



Washington Waste Tire Assessment

Public Listening Session #2: April 28th, 2025

Washington Department of Ecology

Eastern Research Group (ERG, Inc.)

Introductions

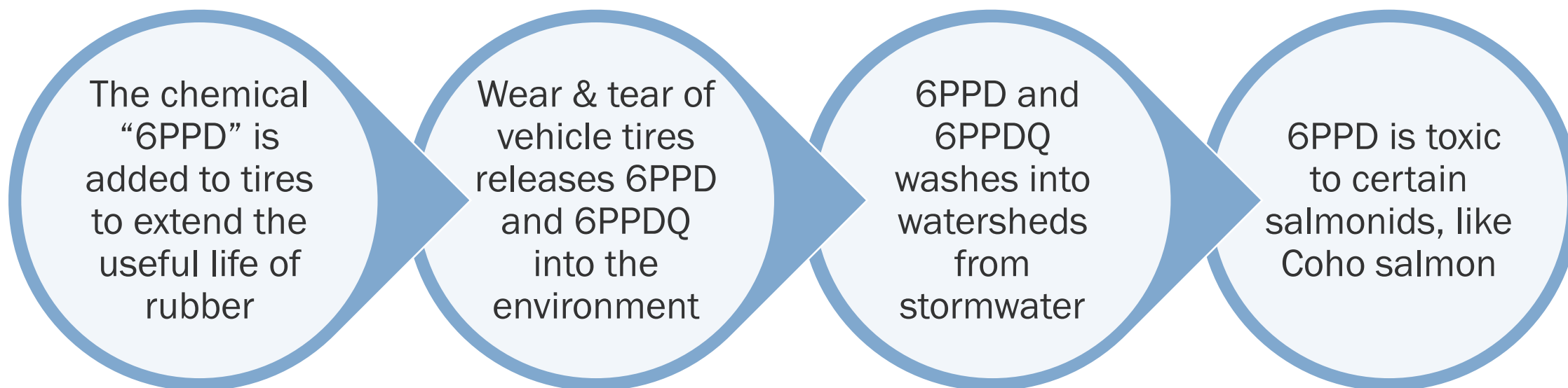
- Today's presenters:
 - **Blake Nelson**, Southwest Section Manager, Solid Waste Management, WA Department of Ecology
 - **Matt Pasquali**, Circular Economy Senior Analyst, Eastern Research Group, Inc.
 - **Hiroko Yoshida**, Senior Environmental Engineer, Eastern Research Group, Inc.
 - **Amy Rowland**, Project Manager, Eastern Research Group, Inc.
- Please introduce yourself in the **chat** by sharing:
 - Name, organization, location
- Please **change your name on Zoom to include:**
 - Name and organization

Agenda

- 1 **Background**
- 2 **Project Scope and Introduction**
- 3 **Project Approach**
- 4 **Draft Findings**
- 5 **Next Steps**
- 6 **Closing**

Background

6PPD – a chemical added to rubber tires to extend their useful life. 6PPD reacts with ozone in the air to form 6PPD-quinone (6PPDQ); both harm Coho salmon in Washington.



Background continued

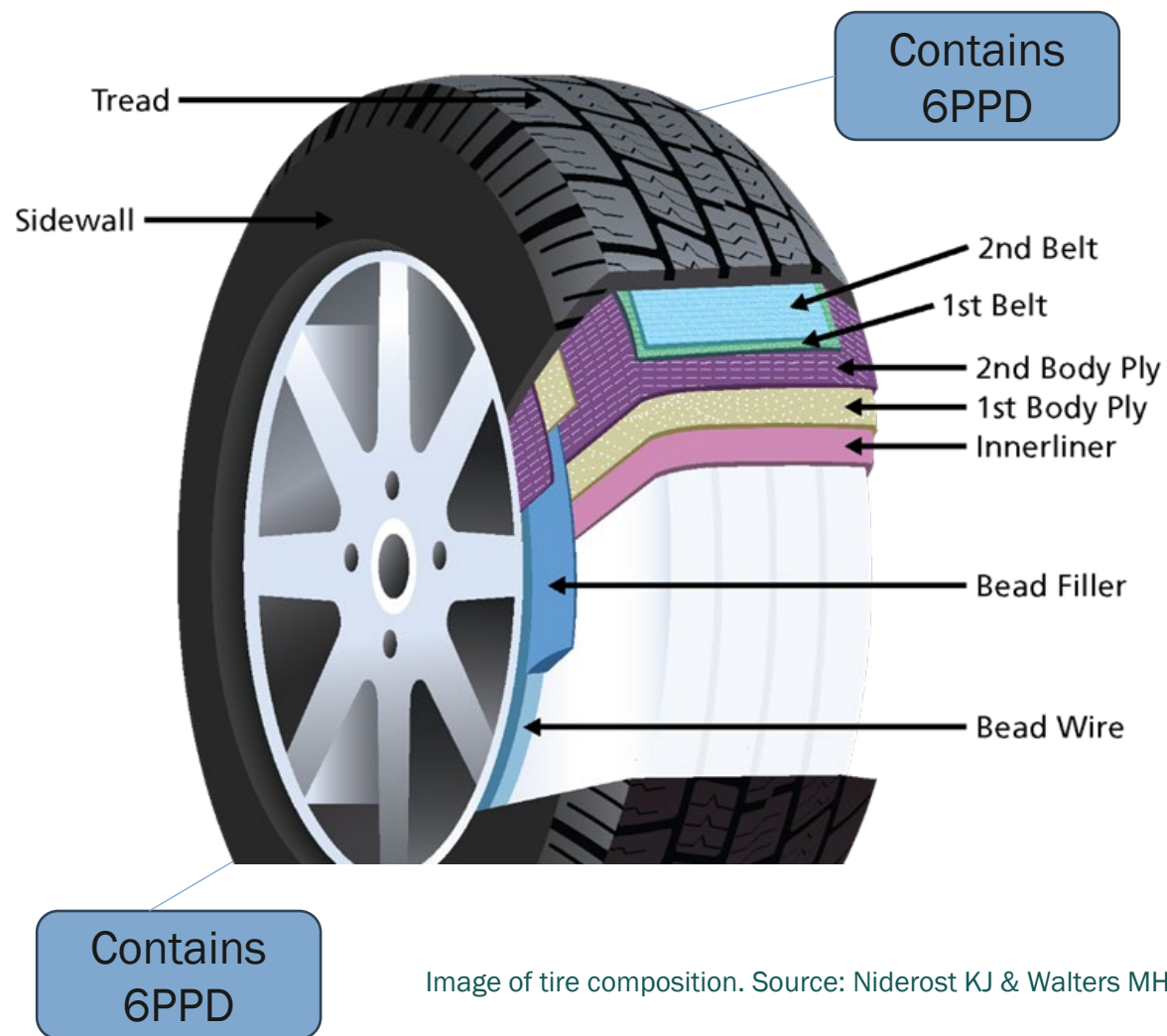


Image of tire composition. Source: Niderost KJ & Walters MH. (2003)



Project Scope and Introduction

Research Goal – conduct a life cycle analysis (LCA) report for used tires to assess environmental pathways of 6PPD and 6PPDQ, and answer the following research questions:

- 1) How many tons of tires enter the secondary market on average each year? What are the sources?
- 2) How are the tires handled? How much is repurposed and how much is disposed? What are the trends?
- 3) What does “recycling” mean in the local and global secondary markets?
- 4) Where are the tires used and what communities are most vulnerable to negative impacts?
- 5) Which Washington state policies and programs support secondary tire product markets?
- 6) What alternatives to using tire derived rubber exist in these markets?

Project Approach



Ecology partnered with ERG, Inc. to conduct the used tire study



Conducted literature and data review to answer research questions



Hosted listening session and engaged the public



Conducted life cycle assessment and reported findings



Draft Findings

The remaining slides will outline draft findings for each research question

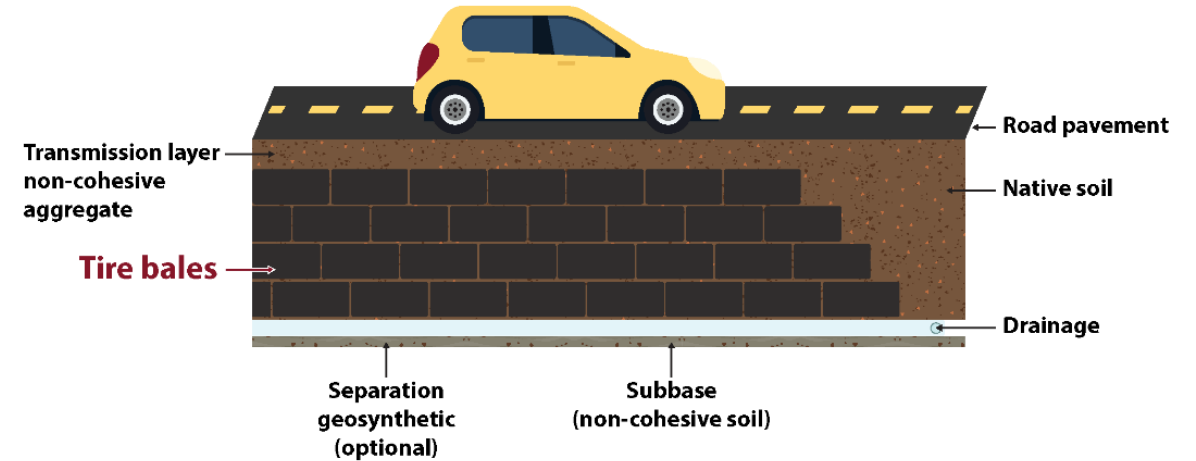
What does “recycling” mean in the local and global secondary markets?

“Tires can be recycled by grinding up the rubber and remolding it for other purposes. Some uses of ground rubber include groundcover under playground equipment, running track material, and components of sports and playing fields.

Tires can also be cut, punched or stamped into various rubber products, including floor mats, belts, gaskets, shoe soles, dock bumpers, seals, muffler hangers, shims and washers.”

Source: 2012 Annual Report to the Washington State Legislature on Tires

Examples of recycling



What does “recycling” mean in the local and global secondary markets? (cont.)

- In Washington, recycling includes tires baled and recycled, and excludes tires burned for energy and retreaded/ reused.
- In 2023, 71% of scrap tire processing is by Liberty Tire (includes L&S Tire and Castle Tire acquisitions), which produces asphalt mix to key markets.
- In the United States and globally, the biggest difference in definitions of “recycling” centers around whether to include incineration, waste to energy, tire-derived fuel, and alternative daily cover.

How many tons of tires enter the secondary market on average each year? What are the sources?



33,883 tons of waste tires entered the secondary market in 2021

22,956 tons of waste tires landfilled



88% from light duty vehicles

Passenger light-duty vehicles: 16,549 tons

Light-duty trucks: 2,569 tons

Scrapped light-duty vehicles: 982 tons

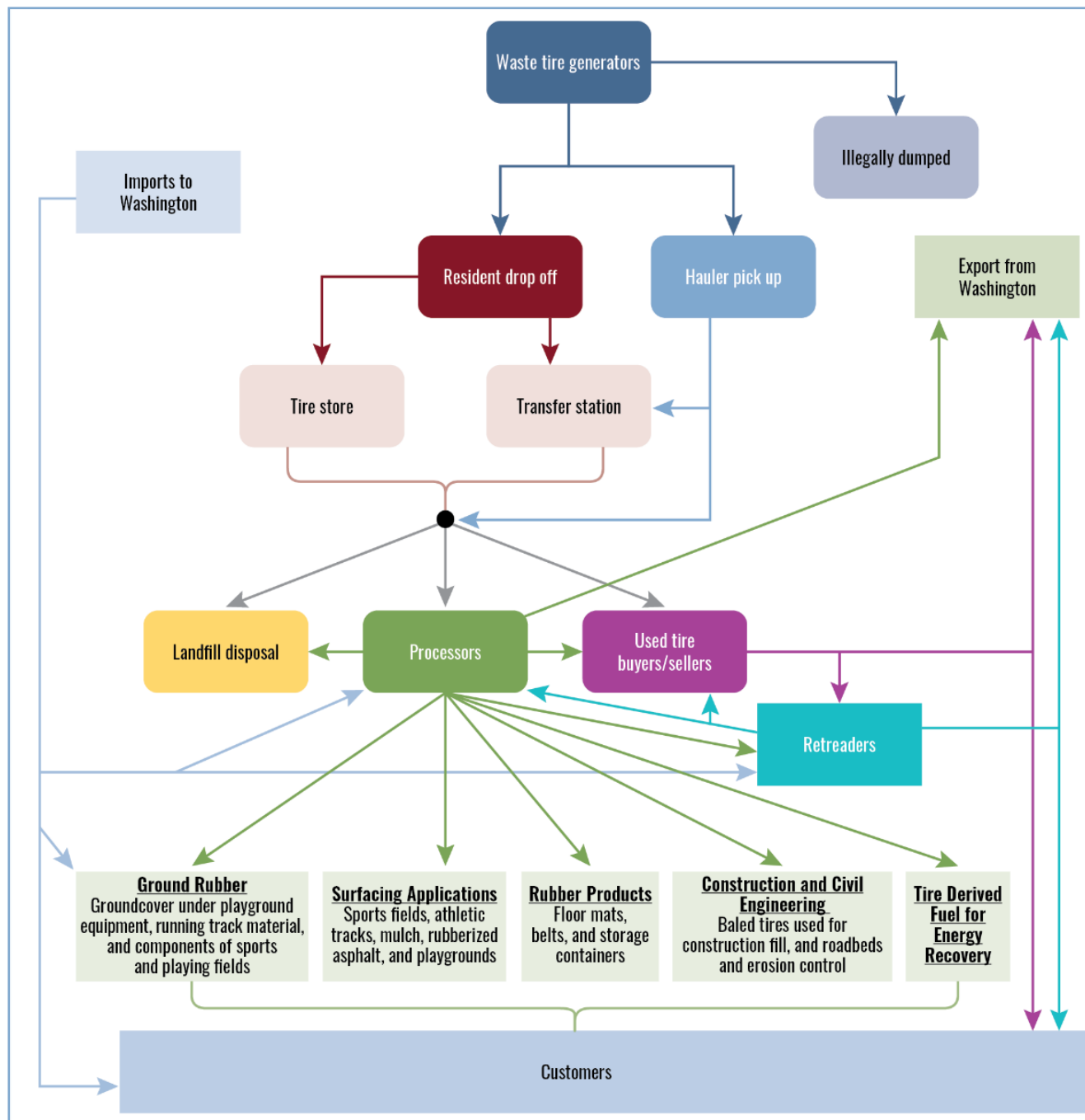


12% from commercial vehicles

Medium and wide base heavy trucks: 7,617 tons

Scrapped trucks and buses: 6,166 tons

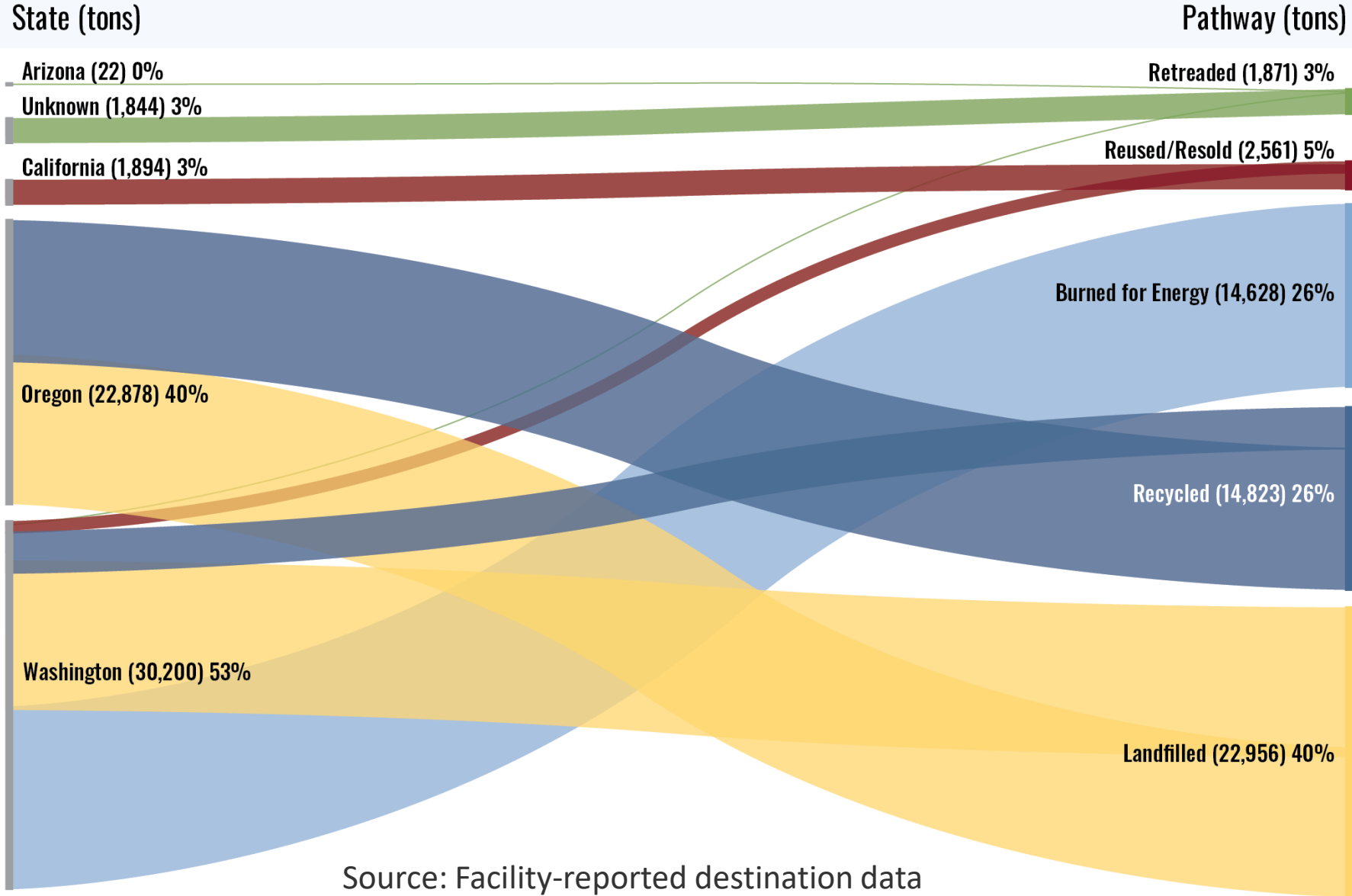
Flow of waste tires in Washington



How are the tires handled? How much is repurposed and how much is disposed? What are the trends?

- In 2021, facilities in Washington sent waste tires to four states and one unknown destination.
- Waste tires were handled through five main pathways:
 - Burned for energy or fuel (14,628 tons)
 - Landfilled (22,956 tons)
 - Recycled (14,823 tons)
 - Retreaded (1,871 tons)
 - Reused or resold (2,561 tons)
- It is difficult to decipher any trends for these pathways because data has undergone minimal quality assurance and quality control (QA/QC) and has not been finalized.

Flow of waste tires in 2021

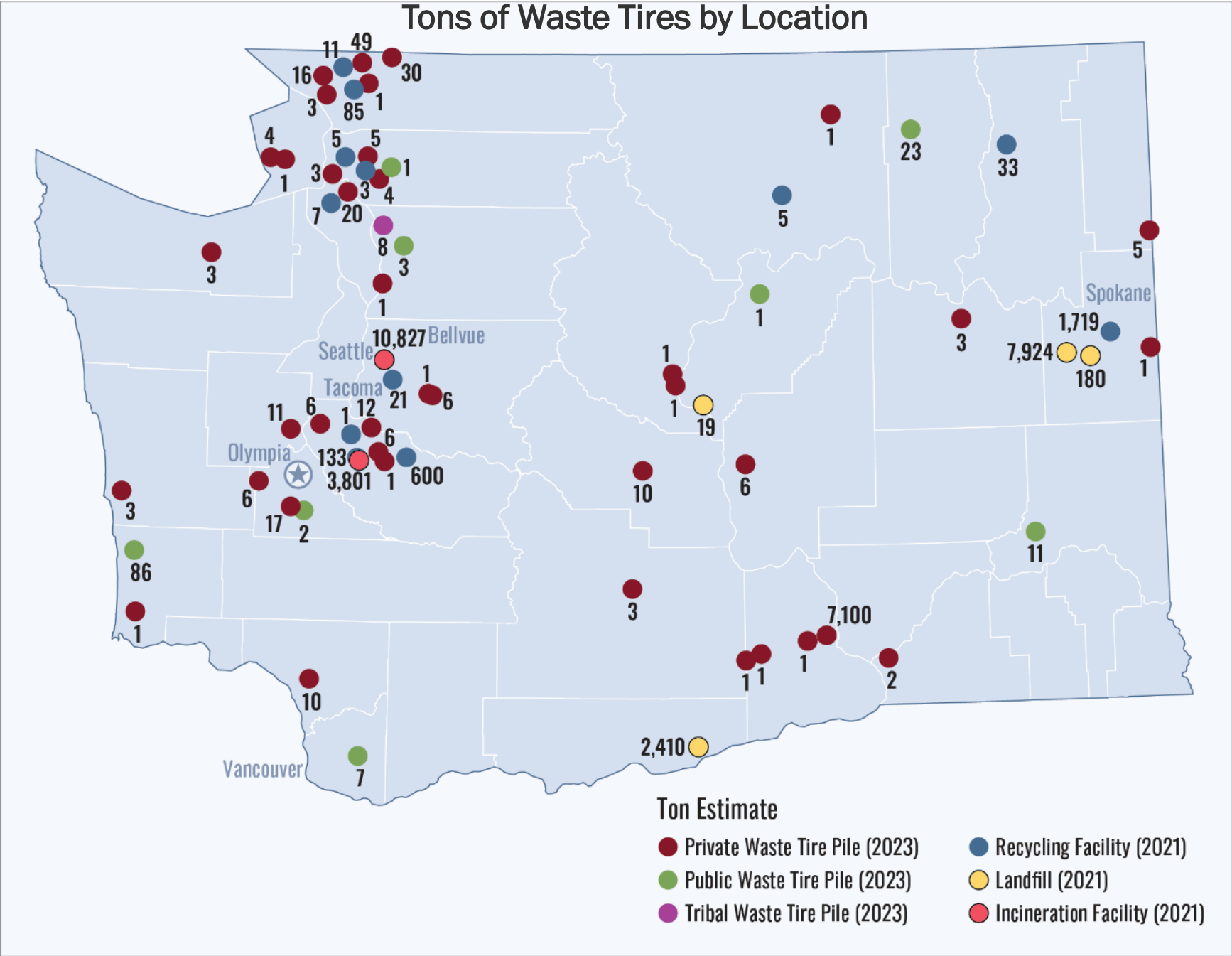


Where are the tires used and what communities are most vulnerable to negative impacts?

- Percent of tons of waste tires sent to areas where the EJ indicator is at or higher than the state average:
 - Low-income population* : 62%
 - Communities of color* : 61%
 - Indigenous people^: less than 1%
- 49 major tire piles, ranging in size from 0.5 tons to 86 tons, in 27 WA counties as of March 2023

**As defined by Washington State DOH's Washington Tracking Network*

^As defined by EPA's EJScreen and tract-level data from the U.S. Census Bureau, American Community Survey (ACS)

[illegible]

Tons of Waste Tires by Location

This map displays the distribution of waste tires across Washington state, categorized by location type and tonnage. Major cities like Seattle, Tacoma, Olympia, Vancouver, and Spokane are labeled. The map uses colored dots to represent different types of waste tire locations, with numbers indicating the tonnage at each site. A legend at the bottom explains the color coding and provides a ton estimate for each category.

Location Type	Ton Estimate
Private Waste Tire Pile (2023)	Dark Red Dot
Public Waste Tire Pile (2023)	Green Dot
Tribal Waste Tire Pile (2023)	Purple Dot
Recycling Facility (2021)	Blue Dot
Landfill (2021)	Yellow Dot
Incineration Facility (2021)	Red Dot with Star

- [illegible]

Which Washington state policies and programs support secondary tire product markets?

4 WA laws and rules relate to waste tire management:

- **Solid Waste Management, Reduction and Recycling statute**
 - *Waste Tire Sections* (RCW 70A.205.400 – RCW 70A.205.460)
- **Solid Waste Handling Standards rule**
 - *Definitions section* (WAC 173-350-100)
 - *Waste tire storage section* (WAC 173-350-350)
 - *Waste tire transportation section* (WAC 173-350-355)
- **Washington Clean Air Act**
 - *Outdoor burning fires prohibited section* (RCW 70A.15.5010)
- **Outdoor burning rule** (WAC 173-425)

Which Washington state policies and programs support secondary tire product markets? (cont.)

Additional policies and programs that could relate to secondary tire product markets:

Recycling Development Center (RDC) (Chapter 70A.240 RCW)

- The law tasks the RDC with facilitating research and development, marketing, and policy analysis to bolster recycling markets and processing in WA.

Revised Code of WA (RCW) 70A.200.060

- Provides penalties and restitution for litter and illegal dumping, which includes tires illegally dumped on private or public property.

Historical Requirements: RCW 70.95.545

- This required Ecology to report the increase or reduction in tire recycling and reuse rates in the state. However, this was repealed in 2014.

Extended Producer Responsibility (EPR)

- Washington is one of 39 states with a tire collection program. However, EPR is a policy vehicle yet to be enacted by the Washington state legislature.

What is the alternatives?



Turf infill

- Zeolite, coated sands, natural fiber



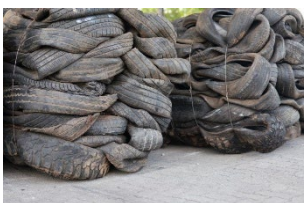
Rubber mulch

- Wood mulch



Rubberized asphalt and modified binder

- Biobased binder, recycle plastic, engineered polymer



Tire derived aggregates or baled tire

- Expanded clay, perlite, sand, gravel



Playground equipment

- Wood, recycled plastic, metal, composite materials, natural fiber-based products

Life Cycle Assessment

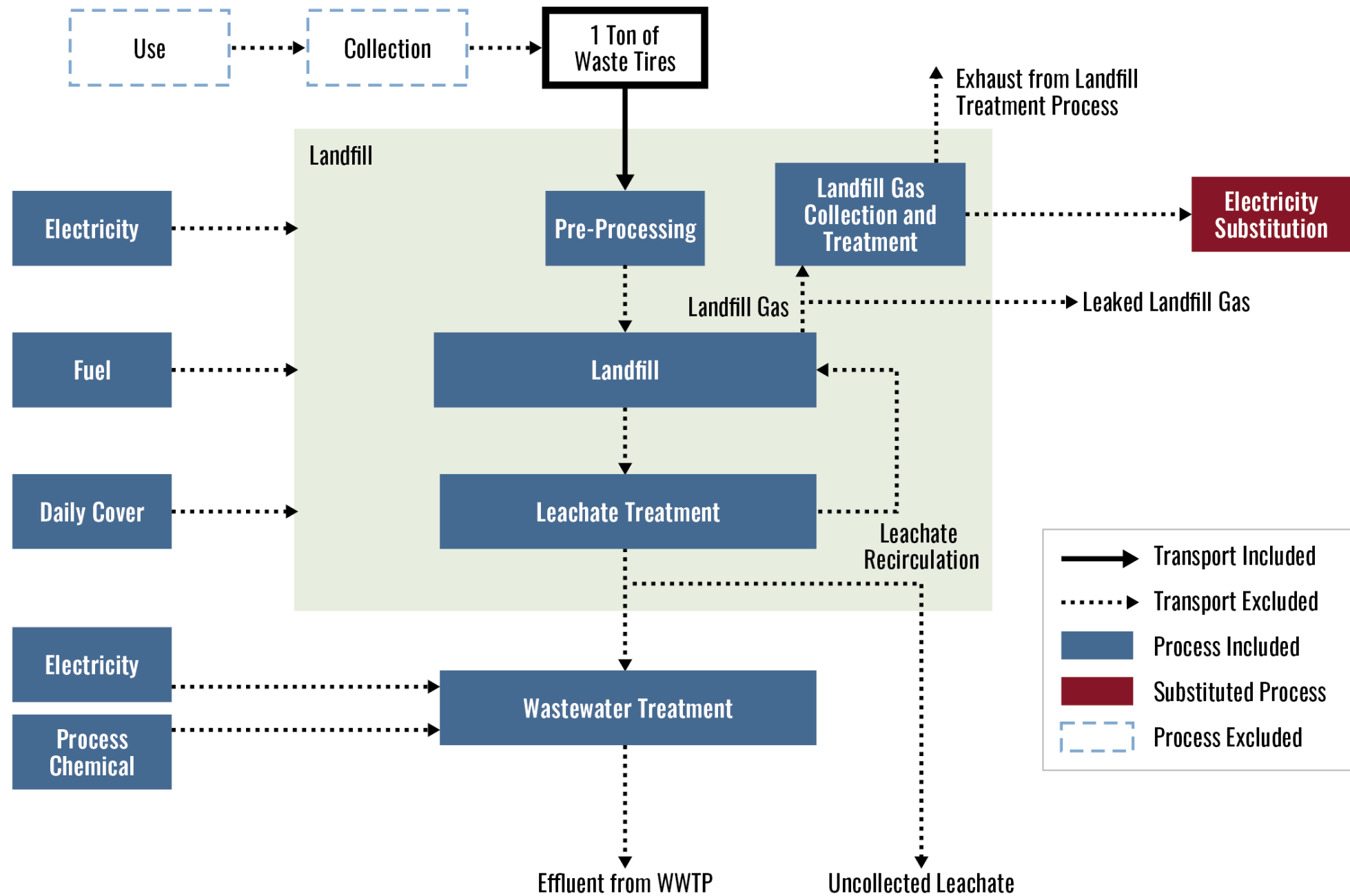
Goal and Scope Definition

- Functional Unit is the End-of-Life treatment of 1 short ton of mixed waste tires
- TRACI 2.2 by USEPA was used for impact assessment
- Impact is calculated by
 - Creating inventory of pollutant emissions
 - Converting the emissions into possible impacts by multiplying characterization factors for eight different impact categories

Composition	Passenger— Light-Duty	Truck— Commercial- Grade
Synthetic rubber	26%	13%
Natural rubber	14%	26%
Carbon black	27%	27%
Steel	16%	17%
Textile	6%	3%
Sulfur	0.5%	0.24%
Zinc oxide (vulcanizing agent)	0.8%	0.41%
Other oils and chemicals	9%	13%

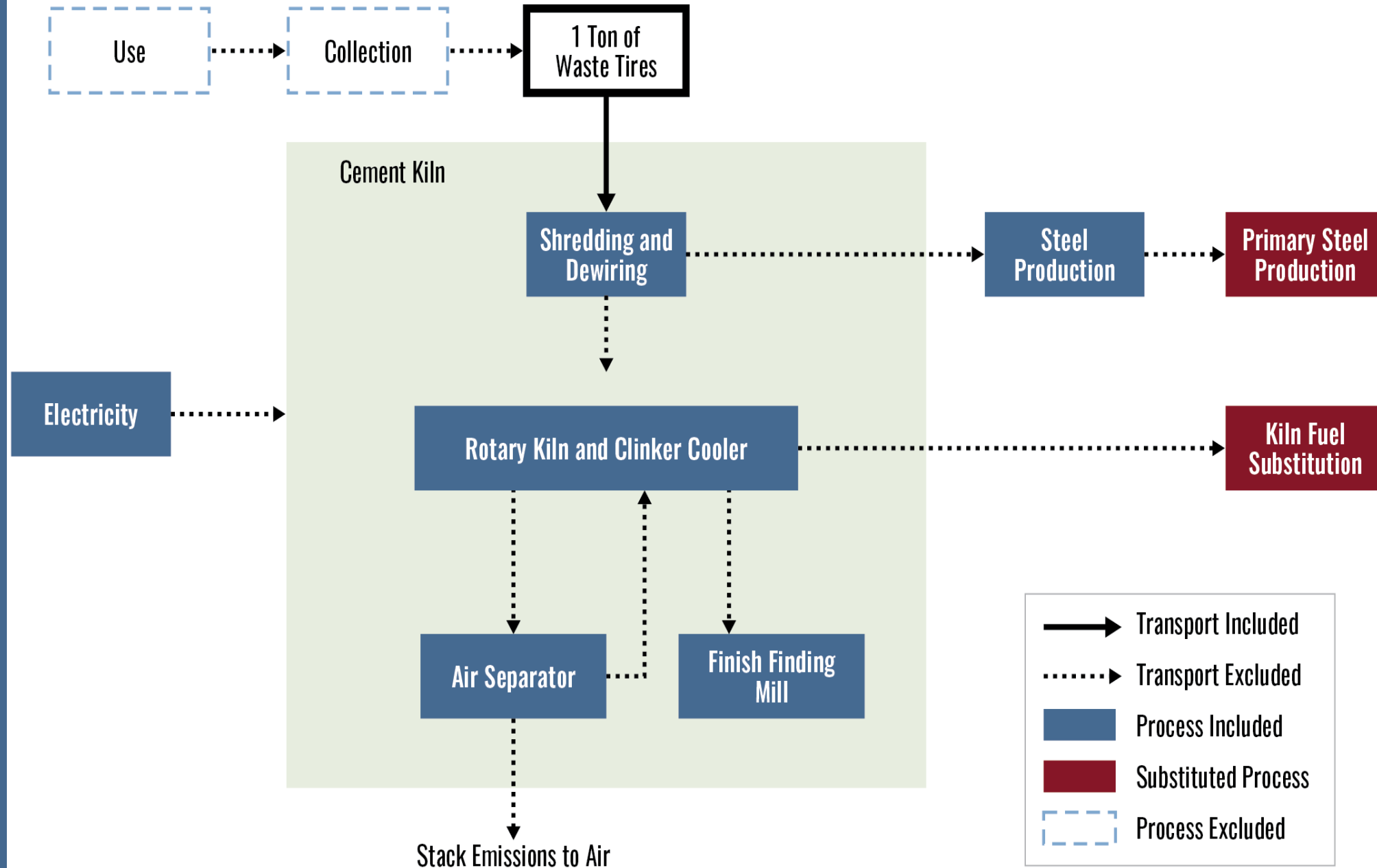
Life Cycle Inventory Development Scenario 1: Landfill

- No landfill gas generation
- No carbon storage



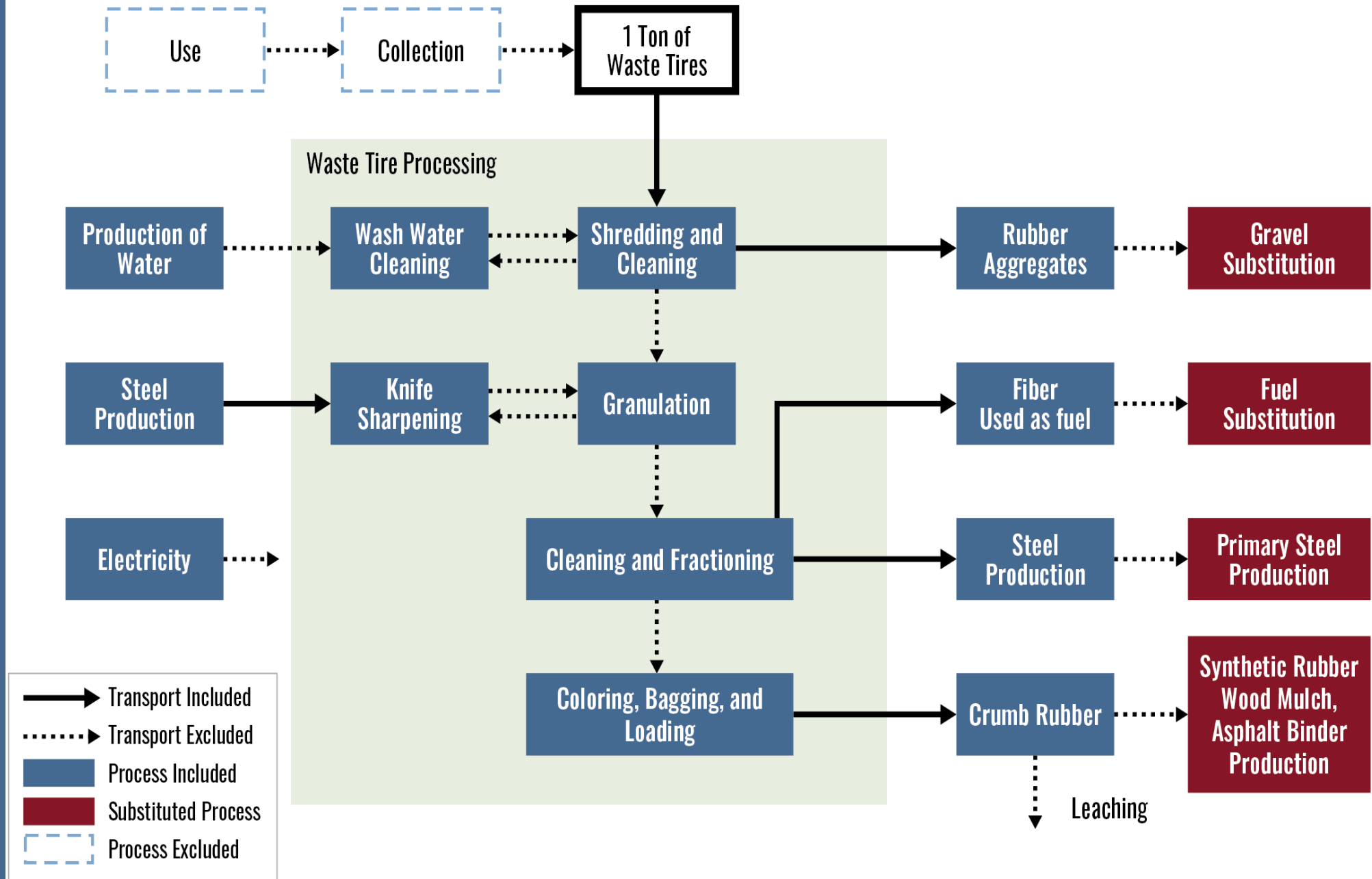
Life Cycle Inventory Development Scenario 2: Energy Recovery

- Conventional fuel includes coal, petroleum coke and natural gas



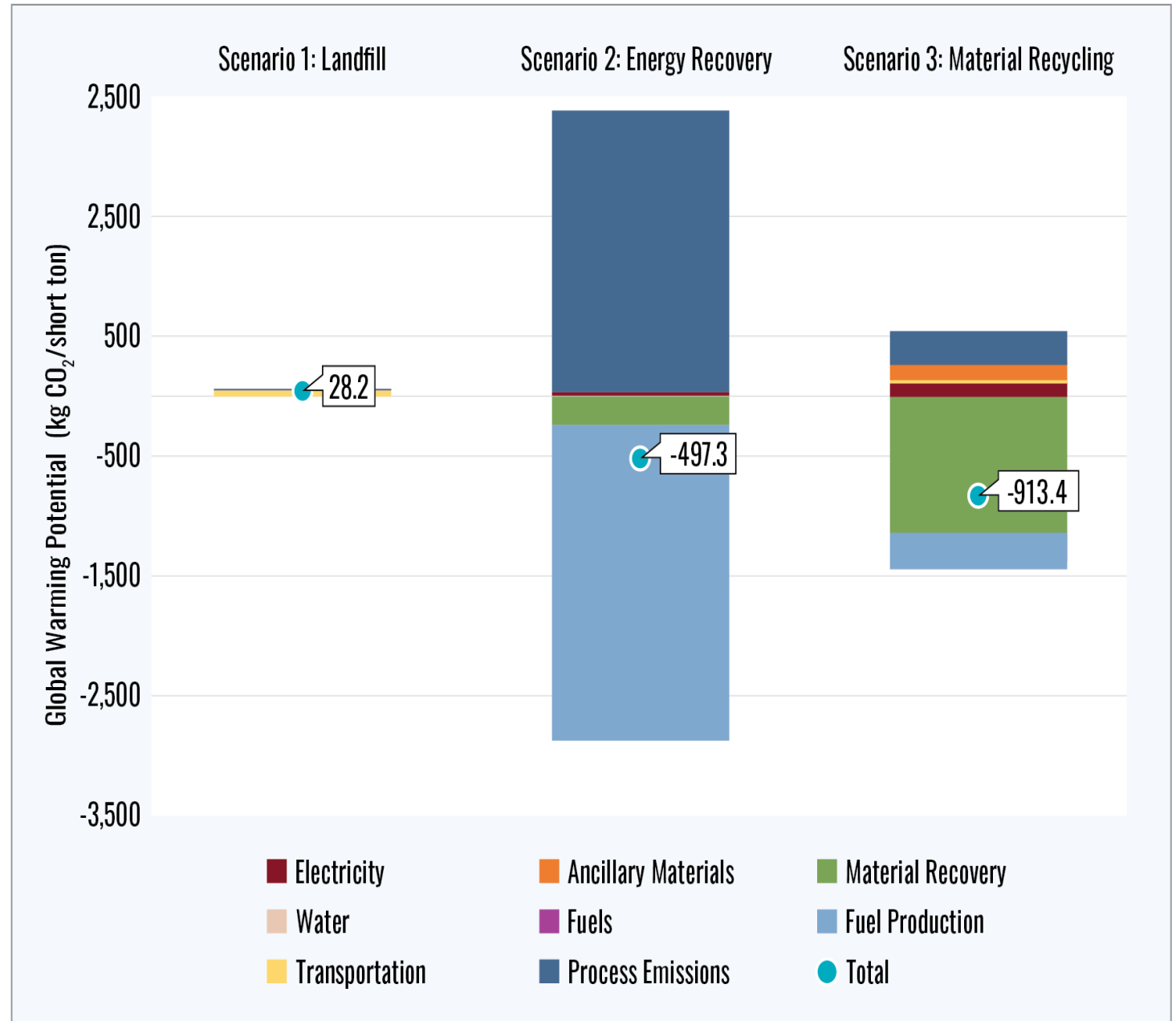
Life Cycle Inventory Development Scenario 3: Material Recycling

- The national average product breakdown



Life Cycle Impact Assessment Results

- **Landfill** : Minimal impacts across most categories evaluated.
- **Energy Recovery**: High process emission but also high impact savings.
- **Material Recycling**: Process emissions for the material recovery pathway are a primary driver of gross impacts and energy consumption.

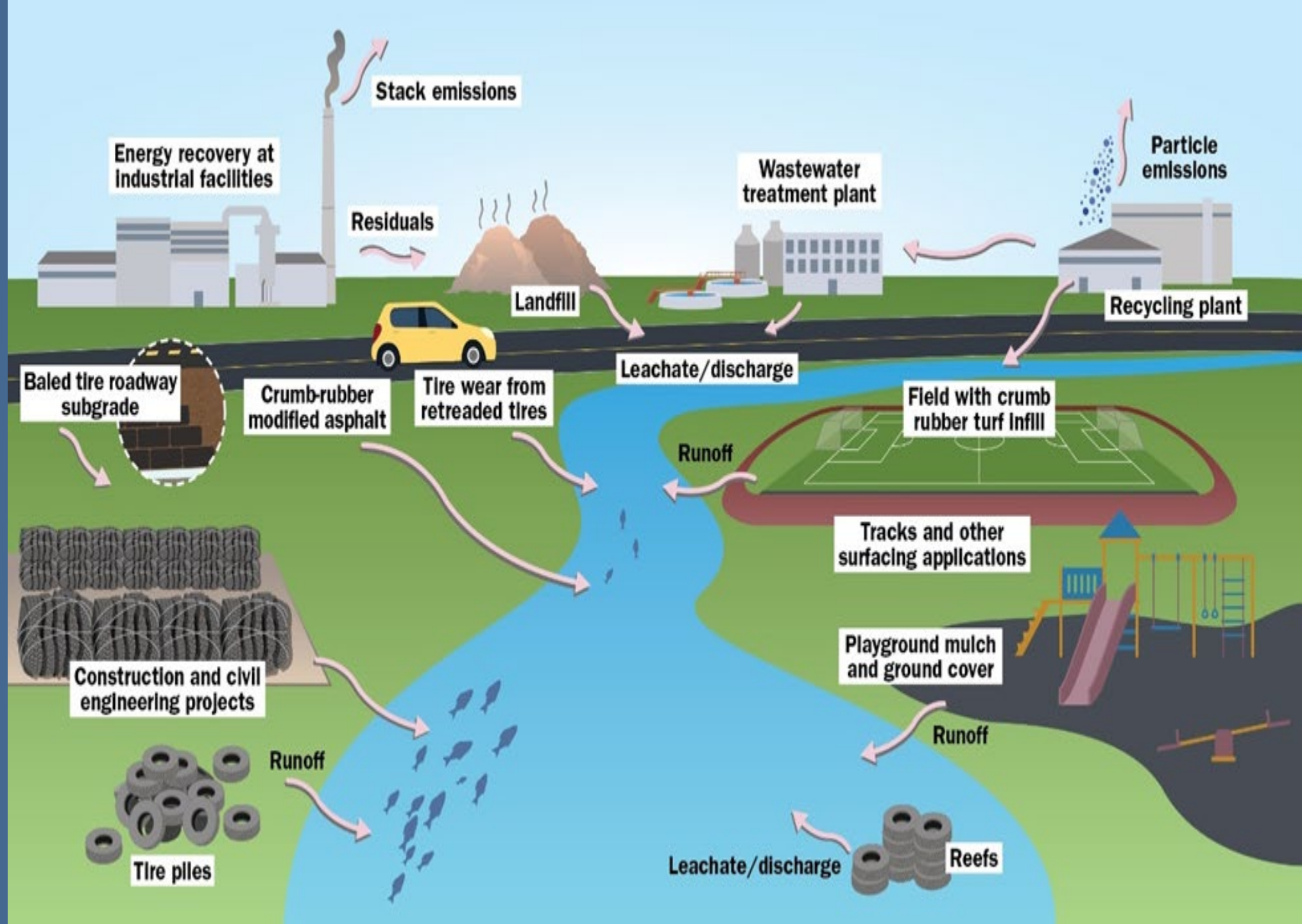


Life Cycle Impact Assessment Results

Impact Category	Units	Scenario 1: Landfill	Scenario 2: Energy Recovery (TDF)	Scenario 3: Material Recycling
Acidification (AP)	kg SO ₂ equivalent	0.1	-2.4	-2.1
Ecotoxicity (ETP)	CTUe	120.9	-9263.8	-4284.7
Eutrophication (marine) (EP)	kg N equivalent	7.0E-03	-1.2E-01	-9.0E-02
Fossil fuel depletion (FFD)	MJ surplus	0.8	-673.9	-205.5
Global warming (GWP)	kg CO ₂ equivalent	28.2	-497.3	-913.4
Ozone depletion (ODP)	kg CFC-11 equivalent	6.24E-08	-1.06E-04	-3.20E-05
Respiratory effects (REP)	kg PM _{2.5} equivalent	1.75E-03	-3.60E-01	-2.46E-01
Smog (SP)	kg NO _x equivalent	3.9E+00	-4.2E+01	-4.7E+01

Data Gaps

- There are several potential emission pathways for 6PPD and 6PPDQ from EOL treatment of waste tires, but most have never been measured for 6PPD or 6PPDQ



Next Steps

- Finalize and perform quality assurance/quality control for facility-reported data
- Further industry collaboration to evaluate 6PPD and 6PPD-Q emissions and prevention measures
- Continuation of monitoring of waste tire disposal and utilization practices

Thank you for your participation!

Questions?

To engage verbally:

Please use the “raise hand” function to indicate that you would like to speak, and wait for your name to be called before unmuting

To engage by chat:

Please send your questions or comments through the chat

Blake Nelson
Southwest Section Manager
Solid Waste Management
Blake.nelson@ecy.wa.gov

Lauren DiRe
Waste Reduction & Reuse Specialist
Solid Waste Management
Lauren.dire@ecy.wa.gov

Derek Rockett
Facilities Specialist
Solid Waste Management
Derek.rockett@ecy.wa.gov

Ecology's 6PPD Team: 6ppd@ecy.wa.gov