

# Phoslock – Innovation in Lake Restoration

## INTRODUCTION

Increased nutrient concentrations leading to eutrophication in water bodies such as lakes, slow-moving rivers and reservoirs is a major environmental problem worldwide. The consequences of increased nutrients such as phosphorus and nitrogen in a water body are: visible cyanobacterial or algal blooms; surface scums; floating algal mats; benthic macrophyte aggregations; death of fish; and, an increase in benthic nutrient deposition.

Nutrient limitation or nutrient precipitation is one of the practical means of reducing eutrophication. Removing nutrients (e.g. phosphorus) from the water column and controlling its release from sediments can control the growth of algae. In contrast to traditional P-inactivation products and technologies, the use of Phoslock®, with its active ingredient lanthanum, is an effective P-inactivation and blue-green algae management tool.



### PHOSLOCK® APPLICATION TO POLISH LAKE

PHOTO TAKEN BY DRONE



### PHOSLOCK® APPLICATION TO CANADIAN LAKE



### PHOSLOCK® BAGS (25 KG) & GRANULES

#### WHAT IS PHOSLOCK® ?

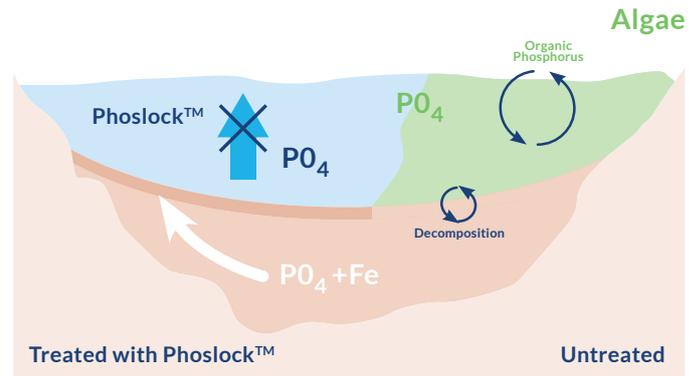
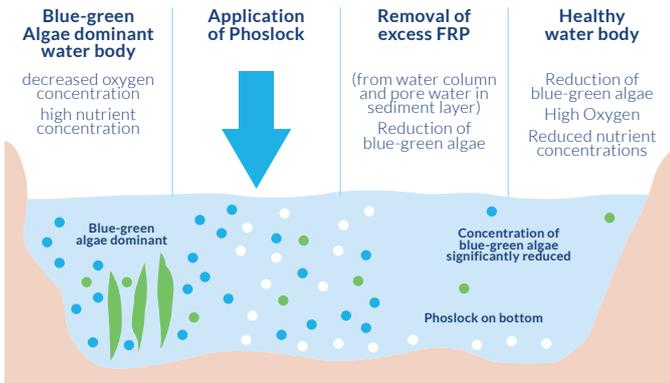
Phoslock® is a modified bentonite clay product that was developed during 10 years of research undertaken at the CSIRO Department of Land and Water and funded by the Western Australian State Government's Water and River Commission and the Swan River Trust. Phoslock® binds phosphate (also known as filterable reactive phosphorus, FRP or soluble reactive phosphorus, SRP) from water. FRP is one of the essential nutrients for phytoplankton growth. By binding FRP from a water body, growth and proliferation of the phytoplankton is decreased due to nutrient limitation. FRP limitation directly affects the biomass of blue-green algae, and thus the phytoplankton species composition shifts away from potentially harmful toxic blue-green algae.

#### HOW DOES PHOSLOCK® WORK?

When Phoslock® is applied to a water body as a slurry or granules, it moves down through the water column, and up to 95% of the FRP is rapidly bound within the first four hours and adsorbed onto the surface of Phoslock®, forming a highly stable insoluble mineral known as Rhabdophane ( $\text{LaPO}_4 \cdot n\text{H}_2\text{O}$ ).



Once the new mineral Rhabdophane is formed, the phosphate will not re-release into the water over time. This makes Phoslock unique compared to other nutrient treatments.



**IMMEDIATE IMPACT – RAPID PHOSPHORUS UPTAKE**

**LONGER TERM IMPACT – FORM A CAPPING LAYER**

**PHOSLOCK® MANUFACTURING PROCESS**

During the manufacturing process of Phoslock®, modified bentonite clay and lanthanum are mixed in an aqueous solution. The lanthanum is adsorbed onto sites within the bentonite structure and becomes the active compound that removes phosphate. The lanthanum ions are incorporated into bentonite via cation exchange in the clay. This exchange capacity is a result of a charge imbalance on the surface of the clay sheets, which is balanced by surface adsorbed cations that are exchangeable in aqueous solutions. Lanthanum ions are strongly associated with the bentonite clay. Once the free phosphate in the water body binds with Phoslock®, the solubility product disallows release.

$K_{sp}$  of  $LaPO_4 = 10^{-26.15}$  (fresh water)

$K_{sp}$  of  $LaPO_4 = 10^{-27.92}$  (sea water)

The lanthanum will either react with the phosphate anion in the water body or remain bound within the clay structure under a wide range of chemical and physical conditions.

**CONCLUSION**

Phoslock Environmental Technologies (formally known as Phoslock Water Solutions Ltd) is an Australian Public Company listed on the Australian Stock Exchange (ticker:PET). PET manufactures, distributes and applies Phoslock® to water bodies such as recreational lakes, slow moving rivers, drinking water reservoirs, and intensive aquaculture ponds in order to remove excess phosphate and control algal blooms. Phoslock® has been applied to water bodies in over 20 countries in order to reduce and control the concentration of blue-green algae (cyanobacteria). The amount of Phoslock® applied to an individual water body depends on: the amount of bioavailable and total phosphorus present in the water body, hydrology of the water body such as inflows and runoff, sediment phosphate release as well as the chemical properties of the water.

**BINDS PHOSPHATE PERMANENTLY**

*Caps Sediments*

*Environmentally Non Hazardous*

*Stable across wide pH range and all redox conditions*

*Safe to use and easy to apply*

**CONTACT**

**Sydney - Head Office**

Suite 403, Level 4, 25 Lime Street  
Sydney, NSW 2000, Australia

Ph: **+61 2 8014 7611**

Fax: **+61 2 8014 7625**

Email: [enquiries@phoslock.com.au](mailto:enquiries@phoslock.com.au)

Website: [www.phoslock.com.au](http://www.phoslock.com.au)

**Europe / the Americas**

Imperial Court, 2 Exchange Quay  
Manchester, M5 3EB, UK

Ph: **+44 161 457 2085**

Ph: **+44 7956 111194**

Email: [info@phoslock.eu](mailto:info@phoslock.eu)

Website: [www.phoslock.eu](http://www.phoslock.eu)

**China – Beijing**

1902-03 T5 Ronghua South Road  
No.2., Yizhuang Economic  
Technological Development Area  
Daxing, Beijing, China

Ph: **+86 10 67 899 833**

Website: [www.phoslock.cn](http://www.phoslock.cn)

**China – Changxing Factory**

No. 333 Nan Gao Road  
Changxing Economic and  
Technological Development Zone  
Zhejiang Province, China