

REED BEDS

low maintenance, low cost, natural alternative for sludge de-watering

Wastewater treatment systems often produce sludge as a by-product of creating clean water. Reed beds passively de-water and compost those sludges on-site while eliminating the need for trucking sludge to a landfill or processing facility. Reed beds utilize regionally native wetland plants such as reeds, canes, or bulrush to aid in the composting process; leachate is returned to the treatment system.

HOW REED BEDS WORK

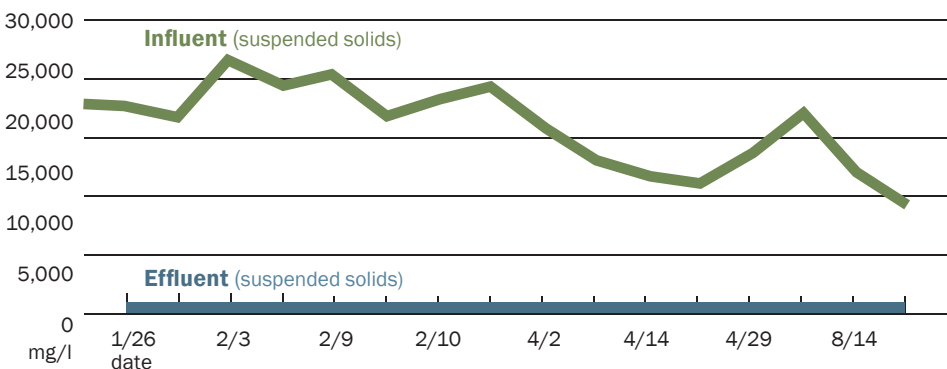
Reed beds mimic the natural decomposition and soil-building capacities of densely vegetated wetland beds. Typically a series of beds is constructed to allow for rest time between addition of sludges. Sludge generated in the wastewater process is pumped through a distribution network to spread the solids on the reed bed surfaces in rotating sequences.

Loading rates are a function of climate, season of the year, and plant growth and development. Generally speaking, as the plants mature, the loading rate can increase; more sludge can be applied in the summer than the winter. In warm climates such as the southern United States or Latin America, where biological activity is greater than in temperate climates, the accumulation rate is lower.

Sludge is broken down over time in the bed, with the aid of plants that seek out moisture and keep the sludge open to air. Continuous exposure of the sludge to air promotes the decomposition and oxidation of the sludge with potential volume reductions up to 98%. Leachates and rainwater that drain through the bed during de-watering are collected and returned to the treatment facility for processing.

After typically 7–10 years, the sludge, which is now a stabilized composted material, is suitable for future land application or for use as a soil amendment. Storage for 90 days is recommended to insure that pathogen removal criteria have been met.

M&M Mars Reed Bed–Waco, Texas



Solids removal capability of a reed bed in central Texas



from top: Reed beds in Waco, Texas and in Macultepec, Tabasco, Mexico

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FOR REED BED DESIGN

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Biohabitats-designed reed beds with giant cane

OPERATIONS

The wastewater system operator will periodically be required to pump sludge from the clarifier or digesters to the distribution network in the reed beds. Beds are loaded sequentially so that each bed will have a chance to dry out before receiving the next dose of sludge.

Drying is not solely the result of draining and atmospheric dehydration. Additionally, as roots penetrate the sludge, soil pore water is drawn up into the reeds and moisture is removed by evapo-transpiration of water through the leaves

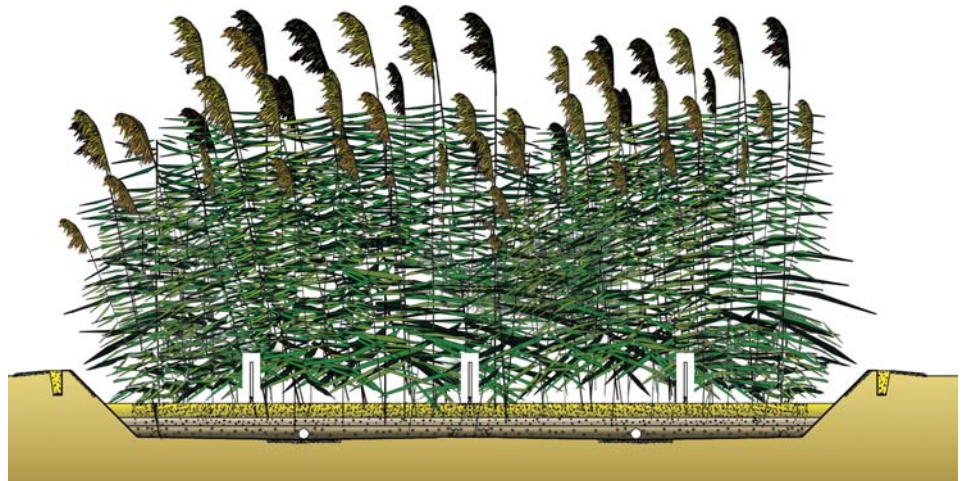
Atmospheric conditions such as humidity, temperature, precipitation, wind, sun, and frost will affect the time required between loading. Precipitation will be instrumental in maintaining some soil (sludge) pore water; however the largest volume of water is supplied by the sludge and the great majority of this water simply drains through the bottom of the reed bed where it is returned to the front end of the wastewater treatment facility.

ODOR

Experience with reed beds is that there are odors generated during the loading of the cells, but within a day or less, obnoxious odors have been replaced by an earthy smell similar to that of a forest floor's soil and leaf litter. During the loading period, most of the odors are trapped by the leaves and plants. Wind blocks, which are strategically placed, further reduce the possibility of unpleasant odor.

ECONOMICS

The principal reason that reed beds are attractive as a sludge de-watering alternative is that the capital and operating costs are very low relative to the costs of land application or the use of digesters. Reed beds are passive treatment systems requiring little or no effort to operate until the bed is unloaded. Typically, de-watered sludge is removed after 7–10 years with a front-end loader and placed in wind rows for 90 days. Capital costs are essentially the same as for sand filters.



Reed bed natural sludge treatment system (typical cross section)



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