



## FAQ – Bio-Regen SA-1000 For Salt Remediation

### What is SA-1000?

3Tier Technologies **SA-1000** is a new management tool for remediation of high sodium and metal contaminated soils and wastewater streams. **SA-1000** is an advanced treatment product combining two, next generation, Polyelectrolyte Enhanced Organic Bio-Polymers (PEB) with bio-available calcium.

This uniquely blended product possess the following properties and functions; optimal molecular mass, active functional groups, hydrophilic and hydrophobic sites, positively and negatively charged sites, non-ionic sites, and specific interactions between molecules themselves and organic/mineral compounds. The combination of these diverse properties and functions provide a product that utilizes multiple functions and mechanisms to detoxify, neutralize and bind, salts and chlorides with the added ability to convert a myriad of toxic metals to benign residual metals.

### What is 3 Tier's Polyelectrolyte Enhanced Biopolymer (PEB)?

The foundation of **SA-1000** is an advanced blend of two Polyelectrolyte Enhanced Biopolymer (PEB) that are derived from very stable, organic compounds found in brown and oxidized black coal. Our proprietary processing technology purifies and unleashes the vast potential of these massive molecular formulas.

PEB is a highly reactive long-chain molecule providing a purified carbon source available with various concentrations of fulvic acids, highly reaction functional groups, high CEC potential, and low ash and ballast. **SA-1000** contains a combination of negatively charged molecules for reactions with positively charged Na and a new generation of non-ionic molecules for negatively charged chlorides. This unique combination with the addition of calcium creates a complete remediation tool for salts, chlorides and metals. PEB is an all-natural, highly soluble, liquid concentrate that is safe and easy to use for both soil and aqueous application

### Why is the PEB important to the salt remediation process?

PEB naturally binds, adsorbs, and coordinates sodium cations and chlorine anions which allow excessive amounts of salts/chlorides to become more mobile in terms of sodium cations and chloride anions, which eliminates the salt's/chlorides ability to bind to soil particles, especially clay. This reaction allows sodium/chlorides to be safely leached and naturally filtered through the soil profile. Any sodium/chloride residue creates a new mineral formation resulting in sodium, chloride, cation and anion conversion into physically and mechanically bound status, thus eliminating salt toxicity resulting in desalination and salt toxicity reduction/elimination. This process also improves the growing profile by reversing negative osmotic pressure, reducing electrical conductivity, increasing soluble organic matter allowing proper nutrient and moisture retention, percolation, and uptake, therefore allowing new plants to establish and regenerate soil back to a healthy and productive state. In aqueous solutions, the reactions are similar, resulting in the precipitation of most of the sodium, chlorides and metals with the remaining soluble forms being neutralized into non-toxic forms.



## How does SA-1000 work?

**SA-1000** possesses several beneficial characteristics that buffers the treatment environment, creates a foundation for maximum biological, geological and chemical reactions, is both hydrophobic and hydrophilic, and is designed to work effectively in both soil and aqueous environments. Through these various reactions with contaminants, **SA-1000** attracts various contaminants, reverses their negative impact in their environment and reduces/or eliminates the harmful impact through the following processes:

- **SA-1000** adsorbs and coordinates sodium cations and chlorine anions which allow excessive amounts of salt to become more mobile in terms of sodium cations and chloride anions that have a natural ability to safely filter through the soil or precipitate out of water. Any sodium residue creates a new mineral formation resulting in sodium, chlorine, cation and anion conversion into physically and mechanically bound status, thus eliminating salt toxicity resulting in desalination and salt toxicity reduction/elimination.
- **SA-1000** with bio-available calcium is immediately soluble and active compared to gypsum applications. See results within a couple weeks.
- In soil, **SA-1000** creates fresh soil organic matter that results in increased CEC, reduced Electrical Conductivity (EC), better water holding capacity through osmotic pressure reduction, and soil porosity/structure that results in healthy, active soil for re-use.
- **SA-1000** will naturally stimulate toxic organic and mineral pollutants decomposition into neutral soil mineral compounds such as converting Chromium VI to Chromium III which is accomplished by an abundance of hydroxyl and phenol groups. These functional groups are key to the metal complexation resulting in the binding of various metals which protects the environment.

## How does SA-1000 improve the soil condition?

When frack/production water or drilling muds are accidentally released onto healthy soils, the results on vegetation are immediate, with devastating results. The impact of the sodium increases compaction through interactions with clay particles, reduces the ability for moisture to naturally penetrate the soils, dramatically increases Electrical Conductivity (EC), and limits natural nutrient conversion and availability to plants resulting in certain death.

Treatment of soils with **SA-1000** creates fresh soil organic matter that results in healthy, active soil for re-use. **SA-1000** will increase CEC while reducing electrical conductivity, improve water holding capacity by reducing the osmotic pressure, and soil porosity/structure by releasing the sodium for the clay and reversing the charge of the clay particles forcing them apart. **SA-1000** helps safely regenerate soil affected by salts/chlorides/metals and promotes improved soil structure for healthy, productive use of the site.

## How quickly will SA-1000 work and when can you expect desired results?

In most of our project sites, the application of **SA-1000** resulted in a reduction in excess of 75% of Total Soluble Salts and over 80% reduction in chlorides within 30 days after application. While results may vary from one project site to the next, it is important to evaluate results after a minimum of six months. At such time **SA-1000** full impact would be realized in terms of improving the soil structure.

In most cases, the speed in which the product will work is impacted by a variety of variables. The most important factor is accurate soil analysis that clearly defines the level of contamination and soil structure/type. This information will insure proper application dosage of the treatment for the desired results. Other critical factors include soil moisture after application (Limited or no rainfall will slow analytical results), proper dosing rate and application, and the establishment of accurate expectations. A reasonable expectation is to see significant results in 30 days if the recommended dosage is used.

## Once SA-1000 is applied is it safe to apply seed and any other required nutrients?

Yes, the impact of **SA-1000** is almost immediate in terms of detoxifying and buffering the soil structure. If desired, you may apply seed & required nutrients to the treated soil immediately after the application of **SA-1000**. With the proper moisture level & rain fall, germination may be seen in as little as 2 weeks