

*APPLICATION OF VIROSEWAGE™ TECHNOLOGY  
IN BIOLOGICAL NUTRIENT REDUCTION AND  
TRICKLE FILTER TREATMENT PLANTS*

**VIROSEWAGE™ TECHNOLOGY  
TECHNICAL PAPER**



## VIROSEWAGE™ TECHNOLOGY

The treated water released from sewage treatments facilities are characterised by high nutrient concentration and odour. It is essential that nutrients (phosphorous and nitrogen) are removed efficiently to ensure that algal blooms do not occur in the receiving waters.

ViroSewage™ Technology is a further development of the Virotec International's Platform Technology. ViroSewage™ Technology was developed and tested in Australia, with the assistance of two Queensland municipal councils, one a conventional Trickle Filter facility, and the other, a BNR facility.

## APPLICATION OF VIROSEWAGE™ TECHNOLOGY

ViroSewage™ Technology may be successfully applied to both Biological Nutrient Reduction (BNR) and trickle filter treatment plants. It is easily integrated into existing sewage treatment facilities and involves the implementation of a relatively simple engineering retro-fit and the application of ViroSewage™ Technology reagents.

ViroSewage™ Technology can deliver outstanding results, including:

- > Substantial odour reduction minimising local impacts from sewage treatment facilities.
- > Reduced residence time in the final clarifier potentially allowing existing plants to significantly increase capacity without substantial increase in capital expenditure.
- > Economically achievable removal of up to 99.9 percent of phosphorus.
- > Superior bio-solids that are free from objectionable odour, phosphate enriched and environmentally safe due to unmatched heavy metal immobilisation.

Treated bio-solids with ViroSewage™ Technology can “cook” during composting at up to 15 degrees centigrade higher than normal untreated bio-solids, while reducing the possibility of spontaneous combustion, providing significant environmental and economic incentives to compost bio-solids that include:

- > Up to 100 percent elimination of pathogens;
- > Up to 65 percent reduction in time required for composting; and
- > Up to 40 percent reduction in the quantity of green mulch required for composting.

ViroSewage™ Technology stimulates faster particle-fluid separation resulting in up to a 50 percent reduction in residence time in the final clarifier. This has significant repercussions for treatment plants operating at 100 percent capacity and facing costly upgrades. Potentially, the ViroSewage™ Technology process allows existing plants to significantly increase current capacity without substantial increase in capital expenditure. Furthermore, ViroSewage™ Technology almost eliminates the need for costly flocculants.

## CHEMISTRY OF VIROSEWAGE™ TECHNOLOGY

### > Phosphorous Removal

A further phase of the ViroSewage™ Technology treatment reduces the soluble inorganic phosphorous content in

sewage effluent to the minimum theoretical solubility limit for phosphate precipitates. In turn, up to 85 percent of the phosphate nutrient is transferred to the ViroSewage™ Technology enriched bio-solids in a remarkably stable form, where it remains stable even in anoxic conditions. Unlike normal bio-solids, phosphate enriched ViroSewage™ Technology bio-solids can potentially be used to improve soils whose pH is even less than 5.5.

ViroSewage™ Technology, when tested at a conventional sewage treatment plant, improved the traditional poor rate of phosphorous removal from the effluent stream from approximately 10-30 percent to over 99 percent.

In a Biological Nutrient Removal (“BNR”) sewage treatment plant, phosphate removal is highly dependent on both the incoming phosphate loading and the current plant operating conditions. Disruption to the BNR process may result from large variation in hydraulic flow, material overload, chemical or toxic shock, all of which generally result in excessive phosphate discharge.

ViroSewage™ Technology at a BNR plant, not only ensures the removal of over 99 percent of phosphorous from the effluent stream, it allows the BNR process to concentrate exclusively on the removal of nitrogen, considerably improving the efficiency of the BNR process and effectively reducing manpower hours needed for critical ongoing BNR management.

### > Metal Binding Capacity

ViroSewage™ Technology can be used to immobilize heavy metals in bio-solids so that stringent standards for leachability of heavy metals are met.

Most trace metals are initially trapped by adsorption. ViroSewage™ Reagent is dominated by particles with a high surface area-to-volume ratio and high change-to-mass ratio. During aging, elements are redistributed to become structural components of new minerals during recrystallisation.

## ENVIRONMENT AND SAFETY

The use of ViroSewage™ Technology to treat municipal effluents is both environmentally sustainable and economically viable. ViroSewage™ reagent consists of minerals that are not known to pose any environmental hazard.

### > Odour

Older sewage treatment works are now much closer to urban centres than when they were first built. Expanding cities and towns mean that houses are located close to the original treatment works. Complaints frequently refer to the unpleasant odour emanating from the open basins where the wastewater is treated and to the odour released from bio-solids (treated sludge) stored at composting sites or sent to landfill. In some crowded cities, governments have been forced to replace all the conventional open tanks in sewage treatment works with covered units to control the emission of foul air.

ViroSewage™ Technology can be applied upstream of known odour sources within a treatment facility, resulting in a reduction in the biological production of organic and inorganic volatile sulphur compounds that cause odour problems, virtually eliminating the discharge of odour from these points to the atmosphere.

ViroSewage™ Technology is a breakthrough in an industry that has employed various unsuccessful means to control odour pollution, including the addition to sewage of water, oxygen, lime, hydrogen peroxide, biological additives, and the use of air phase odour controls such as activated carbon adsorbers, bio-filters and odour neutralising agents.

### > Recycled Bio-solids

The elevated temperatures of the controlled aeration, which is produced by the microbial action, significantly reduces pathogens and breaks down the composting mass until a stabilized product is produced.

Traditionally, the natural biological action creates a temperature rise ranging from 55°C to 65°C and the reaction temperature in the pile must be at least 55°C for three weeks to achieve efficient pasteurization. ViroSewage™ Technology results in the temperature rising as high as 85°C while reducing the possibility of spontaneous combustion and eliminating up to 100 percent of pathogens, generally within 24 hours of reaching this temperature.

ViroSewage™ Technology also results in a 65 percent reduction in time required for the composting stabilization process enabling faster turnover and significantly reducing the size of the composting facility.

Bio-solids composting also requires the addition of a bulking agent to provide air space and to make the mixture permeable. Typical bulking agents include green mulch, wood chips, shredded bark, sawdust, shredded paper other materials. ViroSewage™ Technology results in a 40 percent reduction in the required volume of the bulking agent and, again this contributes to a large reduction in the size of the composting facility.

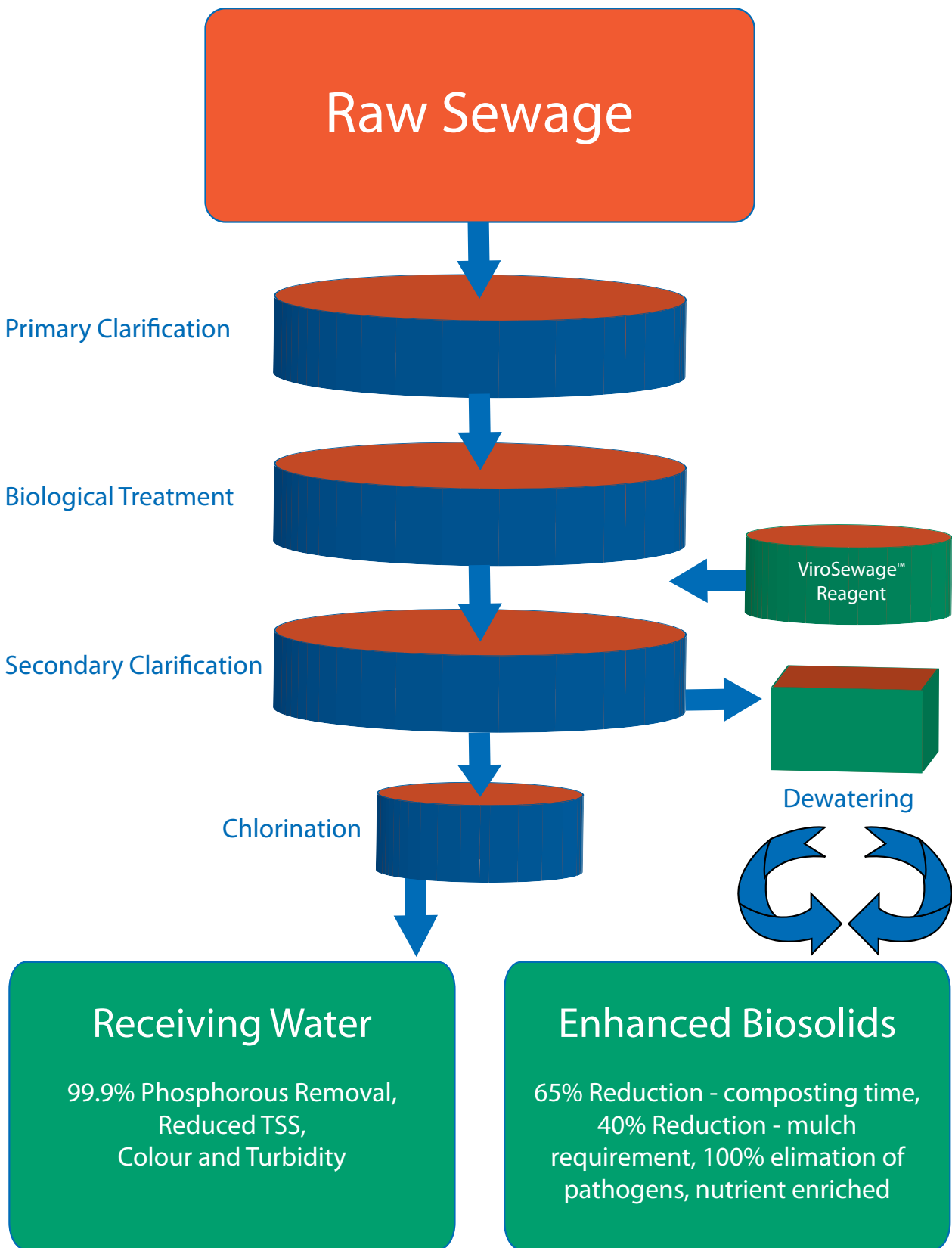
ViroSewage™ Technology not only contributes to faster composting, it also vastly improves the quality of the end products for market, which range from a superior composted product, a first class soil conditioner and even a retail potting mix.

Traditionally, all facilities handling bio-solids produce odours and frequently composting facilities are forced to operate at reduced capacity due to objectionable odour issues.



*ViroSewage™ Technology applied to enhance composting quality.*

# SCHEMATIC OF SEWAGE TREATMENT USING VIROSEWAGE™ TECHNOLOGY



Composting facilities also require drainage systems and a “pond” to catch runoff to eliminate chances of non-point source pollution from noxious leachate. ViroSewage™ Technology significantly reduces leachate run off.

## COMMERCIAL RESULTS: LARGE-SCALE BNR TREATMENT PLANT

The following Table summarises results obtained from implementing ViroSewage™ Technology at a large Biological Nutrient Reduction (BNR) Plant.

Parameter	Present Technology	ViroSewage™ Technology
Treated Wastewater - Volume treated	17.0 ML	17.0 ML
Phosphorous concentration to receiving water	16 ppm	0.05 ppm
Odour level	High	Low
Biomass recovery time after toxic shock or extreme rainfall	6 weeks	Nil
<b>Bio Solids</b>		
Volume produced (m <sup>3</sup> /year)	5,833	4,166
Phosphorous loading (kg/day)	375	614
<b>Compost</b>		
Volume produced (m <sup>3</sup> /year)	35,000	25,000
Greenwaste: Bio solid ratio	5:1	3:1
Odour	High	Zero
Composting time (weeks)	14	7