



## Sustainable Materials Management

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# Sustainable Management of Industrial Non-Hazardous Secondary Materials

The beneficial use of industrial non-hazardous secondary materials (secondary materials) is a key part of EPA's Sustainable Materials Management (SMM) effort. The appropriate beneficial use of secondary materials can advance the goals of EPA's SMM program, which emphasizes a materials management approach that aims to reduce impacts to human health and the environment associated with materials over their entire life cycle (e.g., extraction, manufacture, distribution, use, disposal). Through SMM, EPA is helping change the way our society protects the environment and conserves resources for future generations.

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- What are Secondary Materials?
- What is Beneficial Use?
- How is the Beneficial Use of Secondary Materials Regulated?
- What EPA Resources are Available to Aid in the Determination of Whether a Beneficial Use is Appropriate?
- Additional Resources

### Related Resources

- Coal Ash  
<<https://epa.gov/coalash/coal-ash-reuse>>
- Spent Foundry Sands  
<<https://epa.gov/smm/beneficial-uses-spent-foundry-sands>>
- Construction and Demolition Materials  
<<https://epa.gov/smm/sustainable-management-construction-and-demolition-materials>>
- Guide for Industrial Waste Management  
<<https://epa.gov/smm/guide-industrial-waste-management>>

# What are Secondary Materials?

Secondary materials are any materials that are not the primary products from manufacturing and other industrial sectors.

These materials can include scrap and residuals from production processes and products that have been recovered at the end of their useful life. Some common examples include:

- Coal combustion residuals generated by steam electric utilities
- Spent foundry sand generated by the metal casting sector
- Construction and demolition materials from the construction and demolition of buildings, roads and other infrastructure

- Federal Research on Recycled Tire Crumb Used on Playing Fields and Playgrounds

<<https://epa.gov/chemical-research/federal-research-recycled-tire-crumb-used-playing-fields-and-playgrounds>>

- Electric Arc Furnace Slag

<<https://epa.gov/smm/electric-arc-furnace-eaf-slag>>

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## What is Beneficial Use?

Each year the industrial sector creates hundreds of millions of tons of secondary materials that are sent for disposal, but some have the potential to be beneficially used instead. Beneficial use involves the substitution of these materials, either as generated or following additional processing, for some or all of the virgin materials in a natural or commercial product in a way that: provides a functional benefit; meets product specifications; and does not pose concerns to human health or the environment. Secondary materials can often be used as substitutes for virgin materials because they have many of the same chemical and physical properties as the materials they replace.

Examples of appropriate beneficial use applications include:

- Coal fly ash as a replacement for portland cement in concrete <<https://epa.gov/coalash/coal-combustion-residual-beneficial-use-evaluation-fly-ash-concrete-and-fgd-gypsum>>
- Flue gas desulfurization gypsum as a substitute for mined gypsum in wallboard <<https://epa.gov/coalash/coal-combustion-residual-beneficial-use-evaluation-fly-ash-concrete-and-fgd-gypsum>>
- Spent foundry sands in soil-related applications, such as manufactured soil and road subbase <<https://epa.gov/smm/beneficial-uses-spent-foundry-sands>>

In addition, other secondary materials may be used in the construction of roads, bridges, buildings, and other infrastructure as structural fill, road embankments, flowable fill, and as aggregate in pavements and concrete.

Some of the potential benefits associated with the use of secondary materials include reduced costs, preservation of natural resources, reduced air and water pollution from extraction activities, reduced greenhouse gas emissions, and avoided use of landfill space. Because of the potential for numerous economic, environmental and performance benefits, the appropriate beneficial use of secondary materials can advance the goals of EPA's SMM program.

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## How is the Beneficial Use of Secondary Materials Regulated?

State environmental agencies manage the beneficial use of secondary materials. Prior to beneficially using secondary materials in any projects, interested individuals or organizations should talk to the relevant state environmental agency to ensure proposed uses are consistent with state requirements. The Beneficial Use State Program Locator [✉ <http://www.envcap.org/statetools/brsl/index.cfm>](http://www.envcap.org/statetools/brsl/index.cfm) is a useful tool to identify individual state rules and programs related to beneficial use of secondary materials.

For coal combustion residuals (CCR), the Agency's April 2015 CCR Disposal Final Rule [<https://epa.gov/coalash/coal-ash-rule>](https://epa.gov/coalash/coal-ash-rule) promulgated a definition for beneficial use (40 CFR 257.53). This definition identifies four criteria that distinguish beneficial use from disposal (21349 FR 80). Those parties who propose a beneficial use for CCR should consult both this definition and the relevant state authorities to identify all the requirements that would apply.

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## What EPA Resources are Available to Aid in the Determination of Whether a Beneficial Use is Appropriate?

EPA has developed several tools to assist with addressing barriers to the beneficial use of secondary materials. EPA developed the *Methodology for Evaluating Beneficial Uses (BU) of Industrial Non-Hazardous Waste Secondary Materials* [<https://epa.gov/smm/methodology-evaluating-beneficial-uses-industrial-non-hazardous-secondary-materials-and>](https://epa.gov/smm/methodology-evaluating-beneficial-uses-industrial-non-hazardous-secondary-materials-and) (BU Methodology) and the *Beneficial Use Compendium: A Collection of Resources and Tools to Support Beneficial Use Evaluations* [<https://epa.gov/smm/methodology-evaluating-beneficial-uses-industrial-non-hazardous-secondary-materials-and>](https://epa.gov/smm/methodology-evaluating-beneficial-uses-industrial-non-hazardous-secondary-materials-and) (BU Compendium) to help evaluate the potential for adverse impacts to human health and the environment associated with the beneficial use of secondary materials. Together, the BU Methodology and BU Compendium are intended to help improve the consistency and quality of beneficial use evaluations. However, neither document is intended to be a detailed, step-by-step guide on how to conduct the evaluation for any particular beneficial use of a secondary material. Rather, these documents identify key questions to ask when

designing or reviewing evaluations, as well as a list of tools and other resources that might be helpful. These two documents can help states and others conduct beneficial use evaluations of secondary materials.

## Additional Resources

These additional resources are available to help with the other considerations in determining the appropriateness of a proposed beneficial use, such as how a secondary material substitutes for some or all of the virgin materials in a natural or commercial product in a way that provides a functional benefit. Also, there are resources listed below to help with additional considerations that may also factor into a beneficial use determination, such as quantifying the greenhouse gas impacts from using secondary materials and including community input into the planning for a beneficial use project. Other federal agencies, states, and local governments may use different terms in discussing the beneficial use of secondary materials, such as “industrial byproducts” and “recycled materials.”



Title	Description
<p>User Guidelines for Waste and Byproduct Materials in Pavement Construction <a href="https://www.fhwa.dot.gov/publications/research/infrastructure/structures/97148/app.cfm">🔗</a></p> <p>&lt;<a href="https://www.fhwa.dot.gov/publications/research/infrastructure/structures/97148/app.cfm">https://www.fhwa.dot.gov/publications/research/infrastructure/structures/97148/app.cfm</a>&gt;</p>	<p>This Federal Highway Administration document provides technical information on beneficially using waste and byproduct materials in pavement construction.</p>

Recycled Materials Resource Center [ⓧ](http://rmrc.wisc.edu/) <http://rmrc.wisc.edu/>

The Recycled Materials Resource Center (RMRC) is a national center that provides information and resources to facilitate the appropriate use of recycled materials in the highway environment. The RMRC web site provides access to research efforts and results as well as other technical resources related to the use of recycled materials in transportation applications.

<p>Office of Pavement Technology Recycling Homepage <a href="https://www.fhwa.dot.gov/pavement/recycling/index.cfm">🔗</a> &lt;<a href="https://www.fhwa.dot.gov/pavement/recycling/index.cfm">https://www.fhwa.dot.gov/pavement/recycling/index.cfm</a>&gt;</p>	<p>One of the focus areas for the Federal Highway Administration's (FHWA) Office of Pavement Technology is environmental stewardship, which includes recycling and reducing noise abatement. Their recycling website includes information on FHWA's current projects and activities to facilitate the use of recycled materials in the highway environment.</p>
<p>BEES (Building for Environmental and Economic Sustainability) <a href="http://www.nist.gov/el/economics/beessoftware.cfm">🔗</a> &lt;<a href="http://www.nist.gov/el/economics/beessoftware.cfm">http://www.nist.gov/el/economics/beessoftware.cfm</a>&gt;</p>	<p>BEES is a software tool, developed by the National Institute of Standards and Technology, for selecting cost-effective, environmentally preferable building products.</p>

BIRDS (Building Industry Reporting and Design for Sustainability) [🔗](https://ws680.nist.gov/birds)

<<https://ws680.nist.gov/birds>>

BIRDS is a software tool, developed by the National Institute of Standards and Technology, for comparing the sustainability performance of a building as its energy efficiency design changes.

PaLate (Pavement Life-Cycle Assessment Tool for Environmental and Economic Effects) [☞ <http://faculty.ce.berkeley.edu/horvath/palate.html>](http://faculty.ce.berkeley.edu/horvath/palate.html)

PaLate is a computer-based decision support tool developed by the University of California, Berkeley's Consortium on Green Design and Manufacturing. PaLate is for pavement designers and engineers, transportation agency decision-makers, civil engineers, and researchers, to model economic costs and environmental effects of using traditional highway materials and recycled materials for highway applications.



<p>WARM (Waste Reduction Model) &lt;<a href="https://epa.gov/warm">https://epa.gov/warm</a>&gt;</p>	<p>EPA created the Waste Reduction Model (WARM) to help solid waste planners and organizations track and voluntarily report greenhouse gas (GHG) emissions reductions from several different waste management practices. Examples of industrial non-hazardous secondary materials that the WARM model recognizes include: asphalt concrete, asphalt shingles, clay bricks, concrete, dimensional lumber, drywall, and fly ash.</p>
<p>RCRA Public Participation Manual &lt;<a href="https://epa.gov/hwpermitting/resources-public-participation-hazardous-waste-permitting-and-corrective-action">https://epa.gov/hwpermitting/resources-public-participation-hazardous-waste-permitting-and-corrective-action</a>&gt;</p>	<p>This EPA document provides tools for public participation and public outreach in environmental decision-making.</p>

<p>Environmental Justice &lt;<a href="https://epa.gov/environmentaljustice/learn-about-environmental-justice">https://epa.gov/environmentaljustice/learn-about-environmental-justice</a>&gt;</p>	<p>This EPA web page provides information on environmental justice to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations, and polices.</p>
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<p><a href="https://epa.gov/smm/electric-arc-furnace-eaf-slag">Electric Arc Furnace Slag &lt;https://epa.gov/smm/electric-arc-furnace-eaf-slag&gt;</a></p>
<p><b>Industrial Non-Hazardous Secondary Materials</b></p>
<p><a href="https://epa.gov/smm/sustainable-packaging">Packaging &lt;https://epa.gov/smm/sustainable-packaging&gt;</a></p>
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<p><a href="https://epa.gov/smm/sustainable-materials-management-tools">Additional SMM Tools &lt;https://epa.gov/smm/sustainable-materials-management-tools&gt;</a></p>
<p><a href="https://epa.gov/smm/sustainable-materials-management-web-academy">Past SMM Webinars &lt;https://epa.gov/smm/sustainable-materials-management-web-academy&gt;</a></p>

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