



Foundry Sand Reuse in Nebraska

Best Practices & Regulatory Compliance

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3. Key Concepts and Definitions

What is Foundry Sand?

Foundry sand is a high-quality silica sand used by metal casting facilities to make molds for shaping molten metal into parts. After repeated use, the sand becomes "spent" and needs to be replaced — creating a large volume of by-product material.

What is Beneficial Reuse?

Beneficial reuse means finding safe, productive ways to repurpose industrial by-products (like foundry sand) instead of throwing them away. It protects the environment, saves natural resources, and cuts disposal costs. In Nebraska, beneficial reuse helps businesses lower expenses and communities build infrastructure more sustainably.

Examples of beneficial reuse for foundry sand include:

- Replacing mined sand in concrete or road base

- Using sand as daily cover at landfills
- Mixing into manufactured soils for landscaping

What is a TCLP Test?

TCLP stands for Toxicity Characteristic Leaching Procedure — a laboratory test required by the U.S. EPA to find out if a waste material might release harmful contaminants into groundwater.

How a TCLP test works:

- A sample of the material is soaked in a mild acidic solution that simulates rainwater or landfill conditions.
- Scientists measure what chemicals "leach out" of the sample into the fluid.
- If dangerous levels of metals (like lead) or chemicals are found, the material is classified as hazardous waste and must be managed under strict regulations.

If the material passes the TCLP test (meaning contaminants are below federal limits), it can be reused safely under environmental rules.

Why Should Readers Care About Foundry Sand Reuse?

- Environmental Protection: Reuse reduces waste sent to landfills and conserves natural sand resources, which are expensive and limited.
- Cost Savings: Foundries, cities, and contractors save money by reusing sand instead of buying new materials or paying high disposal fees.
- Public Safety: Proper testing (like TCLP) ensures that reused sand does not threaten drinking water, soil, or the environment.
- Economic Growth: Reuse projects create jobs, strengthen recycling industries, and make local construction and public works projects more affordable.

4. Regulatory Guidelines

Nebraska Department of Environment and Energy (NDEE) Regulations

Under Title 132, Chapter 2, §002, NDEE permits the beneficial use of certain solid wastes, provided they are not mixed with other solid wastes and do not pose a threat to human health or the environment. Spent foundry sand, particularly from iron and steel foundries, may be used in applications such as:

- Raw material for construction products (e.g., in asphalt or concrete)
- Landfill engineering material (e.g., drainage layers, daily cover)
- Structural fill and subbase (e.g., road building)

- Emergency uses (e.g., sandbags for flood control)

Key Regulatory Points:

- Spent foundry sand must be characterized to determine if it is hazardous. If it exhibits hazardous characteristics, it must be managed in accordance with hazardous waste regulations under Title 128. Testing, typically via the Toxicity Characteristic Leaching Procedure (TCLP), is required to confirm non-hazardous status.
- Beneficial use is more readily approved for silica-based sands from ferrous foundries. Non-ferrous foundry sands, such as those from brass or bronze foundries, may contain elevated levels of heavy metals and require case-by-case evaluation.
- Generators seeking to use spent foundry sand beneficially should consult with NDEE and may need to provide detailed information, including chemical analyses and proposed use plans.

Federal EPA Guidelines

At the national level, the U.S. EPA encourages the reuse of spent foundry sands from iron, steel, and aluminum foundries. EPA's major documents include:

- Risk Assessment for Spent Foundry Sands in Soil-Related Applications (2014)
- Sustainable Materials Management Program resources.

EPA concluded that silica-based sands from iron, steel, and aluminum foundries can be safely reused in soil blends, construction materials, and road bases.

EPA does not federally regulate beneficial reuse of non-hazardous foundry sands but defers regulatory authority to states like Nebraska's NDEE.

Local Ordinances

Most cities and counties in Nebraska defer to the Nebraska Department of Environment and Energy (NDEE) framework regarding foundry sand reuse.

Some municipalities may require additional notifications or approvals for larger volume projects, especially those near sensitive areas such as wetlands.

However, if a reuse project complies with NDEE guidelines and has state-level approval, additional local permitting is generally rare.

5. Reuse Applications and Nebraska Examples

Beneficial reuse of foundry sand in Nebraska takes multiple forms depending on material properties, project goals, and DNR approvals. Real-world applications have been proven across industries, especially construction and landfill operations.

Common Beneficial Reuses

Reuse Application	Description	Nebraska Examples or Status
Road Base & Fill	Substitute for sand/aggregate in road subbase, embankments, and structural fill. Provides bulk and drainage.	Permitted under NDEE rules with proper characterization. Used on industrial sites and roadway berms near foundry operations (e.g., in Lincoln and Grand Island).
Cement & Concrete Production	Raw feedstock in Portland cement kilns or as fine aggregate in concrete/masonry products.	NDEE has reviewed projects using spent sand in concrete blocks. Holcim and GCC Dacotah (South Dakota) accept regionally sourced foundry sand.
Landfill Uses	Daily cover, interim cover, or drainage layer material in liners and leachate systems.	Practiced in some county landfills (e.g., Lancaster County). Requires NDEE approval; may reduce tipping fees and native soil use.
Soil Amendment	Blended into topsoil or manufactured soil to improve drainage. Primarily silica-based sands with low metal content.	Pilot projects under review. Used in erosion control mixes on capped industrial land. Limited due to variable heavy metal content in non-ferrous sands.
Sandblasting Abrasive	Granular sand used for industrial surface cleaning, replacing mined blasting sand.	Allowed if free of lead and other contaminants. Foundries in central Nebraska have tested spent core sand in blasting operations. Subject to industrial standards.
Other Innovative Uses	Cattle bedding, snow/ice control, etc. Subject to safety confirmation and NDEE case-by-case review.	Some experimental use reported near Hastings; future uses depend on site-specific safety validation and moisture content/stability of the sand.

Nebraska Examples in Action

- **Cement Kiln Reuse:** Regional cement plants including Holcim (Mason City, IA) and GCC Dacotah (Yankton, SD) accept qualified foundry sands from Nebraska and other states. These reduce the demand for virgin raw materials and lower CO₂ emissions.
- **Road Construction Fill:** Foundry sands have been used beneath access roads and industrial park foundations in eastern Nebraska, especially where foundries partner with local contractors.
- **Landfill Daily Cover:** Select Nebraska landfills, such as those in Lancaster and Platte counties, have integrated foundry sand into their daily or intermediate cover practices, pending approval.
- **Potential Soil Amendments:** Pilot-scale projects are underway evaluating drainage enhancement and erosion control. NDEE requires verification of non-hazardous status before use near agricultural or

residential areas.

- Sandblasting and Niche Uses: Core sand with consistent sizing and minimal contaminant levels has been repurposed by metal fabricators in the Omaha and Kearney regions for surface prep and cleaning.

6. Environmental and Technical Considerations

Beneficial reuse of foundry sand requires careful understanding of material composition, contaminant risks, and environmental testing protocols to ensure safe and responsible outcomes.

Types of Foundry Sands

Ferrous Foundry Sands (Iron and Steel Castings):

- Typically high-purity silica sand bonded with clay (green sand) or chemical resins.
- Low in contaminants.
- EPA and NDEE consider these the safest and most preferred for reuse.

Non-Ferrous Foundry Sands (Aluminum, Brass, Bronze Castings):

- Similar base sand but potential contamination from metal alloys.
- Brass/Bronze sands often contain elevated lead, requiring more stringent testing or stabilization before reuse.

Specialty Sands:

- Some foundries use olivine sands or other media; not covered under EPA's standard risk assessment for reuse.
- May alter soil pH or chemistry.

Contaminants of Concern

Contaminant	Source	Notes
Lead (Pb)	Brass/bronze alloys	Key concern; must not exceed TCLP leaching limit (5.0 mg/L).
Chromium (Cr)	Stainless steel alloys, pigments	Usually low and stable in ferrous foundries; not a major issue.
Phenols / Cresols	Phenolic resins (binder breakdown)	Organic compounds typically present in very low concentrations.

Contaminant	Source	Notes
PAHs	Burnt sea coal or resin residues	Detected at very low levels; below environmental risk thresholds.
Dust / Free Silica	Physical hazard from dry sand	Requires dust suppression measures during handling to protect workers.
pH / Salinity	Binders, chemical additives	Some foundry sands have slightly alkaline pH, generally not problematic unless used directly in soils.

Importance of TCLP Testing

The Toxicity Characteristic Leaching Procedure (TCLP) is the industry-standard EPA test to determine whether foundry sand poses a leaching hazard to groundwater.

- Simulates landfill leachate conditions using an acetic acid solution.
- Measures 8 key metals (Lead, Arsenic, Cadmium, Chromium, etc.).
- Passing TCLP = Sand is classified as non-hazardous.
- Ferrous foundry sands in Nebraska typically pass TCLP easily.

If foundry sand fails TCLP (e.g., high lead from brass castings):

- It must be managed as hazardous waste, not reused without treatment.

Key for Nebraska Reuse: All sands used in landfill cover, road base, concrete, etc., must pass TCLP and have supporting documentation.

Environmental Behavior of Foundry Sand

- Heavy metals in ferrous sands are generally immobilized in the sand matrix.
- Organics (e.g., phenols, PAHs) are below actionable risk levels according to EPA risk assessments.
- Field studies show low leachability and no significant uptake into plants when used in soil amendments.

Conclusion: For properly characterized ferrous foundry sands, environmental risks are minimal — supporting broad beneficial reuse.

7. Funding, Grants, and Incentives

State-Level Incentives

Waste Reduction and Recycling Incentive Grants (WRRIG):

- Administered by Nebraska Department of Environment and Energy (NDEE).
- Provides grants for projects that reduce landfill waste, including material reuse and recycling infrastructure.
- Foundry sand reuse projects qualify (e.g., equipment for screening, transport systems, or storage silos).
- Public, private, and nonprofit entities are eligible.
- Funded by business and landfill disposal fees; competitive grant cycle with variable award sizes.

Landfill Disposal Fee Rebate Program:

- Rebates offered to municipalities and counties that implement diversion/recycling programs.
- Projects using foundry sand in daily cover or other landfill applications may qualify.
- Encourages landfill operators to partner with foundries for beneficial reuse opportunities.

Litter Reduction and Recycling Grant Program:

- Also managed by NDEE.
- Supports recycling infrastructure and public education.
- Not direct funding for foundries but may assist with outreach, signage, or integration into municipal recycling workflows.

Nebraska Recycling Council Equipment Grants:

- Grants of up to \$25,000 for Nebraska businesses and organizations.
- Supports purchase of recycling and processing equipment (e.g., sand screens, conveyors, loaders).
- Foundry reuse initiatives are eligible with clear environmental benefits.

Nebraska Advantage Act (being replaced by Imagine Nebraska):

- Offers tax credits and sales tax refunds to businesses making qualifying investments in equipment and job creation.
- Foundries investing in sand reclamation or reuse systems may qualify.
- Requires application and compliance with job/investment thresholds.

Federal-Level Opportunities**EPA Sustainable Materials Management Grants:**

- Periodically available grants supporting innovative reuse/recycling projects.
- Can fund pilot projects, outreach campaigns, or infrastructure improvements related to foundry sand.

Federal Infrastructure and Recycling Funding (Infrastructure Investment and Jobs Act):

- Some grant programs are open to states and municipalities improving recycling or circular economy initiatives.
- Foundry sand reuse aligns with goals of waste reduction and sustainable construction.

FHWA / DOT Support:

- Federal Highway Administration promotes the use of recycled materials (including foundry sand) in road construction.
- Some research grants and technical support available for projects demonstrating new uses of industrial byproducts in infrastructure.

Local Opportunities

Local Government Partnerships:

- Counties and cities sometimes offer mini-grants or project cost-sharing for green construction and waste diversion projects.
- Example: County public works departments may help subsidize trucking costs if foundry sand is used in local road construction.

Public-Private Collaborations:

- Landfills may waive tipping fees for sand.
- Construction contractors may provide free transport in exchange for discounted material.
- Informal partnerships often unlock major savings without formal grant applications.

Summary Table: Key Funding and Incentive Programs

Program/Incentive	Type	Key Details	Impact for Foundry Sand Reuse
WRRIG (Waste Reduction & Recycling Incentive Grants)	State Grants	Competitive grants for recycling/diversion projects. Open to public, private, and nonprofit applicants.	Can fund equipment, transportation, and infrastructure for sand reuse.
Landfill Disposal Fee Rebate Program	Cost Savings / Local Rebates	Rebates for local governments that reduce landfill waste.	Encourages partnerships with foundries to divert sand for cover or engineering use.
NRC Equipment Grants	State/Nonprofit Grant	Up to \$25,000 for recycling equipment through Nebraska Recycling Council.	Supports purchase of sand processing gear

Program/Incentive	Type	Key Details	Impact for Foundry Sand Reuse
			like screens, hoppers, or conveyors.
Litter Reduction & Recycling Grants	Public Education/Support	Supports recycling outreach, education, and infrastructure upgrades.	Can fund signage, educational campaigns, or public-private integration efforts.
EPA/Federal Grants (SWIFR, USDA, etc.)	Research/Demonstration	Federal programs that support innovative waste diversion and recycling infrastructure.	Can supplement state funding or fund multi-jurisdiction pilot programs.

8. Active Participants in Nebraska

End Users (Consumers of Foundry Sand)

City of Hastings Solid Waste Landfill (Hastings, NE)

- Accepts specific industrial wastes, including foundry green sand, subject to analytical review and approval.

Construction Contractors and Road Builders

- Various contractors may utilize foundry sand for fill material, road subgrades, and other construction applications.

University of Nebraska–Lincoln (UNL)

- Conducted research on foundry sand reclamation and reuse, including life cycle assessments.
- Findings support the environmental benefits of sand reuse in construction and landfill applications.

Supporting Programs and Agencies

Nebraska Department of Environment and Energy (NDEE) – Waste Management Division

- Oversees waste characterization, landfill regulations, and solid waste permits.
- Administers the Waste Reduction and Recycling Incentive Grant (WRRIG) and landfill rebate programs.
- Provides technical assistance and regulatory guidance for reuse projects involving industrial byproducts like foundry sand.

Nebraska Recycling Council (NRC)

- Offers recycling equipment grants and consulting services.
- Facilitates connections between material generators (like foundries) and potential end-users.
- Promotes best practices in material reuse and diversion across Nebraska.

University of Nebraska–Lincoln (UNL) – Civil and Environmental Engineering

- Conducts research into foundry sand reclamation and lifecycle environmental impacts.
- Supports pilot studies and technology evaluations relevant to sand reuse in construction and landfill cover.

Keep Nebraska Beautiful / Local Keep America Beautiful Chapters

- Offer small grants, outreach, and support for recycling and litter reduction initiatives.
- Can be used to promote awareness or support local partnerships around foundry sand reuse.

American Foundry Society (AFS) – Plains States Chapter

- Provides industry resources including technical manuals, case studies, and training.
- Nebraska members collaborate on sand testing, reuse trials, and environmental compliance.

Key Collaboration Insights

- Foundries generate consistent streams of spent sand, often silica-based and suitable for reuse.
- Landfills and Cement Plants are potential high-volume outlets if proper approvals and logistics are in place.
- Contractors and Cities drive demand for fill material, subgrade construction, and low-cost alternatives.
- NDEE, NRC, UNL, and local nonprofits offer the regulatory framework, research, and technical assistance needed to scale reuse projects.
- AFS and regional recycling networks promote knowledge sharing, innovation, and standards adoption.

Nebraska has the foundational pieces for a strong foundry sand reuse ecosystem. Coordinated engagement between industry, government, and academia can unlock large-scale environmental and economic benefits.

9. Success Story Highlights

Success Story 1: City of Hastings Solid Waste Landfill (Hastings, NE)

- Accepted foundry green sand for daily cover, pending material analysis.
- Demonstrated regulatory pathway for industrial byproduct reuse at municipal landfills.

- Provided a model for small-to-midsize Nebraska cities managing landfill capacity and cost.

Success Story 2: University of Nebraska–Lincoln (UNL) Research Collaboration

- Conducted life cycle assessment (LCA) of foundry sand reuse scenarios.
- Found significant environmental benefits over traditional disposal, including reduced raw material use and emissions.
- Helped validate safety and feasibility of sand reuse in engineered fills and construction materials.

Success Story 3: NRC Equipment Grant Implementation

- Several small manufacturers and processors received Nebraska Recycling Council grants to upgrade or acquire recycling equipment.
- Demonstrated how grant funding can be applied to sand screening, storage, or transport infrastructure.
- Created a scalable model for future foundry-related reuse systems.

10. Clear Business Case Summary

Why Foundries Should Reuse Sand:

- Save \$30–\$50 per ton vs. landfill disposal costs.
- Avoid environmental liability.
- Improve sustainability reporting for customers and regulators.

Why Contractors Should Reuse Sand:

- Get free or discounted sand for construction fill.
- Improve project bids by lowering material costs.

Why Landfills Should Accept Foundry Sand:

- Secure free cover material.
- Reduce operating costs.
- Increase daily cover efficiency.

11. Risk Management Overview

Beneficial reuse of foundry sand carries significant economic and environmental benefits, but participants must manage risk carefully to ensure compliance and protect their businesses.

Best Practices

- **Testing:** All sand must pass a current TCLP test (recommended updated annually or if process changes).
- **Documentation:** Keep certificates of analysis (CoA), TCLP results, and shipping records for at least five years.
- **Written Agreements:** Always establish written contracts with receiving facilities (landfills, cement plants, contractors) outlining responsibilities and confirming approved uses. **Site-Specific Approvals:** For new or unusual uses, consult NDEE for guidance or written approval. Nebraska does not have universal BUDs, so case-by-case review is often required.
- **Insurance:** Verify liability coverage, and ensure your insurer understands your beneficial reuse activities.

ARS Support: ARS can assist participants in setting up compliance systems, testing protocols, and document templates to minimize legal risk.

12. Step-by-Step Workflow for Foundries

Simple Process to Start Foundry Sand Reuse:

- **Test:**
 - Conduct TCLP testing on representative sand samples through an accredited laboratory.
 - Confirm results meet Nebraska NDEE non-hazardous thresholds.
- **Document:**
 - Save all lab results, including full reports and summary sheets.
- **Partner:**
 - Contact ARS to match your material to a reuse project (landfill, cement, construction).
- **Agreement:**
 - Sign a beneficial reuse agreement or memo of understanding.
- **Ship:**
 - Begin shipping sand as needed.

- Label loads clearly and maintain load-out logs.
- Monitor:
- If your production process changes (e.g., alloy change, new binder), re-test your sand.
- Maintain communication with ARS and receiving partners.

Result: Compliance, savings, and sustainability without added operational headaches.

13. Real Cost Savings Example

Why Reuse Makes Financial Sense:

- Landfill Disposal Costs:
- Disposal fee: ~\$70-\$150/ton
- Landfill surcharge: +\$4.25/ton
- Total = ~\$74.25-\$154.25/ton to landfill
- Beneficial Reuse Costs:
- Transportation only: ~\$10-\$75/ton (varies by distance)

Savings Calculation:

If your foundry produces 1,000 tons/year:

Landfill cost: 1,000 tons x \$49.25 = \$49,250

Reuse transport cost (avg \$15/ton): 1,000 tons x \$15 = \$15,000

Total annual savings = ~\$34,250

Multiply this by 5–10 years and the impact becomes massive.

15. General FAQ & Landfill-Specific FAQ

Q: Is reused foundry sand safe for public use projects like roads or parks?

A: Yes, provided the sand passes environmental testing (like TCLP), silica-based foundry sand from iron, steel, and aluminum foundries has been proven safe for reuse in infrastructure projects. NDEE and U.S. EPA endorse reuse for approved applications like roads, landfill cover, and construction fill.

Q: How often does foundry sand need to be tested?

A: Sand must be tested initially to prove non-hazardous status. After that, testing frequency depends on process consistency. Most foundries re-test yearly or if they change raw materials or binder systems.

Q: Can reused foundry sand be used near homes, gardens, or drinking water supplies?

A: Applications like road base and landfill cover are common and safe. For use in soils near gardens or homes, additional case-by-case approvals and environmental assurances may be needed (especially for soil amendments).

Q: What happens if a reused sand load fails testing after reuse starts?

A: If post-use monitoring detects hazards (extremely rare with properly approved sand), remediation or removal would be required. This is why initial proper testing and documentation are critical.

Q: Who is responsible for proving the sand is safe - the foundry or the user?

A: The foundry (generator) is responsible for testing and certifying that the sand meets regulatory requirements. The end user must ensure they use the sand only in approved ways.

Landfill-Specific FAQ

Q: Does foundry sand affect landfill leachate or groundwater?

A: No. Studies by EPA, USDA, and NDEE confirm that properly tested ferrous foundry sand does not contribute hazardous leachate or groundwater issues.

Q: Is foundry sand considered "cover material" for daily cover compliance?

A: Yes. NDEE regulations approve foundry sand (mixed up to 50% with soil) as daily cover.

Q: Do we need special equipment to handle foundry sand?

A: No. Standard landfill spreading equipment (dozers, loaders) can handle foundry sand easily.

Q: How do we document use to maintain surcharge exemption?

A: Maintain simple load logs and daily cover documentation. ARS can provide templates.

Q: What if sand chemistry changes?

A: Periodic re-testing is recommended, especially if the foundry changes alloy or binder systems.

16. References

- EPA - Beneficial Uses of Spent Foundry Sands → EPA Beneficial Uses of Spent Foundry Sands
- EPA - Risk Assessment of Spent Foundry Sands in Soil-Related Applications (2014) → EPA Risk Assessment Final Report PDF
- Federal Highway Administration (FHWA) - Foundry Sand Facts for Civil Engineers → Foundry Sand Facts for Civil Engineers (FHWA)
- EPA - Foundry Sand Reuse Toolkit → EPA Toolkit for Developing Beneficial Reuse Programs for Foundry Sand (archived)
- AFS (American Foundry Society) Beneficial Reuse Guides and Case Studies → American Foundry Society Reuse Resources
- EPA Archives - Beneficial Reuse of Foundry Sand PDF → EPA Archive - Foundry Sand Beneficial Reuse PDF
- USDA Agricultural Research Service (ARS) Contributions → Referenced in EPA risk assessments and soil-related environmental studies.
- ScienceDirect Research - Waste Foundry Sand Leachate Characteristics → Waste Foundry Sand: Leachate Study - ScienceDirect
- MDPI Research on Environmental Aspects of Foundry Sand Reuse → Reuse or Disposal of Waste Foundry Sand: MDPI Research Article
- Pollution Prevention Challenge - Amerex Defense Environmental Initiatives → Pollution Prevention Challenge Awards
- Grede Foundries Sustainability Reports and Waste Management Presentations → Grede Sustainability Reports
- EPA - Sustainable Materials Management Program (SMM) Overview → EPA SMM Program
- Federal Infrastructure and Jobs Act (IIJA) Recycling Grants → Infrastructure Investment and Jobs Act - Recycling Grants
- Nebraska Department of Environment and Energy (NDEE) – Waste Grants → Waste Reduction and Recycling Incentive Grants – NDEE
- Nebraska Recycling Council – Equipment Grants & Recycling Programs → Nebraska Recycling Council Grants and Support

- University of Nebraska–Lincoln – Foundry Sand LCA Research → Foundry Sand Source Reduction Options: Life Cycle Assessment (ResearchGate)
- EPA – SWIFR Grants to Nebraska → EPA Solid Waste Infrastructure for Recycling (SWIFR) – Nebraska Award Summary (PDF)
- Keep Nebraska Beautiful – Recycling and Waste Grants → Keep Nebraska Beautiful – Grant Resources
- ImagiNE Nebraska (formerly Nebraska Advantage Act) – Business Incentives → ImagiNE Nebraska Tax Incentive Program
- USDA – Rural Utilities Solid Waste Management Grants (NE Eligibility) → USDA Solid Waste Management Grants – Nebraska