



Foundry Sand Reuse in Virginia

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 to create molds and cores for the metal casting industry. Virginia's industrial landscape—ranging from heavy iron production in Lynchburg to precision aerospace casting in Northern Virginia—generates significant volumes of this material. Once the sand can no longer be used internally due to thermal degradation, it is categorized as **spent foundry sand (SFS)**. In Virginia, SFS is recognized as a non-hazardous industrial byproduct with high potential for beneficial reuse.

What is Beneficial Reuse?

In Virginia, beneficial reuse is a formal determination that a solid waste can be utilized in a manufacturing process or as an effective substitute for a commercial product (such as aggregate or fill) in a manner that protects public health and the environment. This process is managed by the Virginia Department of Environmental Quality (VDEQ).

What is the TCLP Test?

The **Toxicity Characteristic Leaching Procedure (TCLP)** (EPA Method 1311) is the core analytical protocol required by VDEQ to verify that a waste is not hazardous. Under Virginia law, only non-hazardous SFS is eligible for the Beneficial Use Determination (BUD) process or simplified solid waste exemptions.

4. Regulatory Guidelines

Virginia Department of Environmental Quality (VDEQ)

The **VDEQ**, specifically the Division of Land Protection and Revitalization, regulates the disposal and reuse of industrial byproducts under the state's solid waste management rules.

Specific Legal Citations:

- **9VAC20-81-90:** "Relationship to other regulations." Provides the foundational authority for solid waste management and the framework for industrial material diversion.
- **9VAC20-81-97:** "Beneficial use demonstrations." This is the primary regulatory pathway for Virginia foundries, outlining the requirements for obtaining a case-specific BUD.
- **Va. Code § 10.1-1400 et seq.:** The "Virginia Waste Management Act," which grants VDEQ the authority to promote waste reduction and resource recovery.

The BUD Process

To secure a BUD in Virginia, an applicant must demonstrate that the SFS provides a functional benefit and will not adversely affect human health or the environment. This typically involves physical and chemical characterization and a demonstration of a legitimate market for the material.

5. Reuse Applications and Virginia Examples

Application	Description	Virginia Context
Road Sub-base	Foundation layer for road beds.	High potential in VDOT infrastructure and regional highway projects.
Landfill Daily Cover	Alternative Daily Cover (ADC).	Widely used at the SPSA (Hampton Roads) and Richmond landfills.
Concrete/Asphalt Additive	Aggregate replacement in paving.	Viable for local paving contractors in the I-95 and I-81 corridors.
Structural Fill	Bedding for building pads or embankments.	Subject to case-specific VDEQ evaluation and 9VAC20-81-97 approval.
Cement Raw Material	Silica source for cement production.	Potential for delivery to regional cement kilns (e.g., in neighboring WV or MD).

6. Environmental and Technical Considerations

Groundwater and Watershed Protection

Due to Virginia's proximity to the Chesapeake Bay and reliance on sensitive aquifers, VDEQ requires rigorous characterization for any un-bound structural fill projects. Sand used in un-bound applications must ensure zero risk of metal or binder residuals impacting regional water quality or sensitive aquatic ecosystems.

Physical Stability

SFS from Virginia's industrial foundries often exhibits high structural stability and uniform gradation. This makes it a superior material for high-compaction embankments and specialized "flowable fill" compared to naturally occurring silty soils found in many parts of the state.

7. Funding, Grants, and Incentives

VDEQ Recycling and Litter Prevention Grants

The VDEQ occasionally offers funding to support projects that reduce the state's landfill burden through waste diversion. Foundries partnering with local governments to create "Regional Aggregate Hubs" may qualify for technical or financial support.

Virginia Economic Development Partnership (VEDP)

The state offers various incentives (e.g., the **Virginia Investment Performance Grant**) for manufacturers that invest in sustainable technology. Foundries installing sand reclamation systems may qualify for support through regional development initiatives.

8. Active Participants in Virginia

Major Foundries and Hubs:

- **Lynchburg Foundry** (Lynchburg) - Historical leader in gray and ductile iron casting (associated with Grede).
- **Graham-White Manufacturing** (Salem) - Specialized iron and aluminum casting for rail and industrial sectors.
- **Numerous Precision Fabricators**: Concentrated in the Richmond, Roanoke, and Hampton Roads industrial corridors.

Potential End-Users:

- **VDOT (Virginia Dept. of Transportation)** - Major consumer of aggregate for highway construction.
- **SPSA (Southeastern Public Service Authority)** - Significant user of Alternative Daily Cover (ADC).
- **Allan Myers** (Regional) - Large-scale paving, asphalt, and aggregate producer.
- **Luck Stone** (Regional) - Major aggregate supplier and infrastructure partner.

9. Success Story Highlights

Lynchburg Industrial Loop: Industrial manufacturers in the Lynchburg corridor have successfully established diversion programs for their spent silica molding sand. By characterizing the material as a non-hazardous, stable byproduct under 9VAC20-81-97, these facilities provide a localized aggregate source for regional infrastructure and landfill daily cover. These initiatives avoid the rising disposal fees in the Piedmont region (reaching **\$78.00 per ton**) while supporting the state's waste reduction goals and enhancing industrial resource efficiency.

10. Clear Business Case Summary

1. **Avoidance of Gate Fees:** Directly saving up to **\$78.00 per ton** (SPSA Non-Contract rate).
2. **Transportation Savings:** By utilizing sand in local Virginia infrastructure rather than hauling to remote Subtitle D landfills.

3. **ESG Supply Chain Alignment:** Helping major aerospace and defense customers meet their sustainability targets by diverting 100% of mold sand from landfills.

11. Risk Management Overview

- **Regulatory Compliance:** Operating a reuse project without a valid VDEQ Beneficial Use Determination or notification is a violation of state solid waste rules.
- **Contamination Liability:** Foundries must ensure that non-hazardous SFS is not mixed with hazardous wastes (e.g., lead-based alloys) to avoid ten-fold increases in management costs.

12. Step-by-Step Workflow for Foundries

1. **Analytical Profiling:** Conduct a full 32-parameter chemical profile, including TCLP and totals.
2. **VDEQ Consultation:** Contact the Division of Land Protection and Revitalization to discuss the project scope and 9VAC20-81-97 criteria.
3. **End-User Partnership:** Secure an intake agreement with a local asphalt plant or construction project.
4. **Logistics Documentation:** Maintain records of material weights and destinations for 5 years.
5. **Annual Review:** Re-verify sand chemistry annually to ensure consistency with initial VDEQ approval.

13. Real Cost Savings Example

Scenario: A Richmond-area foundry generating 3,000 tons of sand annually.

- **Disposal Cost (at \$65.00/ton average):** \$195,000

- Reuse Program (Testing + VDEQ Filing + Local Logistics): \$40,000
- Annual Savings: \$155,000

15. General FAQ & Landfill-Specific FAQ

Q: Does Virginia have "pre-approved" beneficial uses for sand?

A: While asphalt and concrete are common, VDEQ generally requires a case-specific review to ensure binder chemistry is safe for the intended application.

Q: Are gate fees higher in Norfolk than Richmond?

A: SPSA (Norfolk) rates are around **\$78/ton** for non-contract customers, which is higher than many regional benchmarks, making sand reuse highly profitable in Hampton Roads.

16. References

1. **9VAC20-81-90:** Virginia Solid Waste Management Regulations.
2. **9VAC20-81-97:** Beneficial Use Demonstrations.
3. **SPSA (Hampton Roads):** Transfer Station and Disposal Fee Schedule.
4. **City of Richmond:** Trash Collection and Sanitation Rates.
5. **Virginia Code Title 10.1, Chapter 14:** Waste Management Act.
6. **EPA SMM Technical Guidance:** Foundry Sand in Transportation Applications.