

Texas Sodium Bentonite

Alpine, TX | Alpine Processing Facility | Comanche Packaging Facility



■ CONTROLLED DOCUMENT

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Swine Technical Data Sheet

Feed-Grade Sodium Bentonite & Clinoptilolite Zeolite — Species-Specific Guidance

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Reviewed By	Texas Sodium Bentonite Inc. Regulatory & Nutritional Advisory
Approved By	Texas Sodium Bentonite Inc. Quality Management System Authority

1. Purpose

This technical data sheet has been prepared by **Texas Sodium Bentonite Inc.** to provide species-specific guidance on the use of feed-grade sodium bentonite (montmorillonite clay) and clinoptilolite zeolite in commercial swine production systems. The document is intended to support nutritionists, veterinarians, feed mill operators, and commercial swine producers in the safe, effective, and compliant use of Texas Sodium Bentonite Inc. mineral feed ingredients across all phases of swine production.

This sheet serves as the authoritative controlled reference for product application, inclusion guidance, performance expectations, regulatory compliance, and quality specifications for swine operations utilizing Texas Sodium Bentonite Inc. products.

2. Scope

This technical data sheet applies to:

- Commercial swine producers operating nursery, grow-finish, breeding, gestation, and lactation production phases

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- Swine nutritionists and feed formulators incorporating Texas Sodium Bentonite Inc. products into complete diet formulations
- Licensed veterinarians advising mineral supplementation and gut-health management in swine herds
- Feed manufacturers and feed mill operators sourcing feed-grade sodium bentonite or clinoptilolite zeolite from Texas Sodium Bentonite Inc.
- Quality assurance and procurement personnel requiring controlled documentation for regulatory audits, feed safety certifications, and traceability records

This document covers two core product categories: **feed-grade sodium bentonite** and **feed-grade clinoptilolite zeolite**, as processed and packaged by Texas Sodium Bentonite Inc.

3. Product Overview

3.1 Feed-Grade Sodium Bentonite

Texas Sodium Bentonite Inc. feed-grade sodium bentonite is a naturally occurring, high-swelling montmorillonite smectite clay sourced from volcanic ash deposits in the **Big Bend region of West Texas**. The deposit geology reflects ancient volcanic activity that resulted in mineral-rich, highly pure sodium-dominated bentonite formations. Raw ore is mined and processed at the company's **Alpine, TX facility**, which utilizes controlled drying, milling, and classification to produce consistent, feed-specification mineral ingredient. Final packaging is performed at the **Comanche, TX facility**.

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3.2 Feed-Grade Clinoptilolite Zeolite

Texas Sodium Bentonite Inc. clinoptilolite zeolite is a naturally occurring aluminosilicate mineral with a well-defined crystalline microporous framework structure. Sourced from volcanic tuff deposits consistent with West Texas geological formations, this zeolite exhibits a high cation exchange capacity (CEC) and selective adsorption affinity. Like sodium bentonite, it is processed at the **Alpine, TX facility** and packaged at the **Comanche, TX facility**.

3.3 Physical Characteristics

Property	Sodium Bentonite	Clinoptilolite Zeolite
Mineral Classification	Montmorillonite Smectite	Clinoptilolite (Heulandite Group)
Physical Form	Fine Powder / Granule	Fine Powder / Granule
Particle Size	16–20 mesh (typical)	16–20 mesh (typical)
Moisture Content	≤ 12%	≤ 10%
Color	Cream to light tan	White to off-white
Odor	Essentially odorless	Essentially odorless
Origin	Big Bend Region, West Texas	Big Bend Region, West Texas
Processing Site	Alpine, TX	Alpine, TX

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Property	Sodium Bentonite	Clinoptilolite Zeolite
Packaging Site	Comanche, TX	Comanche, TX

4. Mode of Action

4.1 Sodium Bentonite — Mechanism of Action in Swine

Sodium bentonite exerts its beneficial effects in swine through several distinct physicochemical mechanisms active within the gastrointestinal tract and feed matrix:

- **Gut Wall Protection:** The mucoadhesive properties of bentonite provide a protective coating effect on the intestinal mucosa, supporting epithelial integrity particularly during nursery stress transitions or pathogen challenge.
- **Ammonia Adsorption:** Sodium bentonite adsorbs free ammonia (NH_3) within the intestinal lumen, contributing to reduced hindgut ammonia production, lower blood urea nitrogen, and improved nitrogen utilization efficiency.
- **Pellet Binding Improvement:** The rheological and swelling properties of sodium bentonite enhance die-fill uniformity and inter-particle bonding during the pelleting process, resulting in measurably improved pellet durability index (PDI) and reduced fines at the feed mill.

4.2 Clinoptilolite Zeolite — Mechanism of Action in Swine

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- **Cation Exchange Capacity (CEC):** Clinoptilolite's rigid three-dimensional aluminosilicate framework supports a high CEC (typically 150–230 meq/100g), enabling preferential exchange of NH_4^+ , K^+ , Na^+ , and Ca^{2+} ions within the GI environment.
- **Ammonia Capture in the GI Tract:** The high affinity of clinoptilolite for ammonium ions (NH_4^+) provides significant ammonia sequestration capacity within the intestinal lumen and in the barn environment, reducing circulating blood ammonia levels and improving overall nitrogen metabolism efficiency.
- **Selective Adsorption of Heavy Metals:** Clinoptilolite demonstrates selective binding affinity for heavy metal cations (Pb^{2+} , Cd^{2+} , Cu^{2+}) in the GI tract, providing a protective buffer against trace dietary heavy metal accumulation in tissues.
- **Gut pH Buffering:** The ion exchange activity of clinoptilolite contributes to a mild buffering effect on intestinal pH, supporting optimal enzymatic digestion environments particularly in the proximal small intestine of nursery pigs transitioning from maternal milk to plant-based diets.

5. Inclusion Rates

① Note

All inclusion rates are expressed as a **percentage (%) of complete diet dry matter (DM)**. Rates represent recommended ranges; specific inclusions should be determined by a qualified swine nutritionist based on diet composition, mycotoxin risk assessment, and production goals.

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Production Phase	Body Weight Range	Sodium Bentonite (% DM)	Clinoptilolite Zeolite (% DM)	Combined Maximum (% DM)
Nursery Pigs	5 – 25 kg	0.25 – 0.50%	0.50 – 1.00%	1.50%
Grow-Finish	25 – 115 kg	0.50 – 1.00%	0.50 – 1.50%	2.00%
Breeding / Gestation Sows	—	0.50 – 0.75%	0.50 – 1.00%	1.75%
Lactating Sows	—	0.25 – 0.50%	0.50 – 1.00%	1.50%

⚠ Caution

Total combined mineral clay inclusion should not exceed **2.0% of complete diet dry matter** without veterinary or nutritionist oversight. At elevated inclusion levels, monitor feed intake and ensure adequate dietary energy and phosphorus availability are maintained.

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6. Performance Benefits

Texas Sodium Bentonite Inc. feed-grade products, when incorporated at recommended inclusion rates, offer the following documented and application-supported performance benefits in commercial swine production:

- **Improved Feed Conversion Ratio (FCR):** Enhanced nutrient absorption and reduced GI inflammatory burden contribute to measurable improvements in feed-to-gain efficiency across grow-finish and nursery phases.
- **Improved Pellet Quality and Durability (PDI):** Sodium bentonite acts as a natural pellet binder, improving die throughput efficiency and pellet durability index (PDI), reducing fines and improving feed presentation quality at the feeder.
- **Reduced Barn Ammonia Emissions:** Ammonia adsorption by both bentonite and zeolite in the GI tract and in fresh manure reduces aerial ammonia concentrations in confinement facilities, improving barn air quality, worker safety, and respiratory health of housed animals.
- **Support for Gut Integrity During Nursery Transition:** The mucoadhesive and pH-buffering properties of these minerals support intestinal villus structure and gut barrier function during the post-weaning stress period, reducing scour incidence and associated performance setbacks.
- **Improved Manure Consistency and Lagoon Management:** Modified nitrogen excretion profiles and ammonia capture in the GI tract contribute to reduced total ammoniacal nitrogen (TAN) in manure, benefitting lagoon management, land application nitrogen loading, and odor control.

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7. Nutritional Interaction

Texas Sodium Bentonite Inc. feed-grade sodium bentonite and clinoptilolite zeolite are classified as **inert mineral carriers**. They do not contribute caloric value (zero metabolizable energy), digestible protein, amino acids, or digestible phosphorus to the diet. As such:

- No adjustment to protein, metabolizable energy (ME), or standardized ileal digestible (SID) amino acid specifications are required at recommended inclusion rates (up to 1.0% individual product inclusion).
- At higher inclusion levels approaching 1.5–2.0% combined, the physical dilution effect on diet nutrient density should be accounted for in least-cost formulation, particularly with respect to net energy and lysine: calorie ratios.
- No interaction with phytase, protease, or carbohydrase enzyme activity has been documented at recommended inclusion rates.
- These products are not absorbed systemically and do not accumulate in edible tissues. They are excreted entirely via fecal elimination.

⚠ Formulation Advisory

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At combined total mineral clay inclusion rates exceeding **2.0% of diet dry matter** Nutritionists should monitor voluntary feed intake and ensure available phosphorus specifications remain adequate given potential clay-mineral phosphorus binding interactions in acid-generating fermentation zones of the large intestine.

8. Safety Considerations

8.1 Regulatory Safety Status

- **GRAS Status:** Both sodium bentonite and clinoptilolite zeolite are **Generally Recognized as Safe (GRAS)** for use as feed ingredients in swine diets at recommended inclusion levels.
- **Withdrawal Period:** No withdrawal period is required. These products are not absorbed systemically and do not accumulate in edible tissue.
- **Acute Toxicity:** Non-toxic at recommended dietary inclusion rates. No adverse effects on animal health, reproduction, or tissue quality have been reported at labeled use levels in peer-reviewed or regulatory literature.

8.2 Handling Precautions

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- **Inhalation Risk:** Fine powder forms of both products may generate respirable dust during bulk handling, pneumatic transfer, or bag emptying operations. Personnel must wear appropriate respiratory protection (minimum NIOSH-approved N95 dust respirator) during handling operations.
- **Eye and Skin Protection:** Safety glasses and light work gloves are recommended during open-bag handling and batching operations.
- **Storage:** Store in a cool, dry, well-ventilated location. Avoid exposure to moisture, condensation, or direct contact with wet surfaces. Keep bags sealed until use. Maximum recommended storage temperature: 38°C (100°F).
- **Shelf Life:** When stored under recommended conditions, product maintains specification compliance for a minimum of 24 months from production date.
- **Human Consumption: Not for human consumption.** These products are formulated exclusively for use as animal feed ingredients.

9. Regulatory & Compliance Notes

9.1 Ingredient Recognition

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- **AAFCO Recognized Ingredient:** Sodium bentonite (AAFCO Official Publication Item No. 85.1) is an AAFCO-defined feed ingredient. Clinoptilolite zeolite is recognized by AAFCO as an allowable feed ingredient for specified applications.
- **21 CFR Part 573 Compliance:** Both products are compliant with **21 CFR Part 573 — Food Additives Permitted in Animal Feed**, as administered by the U.S. Food and Drug Administration (FDA) Center for Veterinary Medicine (CVM).

9.2 Quality Management & Traceability

- **Quality Management System:** Texas Sodium Bentonite Inc. produces all feed-grade mineral products under a documented Quality Management System (QMS) encompassing raw material qualification, in-process controls, finished product release testing, and non-conformance management.
- **Certificate of Analysis (COA):** A fully documented Certificate of Analysis is available upon request for each production lot. COAs include batch number, test date, analytical results versus specification, and authorized release signature.
- **Lot Traceability:** Complete forward and backward traceability are maintained from ore extraction at the **Alpine, TX mining and processing facility** through final packaged lot release at the **Comanche, TX packaging facility**, in accordance with FSMA Traceability Rule requirements.
- **Audit Readiness:** Texas Sodium Bentonite Inc. maintains documentation necessary to support third-party feed safety audits, customer quality audits, and regulatory inspection. All records are retained for a minimum of 3 years.

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10. Quality Specifications

The following specifications represent minimum quality standards for Texas Sodium Bentonite Inc. feed-grade products at point of finished goods release. All parameters are tested on a lot-by-lot basis prior to Certificate of Analysis issuance and product release.

10.1 Feed-Grade Sodium Bentonite — Quality Specifications

Parameter	Specification	Test Method
Moisture Content	≤ 12.0%	AOAC 925.10 / Oven Drying Method
Particle Size	-20 mesh (U.S. Standard)	ASTM E11 Sieve Analysis
Swelling Index	≥ 14 mL/2g (Swell Index)	API RP 13B-1 / ASTM C837
pH (10% Slurry)	8.5 – 10.5	EPA 9045D / Potentiometric
Arsenic (As)	30 (ppm in complete feed) 42 (ppm in mineral premixes and supplements)	AAFCO MTL / NRC MTL
Lead (Pb)	10 (ppm in complete feed) 42 (ppm in mineral premixes and supplements)	AAFCO MTL / NRC MTL
Mercury (Hg)	2 (ppm in complete feed) 42 (ppm in mineral premixes and supplements)	AAFCO MTL / NRC MTL

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10.2 Feed-Grade Clinoptilolite Zeolite — Quality Specifications

Parameter	Specification	Test Method
Moisture Content	≤ 10.0%	AOAC 925.10 / Oven Drying Method
Particle Size	-20 mesh (U.S. Standard)	ASTM E11 Sieve Analysis
Clinoptilolite Content (Purity)	≥ 80% Clinoptilolite by XRD	X-Ray Diffraction (XRD)
pH (10% Slurry)	6.5 – 8.5	EPA 9045D / Potentiometric
Arsenic (As)	30 (ppm in complete feed) 42 (ppm in mineral premixes and supplements)	AAFCO MTL / NRC MTL
Lead (Pb)	10 (ppm in complete feed) 42 (ppm in mineral premixes and supplements)	AAFCO MTL / NRC MTL
Mercury (Hg)	2 (ppm in complete feed) 42 (ppm in mineral premixes and supplements)	AAFCO MTL / NRC MTL
Cation Exchange Capacity (CEC)	≥ 150 meq/100g	Ammonium Acetate Method

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① Certificate of Analysis

Lot-specific COAs confirming compliance with all parameters listed above are available upon request. Contact Texas Sodium Bentonite Inc. Technical Support with your lot number to receive a copy. All analytical testing is performed by qualified internal or third-party accredited laboratories.

11. Ordering & Contact Information

Texas Sodium Bentonite Inc. — Contact & Ordering Reference	
Company Name	Texas Sodium Bentonite Inc.
Headquarters	Alpine, TX, United States
Processing Facility	Alpine, TX — Mining, Drying, Milling & Classification
Packaging Facility	Comanche, TX — Finished Product Packaging & Lot Release
Standard Packaging	50 lb. sewn-top multi-wall paper bags; polywoven / poly-lined bags available (Comanche facility). Bulk quantities are available upon inquiry.
Technical Support	Contact Texas Sodium Bentonite Inc. for species-specific technical guidance, inclusion rate consultation, COA requests, and lot traceability documentation.

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Texas Sodium Bentonite Inc. — Contact & Ordering Reference

COA Requests	Provide product name and lot number when requesting a Certificate of Analysis. COAs are issued per finished goods lot and include all specification parameters listed in Section 10.
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12. Revision History

Rev	Date	Description of Change	Author
1.0	June 16, 2026	Initial Release — Swine Species-Specific Technical Data Sheet for feed-grade sodium bentonite and clinoptilolite zeolite. Includes inclusion rate tables, quality specifications, mode of action, regulatory compliance references, and ordering information.	Texas Sodium Bentonite Inc. QA

This document has been prepared using the best available technical and regulatory information as of the effective date. Texas Sodium Bentonite Inc. reserves the right to update this technical data sheet without prior notice. Always reference the current controlled version. Species-specific inclusion rates and applications should be confirmed with a qualified swine nutritionist or veterinarian.

Texas Sodium Bentonite Inc. | TS-SW-001 Rev 1.0

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