



Foundry Sand Reuse in Arizona

Best Practices & Regulatory Compliance

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3. Key Concepts and Definitions

What is Foundry Sand?

Foundry sand is high-quality silica sand used by Arizona's aerospace, defense, and industrial casting sectors to create metal molds. This sand is typically high-grade quartz, often containing additives like bentonite clay or chemical binders (phenolics, urethanes). Once the sand can no longer be reused in the internal casting loop due to thermal degradation, it is categorized as **spent foundry sand (SFS)**.

What is Beneficial Reuse?

In Arizona, beneficial reuse refers to the process of exempting non-hazardous industrial byproducts from solid waste regulations so they can be utilized as functional substitutes for virgin materials (e.g., aggregate, fill, or soil) in a manner that protects public health and the environment.

What is the TCLP Test?

The **Toxicity Characteristic Leaching Procedure (TCLP)** (EPA Method 1311) is the core test required by the ADEQ to determine if a waste is hazardous. Under Arizona law, only non-hazardous foundry sand is eligible for simplified beneficial reuse pathways or solid waste exemptions.

4. Regulatory Guidelines

Arizona Department of Environmental Quality (ADEQ)

The **ADEQ** oversees the state's solid waste program and encourages industrial byproduct reuse through a petition-based exemption framework.

Specific Legal Citations:

- **Arizona Revised Statutes (A.R.S.) § 49-701.01(C)**: "Exemptions from Definition of Solid Waste." This statute allows any person to petition the ADEQ Director to exempt a substance (like SFS) as solid waste if it provides a functional benefit as a substitute for virgin material.
- **Arizona Administrative Code (A.A.C.) Title 18, Chapter 13**: Outlines the administrative procedures for solid waste management, characterization, and the petition process.
- **A.R.S. § 49-701**: Defines "beneficial use" in the context of industrial materials.

Federal Framework

Arizona implements the federal **RCRA Subtitle D** standards for non-hazardous waste. Successfully petitioning for an exemption under § 49-701.01(C) effectively removes the material from the state's Subtitle D regulatory burden.

5. Reuse Applications and Arizona Examples

Application	Description	Arizona Context
Road Base / Sub-base	Substitute for virgin aggregate in road construction.	Requires ADOT material specification matching; high demand in Maricopa County.
Landfill Daily Cover	Alternative Daily Cover (ADC).	Widely used at the Salt River Landfill and Los Reales Campus .
Cement Raw Material	Silica source for cement kilns.	Potential for delivery to Salt River Materials Group or CalPortland .
Manufactured Soil	Blending for landscaping in arid zones.	Subject to site-specific ADEQ exemption under § 49-701.01(C).
Flowable Fill	Low-strength concrete for utility bedding.	Used in municipal trenching projects across the Phoenix-Mesa corridor.

6. Environmental and Technical Considerations

Arid Environment Factors

- **Dust Control (Maricopa Rule 310):** Handling and transport of SFS in the Phoenix metro area must strictly comply with Maricopa County air quality rules to prevent

PM10 emissions.

- **Leaching in High-pH Soils:** Arizona's naturally alkaline soils can influence the mobility of certain organic binders; ADEQ may require a demonstration of leaching stability under arid soil conditions.

Physical Stability

SFS from Arizona's precision foundries often has a very high silica content (>95%), making it an excellent fine aggregate for high-strength concrete mixes used in defense infrastructure.

7. Funding, Grants, and Incentives

Pollution Prevention (P2) Program

ADEQ's **P2 Program** provides technical assistance to industrial facilities that reduce waste at the source. Foundries that implement sand reclamation systems can leverage this program for process optimization and recognition as "Sustainable Manufacturers."

Arizona Commerce Authority (ACA)

The **ACA** offers various tax credits (e.g., the **Quality Jobs Tax Credit**) for manufacturers that invest in clean technology and infrastructure. Equipment for thermal sand reclamation may qualify for capital investment credits.

8. Active Participants in Arizona

Major Foundries:

- **Dolphin Casting** (Phoenix) - Custom manufacturer of aluminum, stainless, and bronze castings.

- **Precision Enterprises** (Phoenix/Mesa) - High-volume aluminum sand casting and CNC machining.
- **Arizona Castings II LLC** (Maricopa) - Cast iron, ductile iron, and aluminum alloys.
- **ME Elecmetal** (Tempe) - Specialty steel and iron casting for industrial components.

Potential End-Users:

- **Salt River Materials Group** (Mesa/Clarkdale) - Major cement and aggregate producer.
- **CalPortland** (Rillito) - Cement manufacturing and kilns.
- **Granite Construction** (Phoenix/Tucson) - Large civil contractor and paving company.
- **Vulcan Materials** (Regional) - High-demand user of recycled industrial aggregate.

9. Success Story Highlights

Phoenix Aerospace Sand Recovery: Leading investment casting foundries in the Phoenix-Mesa corridor, such as **Precision Enterprises**, have implemented advanced sand recovery systems achieving over 90% internal reclamation. By utilizing the final spent sand as a fine aggregate in "flowable fill" for local municipal utility projects, these facilities have effectively eliminated their dependence on regional landfills where gate fees exceed **\$55.00 per ton**. These initiatives demonstrate the economic benefit of aligning industrial byproduct management with Maricopa County's stringent Rule 310 dust mitigation standards and municipal infrastructure needs.

10. Clear Business Case Summary

1. **Avoidance of Gate Fees:** Saving up to **\$60.00 per ton** (Mesa Salt River rate).
2. **Reduced Procurement Costs:** By replacing virgin desert sand with recycled SFS in internal construction or site development projects.
3. **Regulatory De-listing:** A successful ADEQ exemption removes the "waste" stigma, potentially allowing the material to be sold as a value-added aggregate.

11. Risk Management Overview

- **Maricopa Rule 310 Violations:** Failure to cover or stabilize sand during transport in Phoenix can result in heavy air quality fines.
- **Inert Status Consistency:** Regular testing is required to ensure that changes in alloy casting or binder systems do not invalidate the ADEQ solid waste exemption.

12. Step-by-Step Workflow for Foundries

1. **Comprehensive Profiling:** Conduct a full TCLP and totals analysis.
2. **Exemption Petition:** Draft and submit an **A.R.S. § 49-701.01(C)** petition to the ADEQ Director.
3. **Public Notice Verification:** Ensure the determination is published in the Arizona Administrative Register.
4. **Partner Identification:** Match sand properties with a local ADOT project or cement kiln.
5. **Implementation:** Utilize the material per the terms of the approved exemption.

13. Real Cost Savings Example

Scenario: A Phoenix-based foundry producing 3,000 tons of sand annually.

- **Disposal Cost (at \$55.00/ton Gate Rate):** \$165,000
- **Reuse Program (ADEQ Petition + Testing + Dust Suppression):** \$45,000
- **Annual Savings:** \$120,000

15. General FAQ & Landfill-Specific FAQ

Q: Does Arizona have a "Beneficial Use Act"?

A: No, Arizona relies on the "Solid Waste Exemption" petition process found in A.R.S. § 49-701.01.

Q: Are state fees included in the gate rates?

A: Most landfills include the ADEQ **\$0.58/ton** fee, but users should verify this in their commercial contracts.

16. References

1. Arizona Revised Statutes § 49-701.01: Definition of Solid Waste; Exemptions.
2. ADEQ Solid Waste Management: A.A.C. Title 18, Chapter 13 Rules.
3. Maricopa County Rule 310: Fugitive Dust from Dust-Generating Operations.
4. City of Phoenix: 2026 Solid Waste Rate Schedule.
5. Salt River Landfill (Mesa): 2025 Tipping Fee Schedule.
6. EPA SMM Technical Guidance: Foundry Sand in Transportation Applications.