

CDOT Industry
Stakeholder EPD
Workshop – **Asphalt**
Industry Perspective

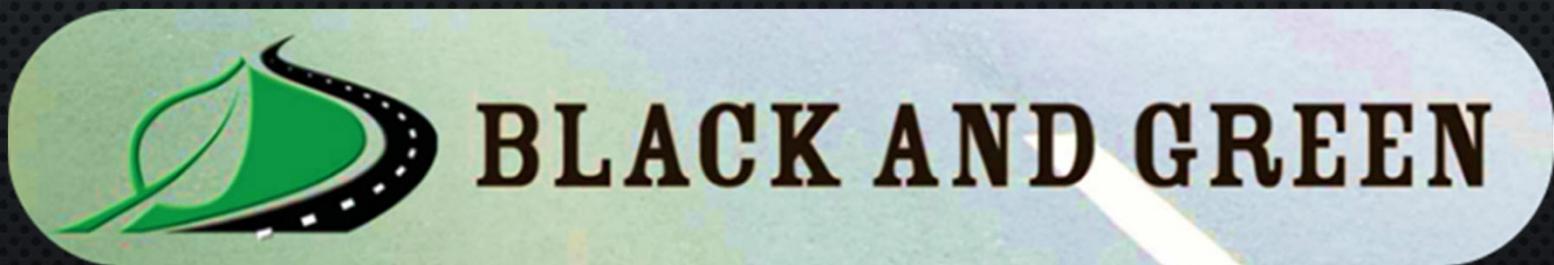


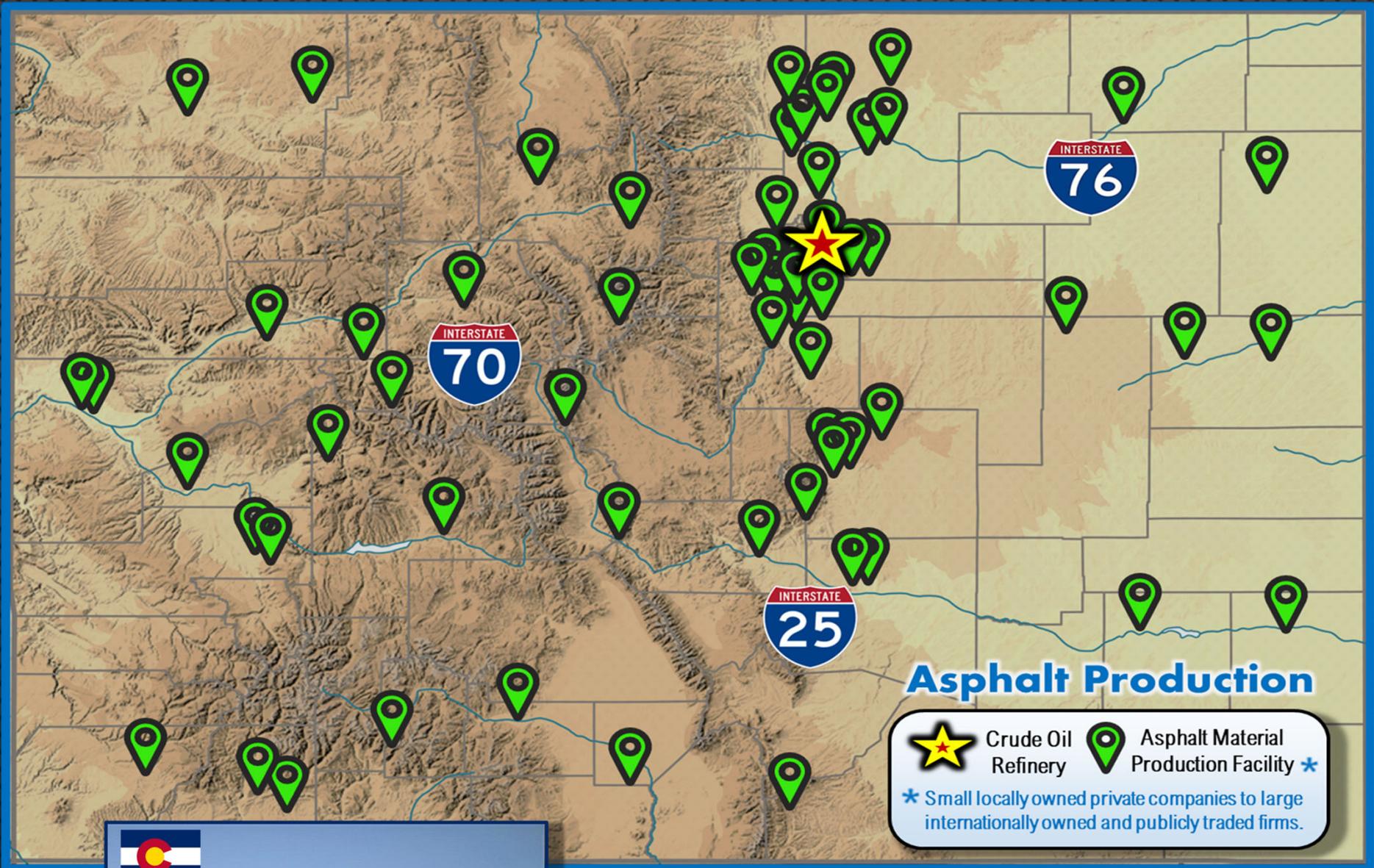
Mike Skinner, PE
Director of Engineering

EPD – Asphalt Industry



- Where the Industry is Currently
- Any Foreseen Hurdles
- Our Perspective on EPDs





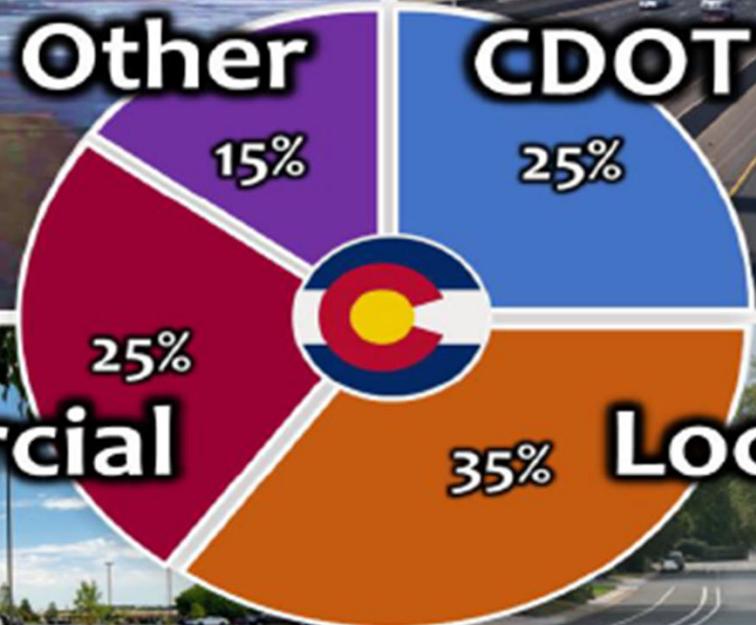
Asphalt Production

 Crude Oil Refinery
  Asphalt Material Production Facility *

* Small locally owned private companies to large internationally owned and publicly traded firms.




- 65 asphalt material facilities in 42 counties
- 1 crude oil refinery - Commerce City
- 5 to 8 portable facilities for remote projects



9M tons of asphalt produced annually

Supply & Demand

pave 
GREEN



Asphalt is the **#1 Recycled Material**.

While asphalt production has increased by over 250% in the past 40 years, **emissions from asphalt material production facilities has decreased by 97%**.

Asphalt material production facilities have been **delisted** by the EPA/CDHPE from the list of major polluters.



EPDs – ASPHALT INDUSTRY PERSPECTIVE

WHERE THE INDUSTRY IS CURRENTLY

- CAPA CONTRACTOR/PRODUCER WORK GROUP
- SUPPORT FROM NAPA TECHNICAL EXPERTS
- CONTRACTORS PURCHASING EPD SOFTWARE



EPDs – ASPHALT INDUSTRY PERSPECTIVE

ANY FORESEEN HURDLES

- IMPACT ON SMALL CONTRACTORS
- PROJECT SIZE, QUANTITY REQUIREMENTS
- PORTABLE PLANT OPERATIONS
- VERTICAL CONSTRUCTION REQUIREMENTS

EPDs – ASPHALT INDUSTRY PERSPECTIVE

GENERAL:

- COST
- OPERATIONAL CHANGES

How to define regions?

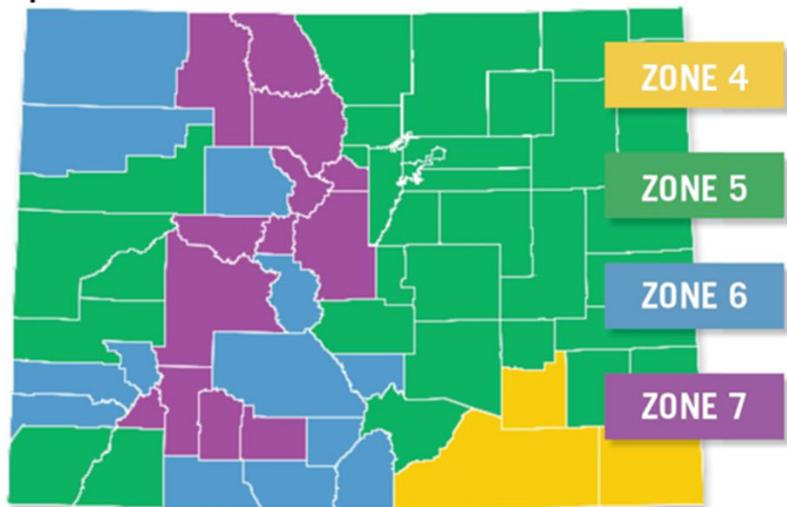
- Where are the asphalt plants located?
- What about portable plants?
- Where are the aggregate suppliers located relative to the asphalt plants?



Geology

- Aggregate hauling, rainfall, altitude, and other factors can affect EPD results

CDOT Regions



Climate Zones

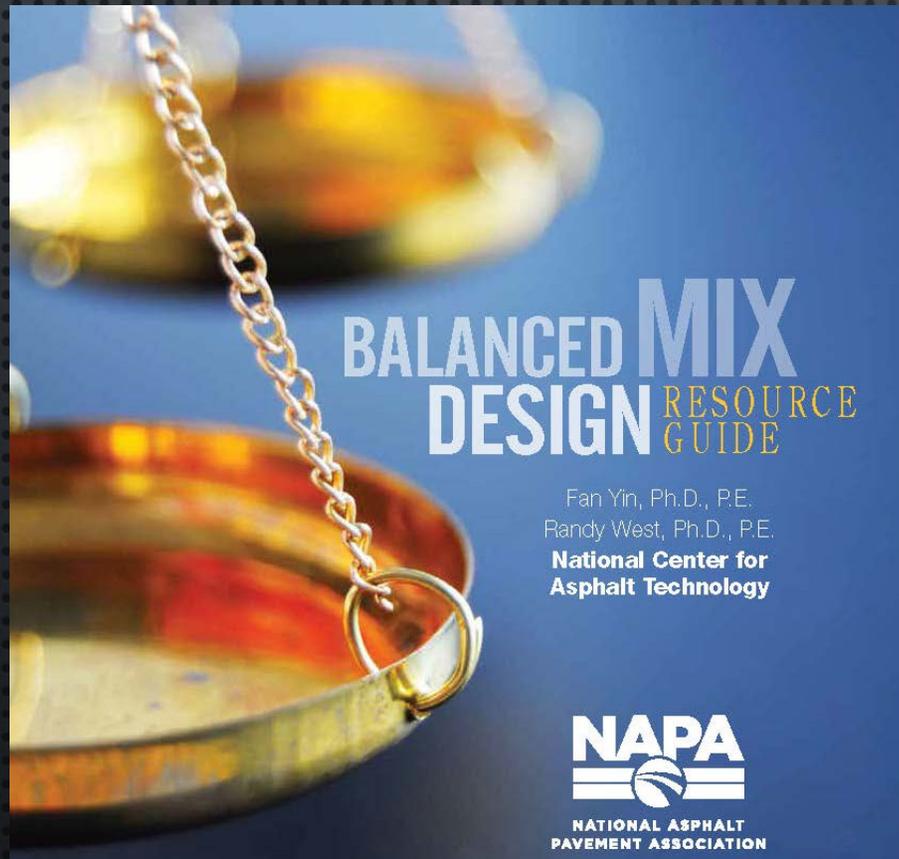
EPD Impacts from Future Methodologies



Emerald
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Currently **only 1**
national input
for AC Binder

EPD Impacts from Future Methodologies



Implementation
of BMD



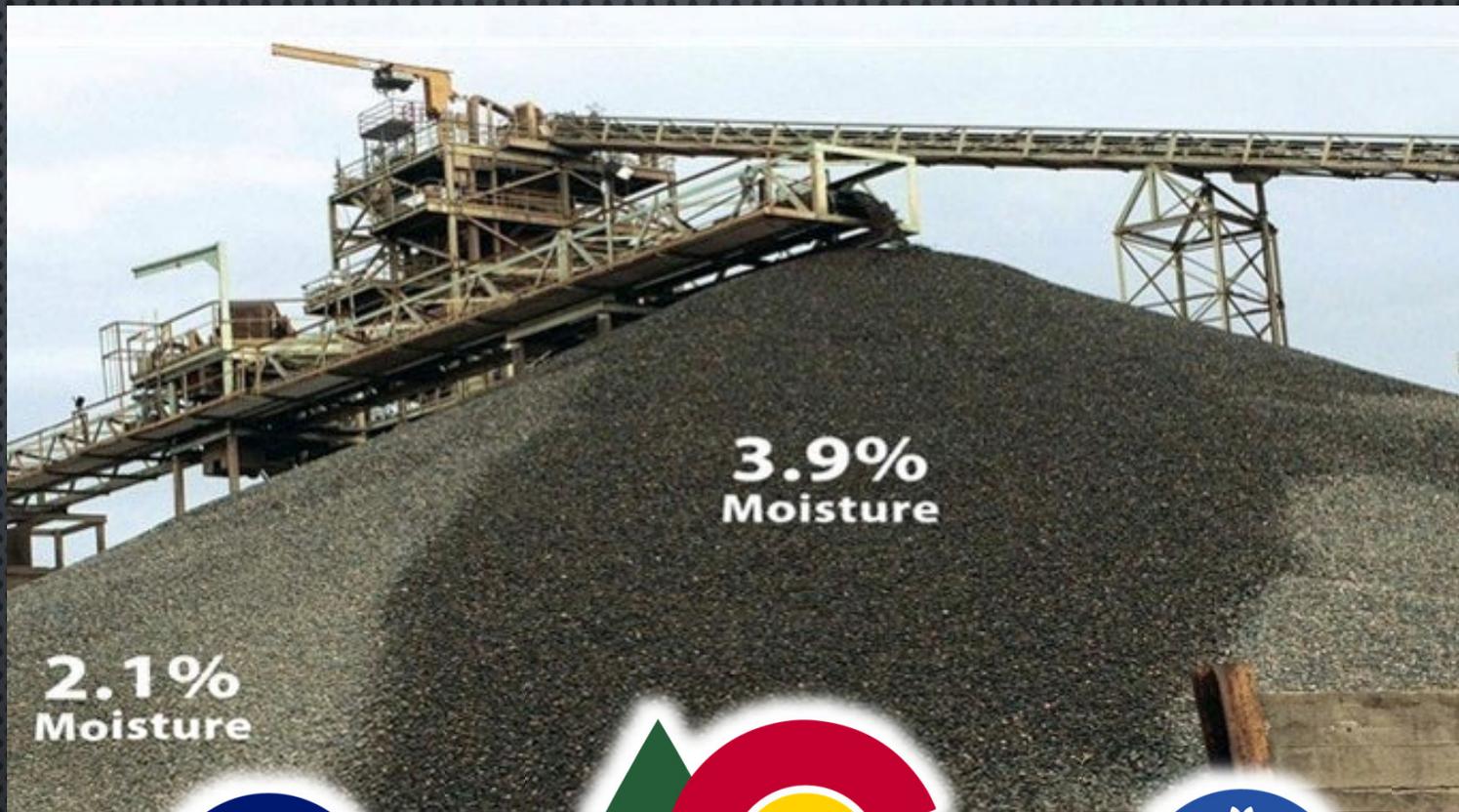
Sensitivity Factors

- #1A Virgin Binder Content %
- #1B Burner Fuel (plants see significant drop in EPD when change from waste oil or diesel to natural gas fuel.
- #3 LONG Transport distance (this factor can overwhelm the EPD if VERY long).



EPD Impacts Portable Plants



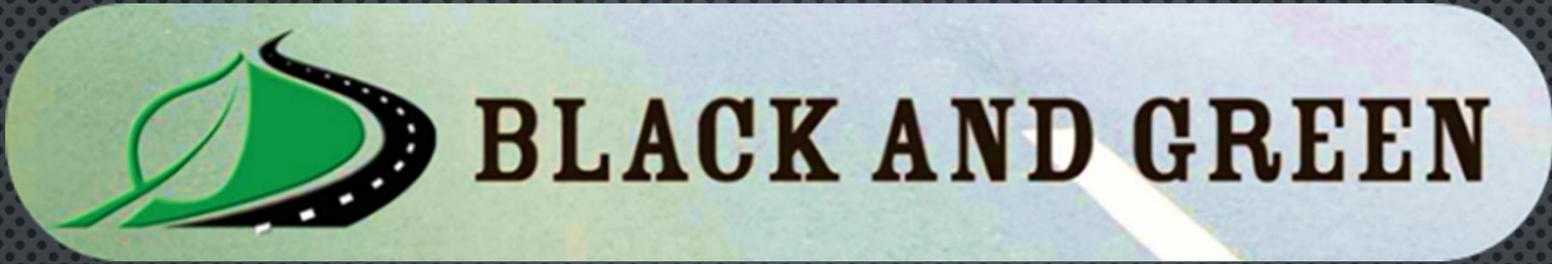


CDPHE wants producers to wash aggregates (reduce air particulates). Some producers require the dust as part of their mix design. The increased moisture content in the aggregate requires more energy to dry and is larger than the initial dust impact. Example of CDPHE vs CDOT and competing goals.



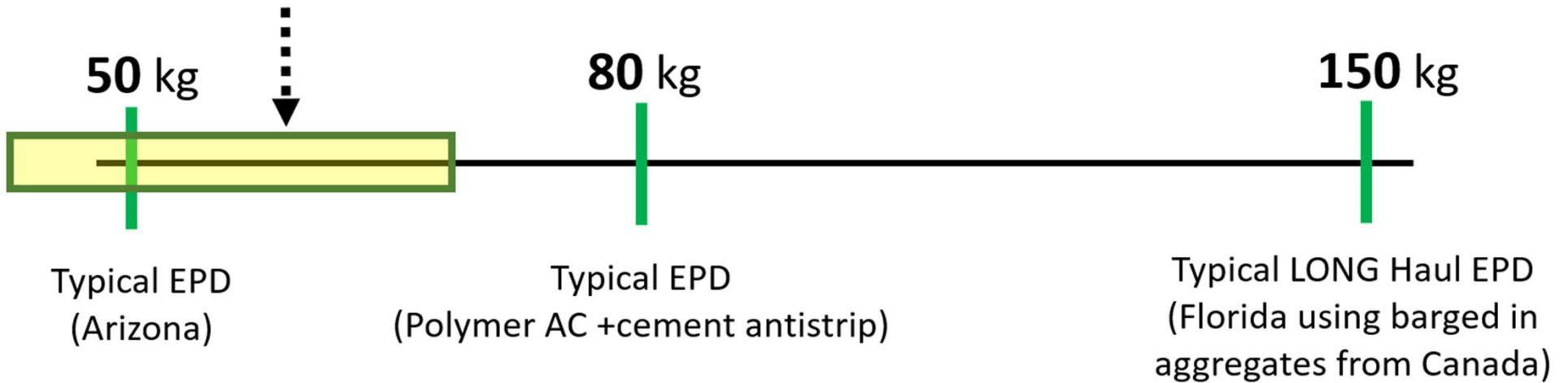
Published EPDs
(08-10-2022)

State	Plants	Mixes
AR	1	2
AZ	1	16
CA	1	5
CO	6	13
CT	2	12
FL	5	42
MD	1	3
NH	1	2
NJ	2	16
NY	1	8
OR	3	27
TX	3	29
VA	1	5
WA	1	9
WI	1	3



CO2 Equiv. (Global Warming Potential)

Range of EPDs
in Colorado



Colorado (13)



Company	Plant	Mix	Location	EPD
Brannan Sand and Gravel Company	Lipan Asphalt Plant	40013-22-L	5880 Lipan St. Denver, CO	65.179.425 v8
Brannan Sand and Gravel Company	Lipan Asphalt Plant	40053-22-L	5880 Lipan St. Denver, CO	65.179.435 v1
Elam Construction	Roland Hot Plant	12-921 5/8" PG64-22	2353 River Road Grand Junction, CO	48.133.268 v1
Elam Construction	Roland Hot Plant	12-922 5/8" PG64-22 w/Lime	2353 River Road Grand Junction, CO	48.133.276 v1
Elam Construction	Silverthorne Hot Plant	12-901 5/8" PG58-28	28755 Highway 9 Silverthorne, CO	48.135.278 v1
Elam Construction	Silverthorne Hot Plant	12-901 SX(75) PG58-34 Lime	28755 Highway 9 Silverthorne, CO	48.135.279 v1
Four Corners Materials	Animas Glacier	CDOT ST 75	9755 CR 213 Durango, CO	70.191.450 v1
Four Corners Materials	Animas Glacier	CDOT SX 75	9755 CR 213 Durango, CO	70.191.449 v1
Kiewit Infrastructure Co - Central District	Aurora HMA Plant	1204-SMA-21	2401 Picadilly Rd Aurora, CO	42.126.491 v1
Kiewit Infrastructure Co - Central District	Aurora HMA Plant	1222-AH-21	2401 Picadilly Rd Aurora, CO	42.126.493 v2
Kiewit Infrastructure Co - Central District	Aurora HMA Plant	1922-AH21	2401 Picadilly Rd Aurora, CO	42.126.311 v10
Kiewit Infrastructure Co - Central District	Colorado Springs HMA Plant	1220-CL-21	3527 Wabash St Colorado Springs, CO	42.127.494 v1
Kiewit Infrastructure Co - Central District	Colorado Springs HMA Plant	1224-CH-21	3527 Wabash St Colorado Springs, CO	42.127.495 v1

Expanding the use of **Green Asphalt** in Colorado



Streamline the use of Warm Mix Asphalt

POSITIVE ENVIRONMENTAL ACTION: *Allow for increased use of WMA and eliminate agency requirements for two separate asphalt mix designs for the same mix when WMA is proposed.*

Expanding the use of **Green Asphalt** in Colorado



Expand the use of Recycled Asphalt

POSITIVE ENVIRONMENTAL ACTION: *Allow mix design appropriate adjustments to incrementally increase the usage of RAP and implement new Balanced Mix Design Approach.*

Expanding the use of **Green Asphalt** in Colorado



Allow Alternatives to Hydrated Lime

POSITIVE ENVIRONMENTAL ACTION: *Develop Approved Product listings for liquid anti-strip and allow for either lime or liquid products in mix designs.*

***“...we need to accelerate the transition to
Clean Energy.”***

***“I Guarantee You We’re Going to
End Fossil Fuel”***

THE BIDEN PLAN FOR
A CLEAN ENERGY
REVOLUTION AND
ENVIRONMENTAL
JUSTICE







The idea of phasing out or eliminating fossil fuels from a heavy civil construction standpoint is

THE ASPHALT INDUSTRY OF COLORADO





Thank You!

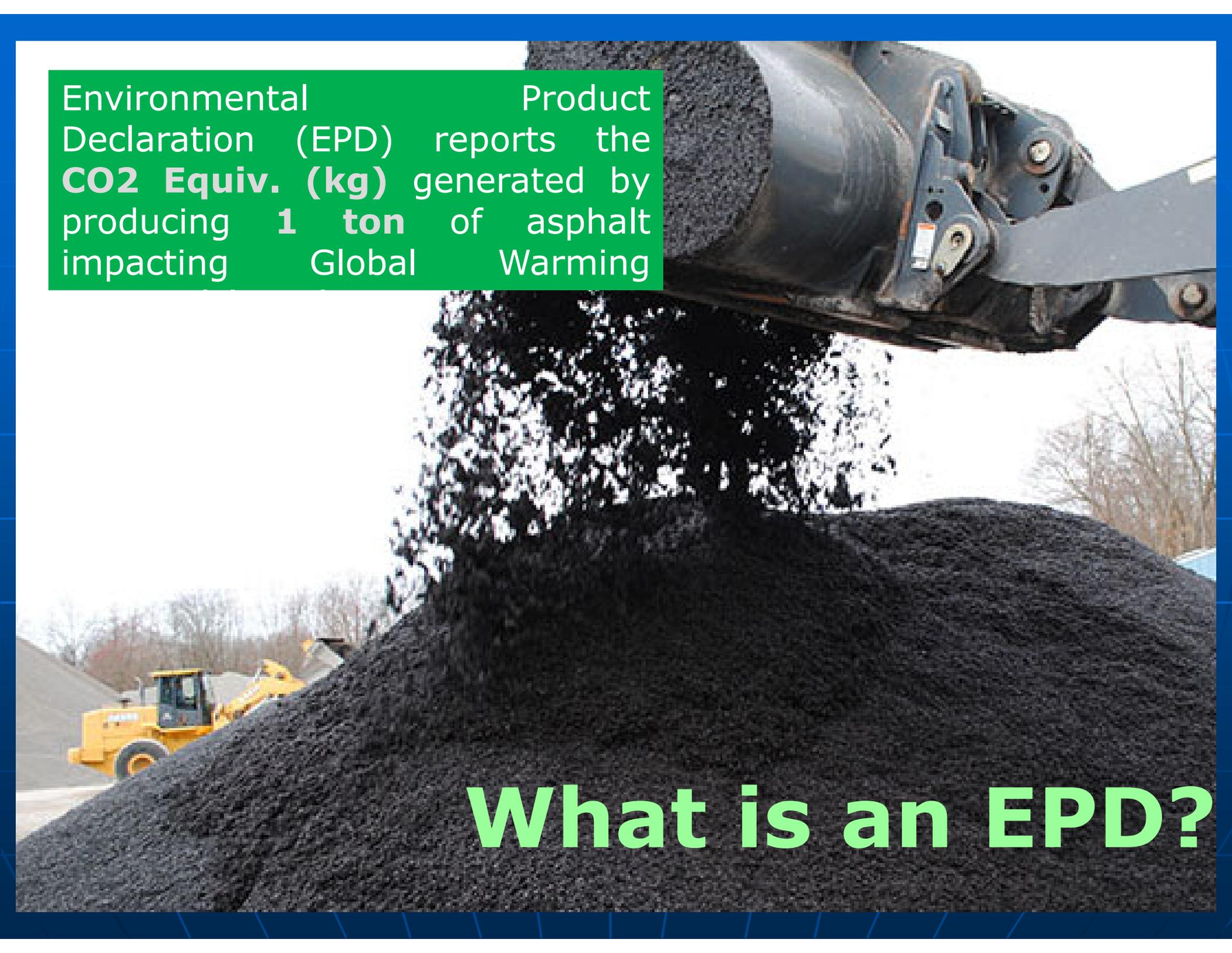
Mike Skinner

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EPDs – Asphalt Industry Perspective

~~Moving Forward...~~ **It's Here**

- **July 1, 2022 – “the rubber meets the road”**
- **2025 Benchmark**



Environmental Product Declaration (EPD) reports the **CO2 Equiv. (kg)** generated by producing **1 ton** of asphalt impacting Global Warming

What is an EPD?

HB21-1303: Global Warming Potential for Public Project Materials (ie. Buy Clean Colorado)

Policy Summary

The **Buy Clean Colorado Act** directs the Office of State Architecture and Department of Transportation to establish policies that reduce greenhouse gas emissions over time by accounting for and limiting the Global Warming Potential (GWP) of key building materials in state-funded buildings and transportation projects. Agencies will accept and evaluate Environmental Product Declaration information from architects, engineers and contractors when materials are specified in bids, and to define methods that prioritize purchasing the cleanest materials available.

**There is great potential to reduce greenhouse gasses through this method,
without imposing additional costs on projects.**



Two Separate Policies

Vertical Construction

- 2024 – State Architect establishes a **maximum GWP limit** for each type of material based on EPD
- 2026 – Review and revise maximum GWP limits

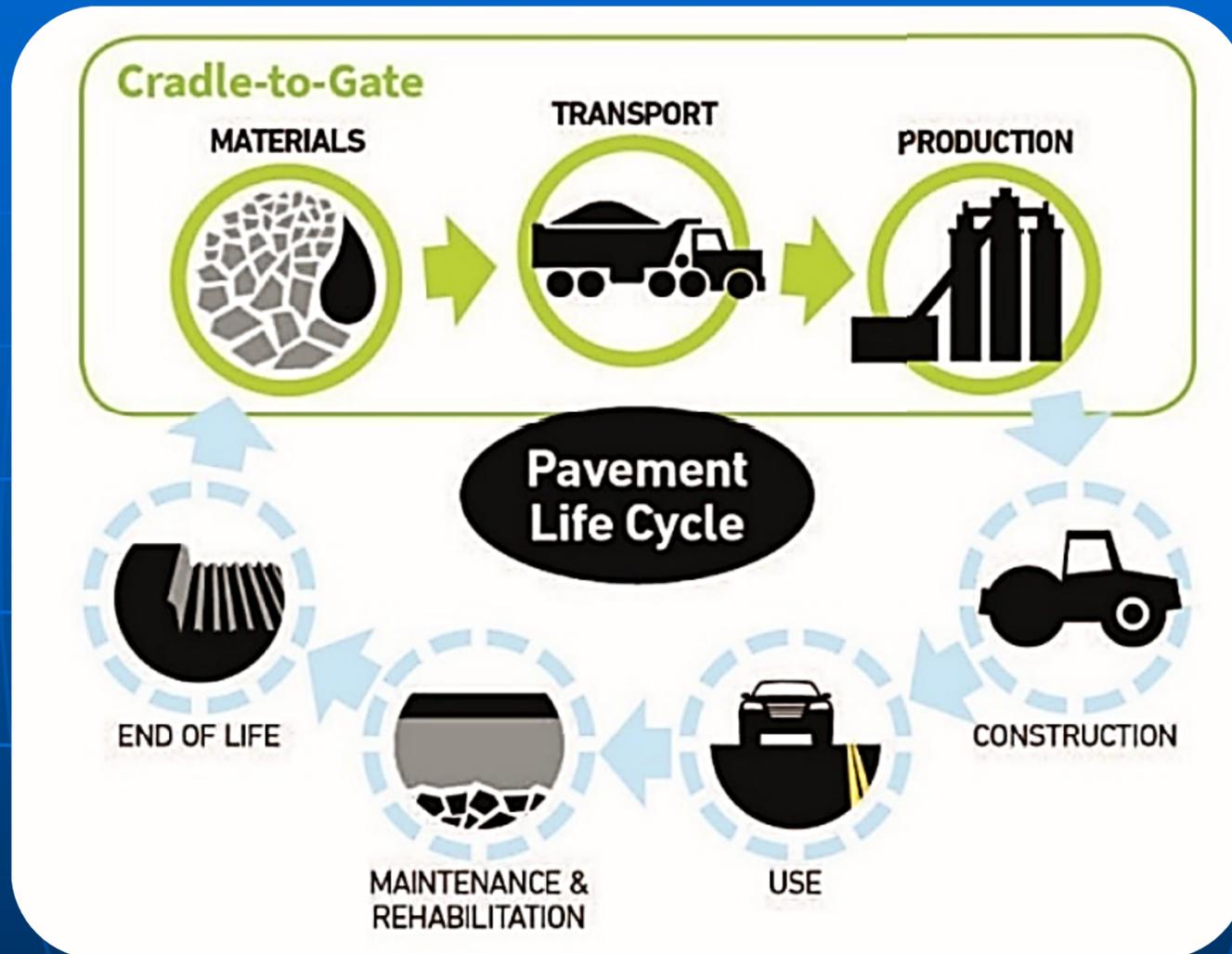
Roads and Highways

- **2022** – EPDs must be submitted to CDOT
- **2025** – CDOT establishes policy to **reduce GHG emissions**
- **2027** – CDOT policy reviewed and revised

A1

A2

A3



EPDs report the cradle-to-gate emissions associated with asphalt mixture production.

Environmental Facts

Functional Unit: 1 U.S. short ton of Asphalt Mixture

Process Energy, Materials (MJ)	6.0×10 ³
<i>Non-Renewable Energy (MJ)</i>	4.9×10 ³
<i>Renewable Energy (MJ)</i>	1.5×10 ¹
Process Energy, Energy (MJ)	4.0×10 ³
<i>Non-Renewable Energy (MJ)</i>	3.9×10 ³
<i>Renewable Energy (MJ)</i>	5.5×10 ¹
Water Use (Gal.)	2.5
Global Warming Potential (kg CO₂ eq)	55
Acidification Potential (kg SO₂ eq)	0.233
Eutrophication Potential (kg N eq)	0.007
Ozone Depletion Potential (kg CFC-11 eq)	7.3×10 ⁻⁹
Smog Potential (kg O₃ eq)	4.4

Boundaries: Cradle-to-Gate

Company: XYZ Asphalt

RAP: 10%

Environmental Product Declarations (EPDs)

On Tuesday, July 6, 2021, Gov. Jared Polis signed [HB 21-1303 Global Warming Potential For Public Project Materials](#), requiring Contractors to submit Environmental Product Declarations (EPDs) for all eligible materials to include asphalt and asphalt mixtures, cement and concrete mixtures, and steel.

The Standard Special Provision, [Revision of Section 101 and 106 - Environmental Product Declarations](#), outlines the contract requirements for projects bid on or after July 1, 2022.

The protocol document, [Appendix O - Environmental Product Declarations](#) of the 2023 Field Materials Manual, provides guidance for the implementation and submission of EPDs. This document also contains cost and small quantity thresholds as well as the specific bid items requiring EPDs.

The CDOT EPD team is working with OIT on a more permanent EPD submission and storage solution through OnBase. In the meantime, EPDs shall be submitted using [this Google Form](#).

The construction conference agendas have been updated to include items for the collection and submission of EPDs. The updated versions are linked below:

- Preconstruction Conference Agenda
 - [Landscape orientation](#)
 - [Portrait orientation](#)
- Pre-paving Conference Agenda
 - [Asphalt](#)
 - [Concrete](#)

The CDOT EPD team requests invitations to the Preconstruction and Pre-pave meetings for all eligible projects with an Engineer's Estimate of \$3,000,000 or greater (not including CE, Indirect, or Force Account costs). Those invitations can be sent to the [CDOT EPD email address](#).

A tool has been developed to assist project staff and Contractors in determining when EPDs are required for eligible materials. That spreadsheet can be accessed [here](#).



Office of the Chief Engineer
Materials and Geotechnical Services
Branch

CONSTRUCTION BULLETIN

Environmental Product Declarations (EPDs)
2022 Number 3, Page 2 of 2
Date: August 5, 2022

The CDOT EPD web page can be found at the following link:

<https://www.codot.gov/business/designsupport/materials-and-geotechnical/epd>

This page contains links to the CDOT EPD requirements, a link to the EPD submission form, training videos on EPD submission, examples of annotated EPDs for each material, workshop recordings and presentations, and more. Any EPD webpage feedback or requests for additional resources can be submitted using [this form](#).

If you'd like to receive updates to EPD requirements and additional resources, you may register for the internal CDOT EPD distribution list using [this form](#).

Please contact CDOT_EPD@state.co.us with any questions or concerns.



Environmental Product Declarations (EPD)

Requirements

- [EPD Specification](#) - Revision of Sections 101 and 106 -Environmental Product Declarations.
- [EPD Protocol Document](#) - Appendix O of the 2023 Field Materials Manual.
- [EPD Quantity Conversion Spreadsheet](#) - This Tool can be used by project personnel to determine the materials eligible for EPD submissions based on bid item number and quantity. It also reports the bid item quantity in the EPD Declared Unit, which is a required value in the EPD submission form.

EPD Submission Form

- [EPD Submission Form](#)
 - [EPD Submission Form Introduction video](#)
- Submission Form Training
 - Asphalt Mixtures
 - [Training Video](#)
 - [Submission Example PDF](#)
 - [Annotated EPD Example PDF](#)
 - Concrete Mixtures
 - [Training Video](#)
 - [Submission Example PDF](#)
 - [Annotated EPD Example PDF](#)
 - Reinforcing Steel
 - [Training Video](#)
 - [Submission Example PDF](#)
 - [Annotated EPD Example PDF](#)
 - Cement
 - [Training Video](#)
 - [Submission Example PDF](#)
 - [Annotated EPD Example PDF](#)

Resources

- [House Bill 21-1303 text](#)
- [Form for website feedback / additional resource requests](#)
- [Form for CDOT EPD distribution list registration](#)
- Product Category Rules (PCR) and Program Operators
 - Asphalt Mixtures
 - [NAPA EPD Program Operator website and EPD Tool](#)
 - [NAPA Asphalt mixture PCR](#)
 - Concrete Mixtures
 - [NRMCA EPD Program Operator website](#)
 - [NSF Concrete mixture PCR](#)
 - Reinforcing Steel
 - [Concrete Reinforcing Steel Institute \(CRSI\) EPD website](#)
 - [UL Steel PCR](#)
 - Cement
 - [NSF Cement PCR](#)
- Presentations and Workshops
 - CDOT's Internal EPD Workshop held on June 8, 2022
 - [Workshop Slide Presentations](#)
 - [Workshop Recording](#)
- Conference Agendas
 - [Preconstruction Conference Agenda \(in Portrait orientation\)](#)
 - [Preconstruction Conference Agenda \(in Landscape orientation\)](#)
 - [Hot-Mix Asphalt Pre-Paving and PC/QA Conference Agenda](#)
 - [Concrete Pavement Pre-Paving and QC/QA Conference Agenda](#)

New Jersey (16)



Company	Plant	Mix	Location	EPD
Braenstone Industries	Braenstone of Sparta	Mix 2	217 Limecrest Rd Lafayette, NJ	45.134.285 v6
Braenstone Industries	Braenstone of Sparta	Mix 3	217 Limecrest Rd Lafayette, NJ	45.134.346 v1
Braenstone Industries	Braenstone of Sparta	Plant Mix Macadam	217 Limecrest Rd Lafayette, NJ	45.134.284 v2
Tilcon NY Inc.	Mt. Hope Asphalt	19 M 64, 15% RAP	625 Mt. Hope Road Wharton, NJ	60.150.414 v3
Tilcon NY Inc.	Mt. Hope Asphalt	19 M 64, 20% RAP	625 Mt. Hope Road Wharton, NJ	60.150.415 v3
Tilcon NY Inc.	Mt. Hope Asphalt	19 M64 40%	625 Mt. Hope Road Wharton, NJ	60.150.416 v3
Tilcon NY Inc.	Mt. Hope Asphalt	9.5 M 64 15% RAP	625 Mt. Hope Road Wharton, NJ	60.150.417 v2
Tilcon NY Inc.	Mt. Hope Asphalt	9.5 M 64 40% RAP (R)	625 Mt. Hope Road Wharton, NJ	60.150.418 v3
Tilcon NY Inc.	Mt. Hope Asphalt	I-2A 25% RAP	625 Mt. Hope Road Wharton, NJ	60.150.424 v1
Tilcon NY Inc.	Mt. Hope Asphalt	Mix 3/PA 5	625 Mt. Hope Road Wharton, NJ	60.150.395 v3
Tilcon NY Inc.	Mt. Hope Asphalt	Mix 3/PA 5 64	625 Mt. Hope Road Wharton, NJ	60.150.396 v2
Tilcon NY Inc.	Mt. Hope Asphalt	Mix 3/PA 5 64 10% RAP	625 Mt. Hope Road Wharton, NJ	60.150.398 v2
Tilcon NY Inc.	Mt. Hope Asphalt	Mix 3/PA 5 76	625 Mt. Hope Road Wharton, NJ	60.150.397 v2
Tilcon NY Inc.	Mt. Hope Asphalt	PA I-1 Plant Mix 64	625 Mt. Hope Road Wharton, NJ	60.150.391 v8

Texas (29)



Company	Plant	Mix	Location	EPD
RK Hall LLC	Plant 07 Paris	10095203 Grd 3 Pre-coat	1245 SW Loop 286 Paris, TX	50.136.263 v4
RK Hall LLC	Plant 07 Paris	10095204 Grd 4 Pre-coat	1245 SW Loop 286 Paris, TX	50.136.264 v4
RK Hall LLC	Plant 07 Paris	13900501 Ty D Cold Mix	1245 SW Loop 286 Paris, TX	50.136.266 v8
RK Hall LLC	Plant 07 Paris	3000000 ASB	1245 SW Loop 286 Paris, TX	50.136.254 v4
RK Hall LLC	Plant 07 Paris	3252509	1245 SW Loop 286 Paris, TX	50.136.255 v3
RK Hall LLC	Plant 07 Paris	3352508	1245 SW Loop 286 Paris, TX	50.136.257 v3
RK Hall LLC	Plant 07 Paris	3352513	1245 SW Loop 286 Paris, TX	50.136.258 v4
RK Hall LLC	Plant 07 Paris	3352514	1245 SW Loop 286 Paris, TX	50.136.259 v3
RK Hall LLC	Plant 07 Paris	3352515	1245 SW Loop 286 Paris, TX	50.136.260 v4
RK Hall LLC	Plant 07 Paris	3452532	1245 SW Loop 286 Paris, TX	50.136.261 v3
RK Hall LLC	Plant 07 Paris	3552506	1245 SW Loop 286 Paris, TX	50.136.262 v3
RK Hall LLC	Plant 07 Paris	3700001	1245 SW Loop 286 Paris, TX	50.136.265 v2
RK Hall LLC	Plant 08 Mt. Pleasant	3354507 344 Ty C	1064 CR 3010 South Mt. Pleasant, TX	50.200.428 v2
RK Hall LLC	Plant 08 Mt. Pleasant	3354509 3077 Ty C	1064 CR 3010 South Mt. Pleasant, TX	50.200.429 v2

3. EPDs for different pavement materials should not be compared to each other – While it can be tempting to use EPDs to compare different pavement materials (e.g., asphalt mixtures and ready-mix concrete), cross-material EPDs are not comparable for several reasons:

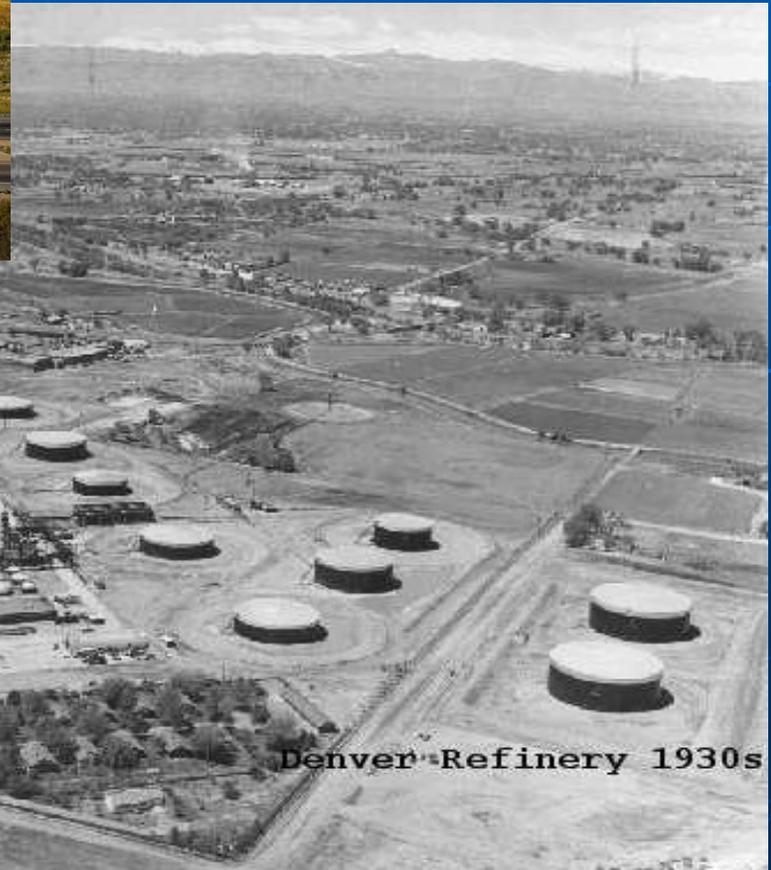
- **They Have Different PCRs** – Different pavement materials are subject to different product category rules (PCRs), which establish the EPD requirements for each pavement material type. The PCRs need to be aligned, a complex process identified by FHWA as critical to enabling comparisons across different pavement materials.⁴
- **EPDs Don't Account for Performance** – Different pavement materials have different performance characteristics, which the cradle-to-gate scope of EPDs does not account for. Additional analysis is required in the form of comparative LCA studies of the entire pavement structure. Comparative LCA studies can use EPDs as input data for the cradle-to-gate stages (once the PCRs have been aligned) and include additional life cycle stages such as construction, use, maintenance, and end-of-life.
- **Knowledge gaps** – Comparative LCA studies are limited by a lack of commonly accepted methodologies for modelling the use phase impacts of different pavement types, which is outside the scope of an EPD. An important knowledge gap is the impact of pavement structural response on vehicle fuel consumption. Many of the computational models have not been comprehensively validated with field experiments, leading to inconsistent and unreliable results depending on which model is used.⁵



General Implementation Concerns

- **Education** – Need to get the word out!
- **How many** separate “products” need to be benchmarked?
 - Can/should certain specifications be grouped together?
 - **More data = better decisions.**
- **Regional** Differences
 - Which regions matter?
 - Need data (EPDs) to determine. **More data = better decisions.**
- Impacts of **data gaps** on benchmark development, decision making, etc.
- Be wary of the **ceiling** for GWP limits
 - How will this be affected by data gaps??





Emerald
ECO LABEL



Rules of Thumb

1% aggregate moisture \approx 50° drum temp. \approx 0.5% AC binder \approx 3 kg GWP

Eliminate/reduce the use of hydrated lime can drop EPD up to 25%

(Pat Weaver, [Solterra Materials](#) in PHX has demonstrated this with lime/liquid antistrip combination)

Concrete Industry: \approx 85% of the EPD for PCC mixes is attributed to % cement in mixture.

Asphalt Industry: \approx 70% -80% of EPD is attributed to % binder + burner fuel