



Embodied Carbon and EPDs: How the Illinois Paving Industry Can Prepare for the Changing Policy Landscape

**Illinois Bituminous Paving
Conference**

December 5, 2023

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Pavements

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A new pair of shoes



Questions

- **68% of consumers are willing to pay a premium for sustainable products.**
 - Would I be willing to pay more for shoes with a lower carbon footprint?
 - Can I compare this pair of shoes to an industry average for athletic shoes?
 - What if the industry average was just for running shoes?
 - Do I need each competitor's data to make an informed decision?

<https://www.asics.com/us/en-us/mk/sustainability/carbonfootprint>

<https://pditechnologies.com/resources/report/2023-business-sustainability-index/>



Methodology of calculation for Carbon Footprint of Product



Version 1.1
ASICS Corporation
30th Nov, 2023

What is an EPD?

- **Environmental Product Declaration**
 - **Quantified** environmental information on the **life cycle** of a product to enable **comparisons** between products fulfilling the **same function***
- **Follows a standard methodology**
 - Product Category Rules (PCR)
- **Independently verified**



EPD “Nutrition” Label

Your Building Product

Amount per Unit

LCA IMPACT MEASURES	TOTAL
Primary Energy (MJ)	12.4
Global Warming Potential (kg CO ² eq)	0.96
Ozone Depletion (kg CFC- 11 eq)	1.80E-08
Acidification Potential (mol H ⁺ eq)	0.93
Eutrophication Potential (kg N ⁻ eq)	6.43E-04
Photo-Oxidant Creation Potential (kg O ₃ eq)	0.121

Your Product's Ingredients: Listed Here

<https://westcoastclimateforum.com/cfpt/concrete/strategy1>

*Source: ISO 14025:2006. EPDs from different Product Categories should NOT be compared to each other.

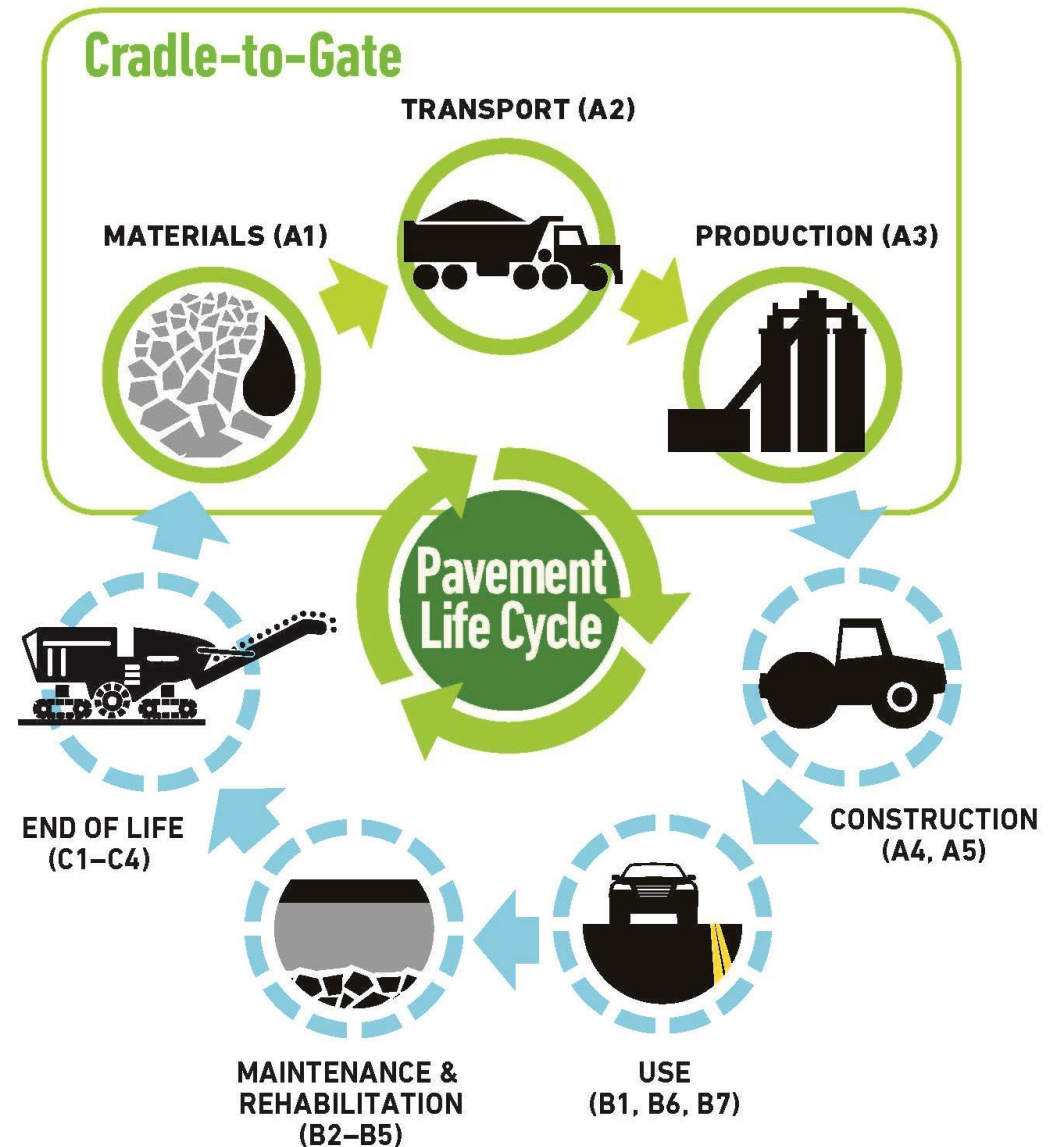
Life Cycle Assessment and EPDs

Cradle-To-Grave LCA

LCA  PAVE

EPDs

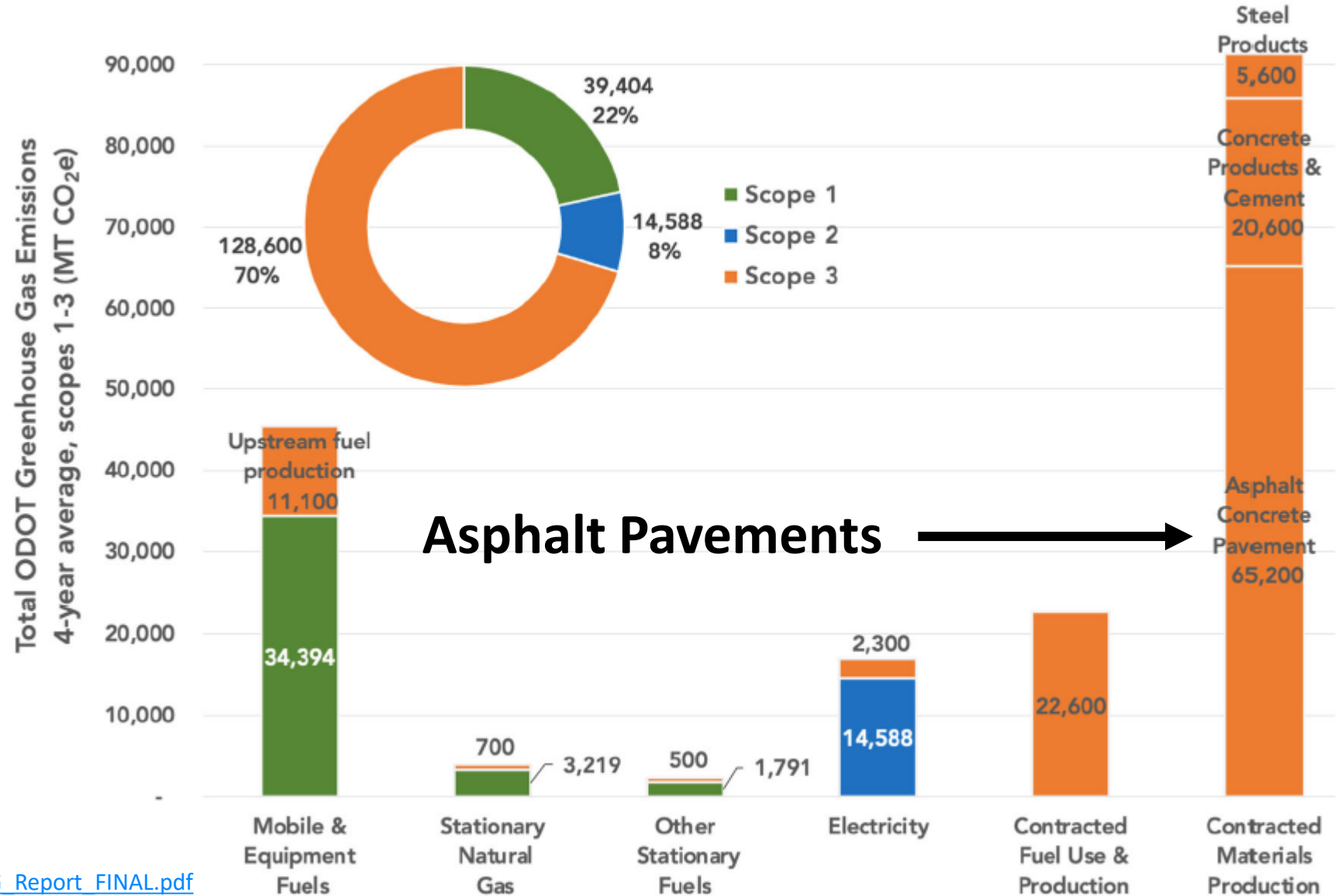
Emerald
ECO LABEL



The Rapidly Changing Policy Environment

Oregon DOT GHG Emissions Inventory (2016-2019 4-yr Average)

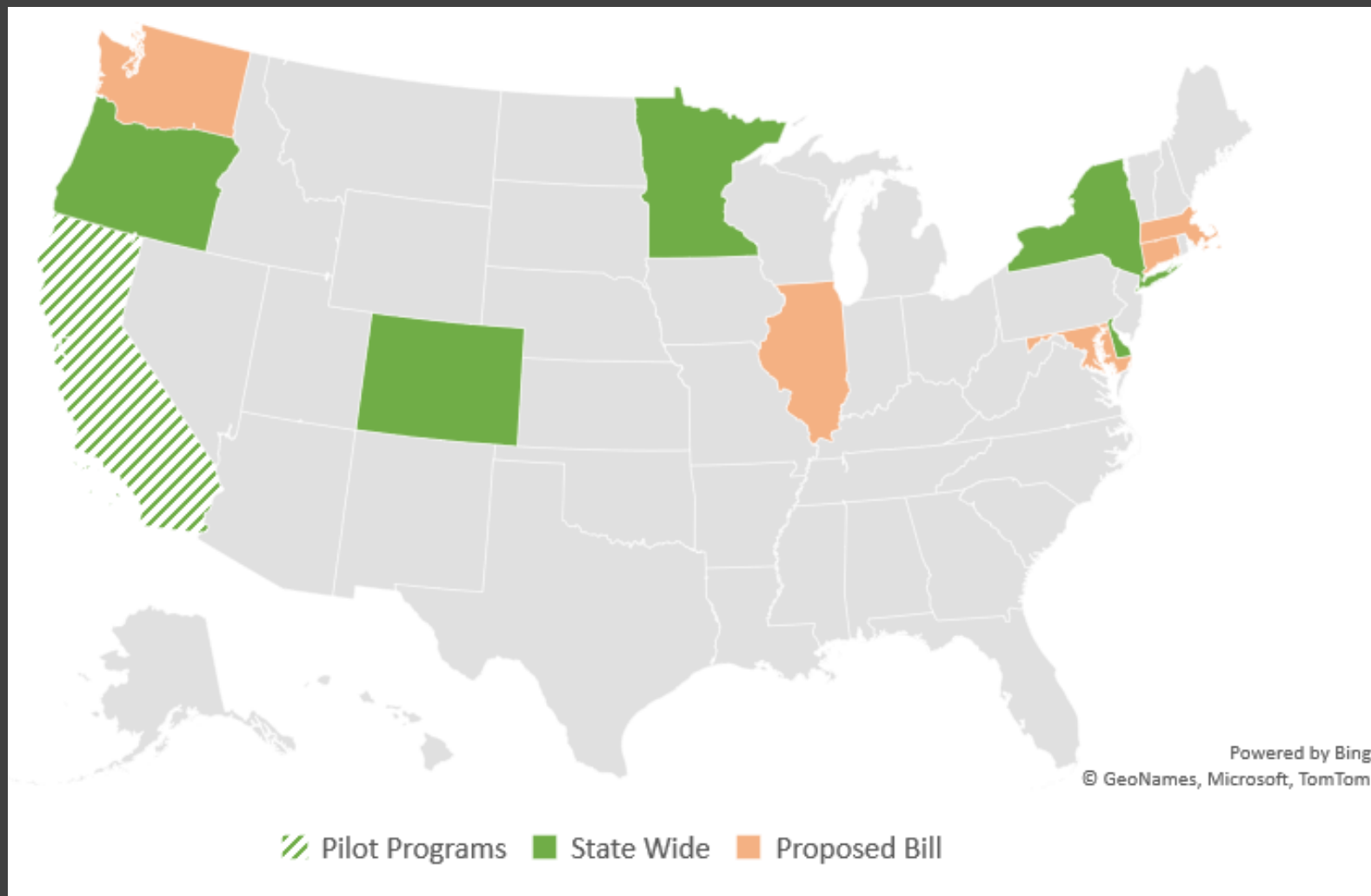
- Asphalt = 35% of ODOT Emissions



State Buy Clean Policies

General Policy Structure:

- Contractor submits EPDs to agency
- Policy options:
 - Go/No-Go
 - Incentives
 - Data collection only
- Agency develops global warming potential (GWP) limits for each mix type





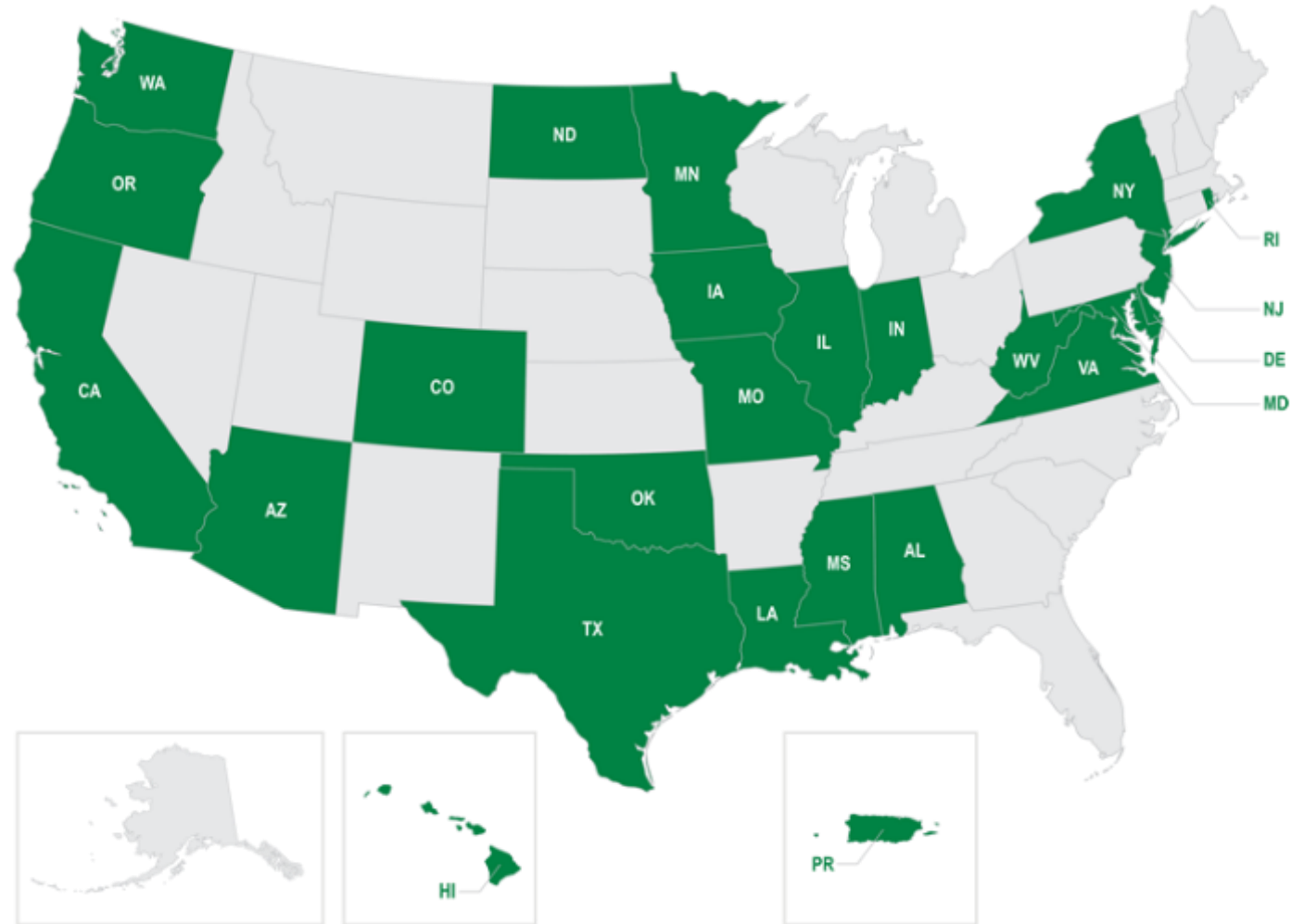
The White House Council on Environmental Quality

Federal Buy Clean Task Force

- Coordinating across 17 Federal agencies
 - 90% of federally financed and purchased construction materials
- U.S. DOT Buy Clean Policy Statement
 - Explore the use of EPDs
 - Develop a Buy Clean Policy based on EPDs

FHWA Climate Challenge

- **30+ proposals from 27 agencies (including 2 local agencies)**
 - Education, implementation, benchmarking, fundamental research projects
- **Providing technical and funding (\$7.1 million) assistance**





Inflation Reduction Act

EPA

- \$250 million to standardize EPDs and help industry develop EPDs
- \$100 million to develop “low-embodied carbon construction material labeling program”

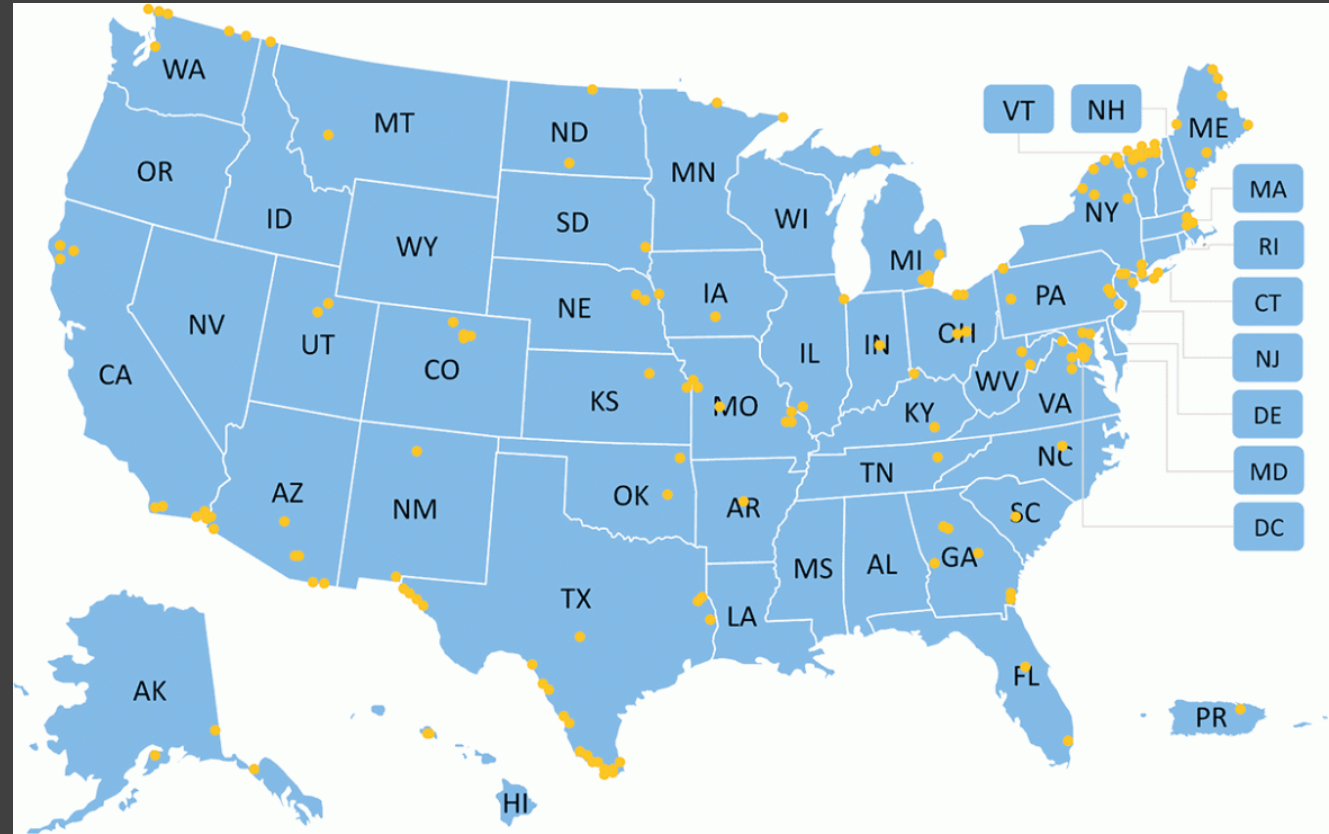
Low Carbon Construction Material Procurement

- **FHWA** – \$2 billion in grant funding to state, local, and federal agencies
- **GSA** – \$2.15 billion for federal building projects
- **FEMA** – Grants can include additional costs for low carbon materials



Low-Embodied Carbon Projects

- 150 projects valued at \$2 billion
- 1 asphalt project in IL
 - East St. Louis



<https://www.gsa.gov/real-estate/gsa-properties/inflation-reduction-act/lec-program-details/lowembodied-carbon-projects>





Inflation Reduction Act

EPA Interim Determination of Substantially Lower Embodied Carbon

- **Best performing 20%** of similar materials/products
 - If not available locally, then best performing 40%
 - If not available locally, then better than estimated industry average
 - **GSA and FHWA will define these thresholds** based on published EPDs
- Also, report **ENERGY STAR** Energy Performance Score (currently under development for asphalt plants)

<https://www.epa.gov/inflation-reduction-act/inflation-reduction-act-programs-fight-climate-change-reducing-embodied>



Low Carbon Material Pilot Program

- Federal office buildings, courthouses, and land ports of entry

GSA IRA Limits for Low Embodied Carbon Asphalt - May 16, 2023 (EPD-Reported GWPs, in kilograms of carbon dioxide equivalent per metric ton - kgCO ₂ e/ t)		
Top 20% Limit	Top 40% Limit	Better Than Average Limit
55.4	64.8	72.6

<https://www.gsa.gov/about-us/newsroom/news-releases/gsa-pilots-buy-clean-inflation-reduction-act-requirements-for-low-embodied-carbon-construction-materials-05162023>



Building a Better Industry Average

In a perfect world, industry averages would be:

- Based on local agency specifications
- Divided into geographic regions within a given state
- Able to account for transport distance from the plant to the jobsite (A4)

This will take several years to accomplish!

What do we do in the meantime?



The paradigm shift of Buy Clean policies

Procurement policies under development include:

- **Pilot programs**
- **Information only** (EPD collection and analysis)
- **Differential cost** (when low carbon materials are *more expensive* than conventional alternatives)
- **Incentives** (when low carbon materials are *less expensive* than conventional alternatives)
- **GWP limits** (prequalification go/no-go criteria)

Industry Voices on EPDs

Priority Targets & KPIs:

Have EPDs available for 50% of our materials facilities by 2025

**Granite Construction
- 2021 Sustainability Report**

<https://www.graniteconstruction.com/sites/default/files/inline-files/Granite-2021-Sustainability-Report.pdf>

“We are working with [NAPA] to generate EPDs for our fixed asphalt plant sites across the Summit enterprise.”

Summit Materials

- 2022 Investor Day presentation

https://s201.q4cdn.com/127035939/files/doc_presentations/2022-Elevate-Summit_ID-Presentation_vFINAL_3.pdf



“We encourage Congress to rely on EPDs for current and future legislation concerning low emission and low carbon materials.”

Dwayne Boyd

President, Midsouth Region, CRH Americas Materials

March 28, 2023

**- Testimony to House Transportation and
Infrastructure Subcommittee on Highways and Transit**

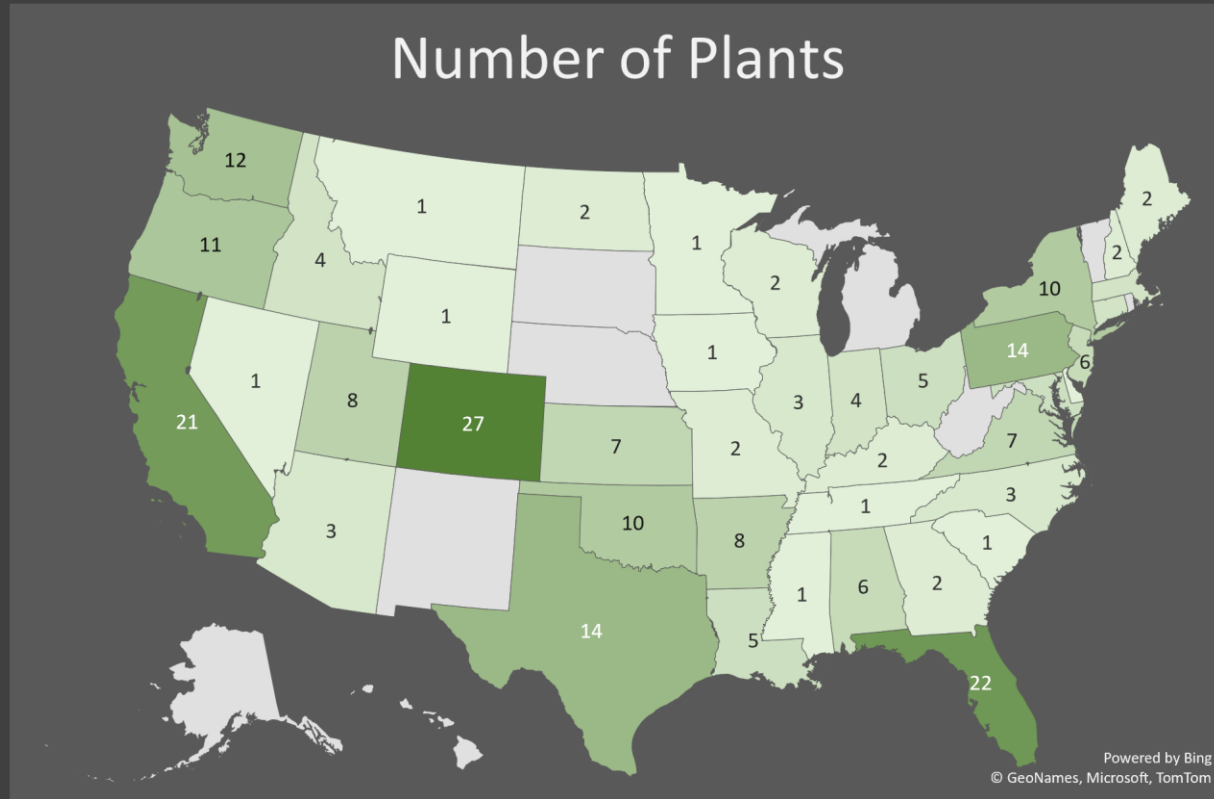
<https://docs.house.gov/meetings/PW/PW12/20230328/115557/HHRG-118-PW12-Wstate-BoydD-20230328.pdf>



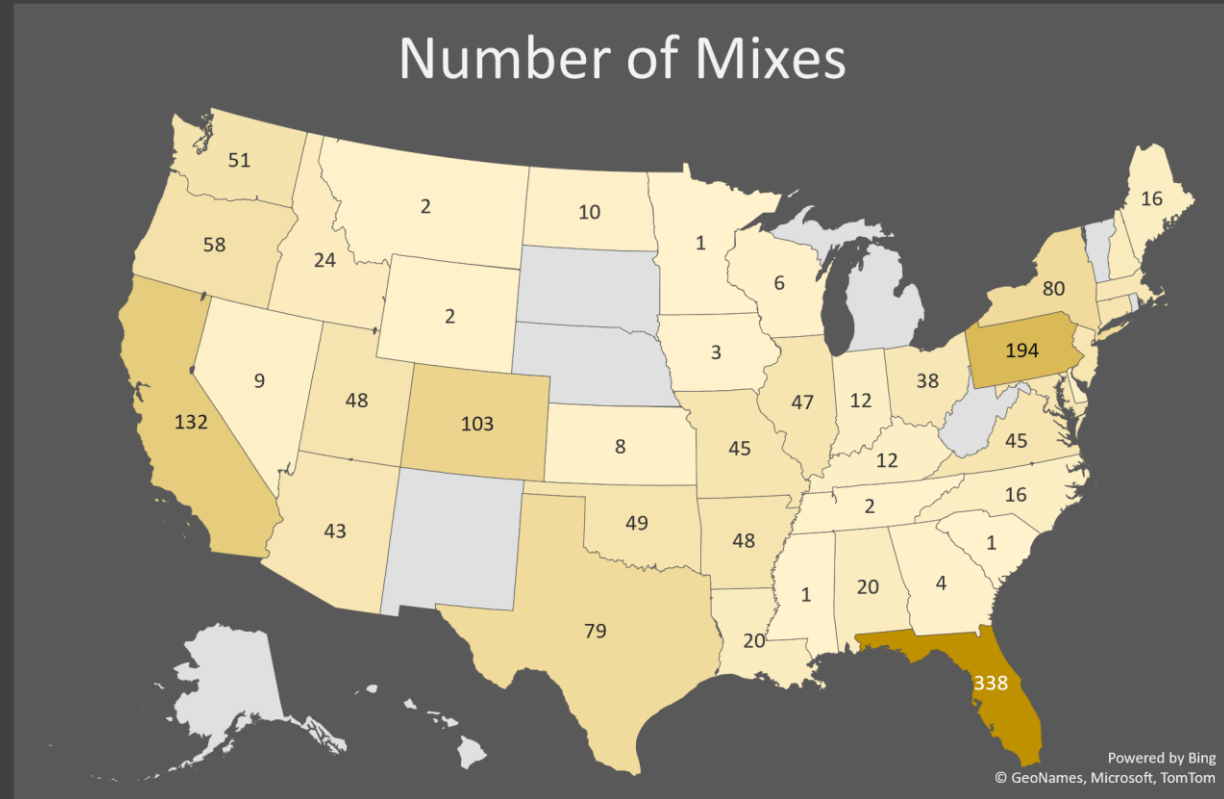
Published EPDs in November 2023

- 246 plants with 1,700+ EPDs across 41 states

Number of Plants



Number of Mixes



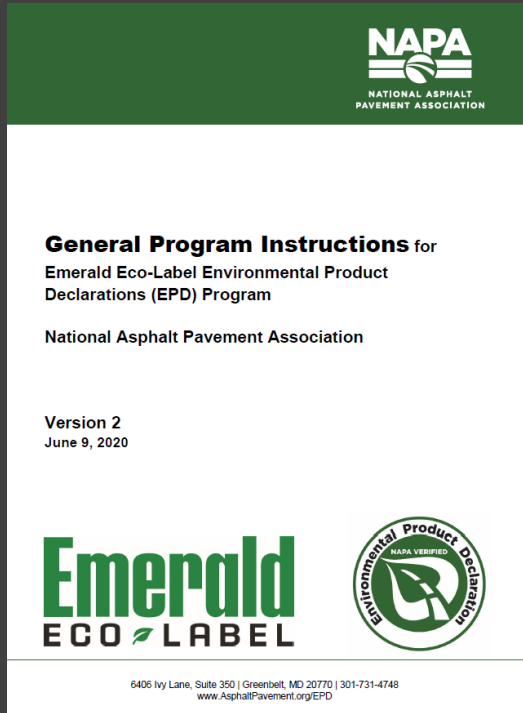
Illinois Companies Leading the Effort



How to Get Started With EPDs

Key Components of NAPA's EPD Program

General Program Instructions




NAPA
NATIONAL ASPHALT
PAVEMENT ASSOCIATION

**General Program Instructions for
Emerald Eco-Label Environmental Product
Declarations (EPD) Program**

National Asphalt Pavement Association

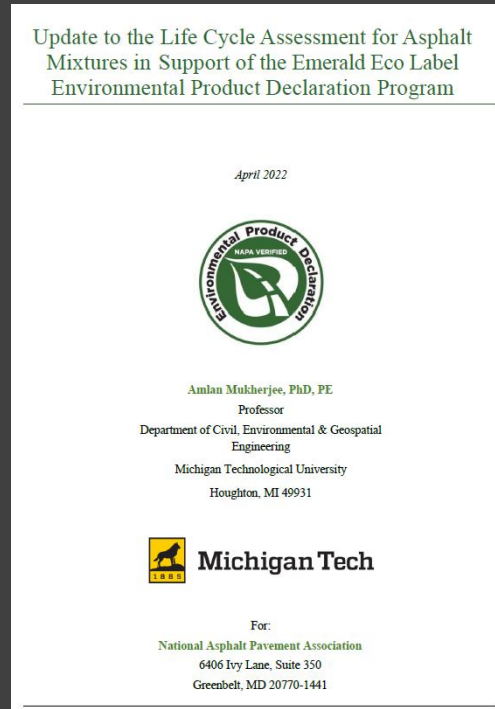
Version 2
June 9, 2020

**Emerald
ECO LABEL**




6406 Ivy Lane, Suite 350 | Greenbelt, MD 20770 | 301-731-4748
www.AsphaltPavement.org/EPD

Underlying Life Cycle Assessment




Update to the Life Cycle Assessment for Asphalt
Mixtures in Support of the Emerald Eco Label
Environmental Product Declaration Program

April 2022



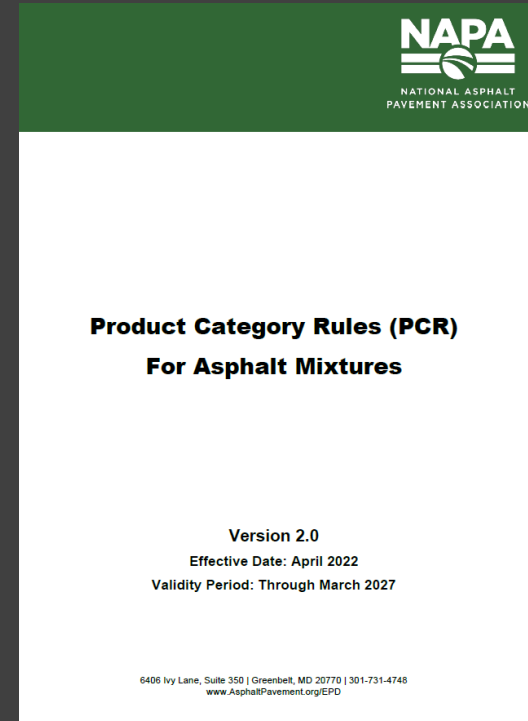
Amlan Mukherjee, PhD, PE
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Houghton, MI 49931



Michigan Tech

For:
National Asphalt Pavement Association
6406 Ivy Lane, Suite 350
Greenbelt, MD 20770-1441

Product Category Rules (PCR)



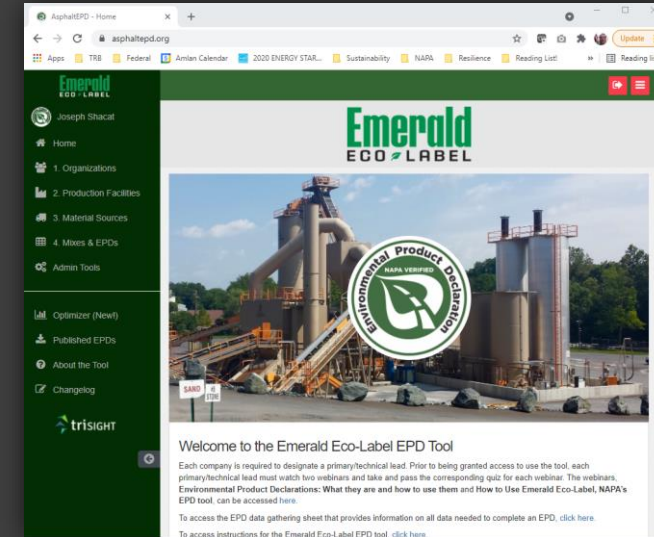
NAPA
NATIONAL ASPHALT
PAVEMENT ASSOCIATION

**Product Category Rules (PCR)
For Asphalt Mixtures**

Version 2.0
Effective Date: April 2022
Validity Period: Through March 2027

6406 Ivy Lane, Suite 350 | Greenbelt, MD 20770 | 301-731-4748
www.AsphaltPavement.org/EPD

EPD Software



AsphaltEPD - Home

Emerald
ECO LABEL

Welcome to the Emerald Eco-Label EPD Tool

Each company is required to designate a primary technical lead. Prior to being granted access to use the tool, each primary technical lead must watch two webinars and take and pass the corresponding quiz for each webinar. The webinars, Environmental Product Declarations: What they are and how to use them and How to Use Emerald Eco-Label, NAPA's EPD tool, can be accessed here.

To access the EPD data gathering sheet that provides information on all data needed to complete an EPD, click here.

To access instructions for the Emerald Eco-Label EPD tool, click here.

Learn more at www.asphaltpavement.org/epd

How to use Emerald Eco-Label

- **Register** at <https://asphaltep.org/>
- **Watch two webinars** and pass the quizzes
- **Compile data** for plant and mixes
 - Use EPD Data Gathering spreadsheet
- **Purchase access** for your plant(s)
- **Enter data** for plant and mixes to produce EPDs
- **Upload supporting documentation**

The screenshot shows a Microsoft Excel spreadsheet titled 'EPD_Data_Gathering_rev4 (3) - Saved to this PC'. The active sheet is '2. Plants'. The spreadsheet is divided into sections for data entry. The '2. Plant Data' section includes instructions and a table for entering plant information. The table has columns for 'Your Data', 'Units', 'Production Facilities', and 'Comments & Help'. The 'Production Facilities' section includes fields for Plant name, Physical address, Address Line 1, Address Line 2, City, State, and Zip Code. The 'Production Facility Resource Use' section includes fields for Annual Production & Water, Data collection start date, Total Asphalt Mix Sold (per year), and Total Water. The spreadsheet also includes a navigation bar at the bottom with tabs for Intro, 1. Organizations, 2. Plants, 2a. Benchmarking, 3. Ingredients, 4. Mix Form A, 4. Mix Form B, Changelog, and Drop-Downs.

Your Data	Units	Production Facilities	Comments & Help
		Plant name*	A user can create multiple plants
		Physical address	Cannot be a PO Box; The ZIP code will be used for certain calculations
		Address Line 1*	
		Address Line 2	
		City*	
		State*	
		Zip Code*	
		Production Facility Resource Use	
		Annual Production & Water	
		Data collection start date*	All quantities reported in the Production Facility section will be over a cumulative period of 12-months, within the last five years. Enter the start date of the twelve month period during which the data was recorded. The reported data for all the subsequent categories (in Production Facility) must have been measured for the same twelve month period starting from this date.
	US Short Tons	Total Asphalt Mix Sold (per year)*	For most plants, the total mix sold will be less than the total amount of mix produced, since some of the produced mix is wasted during startup/shutdown, when switching mixes, etc. This must be over the same 12 month period as all the other plant data
	Gal	Total Water	Include water used for the following purposes: dust control, asphalt binder foaming processes for WMA or CCPR, irrigation (landscaping), slurry for wet scrubber operations, slurry for removing excess baghouse fines, and slurry for adding hydrated lime or other mineral fillers. If your plant does not have its own water meter, you may estimate water consumption based on company records such as daily water truck deliveries, flow rates, operational usage of water pumps,

Data requirements for the plant

- **12 consecutive months of data**
 - Within the past five years
- **Fuel consumption**
 - Burner
 - Hot oil heater
 - Generator
 - Equipment
- **Electricity consumption**
- **Water consumption**
- **Total mix sold (tons)**

Your data is confidential!



Photo courtesy of Duval Asphalt

Data requirements for mix designs

- **Material content (by weight of total mix)**
 - Aggregates
 - Asphalt binder
 - RAP and RAS
 - Additives
- **Transportation mode and distance**
 - Truck, rail, or barge
- **Mix production temperature**

Your data is confidential!



Photo courtesy of Rock Road Companies, Inc.

Where can I find published EPDs?

asphaltpd.org/published/

- The most comprehensive and up-to-date directory of EPDs for asphalt mixtures

www.asphalt pavement.org/epd

- Program documents and other information
 - Product Category Rules (PCR)
 - Underlying Life Cycle Assessment (LCA)
 - Other documents

Find a mix with an Environmental Product Declaration [Help](#)

Available mixes

State	Plants	Mixes	Declarations
AL	1	4	See EPDs
AR	3	25	See EPDs
AZ	1	16	See EPDs
CA	1	6	See EPDs
CO	14	57	See EPDs
CT	2	14	See EPDs
FL	15	76	See EPDs
GA	1	2	See EPDs
ID	1	1	See EPDs
IL	2	9	See EPDs

Resources to Help Mix Producers Reduce Emissions



The Road Forward

A Vision for Net Zero Carbon Emissions
for the Asphalt Pavement Industry

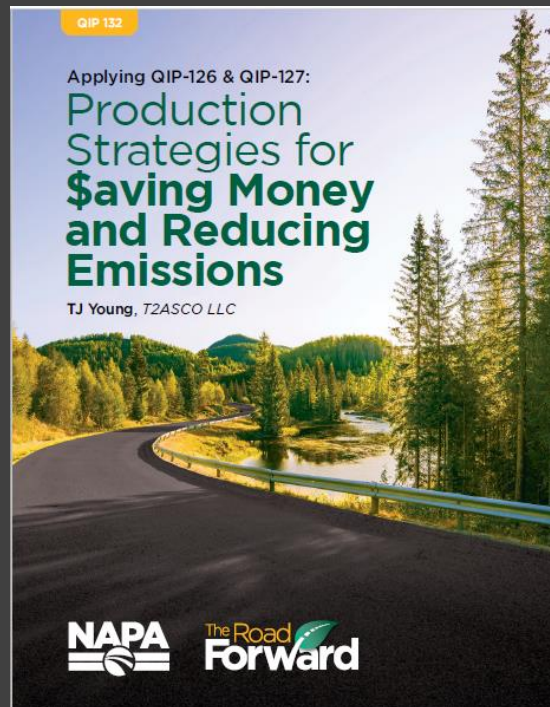
Learn more at
asphaltpavement.org/climate



Vision: Sustainable communities and commerce, connected by net zero carbon emission asphalt pavements

Mission: Engage, educate, and empower the U.S. asphalt community to produce and construct net zero carbon emission asphalt pavements

Production Strategies



Prioritizing RAP

PRIORITIZING RAP SAVES ROAD OWNERS MONEY, REDUCES EMISSIONS, AND IMPROVES PERFORMANCE
How to capture the highest value from infrastructure investments

Introduction
Reclaimed asphalt pavement (RAP) is a valuable material sourced from processes like milling or the removal of asphalt pavements. By detailing the economic, environmental, and performance advantages of RAP, this paper illustrates both the importance of giving priority to RAP utilization in new asphalt mixture production and why using RAP in aggregate replacement and shoulder construction provides a lower return on investment to the road owner.

Cost-Efficiency through Aggregate and Asphalt Binder Replacement
The incorporation of RAP in asphalt mixture production yields substantial cost savings. The aggregate and asphalt binder within RAP can efficiently replace virgin materials, resulting in reduced financial and environmental burdens associated with acquiring these natural resources.

Compared side by side, the savings achieved using one ton of RAP in a common asphalt surface mixture against the use of RAP as shoulder gravel are overwhelming.

Table 1: Costs of Virgin Materials (NAPA)

Material	% of Market	Cost/Ton	
		2020	2021
Asphalt Binder	Unmodified	90	\$490.65
	Modified	10	\$614.01
	Weighted Average*		\$519.45
Aggregate	Crushed Stone	90	\$11.79
	Sand and Gravel	10	\$8.98
	Weighted Average		\$11.51

*The asphalt binder weighted average calculation takes into account that 37 states provide unmodified binder index pricing, while only 6 states provide both modified and unmodified binder pricing.

The comparisons demonstrate how impactful capturing the asphalt binder replacement value of RAP is when utilized in the production of asphalt mix. As shown in Table 2, road owners save three times more by using RAP in a mix (valued at a cost equivalent to replacing both virgin aggregate and virgin asphalt binder in a new asphalt mixture) compared to using it as aggregate alone.

Table 2: Cost Savings of One Ton of RAP, Based on Use (Williams et al, 2023)

Material	% Agg.	% AC	Aggregate Cost Savings, \$/Ton	Asphalt Binder Cost Savings, \$/Ton	Total Cost Savings, \$/Ton
RAP in Asphalt Mix	95	5	\$10.93	\$25.97	\$36.90
RAP in Aggregate	100	0	\$11.79	\$0	\$11.79

Inform Decisions

OPERATIONAL TIPS: THE ROAD FORWARD TO LOWER EMISSIONS AND HIGHER PROFITS

USING EPDS TO INFORM DECISIONS AND MODERNIZE OPERATIONS

A Commitment to Sustainability
An affiliate of an NYC based heavy civil infrastructure contractor, Green Asphalt LLC located in Long Island City, New York was envisioned in 2009 as an asphalt producer committed to making and constructing 100% recycled asphalt pavement mixtures.

The Road Forward
AsphaltPavement.org/Forward

In 2015, New York State approved Green Asphalt's R-0001, making Green Asphalt

THE FIRST RECYCLED ASPHALT PLANT IN THE STATE.

In fact, the team had never produced a ton of mix but wanted to prove that the reuse of construction materials was possible. Knowing that they needed to develop, prove, and sell the vision to road owners, they began by building a plant with old parts. Working in conjunction with the City Department of Design and Construction, they began by placing temporary asphalt, then moved on to get a 100 percent reclaimed asphalt pavement (RAP) mix design approved. Finally in 2015, New York state approved Green Asphalt's R-0001, the first recycled asphalt plant in the state. To this day, despite the ability to run conventional asphalt mixtures, Green Asphalt runs high RAP with the minimum amount of RAP used set to 50 percent.

Quantifying Our Impacts
Emerald Eco-Label, NAPA's verified Environmental Product Declaration (EPD) tool, makes it easy to quantify the environmental impact of an asphalt mix. Created by industry professionals and stakeholders and evaluated by sustainability experts, the Emerald Eco-Label EPD tool was developed in conformance with ISO 14025, ISO 21930, and the Product Category Rules (PCR) for Asphalt Mixtures. These standards establish the principles and procedures for developing a Type III environmental declaration program and prescribe specific rules for asphalt mixture EPDs.

Participate in Benchmarking

- Additional data collection open from **November 6 to January 8**
- No cost to participate
- Benchmark [training webinar](#) is required



NAPA
The Road Forward

The Road **Zero** to

WEBINAR • OCT. 19 • 2 PM ET

US Asphalt Industry EPD Benchmark: 1st Edition

See results of data collected from 300+ asphalt plants during Summer 2023 and impacts on choosing lower-carbon materials.

Environmental Product Declaration
NAPA VERIFIED

EPD Optimizer Tool

- Easily **compare** two of your own mixes to each other
- More **granular analysis** of data
- Create **plant variants** to see how changes to plant operations affect EPDs
- Evaluate **economic** and **environmental** impacts of certain changes
 - Switching fuel types
 - Aggregate moisture reduction



WEBINAR

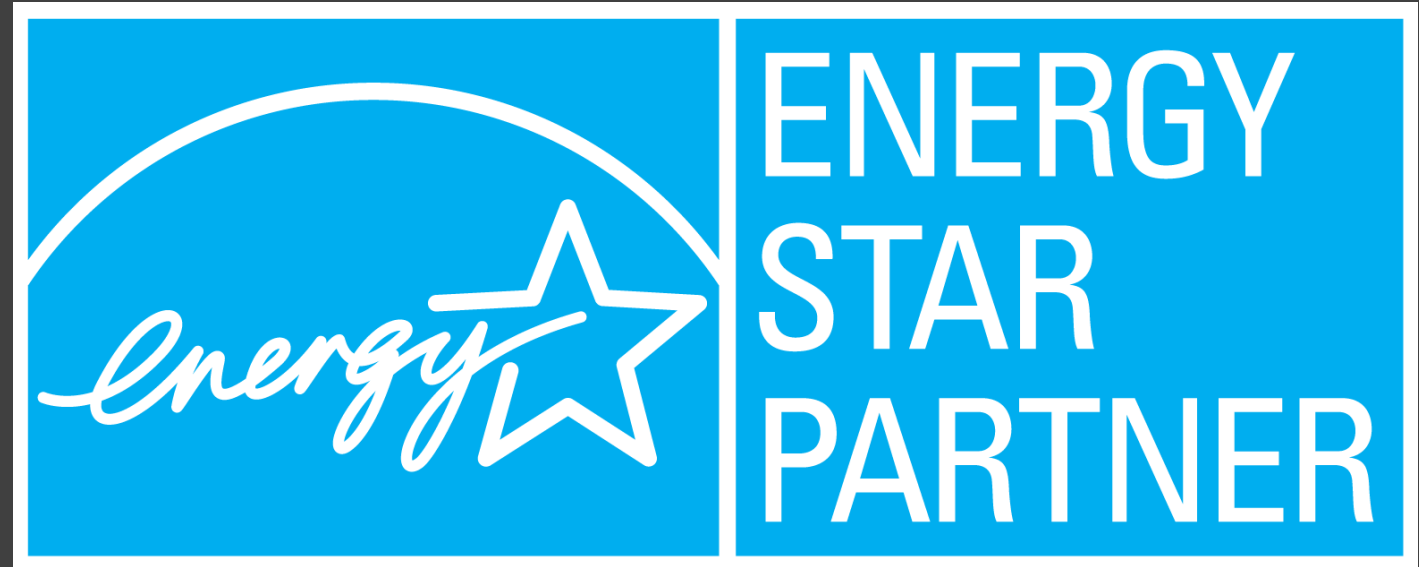


Emerald *OPTIMIZER*
ECO LABEL *BETA*

Included with EPD license

Training webinar available
on NAPA's store at
goaspha.it/Optimizer.

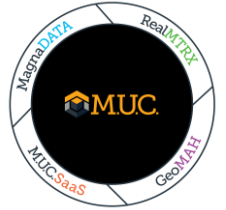
Asphalt Plant Energy Performance Peer Exchange (APEX)



- Partner with U.S. EPA
- Market and promote your company's partnership
- Learn best practices to manage energy
- Get assistance from an experienced industrial energy advisor

<https://www.asphaltpavement.org/expertise/sustainability/tools/energy-star-apex-program>

THE ROAD FORWARD PARTNERS





Illinois Members

Gold Club (50+ Years)

- BP
- E.D. Etnyre & Co.
- Gallagher Asphalt
- Geneva Construction
- Gunther Construction Co.
- Howell Asphalt Co.
- Kankakee Valley Construction
- Open Road Paving Co.
- S.G. Hayes & Company

Members

- Allied-Locke Industries
- Applied Research Associates, Inc.
- Arrow Road Construction Co.
- Asphalt Plus LLC
- Asphalt Sales & Products Inc.

- ASTEC
- Bigane Paving Co.
- Chicago Testing Laboratory
- Curran Contracting Co.
- Digital Forces Corp.

30-Plus Club

- Advanced Asphalt Co.
- BLS Enterprises, Inc.
- Charles E. Mahoney
- Diamond Construction Co.
- E.T. Simonds Materials Co.
- Iroquois Paving Corp.
- Litchfield Bituminous Corp.
- Monmouth Asphalt
- Truman L. Flatt & Sons Co. Inc.
- William Charles Construction Co. LLC

State Advisor: Dan Gallagher, Gallagher Asphalt

- ECF Inc.
- Freesen, Inc.
- Gearflow
- Global Track Warehouse
- Helm Civil



Illinois Members

Members

- Hoerr's Blacktop & Sealcoating
- Holcim US
- Humboldt Mfg. Co.
- Interstate Asphalt
- K-Five Construction Corp.
- Keyesport Asphalt LLC
- MAT Asphalt LLC
- Murphy Pavement Technology Inc.
- Nouryon
- Ogden Avenue Materials
- OMI Industries
- Open Road Paving Co.
- Peter Baker & Son Co.
- Phillips 66
- Southwest Oil
- Tri-State Asphalt LLC
- United Contractors Midwest
- Vulcan Materials Co. Central Division
- W.L. Miller Co.

State Advisor

Dan Gallagher, Gallagher Asphalt Corp.

Thank you, Illinois!



Panel Discussion

James Cassem

Curran Contracting



Don Gallagher

Gallagher Asphalt



Joseph Shacat

NAPA

