

# THE MODERN ANSWER TO SALTWATER SPILLS IN THE OIL AND GAS INDUSTRY

## TERRA SAL-X™

### SALTWATER SPILL REMEDIATOR

100% AVAILABLE 75,000 PPM CALCIUM ION SOURCE  
WITH TERRA-TRATE™ REMEDIAL SOIL PENETRANT



THE MOST ECONOMICAL AND EFFICIENT PRODUCT AVAILABLE FOR PROVIDING SOLUBLE CALCIUM TO SALT-IMPACTED SOILS, PENETRATING THE SOIL COLUMN, AND FLUSHING SODIUM OUT OF THE TOP SOIL.

#### WITH THE ADDED BONUS OF:

- INCREASING MICROBIAL ACTIVITY
- PROVIDING CHELATION OF BENEFICIAL SOIL IONS
- REDUCING REQUIRED IRRIGATION OR RAIN AMOUNTS UP TO 50%
- REDUCING SODIUM ADSORPTION RATIO IN SOIL AND WATER
- INCREASING CATION EXCHANGE CAPACITY (CEC)

#### WITHOUT ADDING SIGNIFICANT:

- CHLORINE OR CHLORIDES
- NITRITES OR NITRATES
- SULFIDES OR SULFATES

[WWW.CLEANLANDPRODUCTS.COM](http://WWW.CLEANLANDPRODUCTS.COM)

TOLL FREE: 1-866-645-1805

**100% Available 75,000 ppm Calcium Ion Source  
With Terra-Trate™ Remedial Soil Penetrant**

Terra Sal-X™ is a concentrated product manufactured and marketed by Clean Land Products, L.P. of Texas for the remediation and improvement of salt impacted soils by typical oilfield saltwater spills. Terra Sal-X™ utilizes a multi-discipline approach to salt spills on land. Chemically, it provides an immediate source of calcium ions for immediate displacement and replacement of sodium as well as powerful natural chelating compounds to further “mine” otherwise unavailable beneficial soil ions including calcium for additional sodium replacement. Physically, Terra Sal-X™ provides an eco-friendly, biodegradable, wetting agent and soil penetrant that opens soil, improves permeability, helps aerate soils, and flushes out sodium ions. Biologically, Terra Sal-X™ supplies Fulvic acid to increase microbial activity while providing optimal environmental conditions and nutrient availability for the restoration of soil health. And, Terra Sal-X™ is guaranteed to give measurable improvements.

**Some of the Benefits:**

- Supplies an instant source of calcium ions (50-150 times gypsum).
- Provides chelation and frees beneficial ions of trapped soil calcium.
- Immediately reduces the affects of Sodium.
- Decreases detrimental sodium adsorption ration (SAR).
- Increases beneficial cation exchange capacity (CEC).
- Lowers water surface tension for maximum penetration in all types of soils.
- Stimulates microbial activity.
- Enhances the availability of nutrients.
- Does not add nitrates, chlorides, or more salts.
- Reduces the required amount of remedial irrigation by up to 50%.
- Helps restore soils to a healthy state chemically, biologically, and structurally.
- Improves any bioremediation program of other toxic compounds.
- Terra Sal-X™ is safe, economical, and very easy to use.

**Economics:**

Terra Sal-X™ is packaged in five-gallon “cubitainers”. Each container holds more than the immediately available calcium equivalent of one-ton of agricultural grade gypsum. One container treats from 1280 to 14,520 square feet depending upon salt impact (SAR from a high of 60 to a low of 15). Application is quick and easy with very little labor and equipment costs. Soils are easy to monitor to verify results. Terra Sal-X™ is guaranteed to improve the sodium adsorption ratio.

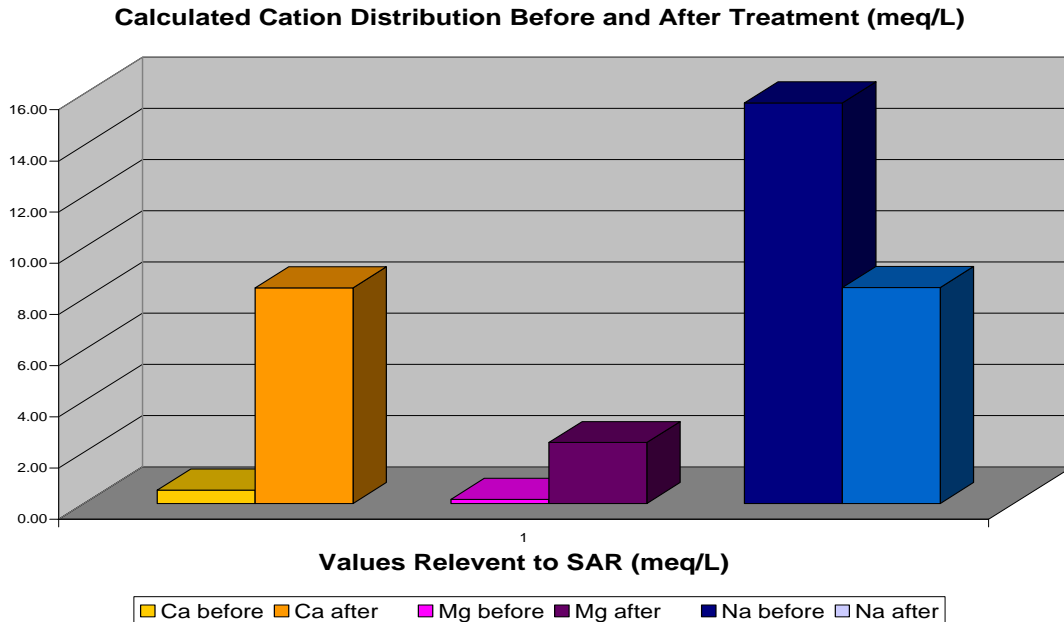
**Time and Water Required:**

The required rainfall and treatment time varies, but can roughly be estimated by taking the depth of impact in inches and dividing by 2 {yielding required rainfall in inches} then multiplying by 10 {yielding the estimated time in days}. The example below is this: 12” impacted soils/2 = 6” required rainfall or irrigation times 10 yields 60 days to completion. The initial sodium level is irrelevant as long as the recommended dosage of Terra Sal-X is applied.

## Example of Results:

Results with Terra Sal-X™ will vary because of initial cation concentrations, rainfall or irrigation amounts, soil type, and depth of sodium impact. As an example, the following charts illustrate average conditions in the upper soils (0-12") of a saltwater impacted sandy loam soil with adequate rainfall {6 inches}.

The first chart illustrates initial and subsequent cation values measured in milliequivalents/liter (meq/l) calculated from standard lab data reported in parts per million (ppm) Ca, Mg, and Na concentrations. Equivalent weights of 20, 12.2, and 23 respectively were used for converting ppm to meq/l using the formula {meq/l = ppm/equivalent wt}.

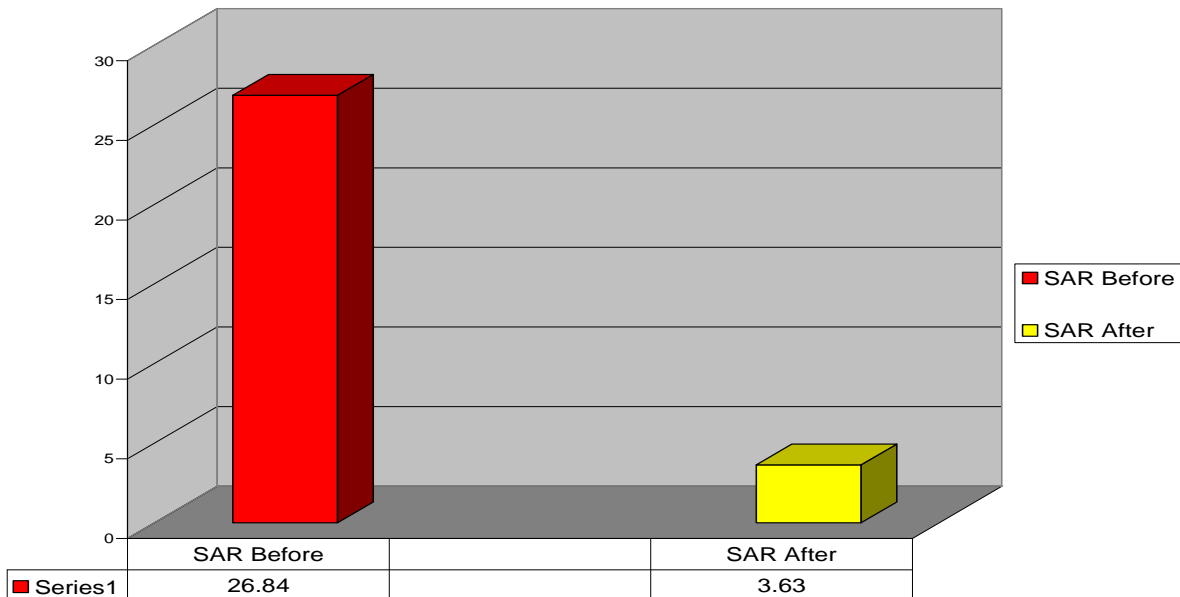


The chart above indicates the soluble calcium levels in the Terra Sal-X treated soil are approximately sixteen times the concentration in untreated soil. Magnesium has also increased in solution from its own displacement due to the high influx of calcium ions upon treatment. Sodium is obviously decreased by greater than 46% due in large part to the increased flushing ability created by the remedial soil penetrant, Terra-Trate™ after displacement by calcium.

Terra-Trate™, also an exclusive of Clean Land Products, L.P. is an exceptional surface tension reducer and wetting agent capable of allowing water to permeate through the tightest of soils and clays. Terra-Trate™ is a proprietary blend of biodegradable, eco-friendly and safe nonionic surfactants that is second-to-none in remedial soil penetrating ability. Terra-Trate™ also wields the two-edged sword of Fulvic Acid. Two-edged because it serves two primary purposes, the chelation of calcium for delivery and the chelation of additional calcium from the existing soils once freed. Fulvic Acid is also proven to greatly enhance microbial activity in soils.

The synergy of Terra-Trate™ and Terra Sal-X™ is meant for one purpose, the dislocation and removal of sodium from the root zone efficiently and cost-effectively. As our example illustrates, it all adds up to a very good resulting sodium adsorption ratio of 3.63 after starting with 26.84. Sodium Adsorption Ratios (SAR) are calculated and presented below using the standard formula of the meq/L Sodium divided by the square root of the Calcium and Magnesium milliequivalent average with the experimental data above.

### Calculated SAR Before and After Treatment



This example demonstrates ideal results with SAR reduced by 86% in a very short amount of time two months. Given adequate time and watering, virtually every oilfield salt-impacted site can be improved using Terra Sal-X™ without worry of added salts, nitrates, or chlorides, and without the time, labor, and expense (and gross inefficiencies) of using gypsum. Terra Sal-X™ will out perform gypsum in every saltwater spill situation.

Gypsum is typically soluble at a rate of 0.205 grams per 100 cc. So, a good high-grade gyp with 25% calcium content by weight would only allow for 0.05 to 0.15 grams per 100 cc (0.05% - 0.15%) of actual soluble calcium ions available, the equivalent of about one to three pounds calcium per ton gypsum. While gypsum does contain much more “bound” calcium, it takes allot of time and water to free it, about one acre-foot of water per ton by most accounts. Again, that is for each ton of gypsum. Consider the rainfall needed for ten to twenty tons.

Terra Sal-X™ weighs in at almost three-fourths (0.75) of a pound soluble calcium per gallon that is 100% soluble and immediately available to overwhelm the sodium in an impacted soil column. The bottom line is that one five gallon container of Terra Sal-X™ is the treatment equivalent of one to three tons Gypsum depending on the source, grade, and which theory of dissolution you follow. Even further, the calcium in Terra Sal-X™ is chelated with organic compounds which help transport it where it is needed and make it readily available for instant displacement of sodium ions.

To use Terra Sal-X™, simply prepare your treatment area as best you can by disking, leveling, and impounding if required, and then follow the simple directions as presented in the product application guide or on the container.

Clean Land Products, L.P. puts the science and engineering of remediation in the box. The application process is very forgiving and not reliant on precision. Basically, just get it in the soil, the quicker the better. If too little is used, you can apply a bit more later. If too much is used, no harm will be done. And, as with most remediation projects, “*the sooner, the better*”.

**PRODUCT APPLICATION GUIDE FOR TERRA SAL-X™:**

- 1) Determine area to be treated in square feet of surface.
- 2) Using SAR or General Conditions chart below, determine the gallons per acre of Terra Sal-X™ required. Over applying TS-X will not harm the soils or the environment.
- 3) Divide the measured area (ft<sup>2</sup>) by 43,560 (ft<sup>2</sup>) and multiply by the gallons per acre from the chart to give you the required gallons for your area. Round up to the nearest five-gallons. This is the amount of Terra Sal-X™ you need to apply (round up to the nearest gallon if less than five for very small areas and/or exhibiting low impact)
- 4) Dilute with clean fresh water before spraying or applying depending upon conditions:
  - a. If soils are dry and/or little rainfall is expected, dilute with as much water as possible for maximum coverage and to completely soak the area.
  - b. If soils are wet and/or moderate rainfall expected, dilute with enough water for full coverage only at a minimum of 1:10 TS-X to water.
  - c. If soils exhibit very sodic conditions or the SAR is above 40, split the determined amount into two equal treatments separated by enough time for the first treatment to have completely soaked in.
  - d. If the soils are extremely saline, consider impounding the entire treatment area and flooding with water or shaping the area to better collect and hold rainfall.
- 5) Apply by whatever means available for complete coverage. This may be an agricultural spray rig, simple pump and tank, or a clean freshwater truck with spray bar or hose.
- 6) Monitor the area for rainfall and water if required to speed up reclamation. Terra Sal-X™ will remain active in place for long periods, but must be moved through the soil column to treat at depth. A good rule of thumb with Terra Sal-X™ application is that one-inch of water is required to fully treat about two inches of soil. Water movement is a key.

**Terra Sal-X Application Rate on All Saltwater Spills Where SAR is known (specific):**

SAR →	<	10	15	20	25	30	35	40	45	50	55	60	>
Soil Texture	<b>Terra Sal-X™ (gallons per acre)</b>												
Coarse	2.5	7.5	15	25	35	40	50	55	65	70	80	85	+
Medium	5	15	25	40	55	60	75	85	100	105	120	130	+
Fine	5	15	30	50	70	80	100	110	130	140	160	170	+
<i>Split into two equal applications</i>													
<i>Completely flood area</i>													

**Terra Sal-X Application Rate on Emergency Spills or Where SAR is unknown (general):**

Site Conditions →	New 0''-6'' deep	New 6''-12'' deep	Sodic* 6''-12'' deep	Sodic* > 12''
Soil Texture	<b>Terra Sal-X™ (gallons per acre)</b>			
Coarse	15	40	65	85
Medium	25	60	100	130
Fine	30	80	130	170
<i>Split into two equal applications</i>				
<i>Completely flood area</i>				

- Sodic Soils are defined here as soils having significantly high sodium content with obvious abnormalities such as surface salt crusting, powdery appearance in clays that will not stick together well, and very little support of vegetation.

## **ADDITIONAL CONSIDERATIONS FOR ANY TREATMENT LOCATION**

- 1) A professional consideration should be made regarding the physical conditions at a treatment location with protection of environment the primary goal. Locations with shallow groundwater should be evaluated as to the impact of Sodium flushing.
  - a) A tile drain system, ditch recovery system, or other means of groundwater recovery may need be employed in areas exhibiting very high Sodium
  - b) Terra Sal-X™ treatments may be broken into numerous smaller application events to achieve a slower, less abrupt movement of Sodium in extremely environmentally sensitive areas where surface or near-surface water protection is a concern. Call for more information.
- 2) All applicable Federal, State, and Local regulations should be consulted and considered before proceeding with any remediation project.
- 3) It is the responsibility of the user of this product to monitor and insure that sufficient rainfall or irrigation amounts are occurring within the required time frame indicated by the anticipated completion date.
- 4) Use Terra-Trate™ Remedial Soil Penetrant at Maintenance dosages with all subsequent irrigation events to further assist in water movement and penetration.

## **MORE ABOUT TERRA SAL-X™ AND TERRA-TRATE™**

As stated earlier, Terra Sal-X™ actually delivers at least 50 times the power of gypsum-based soluble calcium ions (Ca++) immediately upon application to a sodium impacted soil. This translates to a calcium equivalent of about five gallons of Terra Sal-X™ per ton of gypsum. However, because of gypsum's ability to release more calcium over time, our application guidelines for Terra Sal-X™ call for at least 50% more of that amount which creates a very effective recommendation of 7.5 gallons per equivalent gypsum ton. The reality is that your soils are getting a massive dose of Ca++ on the first application that instantly go to work displacing Sodium (Na+). Our proprietary blend of Calcium is chelated with molecular ligands which, when released from the Calcium upon Sodium displacement, are freed to chelate and release other beneficial ions present in the soil. These newly released ions, many of which may be calcium, can then further displace Sodium, or hold nutrients in-place making them readily available to soil microbes or plant substances. In addition, naturally occurring organic acids in Terra Sal-X™ may then continue working by enhancing microbial activity in the soil.

Terra-Trate™, the soil Penetrant/wetting agent found in Terra Sal-X™ is a revolutionary blend of both all-natural and natural-based plant surfactants that are 100% biodegradable and very eco-friendly. The wetting and penetrating ability of Terra-Trate™ is second-to-none for use on all environmental reclamation projects, but the synergistic value it brings to Terra Sal-X™ is really off the charts in the plus direction. While Calcium Ions are actively knocking the Sodium free from clay particles, the wetting ability of Terra-Trate™ is allowing permeation into every tiny crevice and space insuring maximum contact. As water is provided by rain or irrigation, the penetrating ability of Terra-Trate™ moves salt out of the root zone deep into the sub-soils. Some of Terra-Trate™ is left behind within the soil matrix where it continues to benefit by helping to prevent salts from being wicked back up before remediation is complete. Terra-Trate™, as a stand-alone product boasts more than a 2% concentration of pure Fulvic Acid, placing it in a class by itself as a remedial soil penetrant and wetting agent. Professionals use Terra-Trate™ as a maintenance tool for all periodic watering events in any remediation project.

**NOTE:** Terra Sal-X™ and Terra-Trate™ are established Trademarks of Clean Land Products, L.P. All rights are reserved. All information and instructions are based upon single spill events.



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361-645-1800 FAX (361) 645-1802 Email: [cleanland@att.net](mailto:cleanland@att.net)

**MATERIAL SAFETY DATA SHEET**

Product Name: Terra Sal-X  
Date: 03/28/09

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**SECTION I - PRODUCT AND COMPANY IDENTIFICATION**

PRODUCT: Terra Sal-X  
CHEMICAL/COMMON NAME: Fertilizing compound liquid

CASE NO: This product is a mixture – there is no specific CAS number

MANUFACTURER: Clean Land Products, L.P.  
P.O. Box 1093  
Goliad, Texas 77963  
(361) 645-1800

EMERGENCY PHONE NUMBER: CHEMTREC (800) 499-9300

**SECTION 2 – HAZARDOUS INGREDIENTS**

CHEMICAL	CAS NO.	%	TLV OR PEL
No hazardous ingredients			

**SECTION 3 - PHYSICAL/CHEMICAL DATA**

APPEARANCE: CLEAR GREEN LIQUID  
BOILING POINT: 215° F  
VAPOR PRESSURE: N/A  
VAPOR DENSITY (AIR= 1) : <1.0  
WATER SOLUBILITY: Complete, Miscible

ODOR: MILD CITRUS  
SPECIFIC GRAVITY: 1.16  
PH: 1.9  
% VOLATILE: N/A  
EVAPORATION RATE: Same as water

HAZARD RATING: HEALTH: 1 REACTIVITY: 0  
[0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme]

FLAMMABILITY: 0

**SECTION 4 - FIRE AND EXPLOSION HAZARD DATA**

FLASH POINT: Not Combustible TEST METHOD: Not Applicable  
FLAMMABLE LIMITS: Not Applicable LEL: Not Applicable UEL: Not Applicable  
EXTINGUISHING MEDIA: Not Applicable  
SPECIAL FIREFIGHTING PROCEDURES: Wear positive pressure, self-contained breathing apparatus and goggles.  
Contain any liquid runoff.  
UNUSUAL FIRE & EXPLOSION HAZARDS: None

**SECTION 5 - FIRST AID DATA**

EYES: Flush immediately with water for at least 15 minutes. Call a physician if eye irritation persists  
SKIN: Wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. See a physician if skin becomes irritated.  
INGESTION: If conscious and alert, drink water or milk to dilute, and then induce vomiting. Call a physician or Poison Control Center immediately.  
INHALATION: Move to fresh air. If breathing becomes difficult, call a physician.

Product Name: Terra Sal-X  
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**SECTION 6 - REACTIVITY DATA**

STABILITY: Stable  
INCOMPATIBILITY: High pH Acids  
HAZARDOUS POLYMERIZATION: Will not occur

CONDITIONS TO AVOID: N/A  
HAZARDOUS DECOMPOSITION PRODUCTS: Not known  
CONDITIONS TO AVOID: None known

**SECTION 7 - SPILL OR LEAK PROCEDURES**

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

Contain spill, absorb liquids by covering with absorbent material. Vacuum or sweep waste. Place in container.

WASTE DISPOSAL METHOD:

Material which cannot be used at the site should be disposed of following all applicable Federal, State, and Local regulations.

**SECTION 8 - SPECIAL PROTECTION INFORMATION**

EYES: Chemical splash goggles or full-face shield to prevent eye contact. As a general rule, do not wear contact lenses when handling.

SKIN: Impervious gloves and clothes, keep out of open wounds and skin abrasions.

RESPIRATORY: Normally not needed. If use generates an aerosol mist or causes respiratory irritation, use NIOSH-approved dust/mist respirator

VENTILATION: Ample ventilation recommended but no TLV established

OTHER PROTECTIVE EQUIPMENT: Wear clothing consistent for handling and applying liquid fertilizers.

**SECTION 9 - SPECIAL PRECAUTIONS**

Store in cool dry area away from children, pets, food, and feed products.

Protect from freezing.

Avoid contamination and spills.

Avoid contact with eyes, skin, and clothing.

Avoid inhalation.

Wash hands thoroughly after use before eating or smoking.

**SECTION 10 - REGULATORY COMMENTS**

N/A

**NOTE:** This information is based on available information known to Clean Land Products, L.P. at the time and date of its development. The user has the responsibility to insure that it is the most updated version available and is provided solely to comply with OSHA'S Hazard Communications Standard. This MSDS implies no warranty, expressed or implied.