NATIONAL ASPHALT PAVEMENT ASSOCIATION

EPD Program

for Asphalt Mixtures

Interim Guidance for Upstream Suppliers

Public Review Draft

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1. Introduction

1.1 Intended Audience

The intended audience of this document is manufacturers and distributors of ingredients that are used in asphalt mixtures, including aggregates, asphalt binder, additives, and modifiers (collectively, "upstream suppliers"). The intended audience also includes trade associations, life cycle assessment (LCA) consultants, environmental product declaration (EPD) program operators associated with upstream suppliers, and government agencies who interact with and use EPDs for asphalt mixtures. This guidance may also be useful to suppliers of other materials used during construction and maintenance of asphalt pavements, including tack coats, geotextiles, and pavement preservation products, as a resource to enhance consistency across the entire family of asphalt-related materials.

1.2 Purpose and Scope

National Asphalt Pavement Association (NAPA)[1], as a program operator, is responsible for ensuring completeness and consistency in asphalt mixture EPDs. To this end, the availability of complete and consistent upstream life cycle inventory (LCI) data is a critical component of the EPD program for asphalt mixtures. Upstream LCI data can include product-specific EPDs, facility-specific EPDs, industry average EPDs, or publicly available LCAs that have been published to the United States Life Cycle Inventory (USLCI) through the Federal LCA Commons. The purpose of this guidance document is to summarize the minimum requirements and explain additional recommendations for upstream suppliers to prepare these datasets for inclusion in asphalt mixture EPDs. This will help align the efforts of upstream suppliers to develop high quality, transparent, and consistent upstream LCI datasets, thereby improving the quality, consistency, and comparability of asphalt mixture EPDs.

Demonstrating the need for improved upstream datasets, Section 60112 of the Inflation Reduction Act emphasizes "the development, enhanced standardization and transparency, and reporting criteria for environmental product declarations." With agencies and other stakeholders increasingly focused on EPD data quality, this guidance will help upstream suppliers create value by filling data gaps and enhancing the availability of product-specific and facility-specific upstream data for asphalt mixtures. Filling upstream data gaps and improving the quality of upstream datasets will address some (but not all) of the EPD comparability requirements specified in Section 6.7.2 of ISO 14025 and Section 5.5 of ISO 21930. Failure to adhere to these guidelines will erode trust in EPDs for asphalt mixtures and may affect the marketability of upstream suppliers' products as pavement owners develop and refine policies related to EPDs and embodied carbon.

While adherence to this guidance is voluntary at this time, upstream suppliers should anticipate that future versions of the PCR for Asphalt Mixtures will incorporate this guidance, either in its entirety or elements of it, as requirements.

Upstream data may be obtained from LCAs, EPDs that comply with a subcategory Product Category Rule (PCR), and/or EPDs that comply with a core PCR. This guidance applies to all three of these data types.

[1] https://www.asphaltpavement.org/

1.3 Background

The Product Category Rules (PCR) for Asphalt Mixtures establishes the requirements for developing EPDs for asphalt mixtures. Annex 1 of the PCR for Asphalt Mixtures specifies the upstream datasets that must be used to quantify the environmental impacts associated with manufacturing raw materials. Many of the asphalt mixture additives and asphalt binder additives listed in Annex 1 are noted as data gaps. To address these data gaps, there is a need for asphalt additive manufacturers to develop LCAs and EPDs for their products, which can then be used as upstream data for EPDs for asphalt mixtures.

The American Center for Life Cycle Assessment (ACLCA) PCR Guidance – Process and Methods Toolkit[2] provides a framework for developing and evaluating PCRs to reliably inform design and procurement decisions. The ACLCA PCR Guidance was published after the most recent revision to the PCR for Asphalt Mixtures, but we intend to align future revisions to the ACLCA PCR Guidance. Likewise, NAPA encourages all upstream suppliers to review the ACLCA PCR Guidance. When other PCRs for materials within the asphalt mixture value chain (asphalt binder, aggregates, additives, etc.) are being developed or revised, we encourage program operators and other stakeholders to achieve the "Data Source" level of PCR conformance established in the ACLCA PCR Guidance. At a minimum, the "Procurement" level of PCR conformance should be achieved. Additional requirements and guidance that are specific to the asphalt mixture product family are provided in Sections 2, 3, and 4 of this guidance.

NAPA's Emerald Eco-Label EPD Program is a web-based software tool that allows asphalt mix producers to easily and cost effectively develop facility-specific EPDs for asphalt mixtures (note – by definition, facility-specific EPDs are also product-specific). The Emerald Eco-Label software has been independently verified to conform to PCR for Asphalt Mixtures. When new upstream datasets become available, either in the form of LCAs or EPDs, those datasets must be integrated into the Emerald Eco-Label software. Information about integrating upstream datasets into the Emerald Eco-Label software is provided in Section 5 of this document.

2. General Data Requirements and Recommendations

2.1 What type of data are allowed?

Section 7.1.9.2 of the PCR for Asphalt Mixtures establishes the prioritization of data for upstream processes.

The first priority is valid facility-specific and product-specific EPDs with impact categories modeled according to TRACI 2.1 for the specific inputs associated with the EPD.

The second priority is either of the following:

- Valid industry average EPDs with impact categories modeled according to TRACI 2.1 as prescribed in Annex 1 of the PCR for Asphalt Mixtures.
- Freely available public datasets as prescribed in Annex 1, including critically reviewed LCA studies that are compliant with ISO 14040/14044 that have been published to the USLCI.

[2] https://aclca.org/pcr/

The prioritization scheme for upstream data provides three choices for upstream suppliers who would like to integrate their data into EPDs for asphalt mixtures:

1. Develop and publish a facility-specific EPD or product-specific EPD and then work with NAPA to integrate the data into the Emerald Eco-Label software.
2. Collaborate with other manufacturers to develop and publish an industry average EPD, then work with NAPA to add the industry average EPD to Annex 1 of the PCR for Asphalt Mixtures and integrate the data into the Emerald Eco-Label software.
3. Develop and publish (either individually or in collaboration with other manufacturers) a critically reviewed LCA study, publish the LCA dataset to the USLCI through the Federal LCA Commons, ensure that the third-party LCA report is publicly available, and work with NAPA to add the LCA to Annex 1 of the PCR for Asphalt Mixtures and integrate the data into the Emerald Eco-Label software.

2.2 What is the difference between a product-specific EPD and a facility-specific EPD?

A product-specific EPD is one that represents the impacts for a specific product and manufacturer across multiple facilities. A facility-specific EPD is a product-specific EPD in which the environmental impacts can be attributed to a single manufacturer and manufacturing facility. These terms are defined in Section 3.9 of the PCR for Asphalt Mixtures.

2.3 How to decide whether to develop a facility-specific EPD, a product-specific EPD, an industry average EPD, or an LCA?

Each company will need to decide which data type is most appropriate for their situation.

Upstream suppliers should consider the notion that NAPA, regulatory agencies, and purchasers want accurate data to avoid unintended consequences in developing procurement policies and quantifying greenhouse gas (GHG) emissions. Fundamentally, accuracy is critical in the decision-making process and benefits everyone, whether that means filling data gaps or providing facility-specific or product-specific data in place of industry average data. Moreover, EPA's Interim Determination for Low Embodied Carbon Material procurement gives a preference for facility-specific EPDs and EPDs that incorporate supply chain-specific data.[3]

2.3.1 Facility-specific EPDs and product-specific EPDs

Facility-specific EPDs are the preferred data types because they allow differentiation between products with distinct manufacturing processes, input ingredients, and supply chains when compared to industry average data. Product-specific EPDs also allow differentiation between individual manufacturers' products and industry average data but incorporate more variability than facility-specific EPDs.

With additives, it's often the case that there are not enough manufacturers that utilize sufficiently similar ingredients and manufacturing processes to develop an industry average dataset. For example, recycling agents are produced by numerous manufacturers, but they can be comprised of different basic chemistries including petroleum, tall oil, and vegetable oil. Even when the chemical composition is

[3] https://www.epa.gov/system/files/documents/2023-01/2022.12.22%20Interim%20Determination%20on%20Low%20Carbon%20Materials%20under%20IRA%2060503%20and%2060506_508.pdf

similar, supply chain impacts can vary significantly when accounting for the environmental impacts of upstream supply chains, such as forestry or agricultural activities, since these upstream activities can affect parameters like biogenic carbon and GHG emissions associated with land use and land use change. Industry averages may not be appropriate when the environmental impacts for different products are significantly different.

In some cases, a manufacturer may choose to develop a facility-specific or product-specific EPD even when an industry average EPD is available to differentiate their product from the industry average. There are two primary advantages of providing a facility-specific or product-specific EPD when industry average data are available:

- The improved accuracy of facility-specific EPDs and product-specific EPDs relative to industry averages, and
- The ability to differentiate EPDs for asphalt mixtures that incorporate facility-specific or product-specific upstream datasets from EPDs for asphalt mixtures that are based on generic or industry average datasets.

NAPA, regulatory agencies, and purchasers want accurate data to avoid unintended consequences in developing procurement policies and quantifying embodied carbon emissions. To this end, there is a growing movement to disincentivize the use of generic or industry average data by requiring facility-specific and product-specific upstream datasets. Uncertainty adjustments and other statistical approaches are being considered by some agencies to encourage higher quality data. These data adjustment approaches, if employed, are intended to provide an incentive for upstream suppliers to develop and publish facility-specific and product-specific datasets even when the embodied carbon emissions exceed the industry average (50th percentile) values. An example of a facility-specific EPD for an asphalt mixture ingredient is Surface Tech Ace XP.

2.3.2 Industry average LCAs and EPDs

Industry average LCAs and EPDs are generally less expensive to develop than facility-specific EPDs or product-specific EPDs because a group of manufacturers will typically share the cost of developing these datasets. One tradeoff with this approach is the potential for increased uncertainty when using generic or industry average data when compared to facility-specific or product-specific upstream datasets.

In many cases, the simplest and lowest-cost approach is to develop a critically reviewed LCA and publish it to the USLCI through the Federal LCA Commons. This approach is appropriate for products that are produced by multiple manufacturers with generally similar manufacturing processes, input ingredients, and supply chains. Participating manufacturers will often share the costs of developing the LCA. The LCA consultant typically signs a non-disclosure agreement (NDA) with each participant to ensure confidentiality of each company's trade secrets. The results are aggregated and published as an average. An example of this data type for an asphalt mixture ingredient is the industry-wide LCA of Asphalt Binder.[4]

An industry average EPD (sometimes referred to as an industry-wide EPD) meets additional requirements for EPDs as defined in ISO 21930 and the applicable subcategory PCR. Because industry

[4] https://www.asphaltinstitute.org/engineering/sustainability/life-cycle-assessment-of-asphalt-binder/

average EPDs follow a PCR, they are often shorter and employ a more consistent format than LCA reports. Also, NAPA does not require EPDs to be published to the USLCI. An example of this data type for an asphalt mixture ingredient is the Industry Wide EPD for Portland Cement.[5] (Note that portland cement is used in some states as an alternative to hydrated lime as an antistripping agent, and stone matrix asphalt (SMA) mixes sometimes use portland cement as a mineral filler).

2.4 Which life cycle stages need to be included?

Datasets for upstream materials should include the cradle-to-gate life cycle stages (information modules A1-A3 per Figure 1). No additional life cycle stages are required. In some cases, cradle-to-gate EPDs have to report biogenic carbon emissions in subsequent life cycle stages when such emissions are expected to occur (see the section on Biogenic Carbon for more information).

The cradle-to-gate scope of asphalt mixture EPDs can be appropriate for comparing asphalt mixtures that meet the same agency specifications, implying that performance of the mixtures is equivalent. EPDs for asphalt mixtures with different expected performance characteristics can only be compared by using the EPD as a data source in a more holistic LCA that includes the relevant life cycle stages.

Construction Works Assessment Information														
Construction Works Life Cycle Information Within the System Boundary														Optional supplementary information beyond the system boundary
A1-A3			A4-A5		B1-B7					C1-C4				D
Production Stage			Construction Stage		Use Stage					End-Of-Life Stage				
A1	A2	A3	A4	A5	B1	B2	B3	B4[a]	B5	C1	C2	C3	C4	
Extractional upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance (incl. production, transport, and disposal of necessary materials)	Repair (incl. production, transport, and disposal of necessary materials)	Replacement (incl. Production, transport, and disposal of necessary materials)	Refurbishment (incl. Production, transport, and disposal of necessary materials)	Deconstruction / Demolition	Transport to waste processing or disposal	Waste processing	Disposal of waste	Potential net benefits from reuse, recycling, and/or energy recovery beyond the system boundary
			Scenario	*Scenario*	*Scenario*	*Scenario*	*Scenario*	*Scenario*	*Scenario*	*Scenario*	*Scenario*	*Scenario*	*Scenario*	*Scenario*
					B6 Operational Energy Use *Scenario*									
					B7 Operational Water Use *Scenario*									

[a] Replacement information module (B4) not applicable at the product level

Figure 1. Life cycle stages and their information modules as defined in ISO 21930.

The location of the "gate" defined in an EPD or LCA should be clearly stated to ensure the transportation distance from the material supplier to the asphalt mix plant can be accurately calculated. If the gate is defined as the manufacturing facility, but manufacturers tend to ship products to a distribution warehouse prior to delivery to the asphalt mix plant, manufacturers should provide sufficient

[5] https://www.cement.org/sustainability/pcr-epds

information for their customers to determine the total transport distance and mode(s) from the "gate" to the asphalt plant.

In general, NAPA recommends that upstream manufacturers define the gate at the last point where the manufacturer has possession of the product (e.g., at the distribution warehouse) when possible and appropriate. Doing so would simplify transport distance calculations for asphalt mix producers, who are responsible for determining upstream transportation distances and modes for asphalt mixture ingredients. Clear communication regarding the location of the upstream supplier's gate will reduce the potential for errors like double-counting and omissions related to transportation impacts from the upstream supplier's gate to the asphalt plant.

2.5 Which impact indicators, resource use indicators, and waste indicators need to be included?

The LCA-based data in an EPD include a combination of environmental impact indicators and resource use indicators. The environmental impact indicators (Table 1) help reduce the number of parameters reported in an EPD. For example, emissions of carbon dioxide, methane, nitrous oxide, and other compounds are consolidated into a single parameter: the 100-year global warming potential (GWP-100), reported in units of kg CO_2 eq. Additional information about emissions and removals of carbon are provided for transparency (Table 2). The resource use and waste indicators (Tables 3 and 4, respectively) provide information about flows of energy, materials, and waste into and out of the product system.

In general, all indicators should be listed in the EPD or LCA, even if the contribution is zero. Zero is more meaningful than omitting the indicator altogether. If a parameter was not calculated due to a lack of available data or other reasons, this should be indicated.

Table 1. Environmental Impact Indicators

Acronym	Description	Units
GWP-100	100-yr Global warming potential, including biogenic carbon	kg CO_2 eq
ODP	Ozone depletion potential	kg CFC-11 eq
EP	Eutrophication potential	kg N eq
AP	Acidification potential	kg SO_2 eq
POCP	Photochemical oxidant creation potential (smog)	kg O_3 eq

Table 2. Additional Indicators Describing Emissions and Removals of Carbon

Acronym	Description	Units
GHG_{LUC}	GHG emissions from land use change	kg CO_2 eq
BCPR	Biogenic carbon removals associated with biogenic carbon content contained within bio-based products	kg CO_2
BCPE	Biogenic carbon emissions associated with biogenic carbon content contained within bio-based products	kg CO_2
BCKR	Biogenic carbon removals associated with biogenic carbon content with bio-based packaging	kg CO_2
BCKE	Biogenic carbon emissions associated with biogenic carbon content within bio-based packaging	kg CO_2

BCWR	Biogenic carbon emissions from combustion of waste from renewable resources used in production processes	kg CO_2
BCWN	Carbon emissions from combustion of waste from non-renewable resources used in production processes	kg CO_2
CCAL	Carbon emissions from calcination	kg CO_2
CCAR	Carbon emissions from carbonation	kg CO_2

Table 3. Resource Use Indicators

Acronym	Description	Units
RPR_E	Renewable primary resources used as an energy carrier (fuel)	MJ
RPR_M	Renewable primary resources used with energy content as material	MJ
$NRPR_E$	Non-renewable primary resources used as an energy carrier (fuel)	MJ
$NRPR_M$	Non-renewable primary resources with energy content used as material	MJ
SM	Secondary materials	Kg
RSF	Renewable secondary fuels	MJ
NRSF	Non-renewable secondary fuels	MJ
RE	Recovered energy	MJ
FW	Consumption of fresh water	m^3
ADP_{fossil}	Abiotic depletion potential for fossil resources	MJ

Table 4. Waste Categories and Output Flows

Acronym	Description	Units
Waste Categories		
HWD	Hazardous waste disposed	kg
NHWD	Non-hazardous waste disposed	kg
RWD-HL	High-level radioactive waste disposed	kg
RWD-LL	Intermediate- and low-level radioactive waste disposed	kg
Other Material Flows		
CRU	Components for reuse	kg
MFR	Materials for recycling	kg
MFER	Materials for energy recovery	kg
REE	Recovered energy exported from the product system	MJ

2.6 Which LCIA characterization methodology should be used?

The life cycle impact assessment (LCIA) is the stage of the LCA in which the data for individual emissions are reduced into environmental impact indicators. Developed by the U.S. Environmental Protection Agency, the Tool for Reduction and Assessment of Chemicals and Other Environmental Impacts (TRACI) version 2.1 is the default standard in North America.[6] CML, developed by the Center for Environmental

[6] https://www.epa.gov/chemical-research/tool-reduction-and-assessment-chemicals-and-other-environmental-impacts-traci

Science at Leiden University, is the default standard in Europe.[7] The TRACI 2.1 methodology *must* be used for the impact indicators in Table 1 as well as GHG_{LUC} to ensure consistency with the PCR for Asphalt Mixtures.

2.7 Which upstream datasets should be used?

As specified in section 7.1.9.2 of the PCR for Asphalt Mixtures, upstream suppliers are *strongly encouraged* to use the upstream datasets specified in Annex 1 of the PCR for Asphalt Mixtures for common energy and material inputs and transportation processes to ensure consistency throughout the supply chain for U.S. operations. This will help ensure consistency across the value chain of asphalt mixtures, enhancing the comparability of EPDs for asphalt mixtures. The datasets specified in Annex 1 are consistent with the 2022 ACLCA PCR Guidance – Process and Methods Toolkit. Materials that are manufactured outside of the United States, and ingredients that are not provided in Annex 1, should use the appropriate upstream datasets. LCA practitioners should review the background (secondary) data requirements and guidelines provided in the 2022 ACLCA PCR Guidance – Process and Methods Toolkit, including the Guidance for Assessing Data Quality of Background Life Cycle Inventory (LCI) Datasets.[8]

Although not required by ISO standards, EPDs should indicate which upstream datasets were used in the development of the EPD, including the name and version of the background database and the platform from which the data were accessed. (Note: ISO 14044 requires third-party LCA reports to disclose sources of published literature, which includes upstream datasets). An example of how to disclose this information in an EPD is provided in Figure 2. Disclosure helps identify potential inconsistencies between upstream datasets and areas where future standardization may be necessary. If not included in the EPD, manufacturers should be prepared to share this information directly with NAPA. NAPA reserves the right to not utilize EPDs and LCAs when the upstream datasets cannot be identified with reasonable certainty.

[7] https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors
[8] https://aclca.org/pcr/

Table 7. *The LCI datasets from the Ecoinvent v3.7.1 (2020) database used to model the product system for the ACE XP™ product.*

Flow	Dataset
A1. Raw Materials*	
Sasobit® Wax	petroleum slack wax production, petroleum refinery operation | petroleum slack wax | Cutoff, U - ZA
A2. Transport	
Truck Transport	market for transport, freight, lorry 16-32 metric ton, EURO5 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U - RER
Ship Transport	transport, freight, sea, container ship | transport, freight, sea, container ship | Cutoff, U - GLO
A3. Manufacturing	
Electricity	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U (US RFC, EIA 2019) - US-RFC
Natural Gas	heat production, natural gas, at boiler modulating >100kW | heat, district or industrial, natural gas | Cutoff, U - Europe without Switzerland
Waste Transport	market for transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U - RER
A3. Product Packaging	
Polyethylene Bags & Wrap	market for packaging film, low density polyethylene | packaging film, low density polyethylene | Cutoff, U - GLO
Polyester Strapping	market for fibre, polyester | fibre, polyester | Cutoff, U - GLO
Corrugated Boxes	corrugated board box production | corrugated board box | Cutoff, U - RoW
HDPE Pallet	polyethylene production, high density, granulate | polyethylene, high density, granulate | Cutoff, U - RER
A3. Waste Treatment	
Water Discharge	market for wastewater, unpolluted | wastewater, unpolluted | Cutoff, U - CH

*Note that the production of the aramid fiber used as a raw material was not modeled. Instead, the impact results from the production of the aramid fiber were provided by Teijin, whom calculated these results using the impact methods required by the PCR

Figure 2. Example of how to disclose upstream datasets in an EPD. From Table 7 of the EPD for AceXP™ developed by Surface Tech LLC.

2.8 Which allocation and subdivision methodologies should be used, and how should they be documented?

Most industrial processes produce multiple co-products, either through a joint co-production process, a sequential co-production process, or separate production lines. Procedures for allocating and subdividing inputs and outputs to co-products are provided in Sections 7.2.3 through 7.2.6 of ISO 21930. In particular, Section 7.2.5 of ISO 21930 is intended to augment the allocation procedures provided in Section 4.3.4 of ISO 14044. We *strongly recommend* that all upstream EPDs and LCAs follow the allocation procedures set forth in ISO 21930, even when ISO 21930 does not apply (e.g., when an ISO 14044-compliant LCA is being conducted).

For transparency, EPDs and third party LCA reports should disclose the allocation and subdivision methodologies that were used. This will help identify potential inconsistencies between upstream datasets and areas where future standardization may be necessary. An example of how to disclose allocation and subdivision methodologies is provided in Figure 3.

Table 2-3: Proposed and scenario allocation/subdivision methodologies

Input or Output	Proposed baseline methodology	Allocation Scenario 1	Allocation Scenario 2	Allocation Scenario 3
Electricity	Mass allocation	*(no other method deemed applicable)*		
Crude oil	Energy content allocation (net calorific value)	Mass allocation	*(Same as baseline)*	Mass allocation
Thermal energy	Subdivision calculated as sensible heat of asphalt, accounting for inefficiencies	*(Same as baseline)*	Energy content of allocation (using net calorific value)	Energy content of allocation (using net calorific value)
Direct emissions	Allocated based on thermal energy use	*(Same as baseline)*	Energy content of allocation (using net calorific value)	Energy content of allocation (using net calorific value)

Figure 3. Example of how to disclose allocation and subdivision methodologies. From Table 2-3 of the Life Cycle Assessment of Asphalt Binder, published by the Asphalt Institute.

2.9 How should biogenic carbon and other carbon removals and emissions be accounted for?

To enhance transparency, ISO 21930 requires removals and emissions of GHG emissions associated with various processes to be accounted for separately when these removals and emissions are included in the GWP calculation. These processes include:

- biogenic carbon in products and packaging,
- GHG emissions associated with land use change,
- calcination,
- carbonation, and
- combustion of waste from renewable and non-renewable sources.

While separately reporting these carbon flows is not required for LCAs under ISO 14040/14044, NAPA *strongly recommends* that LCAs report the indicators listed in Table 2 of this document if they are included in the calculation of GWP (see Sections 7.2.7, 7.2.8, 7.2.11, and 7.2.12 of ISO 21930 for more information). Additionally, EPDs and LCAs should clearly state whether these processes are accounted for in the calculation of GWP.

For GHG emissions associated with land use change, disclose the methodology for quantifying carbon flows into and out of the product system. This will allow us to understand whether and to what extent this parameter may affect comparability of EPDs for asphalt mixtures that include ingredients derived from bio-based materials and biofuels.

Biogenic carbon is the carbon content of bio-based materials derived from renewable resources. As described in Section 7.2.7 of ISO 21930, upstream suppliers should assign a biogenic carbon flow of -1 kg CO_2e/kg CO_2 of biogenic carbon, since this represents a removal of carbon in the carbon cycle of bio-

based materials. For wood-based products, this negative flow of biogenic carbon can only be included when the wood originates from sustainably managed forests, as provided for in ISO 21930. If the bio-based material is subsequently converted to emissions of CO_2 or CH_4 through combustion or biodegradation (for example, through combustion of biofuels or decomposition of biobased packaging in a landfill), the emissions should be characterized as +1 kg CO_2e/kg CO_2 of biogenic carbon. When this emission occurs after the "gate" (for example in module A5 or C1-C4), it must be declared even when the scope of the study is cradle-to-gate.

3. Specific Requirements for EPDs

3.1 Verification

ISO 14025 requires EPDs to be independently verified but allows for the independent verification to be either internal or external. For example, an internal independent verifier would be someone who works for the firm who developed the EPD but was not directly involved in developing the LCA or the EPD and does not have other conflicts of interest. We *strongly recommend* the use of external (third-party) independent verifiers, and that the verifier has experience developing or reviewing LCAs and/or EPDs for construction materials in the United States.

3.2 Required PCR for EPD Development

The PCR for Asphalt Mixtures is a subcategory PCR under the core PCR of ISO 21930. Therefore, EPDs provided by upstream suppliers must also comply with ISO 21930 coupled with this guidance, or an applicable subcategory PCR under ISO 21930. This will help ensure consistency and comparability throughout the value chain of asphalt mixtures.

Program operators should review new PCR revisions to existing subcategory PCRs for materials within the asphalt mixture value chain for conformance with the ACLCA PCR Guidance – Process Methods and Toolkit.[9] They should aim to achieve the "Data Source" level of PCR conformance established in the ACLCA PCR Guidance. At a minimum, the "Procurement" level of PCR conformance should be achieved.

NAPA will continue working with the program operators and key stakeholders of relevant subcategory PCRs to integrate appropriate elements of this guidance into those PCRs. Following is a summary of applicable subcategory PCRs that are currently available or under development.

3.2.1 Aggregates

The PCR for Construction Aggregates is operated by NSF International.[10] The existing PCR was set to expire in December 2022 but has been extended to December 31, 2023. The revised PCR should be used once it has been published.

3.2.2 Asphalt Binder

The Asphalt Institute is developing a PCR for Asphalt Binder, with Smart EPD as the program operator.[11] Asphalt binder refineries and terminals should follow the PCR for Asphalt Binder after it has been

[9] https://aclca.org/pcr/
[10] https://www.nsf.org/standards-development/product-category-rules
[11] https://smartepd.com/pcr-library

developed. In the meantime, asphalt binder EPDs should comply with ISO 21930, coupled with this guidance.

3.2.3 Additives and Modifiers

The Association of Modified Asphalt Producers (AMAP) is planning to develop a PCR for asphalt binder additives and modifiers. Additional PCRs may be necessary to cover the additives that are not included in the PCR under development by AMAP. In the meantime, manufacturers of asphalt additives and modifiers should follow ISO 21930, coupled with this guidance.

4. Specific Requirements for LCAs

4.1 Which standards apply?

LCAs should be conducted in accordance with ISO 14040/14044 and shall be critically reviewed by an independent third party. The critical review should be conducted in accordance with ISO 14071.

LCA data should be submitted to the USLCI through the Federal LCA Commons. Please contact NAPA prior to uploading your LCA to the Federal LCA Commons to streamline the process of adding the dataset to Annex 1 of the PCR for Asphalt Mixtures and integrating the data into the Emerald Eco-Label software. To upload data to the Federal LCA Commons, LCA consultants should consult with the data format and submittal process requirements in the USLCI Data Submission Handbook (https://github.com/uslci-admin/uslci-content/blob/dev/docs/submission_handbook/00-sub-handbook-landing.md).

4.2 Critical review

LCAs should be critically reviewed by an independent third party. Requirements and guidelines for critical review processes and reviewer competencies are provided in ISO 14044 and ISO/TS 14071. One way to demonstrate competency as an independent critical reviewer is through the ACLCA Certified Life Cycle Assessment Reviewer[12] (or comparable experience and expertise), coupled with experience in the domain of construction materials. Additionally, we *strongly recommend* that the independent third party has experience developing or reviewing LCAs and/or EPDs for construction materials in the United States to will help ensure that norms and conventions practiced in this industry are followed by the LCA practitioner, thereby improving consistency across upstream datasets.

4.3 Submittal and transparency requirements for LCAs

LCAs will require two separate data products:

1. A digital copy of the LCA data, submitted to the USLCI through the Federal LCA Commons.
2. A written third-party LCA report that meets the requirements in Section 5.2 of ISO 14044 and this guidance document.

ISO 14044 requires a third-party report to be made available when the results of the LCA are to be communicated to any other party. Since upstream datasets are intended to be incorporated into EPDs for asphalt mixtures, and since EPDs for asphalt mixtures are publicly available once they have been published, the third-party report should be publicly available. The third-party report includes

[12] https://aclca.org/clar-certification/

information such as the goal and scope of the study, allocation procedures, data validation, interpretation of results, the critical review statement, and other important parameters. However, elements of the third-party report may be redacted to protect confidential or proprietary information due to a competitive business environment or covered by intellectual property rights or similar legal restrictions.

5. How to integrate upstream data into the Emerald Eco-Label software

5.1 General requirements

To integrate new data or updates to existing datasets into the Emerald Eco-Label software, please contact NAPA by sending an email to epd@asphaltpavement.org to request a quote.

5.2 Requirements for industry average EPDs and LCAs

Industry-wide EPDs and LCAs that have been uploaded to the LCA Commons are specified in Annex 1 of the PCR. NAPA can assist upstream suppliers with updating Annex 1. Once Annex 1 is updated, NAPA will coordinate updates to the Emerald Eco-Label software and software verification, if necessary.

5.3 Requirements for facility- and product-specific EPDs

NAPA will coordinate updates to the Emerald Eco-Label software.