

Vetiver System for Landfill Leachate Treatment

Vetiver grass was first used for landfill leachate control in Queensland, Australia in 1994.

Since then it has been used in Australia, China, India, Mexico, Nigeria, Philippines, South Africa, Thailand, USA and Vietnam

The following unique attributes make Vetiver suitable for leachate treatment, which highly contaminated with heavy metals and salt



Extraordinary Physiological Features

Vetiver is highly:

- **Tolerant to soil high in alkalinity, acidity (pH 3.5-11.5), and salinity (EC 17.5 mS/cm).**
- **Tolerant to elevated levels of heavy metals such as Arsenic, Cadmium, Copper, Chromium, Lead, Mercury, Nickel, Selenium and Zinc in the soil and water.**
- **Efficient in absorbing dissolved N and P in polluted water and soil.**
- **Effective in breaking down organic compounds associated with pesticides and herbicides.**
- **Tolerant to flooded soil conditions making it ideal for use in wetlands.**
- **Efficient in taking up water under wetland conditions or high water supply.**
- **Resistant to pests and diseases.**



Australia: This leachate seepage is highly contaminated with Chromium, Cadmium, Copper, Lead and Zinc



Within a year vetiver planting has completely stopped the leachate seepage



Australia: Overhead irrigation with leachate

3 months after planting



Eleven months after planting



Eight months after planting



**Vetiver growth was over
3m in the second summer**



**Growing in highly saline and
polluted leachate pool**



FIFTEEN MONTHS AFTER PLANTING



SINGAPORE - LORONG HALUS WETLAND

A complex of 5 ponds (3 of 6 000 m² and 2 of 10,000 m² totaling 38,000 m² to treat 2,900 m³/day (= 33.6 L/s))



- BOD 2.0 - 336mg/L
- COD 37 - 823mg/L
- Total N 0.7 - 1.04 mg/L
- Total P 0.08 - 5.7mg/L
- Total NH 3 0.06 - 743mg/L



SINGAPORE - LORONG HALUS WETLAND



**One month
after planting**



Six months after planting



One year after planting



Mexico: Disposal of industrial landfill leachate at Poza Rica





One year after planting





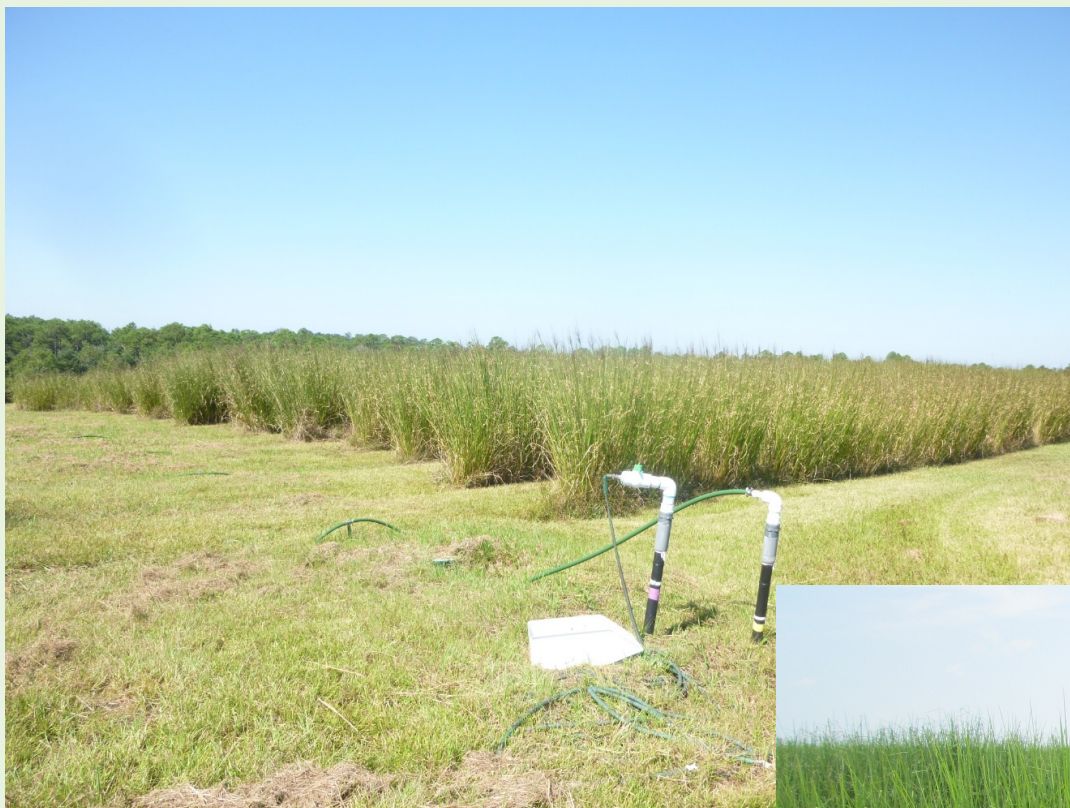
USA: Disposal of leachate at a closed landfill, Biloxi, Mississippi.

- Installed in 2011
- ~75,000 vetiver on 3 acres
- Subsurface irrigation
- As of December 2017, the system has processed over 6.3 million gallons

Leachate Management Specialists, LLC



**One year
after planting**



**Six years after
planting**



Active Landfill in Needville, Texas, USA



- Installed in Summer 2017
- ~65,000 vetiver on 4.7 acres
- Subsurface irrigation
- As of December 2017, the system has processed over 150,000 gallons



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Significant growth by September 2017

