



Compliance managers at many industrial sites are now facing long-term operation responsibility for their systems. The sobering realization is that remediation systems will have to be actively operated and maintained for the next 50 to 100 years. Even if in-situ strategies such as bioremediation or phytoremediation are pursued, the need to maintain hydraulic gradient control often results in the continued generation of a contaminated groundwater source. In this context, mechanical remediation systems begin to look much less attractive due to their high life-cycle operations and maintenance (O&M) costs.

## What does this mean to you?

The remediation reality faced by compliance managers is the need to deal with large quantities of groundwater with low levels of contamination over a very long period of time. The cost benefits of wetland treatment technology can be summed up in a simple phrase: "Plants and bacteria work for free; people and machines don't."

The economics of wetland treatment are most favorable for site managers with long term treatment needs and an obligation to operate the system. Depending on the type of contaminant, capital costs for wetland systems can be on a par with their mechanical counterparts. Since wetlands rely on plants and bacteria instead of people and machines, the long term O&M costs are much less than mechanical treatment systems.



## How can Jacques Whitford NAWE help you?

Jacques Whitford NAWE designs engineered wetland treatment systems using **Forced Bed Aeration™** that can operate year-round under widely varying climates, enabling robust, simple, low-cost and green solutions for complex, long-term problems.

We provide a full range of services to both remediate and restore contaminated sites: from initial site assessment and feasibility studies through complete design, permitting, construction observation, system startup and operations. Our project teams can provide full project support ranging from environmental investigations to design and operation of engineered systems. Our focus is on ecological remedial actions that deliver exceptional business and environmental results.

### Some of the services we provide

- Feasibility assessments
- Engineered wetland design
- Natural treatment system design: aerobic and facultative lagoons, surface flow wetlands, phytoremediation
- Remediation of BTEX, MTBE, and TCE-contaminated groundwater, nutrient removal, and metal sequestration
- Pilot system design and operation
- Groundwater modeling (flow and mass transport in saturated and variably saturated media)
- Design assistance for air sparging and phytoremediation systems
- Geochemical modeling
- Permitting
- Construction observation
- Operations and maintenance



Founded in 1972 • More than 45 offices across North America & Internationally • Employee owned • More than 1,600 staff • 100,000+ projects in North America & over 65 countries • Current projects obtained from repeat clients: 80%

#### Jacques Whitford Companies

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