedestrian facilities in kind when widening roadways and/or bridges does not meet the requirements of this criterion, although this is still encouraged.

Applicable Pedestrian Guidelines

Per the FHWA Memorandum: [Bicycle and Pedestrian Facility Design Flexibility](#)¹ and the [Questions & Answers about Design Flexibility for Pedestrian and Bicycle Facilities](#)², FHWA recommends a flexible approach to pedestrian facility design. FHWA's [Small Town and Rural Multimodal Networks](#)³ and [Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts](#)⁴ address designing multimodal networks. The AASHTO [Guide for the Planning, Design, and Operation of Pedestrian Facilities](#)⁵ is the primary national resource for planning, designing, and operating pedestrian facilities. The National Association of City Transportation Officials' (NACTO) [Urban Street Design Guide](#)⁶, and the Institute of Transportation Engineers (ITE) [Designing Urban Walkable Thoroughfares: A Context Sensitive Approach](#)⁷ guide builds upon the flexibilities provided in the AASHTO guide and can be used when designing safe and convenient pedestrian facilities. The NACTO guide does not supersede compliance with 2010 Americans with Disabilities Act (ADA) [Standards for Accessible Design](#)⁸, the [Public Rights-Of-Way Accessibility Guidelines](#)⁹ (PROWAG), and [The Manual on Uniform Traffic Control Devices for Streets and Highways](#)¹⁰ (MUTCD).

Qualifying Features

For pedestrian facilities to meet scoring requirements, improvements must be context sensitive and appropriate, go beyond minimum requirements, meet the needs of users of all ages and abilities, and include features that are safe, comfortable, convenient, and connected, such as those listed below.

- Examples of **Safe and Comfortable** features include:
 - Increased sidewalk width – an increased width allows for pedestrian amenities without impeding on the walkway width and increases pedestrian comfort.

- Improved intersection and midblock crossing design for pedestrians – such as countdown signal heads, leading pedestrian intervals, narrower lanes, pedestrian medians, pedestrian hybrid beacons, raised crosswalks, and curb extensions.
- Trees – provide a physical buffer between pedestrians and moving vehicles, while also providing shade and potentially reducing traffic speeds.
- Sufficient lighting on all sidewalks and crosswalks within the project footprint.
- Landscaping, art, furniture, and social amenities (such as parklets, sidewalk cafes, and other gathering spaces) as appropriate to promote the use of the facilities and create a comfortable, pleasing facility.
- Examples of **Convenient and Connected** features include:
 - New facilities that connect to existing facilities in the vicinity as part of the project.
 - Infrastructure that connects homes to places of employment, schools, shopping, services, transit, and recreation areas.

Scoring Requirements

Prerequisite PD-10.1P

0 points. Meet ADA Requirements

Facilities must meet ADA requirements to receive credit. No credit is given for improvements and it is assumed that retrofits to existing facilities will bring them up to required ADA standards because it is required by law.

Requirement PD-10.1

1 point. Install Missing Pedestrian Connections

Review pedestrian master plans and other relevant local, regional, and state documents to determine if the project presents an opportunity to incorporate missing pedestrian connections AND fill gaps in the pedestrian network as part of the project.

Requirement PD-10.2

1-2 points. Install Safe, Comfortable, Convenient, and Connected Pedestrian Features

One of the following requirements may apply:

- **Requirement PD-10.2a**

1 point. Enhance Existing Pedestrian Facilities

Implement new or improve existing pedestrian facilities to include both safe and comfortable features and convenient and connected features. Current facilities do not qualify for this criterion without additional effort, such as upgrades, improvements, or construction of new features. The attempt to enhance pedestrian transportation should be deliberate and a direct result of the project. No points are earned for improvements and retrofits to bring existing facilities into ADA compliance. Examples of enhancements include curb extensions, pedestrian crossing islands, adding a landscaped buffer to an existing sidewalk, and making intersections safer and more comfortable to navigate on foot.

OR

- **Requirement PD-10.2b**

2 points. Develop New Pedestrian Facilities

Design and construct new pedestrian facilities that include both safe and comfortable features and convenient and connected features. New facilities include physical or constructed changes to the roadway structure, dimensions, or

form that provide pedestrian access within the right-of-way (ROW) or roadway corridor. Examples include adding a pedestrian hybrid beacon to improve crossings, implementing a road diet that narrows crossing distances, or adding traffic calming elements to improve pedestrian safety.

Reconstruction of facilities with the same features does not meet this requirement (e.g. widening road and replacing sidewalk, or constructing a new bridge with the same sidewalk as a prior bridge, etc.)

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. FHWA, *Bicycle and Pedestrian Facility Design Flexibility* (2013), https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_flexibility.cfm
2. FHWA, *Questions & Answers about Design Flexibility for Pedestrian and Bicycle Facilities* (2014), https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_flexibility_qa.cfm
3. FHWA, *Small Town and Rural Multimodal Networks*, December 2016, https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf
4. FHWA, *Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts*, August 2016, https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_networks/fhwahep16055.pdf
5. AASHTO, *Guide for the Planning, Design, and Operation of Pedestrian Facilities, First Edition* (2004), https://bookstore.transportation.org/item_details.aspx?id=119
6. NACTO, *Urban Street Design Guide* (2013), <https://nacto.org/publication/urban-street-design-guide/streets/>
7. ITE, *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach* (2010), <http://library.ite.org/pub/e1cff43c-2354-d714-51d9-d82b39d4dbad>
8. United States Department of Justice, *Americans with Disabilities Act (ADA) Standards for Accessible Design* (2010), https://www.ada.gov/regs2010/2010ADAStandards/2010ADAStandards_prt.pdf
9. United States Access Board, *Public Rights-of-Way Accessibility Guidelines (PROWAG)* (2011), <https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/proposed-rights-of-way-guidelines>
10. FHWA, *Manual on Uniform Traffic Control Devices for Streets and Highways* (2009 with Revisions 1 and 2, May 2012), <https://mutcd.fhwa.dot.gov/>

Additional Resources

The following resources provide information on this criterion topic in addition to the sources directly referenced:

11. FHWA, *Bicycle & Pedestrian Design Guidance website* (2015), http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/
12. United States Access Board, *Shared Use Paths Guidelines and Standards* (2011) at <http://www.access-board.gov/guidelines-and-standards/streets-sidewalks>
13. FHWA, PEDSAFE website, <http://www.pedbikesafe.org/PEDSAFE/index.cfm>

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Purpose and need or other planning documents addressing pedestrian access on the roadway project, including how it fits with existing land uses and/or existing General and Transportation Plans.
2. Results of public input on proposed pedestrian facilities, if any.
3. Contract documents showing enhanced pedestrian facilities incorporated.

PD-11: Bicycle Facilities

1-3 points

Goal: Provide safe, comfortable, convenient, and connected bicycling facilities within the project footprint.

Sustainability Linkage

Planning and designing for increased bicycling supports all of the triple bottom line sustainability principles by improving the safety for all users, enhancing livability and quality of life in communities, improving access to economic and educational opportunities and essential services, supporting local businesses and economic development, promoting physical activity and public health, and reducing vehicle emissions.



Background and Scoring Requirements

Background

To receive credit for this criterion, the project must enhance existing bicycle facilities or provide new high quality bicycle facilities that meet the needs of people of all ages and abilities, and are context-sensitive and appropriate (not just adding facilities where they are not warranted). Reconstruction of bicycle facilities in kind when widening roadways and/or bridges does not meet the requirements of this criterion, although this is still encouraged.

Applicable Bicycle Guidelines

Per the FHWA Memorandum: [Bicycle and Pedestrian Facility Design Flexibility](#)¹ and the [Questions & Answers about Design Flexibility for Pedestrian and Bicycle Facilities](#)², FHWA recommends a flexible approach to bicycle facility design. The AASHTO [Guide for the Development of Bicycle Facilities](#)³ is the primary national resources for planning, designing, and operating bicycle facilities. The National Association of City Transportation Officials' (NACTO) [Urban Bikeway Design Guide](#)⁴, NACTO [Urban Street Design Guide](#)⁵, and the Institute of Transportation Engineers (ITE) [Designing Urban Walkable Thoroughfares: A Context Sensitive Approach](#)⁶ guide builds upon the flexibilities provided in the AASHTO guide and can be used when designing safe and convenient bicycle facilities. The NACTO guides do not supersede compliance with 2010 Americans with Disabilities Act (ADA) [Standards for Accessible Design](#)⁷, the [Public Rights-Of-Way Accessibility Guidelines](#)⁸ (PROWAG), and [The Manual on Uniform Traffic Control Devices for Streets and Highways](#)⁹ (MUTCD). Additional FHWA resources include FHWA's [Small Town and Rural Multimodal Networks](#)¹⁰, [Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts](#)¹¹, and the [Separated Bike Lane Planning and Design Guide](#)¹².

Qualifying Features

For bicycle facilities to meet scoring requirements, improvements must be context sensitive and appropriate, go beyond minimum requirements, meet the needs of users of all ages and abilities, and include features that are safe, comfortable, convenient, and connected, such as those listed below.

- Examples of **Safe and Comfortable** features include:
 - Bicycle-friendly stormwater drains (grates)

- Resurfaced bike lanes
- Traffic calming features
- Buffered Bike Lanes/ Contra-Flow Bike Lanes/ Left-Side Bike Lanes
- Separated Bike Lanes (also known as Cycle Tracks and Protected Bike Lanes)
- Intersection treatments such as Bike Boxes, Median Refuge Islands, and Through Bike Lanes
- Separation between high-speed/high-volume traffic and bicyclists, such as
 - Buffered and/or separated bike lanes
 - Parallel bike routes (bike boulevards or bikeways)
 - Shared-Use paths
 - Dedicated bicycle bridges and tunnels
- Bicycle signals, signing, and pavement marking, such as
 - Flashing beacons
 - Signal detection and actuation
 - Colored pavement
 - Bike route wayfinding
- Landscaping specifically intended to enhance bicycle facilities
- Lighting
- Examples of **Convenient and Connected** features include:
 - Parking and bikeshare docks (except bicycle amenities at park-and-ride lots, bicycle parking is included in PD-12: Transit and HOV Facilities)
 - End-of-trip facilities as appropriate to promote the use of the bicycle facilities
 - Facilities that connect homes to places of employment, schools, shopping, and essential services such as health care, transit, and recreation areas
 - New facilities that connect to existing bike facilities as part of the project (for example by linking to a regional trail system)

Scoring Requirements

Requirement PD-11.1

1 point. Fill Gaps in Bicycle Network

Review bicycle master plans and other relevant local, regional, and state documents to determine if the project presents an opportunity to incorporate missing bicycle connections AND fill gaps in the bicycle network as part of the project. High traffic volumes and speeds should not be used as justification for not accommodating bicyclists because destinations may be located along these routes and many of these roadways are the only linkages that connect different parts of communities.

Requirement PD-11.2

1-2 points. Install Safe, Comfortable, Convenient, and Connected Bicycle Features

One of the following requirements may apply:

- **Requirement 11.2a**

1 point. Enhance Existing Bicycle Facilities

Implement new features or enhance existing bicycle facilities to include both safe and comfortable features and convenient and connected features. Current facilities do not qualify for this criterion without additional upgrades, improvements, or construction of new bicycle-focused features. The attempt to enhance bicycle

transportation should be deliberate and a direct result of the project. One way that an existing bicycle facility can be enhanced is to design and implement improvements at intersections, driveways, and other potential conflict points. Providing greater separation between bicyclists and high speed traffic also enhances an existing facility.

OR

- **Requirement PD-11.2b**

2 points. Develop New Bicycle Facilities

Design and construct new bicycle facilities that include both safe and comfortable features and convenient and connected features. New facilities include physical or constructed changes to the roadway structure, dimensions, or form that provide bicycle access within the right-of-way (ROW) or roadway corridor. To earn points, the bicycle facilities must be Class I (separated) or Class II (bike lanes). Lanes shared with motorized vehicles and shoulders do not meet this requirement. Reconstruction of facilities with the same features does not meet this requirement (e.g. widening road and replacing bike lane, or constructing a new bridge with the same bicycle facilities as a prior bridge, etc.) Transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient bicycling facilities.

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. FHWA, *Bicycle and Pedestrian Facility Design Flexibility* (2013), https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_flexibility.cfm
2. FHWA, *Questions & Answers about Design Flexibility for Pedestrian and Bicycle Facilities* (2014), https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_flexibility_qa.cfm
3. AASHTO, *Guide for the Development of Bicycle Facilities*, 4th Edition (2012), https://bookstore.transportation.org/item_details.aspx?ID=1943
4. NACTO, *Urban Bikeway Design Guide, Second Edition* (2014), <https://nacto.org/publication/urban-bikeway-design-guide/>
5. NACTO, *Urban Street Design Guide* (2013), <https://nacto.org/publication/urban-street-design-guide/>
6. ITE, *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach* (2010), <http://library.ite.org/pub/e1cff43c-2354-d714-51d9-d82b39d4dbad>
7. United States Department of Justice, *Americans with Disabilities Act (ADA) Standards for Accessible Design* (2010), https://www.ada.gov/regs2010/2010ADASTandards/2010ADASTandards_prt.pdf
8. United States Access Board, *Public Rights-of-Way Accessibility Guidelines (PROWAG)* (2011), <https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/proposed-rights-of-way-guidelines>
9. FHWA, *Manual on Uniform Traffic Control Devices for Streets and Highways* (2009 with Revisions 1 and 2, May 2012), <https://mutcd.fhwa.dot.gov/>
10. FHWA, *Small Town and Rural Multimodal Networks* (2016), https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf
11. FHWA, *Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts* (2016), https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_networks/fhwahep16055.pdf

12. FHWA, Separated Bike Lane Planning and Design Guide (2015),
https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/separated_bikelane_pdg/separatedbikelane_pdg.pdf

Additional Resources

The following resources provide information on this criterion topic in addition to the sources directly referenced:

13. FHWA, Separated Bike Lane Planning and Design Guide (2015),
http://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/separated_bikelane_pdg/page00.cfm
14. FHWA, Bicycle & Pedestrian Design Guidance website (2015),
https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/index.cfm
15. United States Access Board, *Shared Use Paths* Guidelines and Standards (2011),
<https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/shared-use-paths>
16. FHWA, BIKESAFE Bicycle Safety and Countermeasure Selection System,
<http://www.pedbikesafe.org/bikesafe/>

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Purpose and Need addressing bicycle access within the roadway project, including how it fits with existing land uses and/or existing General and Transportation Plans, project analysis, or a Bicycle Master planning process.
2. Results of public input on proposed bicycle facilities, if any.
3. Copy of the contract specification and plans for proposed bicycle facilities.
4. Total cost associated with new or improved bicycle facilities.

PD-12: Transit and HOV Access

Goal: Promote the use of public transit and carpools in communities by dedicating existing facilities to those uses, upgrading existing lanes, or providing new transit and high occupancy vehicle (HOV) facilities.



Sustainability Linkage

Promoting transit and HOV use supports all of the triple bottom line sustainability principles by expanding modal choices while reducing traffic congestion, commuting costs, and emissions.

Background and Scoring Requirements

Scoring Requirements

Transit and HOV facilities installed for this requirement shall be consistent with the need, purpose, and appropriateness for transit and HOV access within the project footprint. To receive credit for this criterion, the project must include contextually appropriate transit and/or HOV facilities that go beyond minimum design standards and requirements, and strive to create safe, versatile, attractive, and convenient transit and HOV networks that are integrated with pedestrian and bicycling networks.

Requirement PD-12.1

1–5 points. Install Transit Features

Achieve the requirements within the project footprint listed in Table PD-12.1,A, which is roughly based on the Federal Transit Authority (FTA) criteria from [Characteristics of Bus Rapid Transit for Decision-Making¹](#) (CBRT), FTA's [TCRP 90, Bus Rapid Transit²](#), and AASHTO's [Guide for High-Occupancy Vehicle \(HOV\) Facilities³](#).

Points are **not** cumulative; rather the highest point value achieved should be used.

TABLE PD-12.1.A. AVAILABLE POINTS FOR TRANSIT AND HOV ACCESS FEATURES (CONTINUED ON NEXT PAGE)

Requirement	No. Points	Requirement Description
PD-12.1a	1	<p>Any of one the following:</p> <ul style="list-style-type: none">• Enhance at least 50 percent of transit station or stop amenities (lighting, trash/recycling bins, benches, bike parking, pay phones, heating and/or cooling, etc.)• Improve at least 50 percent of the transit and HOV facility signage (related to transit and HOV) and vehicular access (beyond basic ADA requirements)• Provide transit shelters at more than 50 percent of the corridor stations/stops

Requirement	No. Points	Requirement Description
		<ul style="list-style-type: none"> Provide seamless pedestrian and bicycle access to stations within at least a half-mile and three-mile catchment area (see FR notice at https://www.federalregister.gov/articles/2011/08/19/2011-21273/final-policy-statement-on-the-eligibility-of-pedestrian-and-bicycle-improvements-under-federal) or other. Provide new park & ride lots in strategic locations.
PD-12.1b	2	Any one of the following: <ul style="list-style-type: none"> Implement two or more of the improvements from the 1 point list above. Implement physical or constructed changes to the roadway structure, dimensions, or form that provide for future HOV access or minor dedicated transit access within the right-of-way (ROW), such as a carpool lane for HOV vehicle, queue jump lanes for transit vehicles, on-street bus lane, bus rapid transit, or an expressway bus lane.
PD-12.1c	3	Implement physical or constructed changes to the roadway structure, dimensions, or form that provide HOV access or minor dedicated transit access within the ROW, such as a carpool lane for HOV vehicles, queue jump lanes for transit vehicles, or shoulder-running buses .
PD-12.1d	4	Implement physical or constructed changes to the roadway structure, dimensions, or form that provide dedicated transit access within the ROW, such as an on-street bus lane, bus rapid transit, or an expressway bus lane .
PD-12.1e	5	Implement physical or constructed changes to the roadway structure, dimensions, or form that provide exclusive mass transit access within the ROW, such as at-grade or grade-separated transit-ways or transit served park-and-ride lots .

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. FTA, from Characteristics of Bus Rapid Transit for Decision-Making (CBRT), <https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/CBRT.pdf>
2. Diaz and Hinebaugh, TCRP 90, Bus Rapid Transit, 2009, http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_90v1fm.pdf
3. AASHTO, Guide for High-Occupancy Vehicle (HOV) Facilities, 3rd Edition, 2004, https://bookstore.transportation.org/item_details.aspx?ID=114

Additional Resources

The following resources provide information on this criterion topic in addition to the sources directly referenced:

4. NACTO, Transit Street Design Guide (2016), <https://nacto.org/publication/transit-street-design-guide/>

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Purpose and need for transit and HOV access on the roadway project, including how it fits with existing land uses and/or existing General and Transportation Plans.
2. Total cost associated with new or improved transit and HOV facilities.
Contract specifications and budget items addressing transit and HOV.

PD-13: Freight Mobility

1-7 points

SCORECARDS: ☐ Paving ☐ Rural Basic ☒ Rural Extended ☐ Urban Basic ☒ Urban Extended

Goal: Enhance mobility of freight movements, decrease fuel consumption and emissions impacts, and reduce freight-related noise.

Sustainability Linkage

Enhancing freight mobility supports the environmental and economic sustainability principles by providing features that make freight transportation more efficient, thereby reducing fuel consumption, decreasing emissions, and reducing noise pollution.



Background and Scoring Requirements

Scoring Requirements

Facilities installed for this requirement shall be consistent with the need, purpose, and appropriateness for freight mobility within the project footprint.

Requirement PD-13.1

1 – 7 points Implement Freight Access Features

Implement one or more of the features in Table PD-13.1.A. Points for features are cumulative if roadways have more than one feature; however, this criterion shall not exceed a total of seven points.

**TABLE PD-13.1.A. POINTS AND REQUIREMENTS FOR FREIGHT ACCESS PROJECT FEATURES
(CONTINUED ON THE FOLLOWING PAGE)**

Requirement	Points	Feature	Requirement Descriptions
PD-13.1a	1	No-idling policy and signage (no-idling policy within certain parameters, such as outside air temperature)	<ul style="list-style-type: none">Implementation and appropriate number consistent with project setting
PD-13.1b	1	Construct new rest area or rest stop, or expand existing rest area or rest stop	<ul style="list-style-type: none">Provides a significant number of new truck parking spots at or within a reasonable distance to a rest areaRegion near proposed rest area experiences extensive interstate shoulder, interchange shoulder, and/or off-road, non-assigned parking by tractor-trailers

Requirement	Points	Feature	Requirement Descriptions
PD-13.1c	2	Safety improvements specifically for freight (e.g., additional safety signage, speed warnings systems for hills, other intelligent transportation system solutions)	<ul style="list-style-type: none"> • Implementation and appropriate number consistent with project setting • Meet requirements in the AASHTO Policy on Geometric Design of Streets and Highways such that there are no height, weight, or turning radius restrictions for freight vehicles
PD-13.1d	2	Physical or otherwise constructed grade, alignment, or other design adjustments for truck safety, mobility, and the reduction of freight-related noise	<ul style="list-style-type: none"> • Implementation and appropriate number consistent with project setting • Include railroad overpass clearance improvements for rail links targeted for freight mobility (i.e., do not preclude rail double stack clearance) • Pullout areas for snow chain-up
PD-13.1e	3	Construct new dedicated truck delivery parking areas or repurpose an existing parking area for truck delivery-only.	<ul style="list-style-type: none"> • Speeds 35 miles per hour or less (local traffic) • Accommodate 40-foot delivery trucks • Accessible within the project site (i.e., located in a parking lane on a local street) • Financed with project budget • Appropriate signage (type and number) within project area
PD-13.1f	3	Automated Weigh-In-Motion stations	<ul style="list-style-type: none"> • Accessible within the project site (i.e., located along the right-of-way), or in close proximity to the roadway
PD-13.1g	4	Virtual Weigh-In-Motion stations	<ul style="list-style-type: none"> • Accessible within the project site (i.e., located along the right-of-way) • Within close proximity to the roadway project right-of-way
PD-13.1h	4	Construct a new electrified rest stop or electrify an existing rest stop	<ul style="list-style-type: none"> • Minimum five electric hookups per stop. • Accessible within the project site (i.e., located at a highway exit) • Within close proximity to the roadway project right-of-way.
PD-13.1i	5	Construct a new or convert an existing mixed-traffic lane to a truck-only lane	<ul style="list-style-type: none"> • Minimum density of 10% truck traffic (Hansen et al., 2008) • Minimum volume of 1300 trucks per hour per lane (Hansen et al., 2008)

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Purpose and need for freight access on the roadway project.
2. Results of public input on proposed freight upgrades or installations, if any.
3. Contract documents showing freight facilities.

PD-14: ITS for System Operations

1-5 points

Goal: Improve the efficiency of transportation systems through deployment of technology and without adding infrastructure capacity in order to reduce emissions and energy use, and improve economic and social needs.

Sustainability Linkage

Intelligent Transportation System (ITS) applications support all of the triple bottom line principles by improving mobility, reducing congestion, and improving safety while avoiding environmentally- and economically-costly physical capacity increases.



Background and Scoring Requirements

Background

Include Intelligent Transportation System (ITS) applications listed in the ITS Joint Program Office (JPO), Office of the Assistant Secretary for Research and Technology (OST-R) [ITS Applications Overview website](#)¹ or equivalent source (also see FHWA's [Office of Operations website](#)²). Table PD-14.1.A lists the standard ITS applications and FHWA and ITS JPO website categories allowable for this criterion. All applications installed should be compliant with owner and/or state ITS architecture(s) (inter-operability). Visit the aforementioned website for more information on each of these applications.

The following list from the OST-R [Connected Vehicle Applications website](#)³ describes vehicle technologies that are being developed and researched to address real-world problems:

- **“Vehicle-to-Vehicle (V2V) Communications for Safety:** This research investigates key questions such as are vehicle based safety applications using V2V communications effective and do they have benefits. Research is designed to determine whether regulatory action by the National Highway Transportation Safety Administration is warranted to speed the adoption of these safety capabilities.
- **Vehicle-to-Infrastructure (V2I) Communications for Safety:** This research investigates similar questions about V2I communications, with an initial focus on applications based on the relay of traffic signal phase and timing information to vehicles. The purpose is to accelerate the next generation of safety applications through widespread adoption of V2I communications.
- **Agency Data:** This research assesses what traffic, transit and freight data are available today from various sources, and consider how to integrate data from vehicles acting as "probes" in the system. The goal is to accelerate the adoption of transportation management systems that can be operated in the safest, most efficient and most environmentally friendly way possible.
- **Mobility:** This research examines what technologies can help people and goods effortlessly transfer from one mode of travel (car, bus, truck, train, etc.) or route to another for the fastest and most environmentally friendly trip. The research seeks to make cross-modal travel truly possible for people and goods, and enable agencies and companies to manage their systems in light of the fact that people and goods will be changing modes often.

- **Road Weather Management:** This research considers how vehicle-based data on current weather conditions can be used by travelers and transportation agencies to enable decision-making that takes current weather conditions and future weather forecasts into account.
- **Environment:** This research explores how to enable transportation managers to manage the transportation network in a manner that better accounts for environmental impact.

Scoring Requirements

Requirement PD-14.1

1-5 points. Install ITS Features

Install one or more allowable applications for the categories in Table PD-14.1.A as defined per the FHWA ITS Applications Overview website referenced above, or equivalent. Points are awarded based on how many categories are installed; multiple applications in one category do not achieve additional points. Points for installing applications from multiple categories are cumulative; however, this criterion shall not exceed a total of five points.

TABLE PD-14.1.A. ALLOWABLE ITS APPLICATIONS FOR INTELLIGENT TRANSPORTATION SYSTEMS (CONTINUED ON NEXT PAGES)

Requirement	Points	Category	Allowable Applications (Install 1 or More per Category)
PD-14.1a	1	Electronic Payment & Pricing	Electronic Toll Collection Congestion Pricing Value Pricing
PD-14.1b	1	Emergency Management / Response & Recovery	Hazardous Materials Management Early Warning System Evacuation & Re-Entry Management Emergency Traveler Information Temporary Incident Management
PD-14.1c	1	Enforcement	Speed Enforcement Traffic Signal Enforcement Managed Lane Enforcement Ramp Meter Enforcement
PD-14.1d	1	Information Dissemination	Dynamic Message Signs (DMS) Highway Advisory Radio (HAR) In-Vehicle Systems (IVS) In-Terminal/Wayside Dynamic Parking Internet/Wireless 511
PD-14.1e	1	Information Management	Data Archiving
PD-14.1f	1	Lane Management	HOV Facilities Reversible Flow Lanes Congestion Pricing Lane Control Variable Speed Limits Emergency Evacuation Transit Signal Priority

Requirement	Points	Category	Allowable Applications (Install 1 or More per Category)
PD-14.1g	1	Ramp Control	Ramp Metering Ramp Closures Priority Access
PD-14.h	1	Road Weather Management	Pavement Conditions Atmospheric Conditions Water Level Fixed Winter Maintenance Mobile Winter Maintenance Bridge Anti-Icing Systems
PD-14.i	1	Surveillance	Traffic Surveillance Infrastructure Surveillance
PD-14.1j	1	Traffic Control	Adaptive Signal Control Advanced Signal Systems Special Events Vehicle Restrictions
PD-14.1k	1	Traffic Incident Management	Response Routing Service Patrols
PD-14.1l	1	Traveler Information	Internet/Wireless 511
PD-14.1m	1	Crash Prevention and Safety	Highway-Rail Crossing Warning Systems Active Collision Warning Active Animal Warning
PD-14.1n	1	Work Zone Management	Temporary Traffic Management Lane Control Variable Speed Limits Speed Enforcement Intrusion Detection Road Closure Management Queue Warning Systems
PD-14.1o	1	Emerging Technologies	Ongoing Research Applications

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. Office of the Assistant Secretary for Research and Technology (OST-R), ITS Applications Overview website, <https://www.standards.its.dot.gov/LearnAboutStandards/ApplicationAreas>
2. FHWA, Operations website at <http://ops.fhwa.dot.gov>
3. Office of the Assistant Secretary for Research and Technology (OST-R), Connected Vehicle Applications website, https://www.its.dot.gov/cv_basics/index.htm

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. A list of the ITS applications and their corresponding categories.
2. Contract documents showing ITS applications to be installed on the project.
3. Photo(s) or other documentation of installed applications.

PD-15: Historic, Archaeological and Cultural Preservation

1-3 points

Goal: Preserve, protect, or enhance cultural and historic assets, and/or feature National Scenic Byways Program (NSBP) historic, archaeological, or cultural intrinsic qualities in a roadway

Sustainability Linkage

Preserving historic, archaeological, and cultural resources supports the social principle by emphasizing significant features that are valued by the community and by providing educational facilities or visual and/or physical access where applicable.



Background and Scoring Requirements

Scoring Requirements

In order to achieve points for this criterion, one of the following prerequisites must apply as noted in Scoring Requirement PD-15.1:

Prerequisite PD-15.1P

0 points. Listed in US National Register of Historic Places

Any part of the project or resource within the project boundaries is listed in the United States National Register of Historic Places (NRHP)¹ or has been determined eligible for the National Register by a State, Local, or Tribal Historic Preservation Officer.

OR

Prerequisite PD-15.2P

0 points. Along America's Byways® or Equivalent

Any portion of the project is along one of America's Byways® (National Scenic Byway or All-American Road)², a State Scenic Byway, an Indian Tribe Scenic Byway, or other route that was designated or officially recognized as such because of its significant *historic, cultural, and/or archaeological* features.

OR

Prerequisite PD-15.3P

0 points. Historic and/or Cultural Significance to Community

Any part of the project or resource within the project boundaries is recognized by the community as having *historic, cultural, and/or archaeological* significance to the community.

See Next Page

Requirement PD-15.1

1-3 points. Avoid or Minimize Impacts to Historic, Archeological or Cultural Qualities or Enhance Features

Points shall be achieved per table PD-15.1.A. Points are **not** cumulative; rather the highest point value earned should be used.

TABLE PD-15.1.A. POINTS AND REQUIREMENTS FOR HISTORIC, ARCHAEOLOGICAL, AND CULTURAL PRESERVATION

Requirement	Points	Method
PD-15.1a	1	Minimize Impacts. Show that an effort has been made to minimize “adverse effects” to the features from Prerequisite PD-15.1P or PD-15.2P , as described in Section 106 of the National Historic Preservation Act (NHPA).
PD-15.1b	2	Avoid Impacts. Show that measures have been taken to specifically avoid impacts to the features from Prerequisite PD-15.1P or PD-15.2P . Or show that impacts to the features were minimized and that the remaining impacts were deemed not adverse.
PD-15.1c	3	Enhance features. Protect, preserve, and/or enhance historic, archaeological, or cultural resources identified in Prerequisite PD-15.1P or PD-15.2P . This could be done through the installation of informational or interpretive facilities (e.g., viewpoint, kiosk, sign, or other installation for visitors detailing historic, archaeological, or cultural significance), where appropriate, to explain the resources or direct roadway users to the site, or through other activities.
PD-15.1d	1	Avoid Impacts. Show that measures have been taken to specifically avoid impacts to the features from Prerequisite PD-15.3P .

Resources

The following resources are referenced in this criterion and consolidated here:

1. NCHRP, United States National Register of Historic Places, <http://www.nps.gov/nr/>
2. FHWA, America’s Byways®, www.byways.org

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Documentation of the eligibility of the resource or location for the United States NRHP.
2. Documentation from associated organization(s), indicating what recognition of a tribal or other appropriate interests were or will be represented.
3. Description of project features and policies that minimize adverse effects according to Section 106 of NHPA.
4. Description of activities to avoid or improvements to enhance features.

PD-16: Scenic, Natural, or Recreational Qualities

1-3 points

SCORECARDS:

☐ Paving

☒ Rural Basic

☒ Rural Extended

☐ Urban Basic

☒ Urban Extended

Goal: Preserve, protect, and/or enhance routes designated with significant scenic, natural, and/or recreational qualities in order to enhance the public enjoyment of facilities.

Sustainability Linkage

Preserving scenic, natural, or recreational qualities supports the social principle by providing the public with an opportunity for increasing their appreciation and respect of the natural environment through facilities such as visitor centers, recreational features, and/or scenic viewpoints, and through promoting community use of facilities.



Background and Scoring Requirements

Scoring Requirements

In order to achieve points for this criterion, both of the following prerequisites must apply:

Prerequisite PD-16.1P

0 points. Location along America's Byway® or Equivalent

Any portion of the project is along one of America's Byways® (National Scenic Byway or All-American Road – www.byways.org), a State Scenic Byway, an Indian Tribe Scenic Byway, or other route that was designated or officially recognized as such because of its significant scenic, natural, and/or recreational qualities. This includes bridges spanning scenic and recreational waterways.

AND

Prerequisite PD-16.2P

0 points. Maintain Access

Existing access to scenic, natural, or recreational qualities has not been removed as a part of this project unless it is specifically removed to protect the scenic, natural, and/or recreational qualities themselves.

Requirement PD-16.1

1-3 points. Avoid or Minimize Impacts to Scenic, Natural, or Recreational Qualities or Enhance Features

Points shall be achieved per Table PD-16.1.A on the next page. Points are **not** cumulative; rather the highest point value earned should be used.

TABLE PD-16.1.A. POINTS AND REQUIREMENTS FOR SCENIC, NATURAL, OR RECREATIONAL QUALITIES

Requirement	Points	Method
PD-16.1a	1	Minimize Impacts. Show that an effort has been made to minimize “adverse effects” to the features from Prerequisite PD-16.1P.
PD-16.1b	1	Provide Access. Provide at least one access from the project to a designated area for vehicles to exit the traffic stream, stop, and experience scenic, natural, or recreational features along the roadway. These areas may be scenic viewpoints or overlooks, welcome centers, tourist activities, or information centers or recreation areas. They must be identified with signage conforming to 23 CFR 655 (the Manual on Uniform Traffic Control Devices, current revision) Part 2 – Signs.
PD-16.1c	2	Avoid Impacts. Show that measures have been taken to specifically avoid impacts to the features from Prerequisite PD-16.1P.
PD-16.1d	3	Enhance Features. Protect, preserve, or enhance scenic, natural, and/or recreational qualities along the roadway. This may include improvements to existing access points, signage, views, or to the scenic, natural, and/or recreational qualities themselves. Also included would be protecting these qualities by the removal of an existing access point if it has been determined that the access threatens them.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of the following documentation sources (or equal where not available):

1. Documentation of national, State, or Indian tribe designation if a byway designation is used to satisfy this criterion or other documentation showing scenic, natural, or recreational values of a project.
2. Contract documents showing roadside access point or other protection, preservation, or enhancements.
3. Description of activities to minimize impacts to features.
4. Description of activities to avoid or improvements to enhance features.

PD-17: Energy Efficiency

1-8 points

SCORECARDS:



Goal: Reduce energy consumption of lighting systems through the installation of efficient fixtures and the creation and use of renewable energy.

Sustainability Linkage

Reduction of energy consumption and conversion to renewable energy sources support the environmental and economic sustainability principles by reducing the demand for fossil fuel generated energy, reducing emissions, and reducing in long-term energy costs.



Background and Scoring Requirements

Scoring Requirements

Requirement PD-17.1

1 point. Evaluate Energy Needs and Implement Alternatives

Evaluate energy needs for the project and implement alternatives to reduce power consumption while still meeting lighting and safety standards. These alternatives could include reduction of lighting; retrofit or installation of energy efficient luminaires, beacons, and traffic signal equipment and lamps; and installation of renewable energy sources.

Requirement PD-17.2

1-6 points. Reduce Total Energy Consumption

Reduce the energy consumption on the project through the installation of energy efficient lighting and signal fixtures (e.g. LED lighting, induction lighting, or other new technology that is Underwriters Laboratories Inc. (UL) Listed for the intended use) and through the installation of autonomous, on-site, renewable power sources (e.g., solar panels). All lighting facilities and systems considered for this criterion must be appropriate for the project. This means that installing pedestrian safety lighting on a project with no pedestrian accessibility will not be awarded credit. Similarly, lighting for new and/or improved driveways and parking lots are subject to the credits only if they are included within the project scope and budget boundaries.

Points are awarded based on the percentage of reduced power use. To determine this reduction, compare the annual power consumption for the baseline condition to the power consumption for the energy efficient electrical system design. Calculations for power consumption should be based on the following assumptions:

- The baseline condition should be calculated using the existing electrical system and assuming new improvements were to be constructed with high-pressure sodium (HPS) luminaires with cut-off optics.
- The baseline condition should be based on the lighting system operating 12 hours/day and 7 days/week.
- The two designs must both meet the same lighting standards.
- Wattage used for energy consumption shall be based on luminaire "input wattage" not lamp wattage.

- Use Table PD-17.2.A to calculate the number of points awarded based on these calculations.

[illegible]

1 point. Establish Auditing Plan

Scoring Sources

1. Documentation of energy usage evaluation and reduction plan.
2. Calculations documenting energy usage if the roadway project was to be constructed with high-pressure sodium (HPS) luminaires and fixtures, the expected energy usage as designed, and the resulting energy savings as a percentage of calculation no. 1.
3. Contract documents and/or cut sheets of the luminaires being installed on the project.
4. Sample cut sheets and specifications for each technology installed on the project that shows the expected wattage of the component(s) used or generated.
5. Documentation of plan for auditing energy use after construction.

PD-18: Site Vegetation, Maintenance and Irrigation

1-6 points

Goal: Promote sustainable site vegetation within the project footprint by selecting plants and maintenance methods that benefit the ecosystem.

Sustainability Linkage

Using sustainable site vegetation supports the environmental and economic sustainability principles by enhancing and protecting the ecosystem by choosing native and non-invasive species, and by reducing maintenance costs.



Background and Scoring Requirements

Background

For the purpose of this criterion, the key terms are defined as follows:

- **“Native plant species”** – Plants native to the EPA Level III ecoregion per the EPA’s [Level III and IV Ecoregions of the Continental United States website](#)¹ that contains the roadway project site or known to naturally occur within 200 miles of the roadway construction site (also see Sustainable Sites Initiative’s [Guidelines and Performance Benchmarks](#)²).
- **“Non-invasive plant species”** – The following items should be performed to ensure that a plant species is considered “non-invasive”: 1) Consult existing local (e.g. city, county, and State natural resources agencies) vegetation policy and procedure that is applicable to the roadway project and ensure vegetation selected and seed mixes used are specifically formulated to prevent the use of invasive plant species and noxious weeds. The [National Invasive Species Information Center’s website](#)³ provides information on how to identify invasive species, 2) Use local and/or regional lists to identify invasive plant species; and 3) Comply with noxious weed laws. The Natural Resources Conservation Service provides Federal- and State-listed noxious species lists by state at USDA’s [Introduced, Invasive, and Noxious Plants website](#)⁴.
- **“Noxious weeds”** – Plants introduced into an ecosystem, which are often invasive, that once established are highly destructive, competitive and difficult to control. They have economic and ecological impacts and are very difficult to control once established. Some noxious weeds are a public health threat to humans and animals, while others destroy native and beneficial plant communities, increase erosion concerns, and clog waterways.
- **“Site vegetation”** – All vegetation associated with a particular roadway project and shall include all vegetation within the roadway’s right-of-way or disturbed area associated with the roadway project (whichever is greater). This can include, but is not limited to, roadside vegetation, decorative planting (e.g., planter boxes or potted plants in urban areas), and vegetation contained in stormwater facilities (e.g., bioswales and rain gardens). Vegetation includes plants and plant propagules such as seeds.

Highway corridors provide opportunities for the movement of invasive species through the landscape. Invasive plant or animal species can move on vehicles and in the loads they carry. Invasive plants can be moved from site to site during spraying and mowing operations. Weed seed can be inadvertently introduced into the corridor during construction on equipment and through the use of mulch, imported soil or gravel, and sod. Some invasive plant

species might be deliberately planted in erosion control, landscape, or wildflower projects. Millions of miles of highway rights-of-ways traverse public and private lands. Many of these adjacent lands have weed problems and the highway rights-of-way provide corridors for further spread. (*Federal Highway Administration Guidance on Invasive Species*⁵).

As explained by the United States National Arboretum (USNA) on their *Invasive Plants website*⁶, invasive species are particularly problematic in construction areas and road cuts as they thrive where the continuity of a natural ecosystem is breached. Ultimately, invasive plants alter habitats and reduce biodiversity. Rich, diverse plant communities can become barren, inhospitable expanses of invasive plants with little value to wildlife. Invasive plants may even deplete groundwater resources. Plants introduced to North America from other parts of the world have come to dominate millions of acres of forest, desert, prairie, and wetlands by out-competing native species.

Native plant species are beneficial and sustainable for roadway projects as they are well adapted to their native climate and soil types. Once established, native plants require little to no maintenance. Properly selected native plant species do not need insecticides or routine irrigation to thrive (sometimes, spot irrigation is needed to control invasive species). Native plants provide habitat for native animals and insects; native wildlife prefers native plants.

While not as beneficial to a native ecosystem, non-invasive plant species that are adapted to site conditions and climate can be considered if there are no native species available that would meet design intent. The following attributes should be considered in determining whether plants are appropriate for the site: cold hardiness, heat tolerance, salt tolerance, soil moisture range, plant water use requirements, soil volume requirements, soil pH requirements, sun/shade requirements, pest susceptibility, and maintenance requirements.” (Sustainable Sites Initiative’s *Guidelines and Performance Benchmarks*²) Both native and non-native plants selected should embody these attributes.

Scoring Requirements

In order to achieve points for this criterion, the following prerequisite must be met:

Prerequisite PD-18.1P

0 points. All site vegetation shall use, or consist of, native and/or non-invasive species and non-noxious species only. The project shall minimize disturbance of native species.

Requirement PD-18.1

1 – 3 points. Vegetation Planning and Selection

Implement one or more of the features in Table PD-18.1.A. Points for features are cumulative if the project has more than one feature; however, Requirement PD-18.1 shall not exceed a total of three points.

TABLE PD-18.1.A. VEGETATION PLANNING AND SELECTION

Requirement	Points	Feature	Minimum Requirements
PD-18.1a	1	Long-term vegetation planning	Have an integrated vegetation management plan to maintain the project and/or corridor, including management of site vegetation and management of invasive species (or continued efforts to eradicate them). This could include a plan and/or financing to support site vegetation.
PD-18.1b	1	Vegetation to replace or enhance structures	Use non-invasive species for snow fences, sight screens, or other otherwise constructed items (vegetation for more than 50% of the project need for snow fences, sight screens to meet this requirement) and/or use non-invasive species to enhance the aesthetics of structural features, such as retaining walls and noise walls.
PD-18.1c	1	Invasive species prevention during construction	Bring only equipment free of dirt, mud, and organics into sensitive sites, such as wetlands, prairies, and water bodies. Have a written plan for the inspection and cleaning of vehicles to prevent the unintentional spread of invasive species during construction.
PD-18.1d	2	Native species	<ul style="list-style-type: none"> Plants or seed with a variety of native plant species only. (Non-invasive and non-noxious plants transplanted from impact areas within the project limits may be used.) Use five or more native species in plantings to increase biodiversity and native habitat for wildlife. Selection of native species shall be appropriate for the context of the project. Salvage rare plants and retain existing vegetation where possible. Reuse native plants salvaged from other projects. Eradicate all existing invasive and noxious plant species or, in cases where eradication is impossible, implement an invasive species management plan.

Requirement PD-18.2

1 – 3 points. Maintenance and Irrigation

Implement one or more of the features in Table PD-18.2.A. Points for features are cumulative if project has more than one feature; however, Requirement PD-18.2 shall not exceed a total of three points.

TABLE PD-18.2.A. VEGETATION MAINTENANCE

Requirement	Points	Feature	Minimum Requirements
PD-18.2a	1	Non-mechanical maintenance	No mowing or other mechanical means of maintenance is planned or required for long-term vegetation maintenance.
PD-18.2b	1	No long-term irrigation	No irrigation is planned or needed after the plant establishment period.
PD-18.2c	1	Non-potable water for irrigation	Use captured rainwater, gray water, captured stormwater, non-potable water conveyed by a public agency, and /or other context-appropriate non-potable water (both in the plant establishment period and beyond) for irrigation needs.
PD-18.2e	1	Reduction in use of fertilizers, insecticides, and herbicides	Appropriately use only fertilizers and pesticides (herbicides, insecticides, fungicides) acceptable in USDA Organic farming. No use of synthetic fertilizers or synthetic pesticides during the construction and plant establishment period.

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. EPA, Level III and IV Ecoregions of the Continental United States website, http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm
2. The Sustainable Sites Initiative, *Guidelines and Performance Benchmarks* (2009), <http://www.coconino.az.gov/documentcenter/view/5469>
3. USDA, National Invasive Species Information Center's website, <http://www.invasivespeciesinfo.gov/index.shtml>
4. USDA, Introduced, Invasive, and Noxious Plants website, <http://plants.usda.gov/java/noxiousDriver>
5. FHWA, *Federal Highway Administration Guidance on Invasive Species* (August 10, 1999), http://www.environment.fhwa.dot.gov/ecosystems/wildlife/inv_guid.asp
6. USNA, *Invasive Plants* (2008), <http://www.usna.usda.gov/Gardens/invasives.html>

Additional Resources

The following resources provide information on this criterion topic in addition to the sources directly referenced:

7. USDA, *Introduced, Invasive, and Noxious Plants*, <https://plants.usda.gov/java/noxiousDriver>
8. FHWA, *Roadside Use of Native Plants*, http://www.environment.fhwa.dot.gov/ecosystems/vegmgmt_rdsduse.asp

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. A vegetation or landscape plan showing type, size, and location of all plant species. This can often be found in the standard project plans.
2. The specification sections relating to site vegetation. These are typically found in the technical specifications.
3. A copy of, or reference to (e.g., web address), the policy or procedure used to select plant species.
4. A design study report approved by the appropriate agency or authority that includes analysis of existing site vegetation, impacts, reuse of vegetation, references to evaluate the invasive species and noxious plants, and planned vegetation species.
5. An integrated vegetation management plan covering the long-term maintenance of vegetation (including irrigation, fertilizer and pesticide use, mechanical maintenance, and control of invasive species.)

PD-19: Reduce, Reuse and Repurpose Materials

1-12 points

Goal: Reduce lifecycle impacts from extraction and production of virgin materials by recycling materials.

Sustainability Linkage

Reducing and reusing materials supports the environmental and economic principles of the triple bottom line by reducing the consumption of raw materials, reducing landfill waste, and encouraging cost savings.



Background and Scoring Requirements

Background

This criterion focuses on reducing and reusing materials while *PD-20: Recycle Materials* focuses on efforts to recycle materials per the descriptions and definitions provided below.

When pavements are originally constructed, the best materials available at the time are usually sourced and used during construction. As resources diminish, that often means that the best materials available for reconstruction are already in place in the existing infrastructure. In addition to reducing waste, recycling pavements allows us to reclaim the best materials that were originally available for construction.

Programs for waste reduction in the United States have generally taken on the concept of the 3Rs: reduce, reuse, and recycle. For the purposes of this criterion, as well as to *PD-20: Recycle Materials*, the key terms are defined as follows:

- **“Reducing”** is used in this tool to refer to processes that reduce the need for virgin paving and structural materials. Examples include soil stabilization methods to reduce the need for structural backfill or to reduce the required thickness of a new pavement or overlay; pavement preservation technologies that extend the life of existing pavements and reduce the need for new materials; bridge preservation technologies that extend the life of existing bridges and reduce the need for new structures and materials; retrofitting existing bridge structures to reduce the need for new structures and materials; or processes that incorporate existing pavement structures into new pavement structures (such as crack-and-seat and rubblization) to reduce the need for new materials and avoid the transportation of the existing used materials which would otherwise be removed from a project.
- **“Reusing”** is the reuse of a material or by-product from another industry for a new function in a transportation application. Examples of the beneficial use of industrial by-products include the incorporation of materials such as coal ash, fly ash, foundry sand, slag, asphalt shingles, construction and demolition materials, or other materials into a transportation project. These reused materials replace traditional materials with similar properties in specific applications. The reuse of these materials should assure that the engineering properties of the final product or mixture are equal to or better than obtained from using traditional materials, and that their economic value is demonstrated in accordance with the FHWA Recycling Policy. Reused materials provide environmental benefit by reducing the unnecessary landfilling of these materials. With proper engineering, these materials can be successfully incorporated into transportation applications and provide economic value to our projects.

- **“Recycling”** is the use of old materials for a new and similar use in a transportation application, or the salvaging and reprocessing of previously used materials from other transportation applications into a new transportation project. See PD-20: Recycle Materials for examples.
- **“Retrofit”** is defined as the addition of new features or technology to an older or existing facility. For INVEST purposes, a project would include retrofit components in order to reinforce structures to become more resistant and resilient to the forces of natural hazards and other environmental factors such as aging and weathering. It involves the consideration of changes in the mass, stiffness, damping, load path, and ductility of materials, as well as radical changes such as the introduction of energy absorbing dampers and base isolation systems.
- **“Existing pavement material”** is defined as all material within the project limits in the existing pavement structure (including surfacing and base material). This includes travelled lanes and shoulders, and pavement structures for physically separated bicycle and pedestrian pathways.
- **“Existing structural material”** is defined as all material within the project limits in existing non-pavement structures such as bridges (including overpasses), retaining walls, and stormwater infrastructure, such as vaults, pipes, and culverts. All existing structural materials include their foundations, for which volumes may be difficult to estimate. Where actual weights are not available, reasonable estimates may be used or volume may be estimated. To compute volume of hollow structural sections such as prefabricated members or corrugated steel, estimate the mass of the material and adjust for material density to determine volume. Note that for typical reinforced concrete sections, the steel does not need to be separated from the composite section for purposes of volume calculations and a composite density may be used.

Scoring Requirements

Implement one or more of the methods listed below. **Points for different scoring requirements are cumulative; however, this criterion shall not exceed a total of 12 points.**

Requirement PD-19.1

2-4 points. Pavement Preservation

Perform pavement preservation activities such as crack sealing, chip sealing, slurry sealing, microsurfacing, or thin ACP overlays that extend the remaining service life of pavements. This scoring requirement applies to pavement preservations and not rehabilitation or reconstruction activities. FHWA’s *ACTION Pavement Preservation Definitions Memo*¹ defines pavement preservation as "a program employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety and meet motorist expectations."

Points are awarded based on increase in remaining service life per Table PD-19.1.A.

TABLE PD-19.1.A. POINTS AWARDED FOR PAVEMENT PRESERVATION ACTIVITIES

Points	Increase in Remaining Service Life ¹
1	1 to 2 years
2	2 to 5 years
3	5 to 7 years
4	7 to 10 years

¹ More than 10 years is considered rehabilitation and isn’t eligible for this scoring requirement.

Requirement PD-19.2

1-3 points. Reduce Pavement Materials

Reduce the amount of new pavement materials needed through soil stabilization methods to reduce the required thickness of a new pavement or processes that incorporate existing pavement structures into new pavement structures. Points are awarded per Table PD-19.2.A based on the percentage of pavement area treated. The area treated is calculated based on the entire area of existing pavement materials that are preserved or reconstructed.

Soil stabilization methods may include the use of geosynthetics (geogrids and fabrics) to reduce the thickness of aggregate required for stabilization of subgrade; the use of geosynthetics to reduce the thickness of aggregate above the geosynthetics that would have been required for structural support when subgrade soils are susceptible to pumping and base course intrusion; the use of portland cement and/or cementitious by-product materials for soil stabilization for pavement construction, if it can be demonstrated that this process will reduce the use of natural aggregate (virgin aggregate or material hauled from off-site source) use for stabilization; other chemical stabilization; and fractured slab techniques, including crack-and-seat, and rubblization.

TABLE PD-19.2.A. POINTS AWARDED FOR REDUCING PAVEMENT MATERIALS

Points	Percentage Pavement Area Treated
1	50–74%
2	75–99%
3	100%

Requirement PD-19.3

2-4 points. Bridge Preservation

Perform bridge preservation activities such as deck overlays, crack sealing, joint sealing, removing channel debris, lubricating bearings, cathodic protection, electrochemical chloride extraction and cleaning, and painting that extend the remaining service life of bridges. This scoring requirement applies to bridge preservations and not rehabilitation or reconstruction activities. For definitions and examples of bridge preservation, see the FHWA [*Bridge Preservation Guide*](#)². Points are awarded based on increase in remaining service life per Table PD-19.3.A.

TABLE PD-19.3.A. POINTS AWARDED FOR BRIDGE PRESERVATION ACTIVITIES

Points	Increase in Remaining Service Life
2	2 to 5 years
3	5 to 7 years
4	7 to 10 years

Requirement PD-19.4

1-3 points. Retrofitting Bridges

Retrofit existing bridge structures to reduce the need for new structures and materials. This could include methods such that improve or add: stainless steel wire mesh composites, full height steel jackets, elastomeric bearings,

steel restrainer cables, shear keys, fiber reinforced polymers wraps, shape memory alloy devices, metallic and viscoelastic dampers, or pipe seat extenders. Points are awarded based on increase in remaining service life per Table PD-19.3.A above.

Requirement PD-19.5

1-3 points. Repurpose Pavements or Structures

Reuse existing pavements, structures, or structural elements for a new use by repurposing them for a use that requires equal or less loading. The purpose of this scoring requirement is to maintain and leverage existing pavements, structures, and structural elements for new uses where possible instead of using new materials (as long as the existing elements meet the performance requirements of the new use). One method is to maintain existing pavements when new alignments are proposed and use the existing pavement for a new use, such as realigning a highway but maintaining the old one as a frontage road, cycle path track, or multiuse path. Another method is to convert existing pavement to a different use, such as converting parking to travelled lanes (or vice versa) or converting pavement to multiuse paths or plazas.

Pavement to be repurposed shall not be processed or moved in any way; it shall remain in-place. Points are awarded per Table PD-19.5.A based on the percentage of existing pavement material (by area) reused and repurposed calculated based on the entire area of existing pavement materials included in the project.

TABLE PD-19.5.A. POINTS AWARDED FOR REUSING AND REPURPOSING PAVEMENTS IN PLACE

Points	Percentage Pavement Reused and Repurposed
1	25–49%
2	50–74%
3	75% or more

Requirement PD-19.6

1-3 points. Reuse Industrial By-Products

Scoring for this requirement is based on the following, cumulative requirements:

- **Requirement PD-19.6a**

1 point. Use By-Products for Pipe Bedding or Backfill

Using foundry sand or other industrial by-products in pipe bedding and backfill.

- **Requirement PD-19.6b**

2 points. Use By-Products in Roadway Elements

Reuse industrial by-products in pavement materials, ancillary structures, and other roadway elements. These could include one or more of the following: coal ash, fly ash, foundry sand, slag, tires, asphalt shingles, and construction and demolition materials.

Requirement PD-19.7

1 point. Recycling and Reuse Plan

Develop and implement a project-specific plan for the innovative reuse of waste materials other than the methods listed in PD-19.1 through PD-19.6.

Resources

The following resources are referenced in this criterion and consolidated here:

1. FHWA, *ACTION Pavement Preservation Definitions Memo*, <http://www.fhwa.dot.gov/pavement/preservation/091205.cfm>
2. FHWA, *Bridge Preservation Guide*, <http://www.fhwa.dot.gov/bridge/preservation/guide/guide.pdf>

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more following documentation sources (or equal where not available):

1. Calculations showing the remaining service life of pavements or bridges expected before the project and after, and clearly demonstrating an extended service life as a result of the treatments applied.
2. Calculation of the percentage pavement area treated, including the area of pavement treated and the existing pavement area preserved and retrofitted.
3. The approved mix design for the pavement materials.
4. Recycling and Reuse Plan.

PD-20: Recycle Materials

1-10 points

Goal: Reduce lifecycle impacts from extraction, production, and transportation of virgin materials by recycling materials.

Sustainability Linkage

Recycling materials supports the environmental and economic principles of the triple bottom line by reducing the consumption of raw materials, reducing landfill waste, and encouraging cost savings.



Background and Scoring Requirements

Background

This criterion focuses on recycling of materials while *PD-19: Reduce, Reuse and Repurpose Materials* focuses on efforts to reduce and reuse materials per the descriptions and definitions provided below.

When pavements are originally constructed, the best materials available at the time are usually sourced and used during construction. As resources have diminished, that often means that the best materials available for reconstruction are already in place in the existing infrastructure. In addition to reducing waste, recycling pavements allows us to reclaim the best materials that were originally available for construction.

Programs for waste reduction in the United States have generally taken on the concept of the 3Rs: reduce, reuse, and recycle. For the purposes of this criterion, as well as for *PD-19: Reduce, Reuse and Repurpose Materials*, the key terms are defined as follows:

- **“Reducing”** is used in this tool to refer to processes that reduce the need for virgin paving and structural materials. See *PD-19: Reduce, Reuse and Repurpose Materials* for examples.
- **“Reusing”** is the reuse of a material or by-product from another industry for a new function in a transportation application. See *PD-19: Reduce, Reuse and Repurpose Materials* for examples.
- **“Recycling”** is the use of old materials for a new and similar use in a transportation application, or the salvaging and reprocessing of previously used materials from other transportation applications into a new transportation project. Examples of recycling solutions include the incorporation of reclaimed asphalt pavement (RAP) and recycled concrete aggregate (RCA); cold-in-place recycling (CIR); hot-in-place recycling (HIR); and full depth reclamation (FDR). Also included are the salvage and recycling of aggregate, rock, asphalt, concrete, wood, metal (rebar, sign posts, signal poles, etc.), and other materials that have previously been used in other transportation applications and can be incorporated into a new project. Examples include the salvage and recycling of sign posts, signal poles, luminaries, rock or concrete used as rip-rap, and asphalt millings used as a shouldering material. For bridges, an example would be using recycled steel girders from a roadway bridge for a new pedestrian structure.
- **“Existing pavement material”** is defined as all material within the project limits in the existing pavement structure (including surfacing and base material). This includes travelled lanes and shoulders, and pavement structures for physically separated bicycle and pedestrian pathways.
- **“Existing structural material”** is defined as all material within the project limits in existing non-pavement structures, such as bridges (including overpasses), retaining walls, and stormwater infrastructure such as

vaults, pipes, and culverts. All existing structural materials include their foundations, for which volumes may be difficult to estimate. Where actual weights are not available, reasonable estimates may be used or volume may be estimated. To compute volume of hollow structural sections such as prefabricated members or corrugated steel, estimate the mass of the material and adjust for material density to determine volume. Note that for typical reinforced concrete sections, the steel does not need to be separated from the composite section for purposes of volume calculations and a composite density may be used.

Scoring Requirements

Implement one or more of the methods listed below. Points for different methods are cumulative; however, this criterion shall not exceed a total of 10 points.

Requirement PD-20.1

1-5 points. Recycled Asphalt Pavement or Recycled Concrete Aggregate

Use RAP or RCA in new pavement lifts or granular base course or embankments. The recycled materials can originate from the project and be recycled onsite or offsite and returned or recycled materials can originate from an offsite source. However, no points are awarded for removing paving materials from the project and sending them offsite to be recycled for another project(s).

Points are awarded based on the origin of the source material and location of recycling activities as well as the Average Recycled Content (ARC) per the following calculation and using Tables PD-20.1.A or PD-20.1.B (on the next page) as follows below.

$$\text{ARC (\%)} = \frac{\sum r_n}{\sum W_n} \times 100\%$$

Where:

r_n is the total weight or volume of RAP or RCA.

W_n is the total weight or volume of either all existing pavement materials or all bedding, backfill, and granular embankment materials per the method of recycling used.

n represents the number of materials considered in accordance with the method used.

TABLE PD-20.1.A. POINTS FOR AVERAGE RECYCLED CONTENT (PERCENT BY WEIGHT OR VOLUME OF MATERIALS) WHEN ORIGINATING FROM PROJECT AND RECYCLED ONSITE

Recycling Method Used	Points Earned				
	1	2	3	4	5
Percent average recycled material (ARC) required for recycling in pavements (onsite recycling)	10%	20%	30%	40%	50% or more
Percent average recycled material (ARC) required for granular base course or embankments (onsite recycling)	20%	30%	40%	50%	60% or more

TABLE PD-20.2.B. POINTS FOR AVERAGE RECYCLED CONTENT (PERCENT BY WEIGHT OR VOLUME OF MATERIALS) WHEN ORIGINATING FROM ONSITE AND RECYCLED OFFSITE OR ORIGINATING OFFSITE

Recycling Method Used	Points Earned			
	1	2	3	4
Percent average recycled material (ARC) required for recycling in pavements (offsite source or recycling)	20%	30%	40%	50% or more
Percent average recycled material (ARC) required for granular base course or embankments (offsite source or recycling)	30%	40%	50%	60% or more

Requirement PD-20.2

2-6 points. In-Place Asphalt Pavement Recycling

Recycle pavement materials in place using cold-in-place recycling, hot-in-place recycling, and full depth reclamation methods. Points are awarded based on the percentage of pavement area recycled compared to the entire area of existing pavement materials as shown in Table PD-20.2.A.

TABLE PD-20.2.A. POINTS AWARDED FOR IN PLACE RECYCLING

Percentage Pavement Area Recycled	Points Awarded by Method of Recycling		
	HIR	CIR	FDR
50–74%	2	3	4
75–99%	3	4	5
100%	4	5	6

Requirement PD-20.3

1-2 points. Reuse of Sub-base Granular Material

Reuse the subbase granular material of existing pavement elements as subgrade embankment or as part of the new subbase during construction of the proposed new pavement structure.

Points are awarded based on the percentage of pavement area for which sub-base material was reclaimed and reused compared to the entire area of existing pavement materials as shown in Table PD-20.3.A.

TABLE PD-20.3.A. POINTS AWARDED FOR REUSE OF SUB-BASE GRANULAR MATERIAL

Percentage Pavement Area Recycled	Points Awarded for Sub-base Reused
50–74%	1
75–100%	2

Requirement PD-20.4

1 point. Recycle Minor Structural Elements

Relocate and reuse at least 90 percent of the minor structural elements that meet current code, including existing luminaires, signal poles, and sign structures that are required to be removed and/or relocated onsite or by the agency. Signs mounted on posts are not included in this criterion. Structures that do not meet current code are not counted in the percentage.

In order to achieve credit, the minor structural elements must be moved and reused onsite or provided to the agency's Maintenance & Operations group specifically for reuse. Elements shall be counted by numbers of foundations without regard to size of the structure. In this case, a signal pole would be counted as a single structure and an overhead sign structure would be counted twice because it has two foundations.

Requirement PD-20.5

2 points. Salvage or Relocate Buildings

Salvage or move a building instead of demolishing it.

Resources

None referenced.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more following documentation sources (or equal where not available):

1. A calculation that shows the computed percentage of pavement and/or structural material recycled.
2. Calculation of the percentage pavement area recycled in-place.
3. Documentation showing the origin and processing location of RAP or RCA.
4. A calculation that shows the percentage of luminaires, signal poles, and sign structures reused.
5. A payment clause or item for salvaging and relocating a building.

PD-21: Earthwork Balance

1-3 points

SCORECARDS: ☐ Paving ☐ Rural Basic ☒ Rural Extended ☐ Urban Basic ☒ Urban Extended

Goal: Reduce the need for transport of earthen materials by balancing cut and fill quantities.

Sustainability Linkage

Balancing cut and fill quantities in a project supports the environmental and economic sustainability principles by reducing the environmental and economic costs associated with the transport of earthen materials.



Background and Scoring Requirements

Scoring Requirements

Requirement PD-21.1

3 points. Balance Cut and Fill Volumes within 10 Percent

Balance earthwork cut (excavation) and fill (embankment) volumes such that the percent difference between cut and fill is less than or equal to 10 percent of the average total volume of material moved. For purposes of this criterion, it is recommended that the owner use the following method and definitions, or equivalent, to compute cut and fill volumes. Include miscellaneous additional cut and fill such as outlet ditches and muck excavations, and account for moisture and density as well as shrink and swell. Note that for purposes of this criterion, all volumes are positive quantities.

One of the following scoring requirements may apply.

- **Requirement PD-21.1a**

3 points. Balance Cut and Fill Volumes without Construction Banking

Show that that design volumes (for projects that haven't been constructed) or actual construction volumes (for projects that have been constructed) meet:

$$\frac{(A + C) - (B + D)}{\frac{1}{2}(A + C + B + D)} \times 100\% \leq 10\%$$

A = Volume of Cross Section Cut

B = Volume of Cross Section Fill

C = Volume of Miscellaneous Cut

D = Volume of Miscellaneous Fill

Include the following materials in the calculations: (1) Soil stabilizer materials or other soil additives, (2) Removed topsoil materials, and (3) Unused cut or imported fill materials placed in stockpiles.

Exclude the following materials from the calculations: (1) Mechanical stabilizers such as rock bolts and geotextile fabric materials, (2) Structural aggregate for base courses in pavements, foundations, or superstructures such as bridges, (3) Structural backfill and drain rock specifically intended for utility trenches and stormwater infrastructure, and (4) Rock (Stable Rock, defined by the Occupational Health and Safety

Administration) cuts sourced within the project boundary that are intended for use as structural aggregate within the project boundary.

OR

- **Requirement PD-21.1b**

1 point. Balance Cut and Fill Volumes Using Construction Banking

Show that the design volumes (for projects that haven't been constructed) or actual construction volumes (for projects that have been constructed) meet the Requirement PD-21.1a only if construction banking is used and the following requirements are met:

- Construction banking may be accomplished using adjacent projects or other phases of the same project.
- Trucking distance from banking stockpiles to project limits must be less than 10 miles.
- Banking stockpiles must be used and earthwork balanced within a period of 24 months.
- All stockpiles must have a temporary erosion and sedimentation control (TESC) plan in place and appropriate measures must be installed. Maintenance for TESC methods must be accounted for in the project being evaluated or the adjacent project sharing earthwork banking and maintenance must be completed and documented.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Grading plan, reporting total cut and fill quantities and total miscellaneous cut/fill.
2. Inspector or Contractor's actual construction earthwork volumes for the project, including actual cut and fill, volume of unused embankment materials, and volumes of imports to and exports from site.

PD-22: Long-Life Pavement

1-7 points

Goal: Minimize life-cycle costs by designing long-lasting pavement structures.

Sustainability Linkage

Including long-life pavement supports the environmental and economic principles by reducing the life-cycle costs of the road and the need for raw materials over time.



Background and Scoring Requirements

Background

The definition of long-life pavement for this criterion is:

- Service life of 40+ years for new construction and major reconstruction projects that add travel lanes to an existing roadway or bridge. Service life of 20+ years for small reconstruction and bridge replacement projects that do not expand capacity of the roadway, preservation projects, and restoration projects.
- Pavement will have reduced potential for rutting, cracking, faulting, and spalling.
- Pavement will maintain desirable ride and surface texture characteristics with minimal intervention activities, if warranted, for ride and texture, joint resealing, and minor repairs.

This criterion is not applicable to roads that are not surfaced with hot mix asphalt (HMA) or portland cement concrete (PCC), such as gravel roads, dirt roads, and roads sealed with bituminous surface treatments. Existing pavements that are to partially remain in place (in any condition) can also qualify for this criterion. In these cases, evaluation shall be based on the final pavement structure, which may include (1) existing pavement remaining in place, and (2) any new pavement structure added. In this manner, a diamond grind of an existing PCC pavement or an overlay of an existing HMA pavement can qualify for this criterion if the resultant pavement structure meets the requirements stated above.

Scoring Requirements

Implement one or more of the methods listed below. **Points for different scoring requirements are cumulative; however, this criterion shall not exceed a total of seven points.**

Requirement PD-22.1

1-5 points. Long-Life Pavement Design

Long-life pavement design must be in accordance with a design procedure that is formally recognized, adopted, and documented by the project owner. In many instances (but not all), this could be the process described in AASHTO's *Guide for Design of Pavement Structures, 4th Edition with 1998 Supplement*¹ or the process described in AASHTO's *Mechanistic-Empirical Pavement Design Guide, Interim Edition: A Manual of Practice*².

One of the following scores applies:

- **0 points.** No long-life pavement is used, it does not meet the minimum requirements of this criterion, or it does not meet the minimum quantities described below.

- **1 point. Bus Pull-outs.** Design at least 95 percent of the total new or reconstructed pavement surface area dedicated to bus pullouts to meet long-life pavement design criteria with specific bus axel loads considered. The length of the bus pullout designed should, at a minimum, include all pavements subject to turning and deceleration forces.
- **2 points. Dedicated or Primary Bus Lanes.** Design at least 75 percent of the total new or reconstructed pavement surface area for dedicated or primary bus lanes to meet long-life pavement design criteria with specific bus axel loads considered. Compute the total surface area of all trafficked lanes dedicated to buses and show that, at a minimum, 75 percent of that area is designed for long-life. Include stripe-to-stripe lane widths, including intersections.
- **5 points. Regularly Trafficked Lanes.** Design at least 75 percent of the total new or reconstructed pavement surface area for regularly trafficked lanes of pavement to meet long-life pavement design criteria. Compute the total surface area of all trafficked lanes and show that, at a minimum, 75 percent of that area is designed for long-life. Do not include shoulders, medians, sidewalks, and other incidental paved areas in the computation.

Requirement PD-22.2

5 points. Increase Asphalt Concrete Pavement Density

Design and specify 100 percent of the total new or reconstructed asphalt pavement for regularly trafficked lanes using materials and technologies to achieve a field construction density of 94 percent of maximum theoretical density. The density at construction must represent the in-place density after the asphalt mixture has been compacted with the rollers, but prior to opening the roadway to traffic.

Compute the total asphalt pavement quantity of all trafficked lanes and show 100 percent of the quantity is designed and specified using materials and technologies to meet this requirement. Do not include drainage layers, permeable base course, asphalt treated permeable base (ATPB), open graded surface course, surface friction course, and other permeable designed layers of asphalt pavement in the computation. Do not include shoulders, medians, sidewalks, and other incidental paved areas in the computation.

Requirement PD-22.3

2 point. Leverage Pavement Smoothness Incentive

Leverage a performance-based pay incentive for pavement smoothness targeting a pavement ride quality of 58.5% or better. Alternatively, the specifications may require that the contractor meet this ride quality goal without providing a pay incentive (mandatory performance).

Resources

The following resources are referenced in this criterion and consolidated here:

1. AASHTO, *Guide for Design of Pavement Structures*, 4th Edition with 1998 Supplement (1993, 1998), https://bookstore.transportation.org/item_details.aspx?id=374
2. AASHTO, *Mechanistic-Empirical Pavement Design Guide*, Interim Edition: A Manual of Practice (2008), https://bookstore.transportation.org/item_details.aspx?ID=1249

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Calculations indicating the total percentage of trafficked lane pavement surface areas designed for long-life.
2. The project owner's formally recognized, adopted, and documented pavement design procedure.
3. Documentation showing long-life pavement was designed using a minimum 20- or 40-year service life (per the appropriate requirements above).
4. Documentation showing long-life pavement was designed and specified using materials and technologies to achieve a construction field density of 94 percent of maximum theoretical density (per the appropriate requirements above).

PD-23: Reduced Energy and Emissions in Pavement Materials

1-3 points

Goal: Reduce energy use in the production of pavement materials.

Sustainability Linkage

Reducing energy use in the production of pavement materials supports all of the triple bottom line principles by lessening impacts to air quality through reduced emissions and reducing energy consumption.



Background and Scoring Requirements

Scoring Requirements

Implement one or more of the methods listed below. **Any of the following requirements (Requirements PD-23.1, PD-23.2, or PD-23.3) may earn 3 points, however, this criterion shall not exceed a total of 3 points.**

Requirement PD-23.1

1-3 points. Asphalt Production

Use low-energy material for at least 50 percent of the total projects asphalt material. One of the following scores may meet this requirement:

- **Requirement PD-23.1a**

1-3 points. Warm Mix Asphalt (WMA)

Mixing temperature shall be measured as the temperature of the mixture as it exits the mixing drum (for drum plants) or pugmill (for batch plants). This credit requires a recommended hot mix asphalt (HMA) mixing temperature to be provided by the asphalt binder supplier. This recommended temperature should be as if no WMA technology were to be used. If the recommended mixing temperature is provided as a range, use high end of the range for calculation of the required temperature reduction.

Use the highest point value achieved from only one of the following options:

- **0 points.** Warm Mix Asphalt is not used.
- **1 point.** Use Warm Mix Asphalt. Reduce the mixing temperature of HMA by a minimum of 30°F from that recommended as the mixing temperature by the asphalt binder supplier.
- **2 points.** Use Warm Mix Asphalt. Reduce the mixing temperature of HMA by a minimum of 40°F from that recommended as the mixing temperature by the asphalt binder supplier.
- **3 points.** Use Warm Mix Asphalt. Reduce the mixing temperature of HMA by a minimum of 50°F from that recommended as the mixing temperature by the asphalt binder supplier.

OR

- **Requirement PD-23.1b**

3 points. Asphalt Production Using Energy and Fuel Saving Technologies

Burn recycled oil, waste materials, or natural gas; or use other energy and fuel saving technologies in asphalt production to reduce conventional fuel usage by a minimum of 25 percent. Recycled oils, garbage, or other materials that would otherwise go to waste that are used for burner fuel or any other energy or fuel saving technologies that can be shown to reduce the normal electricity or petroleum fuel usage by 25 percent.

Requirement PD-23.2

3 points. Raw Material – Cement Production

One of the following scores may meet this requirement:

- **Requirement PD-23.2a**

3 points. Cement Production Using ENERGY STAR® Certified Plant

Use an ENERGY STAR® certified cement production plant for cement materials used on the project. To be ENERGY STAR® certified, the plant must score in the top 25 percent based on the [EPA National Energy Performance Energy Rating System](#)¹.

OR

- **Requirement PD-23.2b**

3 points. Cement Production Using Fuel Saving Technologies

Burn recycled oil, waste materials, natural gas, or other fuel saving technologies in cement production to reduce conventional fuel usage by a minimum of 25 percent. Recycled oils, garbage, or other materials that would otherwise go to waste that are used for burner fuel or any other fuel saving technologies that can be shown to reduce the normal petroleum fuel usage by 25 percent.

OR

- **Requirement PD-23.3c**

3 points. Cement Production Using Limestone Additive

Use blended cement using a minimum 3 percent ground limestone addition. Per Advanced Concrete Pavement Technology's (ACPT) [TechBrief: Blended and Performance Cements](#)² the use of 5 percent ground limestone in cement is permitted by ASTM C150 (and AASHTO M 85), which reduces the cement clinker in concrete and ultimately reduces the carbon footprint.

Requirement PD-23.3

3 points. Concrete Production

One of the following scores may meet this requirement:

- **Requirement PD-23.3a**

3 points. Concrete Production in Plant with Demonstrated Reduction in Energy and Carbon Footprint

Concrete shall be supplied from a concrete plant that can demonstrate a carbon footprint and embodied energy 15 percent below the national averages as established in the National Ready Mixed Concrete

Association's (NRMCA) [Sustainable Concrete Plant Guidelines](#)³. Carbon footprint and embodied energy shall be calculated using the [Athena EcoCalculator](#)⁴.

OR

- **Requirement PD-23.3b**

3 points. Concrete Production in NRMCA Sustainable Concrete Plant

Concrete shall be supplied from a concrete plant that is an [NRMCA Certified Sustainable Concrete Plant \(Silver\)](#)⁵.

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. EPA National Energy Performance Energy Rating System,
https://www.energystar.gov/ia/business/healthcare/natl_energy_rating_system.pdf
2. Advanced Concrete Pavement Technology (ACPT), TechBrief: Blended and Performance (2011),
<http://www.fhwa.dot.gov/pavement/concrete/pubs/hif11025/index.cfm>
3. National Ready Mixed Concrete Association's (NRMCA), Sustainable Concrete Plant Guidelines (2011),
<http://www.nrmca.org/sustainability/Certification/SCP%20Guidelines%20Version%201.1.pdf>
4. Athena EcoCalculator, <http://www.athenasmi.org/our-software-data/ecocalculator/>
5. NRMCA Certified Sustainable Concrete Plan (Silver),
<http://www.nrmca.org/sustainability/certification/plantcertification.asp>

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Calculations to show at least 50 percent of the total project pavement material meets requirement options 1, 2, 3, or 4.
2. Asphalt or concrete pavement mix designs showing the requirements of options 1 or options 3 were met.
3. Documentation for the cement production facility, asphalt plant, or concrete mixing plant showing the requirements were met.

PD-24: Permeable Pavement

1-2 points

Goal: Improve flow control and quality of stormwater runoff through use of permeable pavement technologies.

Sustainability Linkage

Permeable pavements primarily have environmental benefits to the natural and built environment.



Background and Scoring Requirements

Background

Using permeable pavement is a low-impact development technique that can be used as part of a roadway stormwater management plan.

For the purposes of this criterion, the key terms are defined as follows:

- **“Permeable,” “porous” or “pervious”** are used interchangeably to describe a pavement structural system that has more voids than a conventional paved surface such as concrete or asphalt. As a result, both infiltration and evaporation are allowed as water passes through the pavement section.
- **“Permeable pavements”** include, but are not limited to, porous asphalt pavement, pervious concrete pavement, or permeable block pavers.
- **“Secondary pavement areas”** shall include all pavements that are not intended for high speed traffic or heavy trucks. Appropriate uses would include parking lots, alleys, access roadways, sidewalks, bike lanes, multi-use paths, and shoulders. However shoulders planned for future trafficked uses through widening should be excluded (for example, shoulders to become mainline lanes or shoulders used for shoulder-running buses).

Scoring Requirements

Prerequisite PD-24.1P

0 points. Include Maintenance Plan

The project must include a maintenance plan for permeable pavements (or a design memo justifying why one is not necessary).

Prerequisite PD-24.2P

0 points. Exclude Sanded and Sealed Areas

Permeable pavements must not be placed in areas where sand may be used for snow and ice control or where the pavement will be sealed (during project or in the future).

Requirement PD-24.1

1-2 points. Permeable Pavement

One of the following scores may apply:

- **1 point.** Use permeable pavement to treat at least 50% of the secondary pavement areas on the project.
- **2 points.** Use permeable pavement to treat at least 75% of the secondary pavement areas on the project.

Resources

None referenced.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Contract documents.
2. Technical memoranda or reports.

PD-25: Construction Environmental Training

1 point

Goal: Provide construction personnel with the knowledge to identify environmental issues and best practice methods to minimize impacts to the human and natural environment.

Sustainability Linkage

Environmental training for construction personnel supports the environmental and social principles by ensuring that workers understand the importance of protecting and enhancing the human and natural environment, follow environmental regulations, and implement sustainable construction methods correctly.



Background and Scoring Requirements

Scoring Requirements

Implementation of regulatory permits and related training, including a Stormwater Pollution Prevention Plan (SWPPP) may be included in an Environmental Awareness Training Program, but does not meet the following requirements on its own.

Requirement PD-25.1

1 point. Implement Formal Environmental Awareness Training

The owner shall require the Contractor to plan and implement a formal environmental awareness training program during construction in order to provide tools and information to assist staff in ensuring that projects stay in compliance with environmental laws, regulations, and policies.

The Contractor shall provide an environmental awareness training plan that is customized to the project, including:

- A list of the types of project personnel to be trained. This list may be by job-type and/or by employer and need not contain actual employee names. Personnel should include members of the owner's organization or its construction representative, assigned regulatory agency staff, and prime and subcontractors. Suggested classifications of personnel to be trained include, but are not limited to, managers, inspectors, superintendents, operators, and laborers.
- A description of the types, goals, and objectives of training to be given. Types of training might include one or more of the following: topic-specific trainings, topic-specific emails, regular toolbox meetings, standing topics on regular agendas, classroom training, and more. This criterion cannot be met by one-time-only discussions of environmental topics, such as at a preconstruction meeting. Training does not have to be lengthy classroom training and it does not need to be dedicated to environmental issues only.
- A process to track training efforts, including dates, means (e.g., online, classroom, field training), topics, the identification of those participating in training, and attendance numbers.
- A process to measure training effectiveness such as self-assessment, pre-test and post- test, and productivity measurement, which includes names of attendees, topic, dates, and location of training.

The environmental awareness training plan shall address the following training elements as a minimum, or state why any are inappropriate:

- Permit conditions, performance standards, environmental commitments, and environmental regulations related to the project
- Overall importance of environmental issues
- Identifying work activities that present the greatest risk for compliance
- Required environmental qualifications/certifications
- Environmental records management
- Environmental compliance monitoring and reporting procedures
- Environmental notification triggers and emergency response procedures
- Oil spill prevention and response procedures
- Construction stormwater management, erosion and sediment control procedures, and in-water work
- Reduction of air pollution
- Management of known or suspected contamination
- Hazardous materials management

Some types of environmental training may be required. These requirements should be included in the plan; however, the plan should go above and beyond what is required by regulations and should cover all potential environmental issues.

Resources

None referenced.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Contract Documents showing an Environmental Awareness Training Plan is required.
2. Contractors' Environmental Awareness Training Plan.

PD-26: Construction Equipment Emission Reduction

1-2 points

Goal: Reduce air emissions from non-road construction equipment.

Sustainability Linkage

Reducing emissions from construction equipment supports environmental and social principles by lessening impacts to air quality and reducing fossil fuel consumption.



Background and Scoring Requirements

Scoring Requirements

Requirement PD-26.1

1-2 points. Implement Methods to Reduce Emissions

Implement one or more of the methods to reduce emissions in Table PD-26.1.A. **Points for methods are cumulative if roadways have more than one feature; however, this criterion shall not exceed a total of two points.**

TABLE PD-26.1.A. METHODS TO REDUCE CONSTRUCTION EQUIPMENT EMISSIONS (CONTINUED ON NEXT PAGE)

Requirement	No. Points	Method
PD-26.1a	1	Use non-road construction equipment that have engines that meet the current U.S. Environmental Protection Agency (EPA) Tier emission standards (Tier 3/Interim, Tier 4 as of April 2011) in effect for non-road engines of the applicable engine power group and account for at least 50 percent of the non-road construction equipment fleet operating hours for the project.
PD-26.1b	1	Use non-road construction equipment that have diesel retrofit devices for after-treatment pollution control verified by EPA or the California Air Resources Board (CARB) for use with non-road engines and account for at least 50 percent of the non-road construction equipment fleet operating hours for the project.
PD-26.1c	1	Owner shall require contractor to implement a no-idling policy during construction. The policy should include, at a minimum, the following topics (or equivalents): <ul style="list-style-type: none">• When drivers arrive at loading or unloading areas to drop off or pick up passengers, they should turn off their vehicles as soon as practical to eliminate idling time and reduce harmful emissions. Vehicles should not be restarted until passengers are ready to depart. Exceptions include conditions that would compromise passenger safety, such as extreme weather or idling in traffic.• Delivery vehicles should turn off their engines while making deliveries to the construction site.• All drivers of any company vehicle should receive a copy of the policy and have an opportunity to discuss it at the beginning of construction.

Requirement	No. Points	Method
PD-26.1d	1	Contractor reduces emissions related to hauling earthwork onsite by using larger non-road hauling vehicles and establishes a materials hauling plan to make efficient use of backhauls, maximizing efficiency, and minimizing the number of “empty” trucks.
PD-26.1e	2	Use non-road construction equipment that have engines that meet the current U.S. EPA Tier emission standards (Tier 3/Interim, Tier 4 as of April 2011) in effect for non-road engines of the applicable engine power group and account for at least 75 percent of the non-road construction equipment fleet operating hours for the project.
PD-26.1f	2	Use non-road construction equipment that have diesel retrofit devices for after-treatment pollution control verified by EPA or the CARB for use with non-road engines and account for at least 75 percent of the non-road construction equipment fleet operating hours for the project.

Resources

None Referenced.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. A signed letter from the prime contractor stating the total non-road construction fleet operating hours and the percentage of those operating hours that meet at least one of the three criteria.
2. Provide a list of all non-road construction equipment used on the project that contains the following information for each piece of equipment:
 - Make and model of each piece of equipment.
 - Operating hours associated with the project.
3. Contract Documents requiring the Contractor to have a no-idling policy.

PD-27: Construction Noise Mitigation

1-2 points

Goal: Reduce annoyance or disturbance to surrounding neighborhoods and environments from road construction noise.

Sustainability Linkage

Reducing noise from construction supports environmental and social principles by reducing impacts to quality of life, community facilities, and sensitive habitat.



Background and Scoring Requirements

Scoring Requirements

Require the Contractor to plan and monitor noise control measures throughout construction with care above and beyond what is typically required by regulations (i.e., NEPA).

Requirement PD-27.1

1 Point. Construction Noise Mitigation Plan

The Owner shall require the Contractor to establish, implement, and maintain a formal Noise Mitigation Plan (NMP) during roadway construction. The Contract Documents should include a requirement for a NMP that contains, at minimum, the following information for all elements of construction:

1. Responsible party for noise mitigation activities, contact information, their responsibilities, and qualifications. Include information for the NMP preparer, if applicable, or if completed by an outside party.
2. Project location and distance to closest receptor of noise. Include a description of the surrounding zoning and parcel information (i.e., commercial, residential, hospitals, schools, parks, sensitive habitat).
3. A list of proposed construction activities (e.g., demolition, excavation, paving, bridge foundations, finishing).
4. Dates and working hours of proposed construction activities.
5. A list of noise-generating devices used during each construction activity listed in #3.
6. A list of noise-mitigating devices used during each construction activity listed in #3, including personal safety equipment requirements for all site employees.
7. Noise permit numbers, agency, or local authority policies associated with construction work, as applicable.
8. Description of noise monitoring standards, methods, and acceptable levels.
9. Description of correction procedures for non-compliant noise levels.
10. Description of complaint or feedback mechanism for public use.
11. Signature of responsible party.

Some state and local owner agencies already have requirements for such plans written into their standard specifications. However, a written specification requiring the prime contractor to have an NMP is insufficient, especially because many local authorities and owner agencies offer certain exemptions to their policies, such as daylight work schedules or projects with minimal areas of land-disturbing activities.

Requirement PD-27.2

1 Point. Monitor Noise Receptors

Require contractor to monitor noise and the effectiveness of mitigation measures at the receptors throughout construction to ensure compliance with the NMP.

Resources

None referenced.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Contract documents requiring contractor to develop a Noise Mitigation Plan and/or monitor noise during construction.
2. Noise Mitigation Plan.
3. Applicable noise permits, or agency or local authority noise policies.

PD-28: Construction Quality Control Plan

2-5 points

Goal: Improve quality by requiring the contractor to have a formal Quality Control Plan (QCP).

Sustainability Linkage

Implementation of a Construction Quality Control Plan promotes higher quality construction and supports the environmental and economic principles of the triple bottom line by minimizing life-cycle costs and raw material usage.



Background and Scoring Requirements

Scoring Requirements

Requirement PD-28.1

3 points. Quality Control Plan

Require the Contractor to plan and implement quality control measures throughout construction with care and for materials above and beyond what is typically required by specifications and regulations. The Owner shall require the Contractor to establish, implement, and maintain a formal QCP during roadway construction. The Contract Documents should include a requirement for a QCP that includes, at a minimum, the following information:

- Key quality control personnel, their responsibilities, and qualifications (resumes, certifications with expiration dates, etc.).
- Project location and locations of major pavement and earthwork sources.
- Procedures used to control quality during construction including (as a minimum):
 - Items to be monitored (including pavement mix designs)
 - Submittals required, approximate dates, responsible person, and submittal process
 - Testing to be done (including testing standards and frequency)
 - When corrective action is required (action limits)
 - Procedures to implement corrective action
 - Procedures to modify QCP if ineffective or when modifications are necessary
 - Critical inspection point notification plan. As an example, 48 hours before concrete delivery, 48 hours before asphalt paving operations begin, etc.
- The QCP should cover all project construction; not just the pavement.
- Subcontractors need to be included in this plan, which typically means identifying a responsible party and obtaining a quality control procedure from the subcontractor. The Prime contractor shall maintain authority to enforce the QCP for work performed by all subcontractors. Expected beginning and ending dates for the subcontractors should be included.
- The QCP should be approved by the owner before construction begins.

Some state and local owner agencies already have requirements for such plans written in to their standard specifications. Such existing requirements should be able to meet the requirements above; however, some only address construction quality for hot mix asphalt (HMA) or Portland cement concrete (PCC) paving and not

construction of the overall project. While paving needs to be covered in the QCP, all other major components of construction (e.g., structures, earthwork, drainage, traffic control items, etc.) must also be covered.

Some state highway agencies use contractor testing in their acceptance process. In these cases, the independent assurance tests must be performed on samples that are taken independently of quality control samples. QCPs are required in these cases, as defined in CFR 637, Title 23.

A large document that repeats language from the contract specifications need not be generated for this scoring requirement. Rather, the document should clearly identify the major aspects of the prime contractor's plan to control project construction quality and who is responsible for quality control for a particular item or process, when key inspections are made, when corrective actions are to be taken, and how they are to be taken.

Requirement PD-28.2

2 points. Quality Price Adjustment Clauses

Leverage the use of Quality Price Adjustment Clauses to link payment and performance of the constructed products. Quality Assurance specifications generally include statistically based acceptance plans, require contractor process control testing, and have provisions for pay adjustments based on the degree of compliance with specified requirements. Quality assurance specifications and programs may lead to better contractor control of the quality of the specified product; however, they do not diminish the need for effective construction inspection. For more information, see FHWA's [Technical Guidance on Price Adjustment Clauses for Quality](#)¹.

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. FHWA, Technical Guidance on Price Adjustment Clauses for Quality, (January 24, 1992), <https://www.fhwa.dot.gov/programadmin/contracts/coretoc.cfm?CFID=33464143&CFTOKEN=9fa197a0851235dc-B80B3D78-B1F2-8>

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Contract Document Specifications requiring contractor to establish and implement a project-specific QCP.
2. Contract Document Specifications requiring quality price adjustment clauses.

PD-29: Construction Waste Management

1-4 points

Goal: Utilize a management plan for road construction waste materials to minimize the amount of construction-related waste destined for landfill.

Sustainability Linkage

Managing construction waste supports the environmental and economic principles of the triple bottom line by reducing landfill waste and by encouraging recycling and reuse of construction materials, thereby decreasing raw material consumption.



Background and Scoring Requirements

Background

Construction and demolition waste constitutes any material that must be hauled off-site for disposal or reprocessing, or, if disposed (stockpiled) within the project right-of-way (ROW), is not intended for use as structural material (e.g., pavements, embankments, shoulders, base materials, and fill). Materials that leave the ROW for reprocessing (recycling) activities to return later for use on within the project boundaries are not considered C&D waste. Typical C&D waste for roadway construction projects may include, but is not limited to, any of the following:

- Paving (e.g., asphalt, concrete)
- Milling , concrete slough and grindings, cobble
- Metals (e.g., waste steel rebar, metal guardrails, pipes, luminaires, signs, aluminum, and various household metals)
- Plastic (e.g., waste plastic pipes)
- Excavated soil cuttings and boulders
- Sediment removed from temporary construction settling ponds
- Land clearing debris or excess topsoil
- Hazardous materials including liquids
- Wood and paper products (e.g., packaging materials, copier paper, paper products, cardboard, and pallets)
- Glass
- Household trash or compostables (including recyclable materials generated from mobile office)
- Packaging

The CWMP is typically completed by the prime contractor, submitted to the owner agency for approval, and implemented by all parties on the construction site. The CWMP need only apply to wastes generated during the project construction phase.

Scoring Requirements

Requirement PD-29.1

1 point. Construction and Demolition Waste Management Plan

The Owner shall require the Contractor to establish, implement, and maintain a formal Construction and Demolition Waste Management Plan (CWMP) during roadway construction, or its functional equivalent. The Contract Documents should include a requirement for a CWMP that contains, at minimum, the following information:

- Type of construction and demolition waste expected (C&D waste)
- Expected (or actual) tonnage
- Goal for percentage of waste diverted from landfills
- Contact information of responsible party for hauling
- Destination of waste (e.g., recycling facility, landfill, contractor's backyard)
- Contact information of responsible party at disposal site
- Strategy for waste generated from mobile office activities and personal worker (household) waste
- Opportunities for recycling of construction waste materials.

Requirement PD-29.2

1-2 points. Divert Waste from Landfills

The Contractor demonstrates that a percentage of the construction waste, including the materials listed above, has been diverted from landfills. The percentage diverted should be calculated by weight. One of the following scores applies:

- **1 point.** Divert at least 50 percent of the construction waste from landfills.
- **2 points.** Divert at least 75 percent of the construction waste from landfills.

Requirement PD-29.3

1 point. Haul Excess Materials Directly to other Projects for Recycling

Reduce lifecycle transport costs and impacts by coordinating and transporting suitable excess excavated material that cannot be used within the project limits to offsite projects where it will be reused. Only projects that transport materials directly to specific project sites are eligible for this credit, non-specific stockpiling sites for future recycling are excluded.

Resources

None referenced.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Contract Document requiring contractor to establish and implement a project-specific CWMP or its functional equivalent.
2. Documentation showing the construction materials were diverted from landfills. This should include trucking tickets with weights, destinations, and materials, and calculations of percentages diverted from landfills.

PD-30: Low Impact Development

1-3 points

Goal: Use low impact development stormwater management methods that reduce the impacts associated with development and redevelopment and that mimic natural hydrology.

Sustainability Linkage

Implementing more sustainable stormwater management practices supports the environmental principle by improving water quality, managing runoff, and using technology that mimics natural hydrology.



Background and Scoring Requirements

Background

Also see PD-08: Stormwater Quality and Flow Control Low.

For the purpose of this criterion, the key terms are defined as follows:

- **“Best Management Practices”** – BMPs are stormwater management techniques that mimic natural hydrology to treat pollutants.
- **“Low-Impact Development”** – The US EPA’s [Low Impact Development website](#)¹ defines LID as an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product. There are many practices that have been used to adhere to these principles such as bioretention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements. By implementing LID principles and practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed. Applied on a broad scale, LID can maintain or restore a watershed's hydrologic and ecological functions. LID has been characterized as a sustainable stormwater practice by the Water Environment Research Foundation and others.

Scoring Requirements

Requirement PD-30.1

1-3 points. Use Effective BMPs

Use effective BMPs or stormwater management techniques that mimic natural hydrology to treat pollutants. To calculate the points earned for this scoring requirement, follow Steps 1 through 3 below:

- Step 1** Table PD-30.3.A on the next page identifies BMPs considered most effective for specific target pollutants. If the project uses one of these BMPs, go to step 2 to calculate how many points are earned.

TABLE PD-30.1.A. EFFECTIVE BMPS AND INFILTRATION/VOLUME REDUCTION

Target Pollutant	BMP					
	Detention Pond	Wet Pond	Wetland	Biofilter	Media Filter	Infiltration /LID ¹
Suspended Solids	X	X	X	X	X	X
Total Copper	X			X		X
Dissolved Copper		X		X		X
Total Lead		X		X	X	X
Dissolved Lead		X				X
Total Zinc		X	X		X	X
Dissolved Zinc				X		X
Total Phosphorus ²		X	X	-		X

1 – Provide 100% infiltration for the water quality storm/volume using a pond, LID techniques, or a combination.

2 – Phosphorus or other additional basin-specific pollutant

- Step 2** Calculate the Target Impervious Surface Area Treated as a percentage of added impervious surface area). For retrofit projects, use Table PD-30.1.B to calculate the equivalent value to use for Target Impervious Surface Area.

TABLE PD-30.1.B. RETROFIT PROJECTS – CALCULATING EQUIVALENT TARGET IMPERVIOUS SURFACE AREA TREATED

Existing Impervious on Project (acres)	% of Existing Impervious Area Treated	Equivalent Target Impervious Surface Area Treated (% of Added)
0–1.0	0–50%	101%–125%
	50.1%–100%	>125%
1.1–5.0	0–40%	101%–125%
	40.1%–100%	>125%
5.1–10.0	0–30%	101%–125%
	30.1%–100%	>125%
>10.0	0–20%	101%–125%
	20.1%–100%	>125%

Step 3 Use the Target Impervious Surface Area Treated that was calculated in Step 2 in Table PD-30.3.C to determine the points earned for this scoring requirement.

TABLE PD-30.3.C. POINTS EARNED FOR EFFECTIVE BMPS BASED ON TARGET IMPERVIOUS SURFACE AREA TREATED

(Step 1)	(Step 2)	(Step 3)
Effective BMP/Infiltration/LID Used?	Target Imp. Surface Area Treated (% of Added)	Points Earned
Yes	101%–125%	2
	125% +	3

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. Environmental Protection Agency, Low Impact Development website, <http://water.epa.gov/polwaste/green/>

Additional Resources

The following resources provide information on this criterion topic in addition to the sources directly referenced:

2. NCHRP, *Report 565: Evaluation of Best Management Practices for Highway Runoff Control* (2006), http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_565.pdf
3. Environmental Protection Agency, Low Impact Development Literature Review, <http://water.epa.gov/polwaste/green/upload/lid.pdf>
4. NCHRP, *Report 792: Long-Term Performance and Life-Cycle Costs of Stormwater Best Management Practices* (2014), http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_792.pdf
5. FHWA, Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring website, https://www.environment.fhwa.dot.gov/Env_topics/water/ultraurban_bmp_rpt/index.aspx

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of the following documentation sources (or equal where not available):

1. Project Drainage Report or other relevant calculations and studies.
2. Project Contract Documents.

PD-31: Infrastructure Resiliency Planning and Design

1-12 points

Goal: Respond to vulnerabilities and risks associated with current and future hazards (including those associated with climate change) to ensure transportation system reliability and resiliency.

Sustainability Linkage

Designing for infrastructure resiliency in the face of potential hazards supports all of the triple bottom line principles by reducing spending on infrastructure replacement, improving the safety and security of multimodal transportation system, providing energy savings from long-lasting investments, and reducing effects of vehicle travel on climate changes.



Background and Scoring Requirements

This criterion, PD-31: Infrastructure Resiliency Planning and Design, is related to SPR-16: Infrastructure Resiliency (Regional) and SPS-16: Infrastructure Resiliency (State).

Background

For the purposes of this criterion, key terms are defined as follows:

- **“Adaptation”** is adjustment in natural or human systems in anticipation of or response to a changing environment in a way that effectively uses beneficial opportunities or reduces negative effects.
- **“Climate Change”** refers to any significant change in the measures of climate lasting for an extended period of time. Climate change includes major variations in temperature, precipitation, or wind patterns, among other environmental conditions, that occur over several decades or longer. Changes in climate may manifest as a rise in sea level, as well as increase the frequency and magnitude of extreme weather events now and in the future.
- **“Extreme Weather Events”** can include significant anomalies in temperature, precipitation and winds and can manifest as heavy precipitation and flooding, heatwaves, drought, wildfires and windstorms (including tornadoes and tropical storms). Consequences of extreme weather events can include safety concerns, damage, destruction, and/or economic loss. Climate change can also cause or influence extreme weather events.
- **“Extreme Events”**, for the purposes of this criterion, refers to risks posed by climate change and extreme weather events. The definition does not apply to other uses of the term nor include consideration of risks to the transportation system from other natural hazards, accidents, or other human induced disruptions.¹
- **“Greenhouse Gas (GHG) Emissions”** are gases emitted, in this case, mostly by vehicles engaged in activities to construct or use the transportation facility. These gases absorb and emits radiation within the thermal infrared range and contributes to the greenhouse effect. Greenhouse gases greatly affect the temperature of the Earth and are the primary source of climate change.
- **“Preparedness”** means actions taken to plan, organize, equip, train, and exercise to build, apply, and sustain the capabilities necessary to prevent, protect against, ameliorate the effects of, respond to, and recover from climate change related damages to life, health, property, livelihoods, ecosystems, and national security.

- **“Resilience”** or resiliency is the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.

Climate Change Effects on Transportation Infrastructure

The U.S. Global Change Research Program’s 2014 Report, *Climate Change Impacts in the United States*¹ summarizes 4 Key Messages related to transportation infrastructure and climate changes:

1. The impacts from sea level rise and storm surge, extreme weather events, higher temperatures and heat waves, precipitation changes, Arctic warming, and other climatic conditions are affecting the reliability and capacity of the U.S. transportation system in many ways.
2. Sea level rise, coupled with storm surge, will continue to increase the risk of major coastal impacts on transportation infrastructure, including both temporary and permanent flooding of airports, ports and harbors, roads, rail lines, tunnels, and bridges.
3. Extreme weather events currently disrupt transportation networks in all areas of the country; projections indicate that such disruptions will increase.
4. Climate change impacts will increase the total costs to the nation’s transportation systems and their users, but these impacts can be reduced through rerouting, mode change, and a wide range of adaptive actions.”

Scoring Requirements

Requirement PD-31.1

2 points. Address Climate Change in Project Development

Incorporate consideration of climate change at a project-specific level in project development and environmental reviews.

Requirement PD-31.2

1-6 points. Incorporate Future Climate Change Effects in the Design Process or the Design

One of the following scoring requirements may apply; PD-31.2a and PD-31.2b are not cumulative.

- **Requirement PD-31.2a**

3 points. Incorporate Future Consideration of Climate Change Effects in the Design Process

Incorporate and document consideration of the effects of climate change in the design process.

For example, when designing a bridge over a water body, a project analysis might consider future climate change effects, such as rising storm water levels. However, the owner may decide that there is an acceptable factor of safety already included in the design, that the potential impacts are acceptable or can be mitigated, or that the cost to make changes is more significant than the risks of the effects pose.

One of the following scores applies:

- **0 points.** Climate change effects are not considered in the design process.
- **1 points.** Climate change effects are qualitatively considered in the design process.
- **3 points.** Climate change effects are quantitatively considered in the design process.

OR

- **Requirement PD-31.2b**

4 or 6 points. Incorporate Future Consideration of Climate Change Effects into the Design

Based on a project-specific identification of hazards, and assessment of risks and vulnerabilities resulting from those hazards, incorporate additional design efforts above and beyond requirements and regulations to address the vulnerabilities identified. The U.S. Global Change Research Program's 2014 Report, *Climate Change Impacts in the United States*¹ lists additional design actions as "Adaptive Strategies to Reduce Impacts" and describes that actions may include, but are not limited to: retrofitting pavements, stormwater drainage facilities, structures and other infrastructure; relocating facilities to avoid impacts; upgrading design of stormwater drainage facilities above and beyond what is required to mitigate changing weather patterns; designing new pavements, structures and other infrastructure to higher standards than is typically required by design requirement or regulation; or designing protection of existing infrastructure. Some examples of design changes include:

- **Alignment and Grade** – For example, raising the grade of a roadway above levels required in current regulations to address higher flood levels resulting from climate changes.
- **Stormwater Drainage System** – For example, increasing the capacity of conveyance and detention facilities to address higher flood levels resulting from climate changes.
- **Pavement Structures** – For example, designing pavements to withstand the effects of heat waves resulting from climate changes.
- **Bridge Structures** – For example, designing bridge piers to withstand the effects of scour or storm surges resulting from more intense flooding events.
- **Tunnels and other Structures** – For example, designing tunnels or sign structures to withstand the effects of more intense weather or seismic events than is required.

Agencies can use FHWA's 11-step process for engineering transportation assets to be more resilient to climate impacts and the associated tools that were developed under *Phase II of the Gulf Coast Study*^{2,3}. This process describes consideration of multiple alternatives and cost benefit analysis of designed infrastructure.

One of the following scores applies:

- **0 points.** No design changes are required to accommodate future climate change effects or no changes are incorporated in the design.
- **4 points.** Design changes are incorporated in the design of one design discipline (e.g. bridges, pavements, drainage, etc.).
- **6 points.** Design changes are incorporated in the design of more than one design discipline (e.g. bridges and pavements, drainage and bridges, etc.).

Requirement PD-31.3

4 points. Mitigate Climate Change and Extreme Weather Effects

Mitigate the effects of GHG emissions through design efforts above and beyond requirements and regulations. Some examples of strategies meeting this requirement, include, but are not limited to:

- Incorporating transportation system and operational efficiencies by optimizing the design, construction, operation, and use of transportation networks. The strategies range from anti-idling ordinances to traffic management to congestion pricing. The objective of this group of strategies is to reduce the energy use and

GHG emissions associated with a given unit of passenger or freight travel (e.g., person-miles, vehicle-miles, or ton-miles of travel).

- Reduce travel activity by reducing growth in vehicle-miles traveled. The objective of this group of strategies is to influence travelers' activity patterns, thereby reducing total travel, shifting travel to more efficient modes, increasing vehicle occupancy, or otherwise taking actions that reduce energy use and GHG emissions associated with personal travel.

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. U.S. Global Change Research Program, *Climate Change Impacts in the United States* (2014), <http://nca2014.globalchange.gov/downloads>
2. FHWA, *U.S. DOT Gulf Coast Study Phase 2*, http://www.fhwa.dot.gov/environment/climate_change/adaptation/case_studies/gulf_coast_study/engineering_and_tasks/task32.pdf and http://www.fhwa.dot.gov/environment/climate_change/adaptation/ongoing_and_current_research/gulf_coast_study/
3. FHWA, *U.S. DOT Gulf Coast Study Phase 2 (Tools)*, http://www.fhwa.dot.gov/environment/climate_change/adaptation/ongoing_and_current_research/gulf_coast_study/index.cfm#l2

Additional Resources

The following resources provide information on this criterion topic in addition to the sources directly referenced:

4. FHWA, *FHWA Order 5520: Transportation System Preparedness and Resilience to Climate Change and Extreme Weather Events* (2014), <http://www.fhwa.dot.gov/legisregs/directives/orders/5520.cfm>
5. FHWA, *Integrating Climate Change into the Transportation Planning Process* (2008), https://www.fhwa.dot.gov/environment/sustainability/energy/publications/integrating_climate_change/index.cfm
6. FHWA, Climate Adaptation Website, http://www.fhwa.dot.gov/environment/climate_change/adaptation/
7. FHWA, Vulnerability Assessment Framework Website, http://www.fhwa.dot.gov/environment/climate_change/adaptation/adaptation_framework/
8. TRB, *E-C152: Adapting Transportation to the Impacts of Climate Change*, <http://onlinepubs.trb.org/onlinepubs/circulars/ec152.pdf>

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Contract documents including plans and specifications showing designed infrastructure.
2. Design documentation showing design above and beyond requirements and regulations was performed to specifically address the effects of GHG emissions and climate changes.

PD-32: Light Pollution

1-3 points

Goal: To safely illuminate roadways while minimizing unnecessary and potentially harmful illumination of the surrounding sky, communities, and habitat.

Sustainability Linkage

Reducing lighting pollution benefits both the natural and human environment.

Background and Scoring Requirements

Background

Roadway lighting is an essential component of safe roadway design. However, in addition to useful light that illuminates the roadway, light can be emitted upward directly from existing light fixtures, or reflect from the roadway surface, both of which contribute to sky glow. Light from overhead fixtures can “trespass” and illuminate surfaces and areas other than the roadway, including private property and or natural areas. Mismanaged lighting can alter the appearance of a dark sky; eclipse natural starlight; disrupt the feeding, sleeping, mating, and migration cycles of wildlife; and disrupt the growth cycles of plants. However, in many cases, careful lighting design can provide safe driving conditions while minimizing wasted light and adverse lighting effects.

The purpose of this criterion is to promote the management of Backlight, Uplight, and Glare (BUG) using prescribed Backlight, Uplight, and Glare ratings to evaluate luminaire optical performance related to light trespass, sky glow, and high angle brightness control. For the purposes of this criterion, the key terms are defined as follows:

- **“Backlight”** refers to the light directed in back of mounting pole.
- **“Glare”** is the sensation produced by luminance within the visual field that is sufficiently greater than the luminance to which the eyes are adapted causing annoyance, discomfort, or loss in visual performance and visibility.
- **“Glare ratings”** refer to the amount of light emitted from the luminaire at angles known to cause glare.
- **“Light trespass”** is the effect of light that strays from the intended purpose and becomes an annoyance, a nuisance, or a detriment to visual performance.
- **“Lighting boundary”** is located at the edge of the roadway plus any adjacent features intended to be lit, such as sidewalks, bikepaths, multi-use paths, etc. It does not include adjacent areas to be lit for private purposes such as parking lots or car dealerships.
- **“Lighting Zone”** is the lighting zone type being modelled based on characteristics of the natural environment, including, but not limited to, flora, fauna and humans as described by the Illuminating Engineering Society of North America (IES).
- **“Roadway or Highway lighting”** is defined as lighting provided for freeways, expressways, limited access roadways, and roads on which pedestrians, cyclists, and parked vehicles are generally not present. The primary purpose of roadway or highway lighting is to help the motorist remain on the roadway and help with the detection of obstacles within and beyond the range of the vehicle's headlights.
- **“Sky glow”** refers to the brightening of the night sky that results from the reflection of radiation (visible and non-visible), scattered from the constituents of the atmosphere (gaseous molecules, aerosols, and particulate matter), in the direction of the observer.



- **“Street lighting”** is defined as lighting provided for major, collector, and local roads where pedestrians and cyclists are generally present. The primary purpose of street lighting is to help road users identify obstacles, provide adequate visibility of pedestrians and cyclists, and assist in visual search tasks, both on and adjacent to the roadway.
- **“Uplight”** refers to or the light directed above the horizontal plane of the luminaire.

Lighting Zone (LZ)

The IES defines the lighting zones shown in Table PD-32.0.A.

TABLE PD-32.0.A LIGHTING ZONES

Lighting Zone (LZ)	Zoning Considerations	Recommended Uses or Areas
LZ0	Undeveloped areas within national parks, state parks, forest land, rural areas, and other undeveloped areas	Should be applied to areas in which permanent lighting is not expected and when used, is limited in the amount of lighting and the period of operation. LZ0 typically includes undeveloped areas of open space, wilderness parks and preserves, areas near astronomical observatories, or any other area where the protection of a dark environment is critical. Special review should be required for any permanent lighting in this zone. Some rural communities may choose to adopt LZ0 for residential areas.
LZ1	Developed areas of national parks, state parks, forest land, and rural areas.	Pertains to areas that desire low ambient lighting levels. These typically include single and two family residential communities, rural town centers, business parks, and other commercial or industrial/ storage areas typically with limited nighttime activity. May also include the developed areas in parks and other natural settings.
LZ2	Areas predominantly consisting of residential zoning, neighborhood business districts, light industrial with limited nighttime use, and residential mixed-use areas.	Pertains to areas with moderate ambient lighting levels. These typically include multifamily residential uses, institutional residential uses, schools, churches, hospitals, hotels/motels, commercial and/or businesses areas with evening activities embedded in predominately residential areas, neighborhood serving recreational and playing fields and/or mixed use development with a predominance of residential uses. Can be used to accommodate a district of outdoor sales or industry in an area otherwise zoned LZ1.
LZ3	All areas not included in LZ0, LZ1, LZ2, or LZ4.	Pertains to areas with moderately high lighting levels. These typically include commercial corridors, high intensity suburban commercial areas, town centers, mixed use areas, industrial uses and shipping and rail yards with high night time activity, high use recreational and playing fields, regional shopping malls, car dealerships, gas stations, and other nighttime active exterior retail areas.

Lighting Zone (LZ)	Zoning Considerations	Recommended Uses or Areas
LZ4	High activity commercial districts in major metropolitan areas as designated by the local jurisdiction.	Pertains to areas of very high ambient lighting levels. LZ4 should only be used for special cases and is not appropriate for most cities. LZ4 may be used for extremely unusual installations such as high density entertainment districts, and heavy industrial uses.

Source: IES

BUG Rating System

*Fundamentals of Lighting – Addenda #1 BUG Ratings – Backlight, Uplight, and Glare (ref. TM-15 and addenda)*¹, published by IES, makes the evaluation and selection of outdoor luminaires fast, easy and complete. Added to TM-15 as an addenda, the BUG stands for “Backlight”, “Uplight” and “Glare”, each describing one of the three types of stray light that escape from a lighting fixture as defined above.

The BUG Rating System divides the sphere around a luminaire into zones, assigning B, U, and G values according to expected environmental impact for each type of light trespass. It takes into account uplight shielding, glare shielding and backlight shielding as well as limiting lamp lumens to values appropriate for the lighting zone. Once the lowest BUG Ratings have been established, the System provides tables of acceptable values against which any luminaire having photometric data can be evaluated.

Scoring Requirements

The following scoring requirements are cumulative.

Requirement PD-32.1

1 point. Uplight Design

Do not exceed the luminaire uplight ratings shown in Table PD-32.1.A, based on the specific light source installed in the luminaire, as defined in [IES TM-15-11, Addendum A](#)².

TABLE PD-32.1.A. MAXIMUM UPLIGHT RATINGS

	Lighting Zone				
	LZ0	LZ1	LZ2	LZ3	LZ4
Allowed uplight ratings	U0	U1	U2	U3	U4

Requirement PD-32.2

1 point. Backlight Design

Do not exceed the luminaire backlight ratings shown in Table PD-32.2.A (based on the specific light source installed in the luminaire), as defined in [IES TM-15-11, Addendum A](#)², based on the mounting location and distance from the lighting boundary.

TABLE PD-32.2.A. MAXIMUM BACKLIGHT RATINGS

Luminaire Mounting	Lighting Zone				
	LZ0	LZ1	LZ2	LZ3	LZ4
> 2 mounting heights from lighting boundary	B1	B3	B4	B5	B5
1 to 2 mounting heights from lighting boundary and properly oriented	B1	B2	B3	B4	B4
0.5 to 1 mounting height to lighting boundary and properly oriented	B0	B1	B2	B3	B3
< 0.5 mounting height to lighting boundary and properly oriented	B0	B0	B0	B1	B2

Requirement PD-32.3**1 point. Glare Design**

Do not exceed the glare ratings shown in Table PD-32.3.A, based on the specific light source installed in the luminaire, as defined in [IES TM-15-11, Addendum A²](#).

TABLE PD-32.3.A. MAXIMUM GLARE RATINGS

	Lighting Zone				
	LZ0	LZ1	LZ2	LZ3	LZ4
Allowed glare ratings	G0	G1	G2	G3	G4

Resources

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. IES, *Fundamentals of Lighting – Addenda #1 BUG Ratings – Backlight, Uplight, and Glare* (ref. TM-15 and addenda), <https://brownep.files.wordpress.com/2014/01/ies-fol-addenda-1-bug-ratings.pdf>
2. IES, *TM-15-11 Addendum A*, <https://www.ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf>

Additional Resources

The following resources provide information on this criterion topic in addition to the sources directly referenced:

3. International Dark Sky Association, *Specifier Bulletin for Dark Sky Applications* (2009), Volume 2: Issue 1, http://www.aal.net/content/resources/files/BUG_rating.pdf
4. LEED, *REQS801-0: Bug rating method*, <http://www.usgbc.org/credits/reqs801-0>
5. U.S. Department of Energy, *LED Application Series: Outdoor Area Lighting* (June 2008), http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/outdoor_area_lighting.pdf
6. IES, *TM-15-11: Luminaire Classification System for Outdoor Luminaires + Addendum A*, <https://www.ies.org/store/technical-memoranda/luminaire-classification-system-for-outdoor-luminaires/>

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Contract documents showing the plans and specifications required BUG compliant or equivalent fixtures.
2. Illumination design documentation showing that lighting was required for this project to meet safety requirements, that the types of lighting fit the context of the roadway and that, if the illumination levels were reduced, that safety was not compromised.

PD-33: Noise Abatement

1-5 points

Goal: Reduce traffic noise impacts to surrounding communities and environments.

Sustainability Linkage

The reduction of noise benefits both the human and natural environment. Therefore, this criterion supports the environmental and social principles of the triple bottom line.



Background and Scoring Requirements

Background

The objective of this criterion is to consider options for reducing traffic noise. Evaluating noise impacts is required per the Agency's governing Noise Study and Abatement Policy, however, there are elements of noise management that can provide opportunities for sustainable practices. Noise levels can be reduced by altering the source of the noise (engine and exhaust and tire/pavement interaction) or by protecting the receptors. The most common method of reducing noise, and the only method eligible for Federal-aid highway funding as a noise abatement measure, is compliance with 23 CFR 772 and the highway agency's noise policy/procedures. Compliance with 23 CFR 772 and the highway agency's noise policy/procedure typically results in the construction of a noise barrier, but can also include traffic management measures, alteration of horizontal and vertical alignments by suppressing or moving the roadway further away from the noise receptors, acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise, or noise insulation of Activity Category D land use facilities. Another methods to reduce noise levels is by altering pavement type or surface characteristics. While the pavement itself may be Federal-aid reimbursable, the pavement as a noise abatement measure is not Federal-aid reimbursable.

Scoring Requirements

Implement one or more of the methods listed below. **Points for different scoring requirements are cumulative; however, this criterion shall not exceed a total of five points.**

Requirement PD-33.1

2 points. Specialized Noise Barrier Construction

Construct one or more of the following specialized noise barriers on the project to provide noise abatement. Noise barriers must comply with the Agency's governing Noise Study and Abatement Policy.

- Construct a new noise barrier using recycled materials.
- Re-use an existing noise wall previously constructed within the project limits. Over 75% of the existing noise wall material needs to be re-used to be considered.
- Construct an earthen berm using over 80% of excavated soils generated from within the project limits and/or corridor.

Requirement PD-33.2

2 points. Incorporate Traffic System Management Techniques to Reduce Existing Noise Levels

On projects where noise sensitive receptors have been identified, reduce traffic noise by implementing one or more of the following traffic management options:

- Roadway geometry design or traffic control elements that develop free-flow traffic
- Speed limit reductions
- Signage for prohibiting air braking
- Coordinated signals
- Use of roundabouts

Requirement PD-33.3

2 points. Provide a Buffer Zone for Adjacent Noise Sensitive Receptors

Utilize one of the following approaches to provide a noise buffer zone:

- Selection of an alternative that is not within close proximity to noise sensitive receptors or compared to other alternatives has the least amount of noise impacts.
- Shift of the alignment within the right-of-way or adjustment of right-of-way to move the roadway away from noise sensitive receptors.
- Coordination with local officials to create or preserve compatible land uses adjacent to the roadway."

Requirement PD-33.4

1-3 points. Design Quiet Pavements

Design and specify the total new or reconstructed pavement surface area for regularly trafficked lanes of pavement with a pavement type or surface characteristics designed to reduce the noise from the tire/pavement interaction. The On-board Sound Intensity (OBSI) measurement for the pavement type or surface characteristic should not exceed the maximum noise levels listed in Table PD-41d.A for each posted speed limit range. Credit earned for each posted speed range varies based on the percentage of trafficked pavement area that is designed to meet the corresponding maximum noise level. When calculating the trafficked area, do not include shoulders, medians, sidewalks, maintenance and access roads, or other paved areas outside of the travelled way.

TABLE PD-33.4.A. TESTING SPEEDS AND MAXIMUM AVERAGE OBSI NOISE LEVELS

Posted Speed Limit	Maximum Noise Level	Minimum Percentage Trafficked Area		
		1 point	2 points	3 points
55 mph or more	98 dBA	20%	40%	60%
30 to 54 mph	90 dBA	40%	60%	80%

Pavement sections with posted speeds less than 30 mph do not qualify for this criterion.

Requirement PD-33.5

1 point. Provide Plantings or Sight Screen to Separate Receptors from Roadway

Construct a vegetative barrier a minimum of 100 feet thick, a minimum of 20 feet high with 100% density.

Resources

None referenced.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. Pavement design documentation showing pavement sections to be constructed or reconstructed and their associated surface material type, surface areas, demonstrating that the design was intended to be quiet in accordance with the requirements of this criterion.
2. A calculation to indicate the total percentage of trafficked lane pavement surface areas surfaced with quiet pavement.
3. Design documentation and construction documents showing implemented features.
4. Design studies, including Noise and/or Traffic; and alternatives analysis documentation.

Innovative Criterion

IN-01: Innovative Criterion Information.....IN-01

Innovative Criterion

IN-01: Innovative Criterion Information.....IN-01

XX-IN-##: [Insert Title Here]

points

Goal: [Provide the goal of the criterion. Describe the overall intent of the criterion in a statement that reflects the larger concept.]

Sustainability Linkage

[Describe why this innovative criterion achieves a sustainable result by describing how it affects the triple bottom line principles (Social, Environmental, and Economic). Only benefits considered primary and secondary are described; tertiary and other ancillary benefits may be evident but are not included in this description.]



Affected Triple Bottom Line Principles

- ☐ Environmental
- ☐ Social
- ☐ Economic

Background and Scoring Requirements

Innovative Criteria Rules and Disclaimers

[This section describes a few basic requirements/rules that apply to innovative criteria; delete from the final criterion write-up.]

1. Only one topic is allowed per innovative criterion.
2. No sub-requirement scoring is allowed for innovative criteria.
3. Points assigned to innovative criteria must be a whole number, no fractions of points may be used.
4. Table XX-IN-##.A shows the maximum points per innovative criterion, the maximum innovative criteria allowed per scorecard, and the maximum cumulative points for all innovative criteria for a given scorecard. For example, a PD scorecard may have one three-point innovative criterion or it may have three one-point innovative criteria, or one two-point criterion and one one-point criterion. However, whichever combination of innovative criteria are used, the total of the innovative criteria may not exceed 3 points.

Table XX-IN-##.A Maximum Points and Innovative Criteria per Scorecard

	SPR Module	SPS Module	PD Module	OM Module
Max. Points/Innovation	5	5	3	5
Max. Innovations/Scorecard	3	3	3	3
Max. Points/All Innovations	10	10	6	10

5. With the submittal of an innovative criterion, FHWA reserves the right to:
 - a. Share your criterion on the INVEST website. (The agency name will be shared, but name and contact information of the person who submitted the criterion will NOT be shared on the website)
 - b. Elect to review and provide feedback on your criterion, but is not obligated to do so.
 - c. Adopt any or all of the innovative criterion into future versions of INVEST.
6. While use of the INVEST website is private, and information about projects/programs and scores is not available to FHWA or other users, if a user selects to submit an innovative criterion, the information provided within that submittal is not considered private. The purpose of this is to ensure that points received for

innovations are carefully considered by users and to provide a “forum” for innovative ideas and methods to be shared among transportation practitioners. The scoring for the remainder of the project/program stays private; only the information pertaining to the innovative criterion is shared. Users can choose to share the scoring for their project/program, if desired, through the submittal of a case study or criterion example; go to FHWA’s [Case Studies webpage](#)³ for more information.

Criterion Template Directions

[Narrative instructions to the user are shown in square brackets throughout this document. They should be deleted in the final criterion.]

[This section provides directions for completing this template; delete from the final criterion write-up.]

1. Download this criterion template from FHWA’s [INVEST Innovative Criteria webpage](#)¹ to aid in writing and developing the innovative criterion. Follow the guidelines written within this template and adhere to the format provided. Use the existing INVEST criterion for examples of formatting and numbering.
2. In the header at the top of this criterion, give the criterion a **Criterion Identifier** and **Title**. The identifier should follow the format XX-IN-##. With XX specifying the module in which the criterion is being proposed (PD, OM, SPS, or SPR); IN for “innovative”; and ## serving as the sequential numbering of innovative criteria for your program or project. For example, if a project is being evaluated has two innovative criteria, their criterion identifiers would be PD-IN-01 and PD-IN-02. See number 6 for guidance on the number of innovative criteria and maximum points permitted per module and type of scorecard.
3. Fill in the **Goal** section by answering the question, “what is goal of this criterion as it relates to transportation projects and sustainability?”
4. Fill in the **Sustainability Linkage** section by describing how the innovation is sustainable.
5. Under the Graphic labelled, “**Affected Triple Bottom Line Principles**”, put a check mark in the primary and secondary principles affected by this innovation. This should clearly match the Sustainability Linkage text. Once submitted and accepted, FHWA will update the graphic as appropriate.
6. In the **Background** section:
 - a. List any related INVEST criteria.
 - b. Define any key or technical terms that may be unknown or ambiguous to a transportation professional or that may require a more precise definition with respect to the innovative criterion.
 - c. Describe the applicable regulations, standards and conventions that apply to the criterion and specifically state how this innovation meets the above and beyond requirement.
 - d. Include a description of information relevant to all of the requirements or information that will help transportation professionals understand the scoring requirements.
 - e. Mention any resources and how they are useful in this section.
7. In the **Scoring Requirements** section:
 - a. Only one scoring requirement may be used per innovative criterion proposed.
 - b. Clearly title the requirement using a present tense verb plus short description, e.g. Install Wind Powered Luminaire.

- c. Assign a number of points to the innovation. Use the existing INVEST criteria for reference. The number of points achieved should be representative of the sustainability impact and duration of the best practice (not the effort, cost, or uniqueness of the best practice).
 - d. Describe the requirement completely, clearly, and concisely. Make sure the description helps clarify how the innovation is different from existing INVEST criterion and how the “above and beyond” requirement is to be met.
 - e. Add a table of any data necessary.
8. Summarize referenced and additional resources in the **Resources** section. Within the text refer to the Publisher (or author), hyperlink and italicize the title of the document or hyperlink a website resourced, show a date of publication in parenthesis and include the URL to the document, if available. Insert a superscript number after the title and use that numbering in the Resources section below. The numbering of resources shall be sequential within the criterion. Refer to existing INVEST criterion for format.
 9. In the **Scoring Sources** section, list places where the reviewer can look to determine if the innovative criterion has been met.
 10. When the criterion or all innovative criteria are complete for the project or program being evaluated, go to FHWA’s [INVEST Innovative Criteria Submittal webpage](#)² to submit the innovative criterion/criteria to FHWA. All innovative criteria for a project/program should be submitted together. The submittal page includes information necessary for submittal, this includes key information about the innovative criterion needed for scoring, the project/program name, the name and contact information of the person submitting the criterion/criteria, and the name and contact information of the agency or organization submitting the criterion/criteria. The name and contact information of the person submitting the criterion/criteria will not be published on the website.
 11. Once the innovative criteria for a project have been submitted along with the required submittal information, the points for the innovative criteria will be added to the applicable program/project score and the innovative criteria will be available to view on the program/project scorecard page. Periodically, FHWA will review the innovative criteria submitted and may choose to publish them on the website.

Background

[This section describes the background of the innovative criterion; replace with text specific to the innovation proposed.]

This criterion is related to the following INVEST criteria:

- SPR-01: Integrated Planning: Land Use and Economic Development (Regional)
- SPS-01: Integrated Planning: Land Use and Economic Development (State)
- PD-01: Economic Analysis
- OM-01: Internal Sustainability Plan

For the purpose of this criterion, the key terms are defined as follows:

- **“Above and Beyond”** refers to best practices that are in addition to what is typically required by standard or regulation, or by conventional practice for similar projects.
- **“Best Practices”** are sustainable techniques, methods, practice, processes, or materials.

- **“Emerging Technology”** is a best practice that has not yet been tested and proven effective or feasible for wide-spread adoption or application.
- **“Innovative”** refers to a new and unique method, practice, or solution that is not already addressed in INVEST. If the points earned by employing the best practice can earn points elsewhere within the existing INVEST criteria, this does not satisfy the definition of “innovative.”
- **“Sustainable”** means contributing to one or more of the triple bottom line principles.

A Best Practice selected to be submitted as an innovative criterion should be considered to be innovative or an emerging technology AND should also be “above and beyond” regulations, standards and conventional practice. Many criteria within INVEST are results-based, meaning the results are measured rather than the method itself. This is intentional as to allow practitioners ample leeway for obtaining sustainable results. Keep this in mind when determining whether a best practice is indeed innovative.

Scoring Requirements

[This section describes the scoring requirements of the innovative criterion; replace with text specific to the innovation proposed.]

Requirement XX-IN-##.1

points. Description of Scoring Requirement

[Describe the requirement.][Insert relevant tables using the following format. Tables should be labelled Table XX-IN-##.1.A, where A is a single letter designating the table, assigned sequentially from A to Z.]

Table PD-IN-01.1.A Clear and Concise Table Description

	Column Header 1*	Column Header 2	Column Header 3	Column Header 4
Row Descriptor 1	Data	Data	Data	Data
Row Descriptor 2	Data	Data	Data	Data

* Footnote any relevant information below the table. A second table within this requirement should be given the table identifier of “Table PD-IN-01.1.B.”

Resources

[This section provides a brief bibliography of resources referenced or relevant to the innovative criterion; replace with text specific to the innovation proposed.]

Above-Referenced Resources

The following resources are referenced in this criterion and consolidated here:

1. FHWA, INVEST Innovative Criteria webpage, <http://www.sustainablehighways.org/innovative>
2. FHWA, Life-Cycle Cost Analysis Primer (2002), <http://isddc.dot.gov/OLPFiles/FHWA/010621.pdf>

Additional Resources

The following resources provide information on this criterion topic in addition to the sources directly referenced:

3. FHWA, INVEST webpage, <http://www.sustainablehighways.org>

Scoring Sources

[This section indicates where an evaluator can look for information to score this innovative criterion; replace with text specific to the innovation proposed.]

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more of the following documentation sources (or equal where not available):

1. List possible documentation sources, such as calculations and reports.
2. Documentation of techniques and underlying assumptions.
3. Documentation that will validate the score selected for the criterion.

