



Passive Treatment Systems

Earth Systems provides specialist expertise in the design, installation and monitoring of Passive Water Treatment Systems. Our indepth knowledge of water chemistry and understanding of Passive Treatment Systems means that we can select, scale and impliment an appropriate low-cost Passive Treatment System for your long-term water quality applications.

Passive Treatment Systems are engineered treatment systems that do not require the continuous addition of chemical reagents to conduct treatment. These systems rely on installed physical, chemical and biological processes for treatment. If used appropriately they can have a positive, long term, benefit on water quality at low cost.

They are ideally suited to the treatment of water with low acidity, pollutant and suspended particle loads. An understanding of the inflow water chemistry is required to correctly design and scale the system to achieve the desired final water quality. Incorrectly scaled systems can result in poor effluent water quality or very limited life expectancy due to precipitates and armouring of installed reactive materials. In most cases drainage with acidity loads < 150 kg H₂SO₄ / day can be treated by passive systems.

Several Passive Treatment Systems use limestone as their primary source of alkalinity and are capable of raising the effluent stream to near neutral pH, and in the process lower the concentration of most dissolved metals. For some metals, the addition of other forms of alkalinity, or organic matter, may be necessary to reduce their dissolved concentrations even further.

Passive Treatment Systems include:

- Oxidic / Anoxic Limestone Drains (OLD/ALD).
- Limestone Diversion Wells (LDW).
- Reducing and Alkalinity Producing Systems (RAPS).
- Successive Alkalinity Producing Systems (SAPS).
- Alkalinity Ponds.
- Pyrolusite Limestone Beds (PLB).
- Aerobic / Anaerobic Wetlands.
- Vertical Flow Wetlands (VFW).
- Inert Atmosphere Systems.
- Permeable Reactive Barriers (PRB).
- Slag Leach Beds (SLB).
- Microbial Reactor Systems (MRS).
- Alkalinity Producing Covers.

Once pollutant (i.e. acidity) loads are understood, appropriately designed, scaled and implimented passive systems can be used for:

- Mine site discharges.
- Storm water runoff.

- Long term treatment of low acid, metal and sediment load runoff.
- Landfill leachate treatment.
- Final polishing of effluent from treatment plants.
- Turbidity reduction.
- Phosphate, Nitrate and Ammonia reduction and control.
- Acid & Metalliferous Drainage from mines, or Acid Sulfate Soils.
- Metal removal (e.g. Al, As, Cd, Co, Cu, Fe, Ni, Pb, Sb, U, Zn).
- Sulfate removal.

SERVICES PROVIDED

- Sampling, assessment and reporting of feed water (influent) water quality, including dissolved metals, total acidity and acidity load assessments.
- Design and construction of appropriately selected and scaled passive treatment systems to address water quality parameters of concern (e.g. dissolved metal concentrations, sulfate removal).
- Design and implimentation of inert atmosphere systems to lower pollution generation from abandoned and derelict underground mines.
- Wetland design for stormwater treatment.
- Review and upgrade of existing passive water treatment systems.
- Development of effective, cost-efficient water quality monitoring programs for passive treatment systems.

PROJECT EXPERIENCE

- Design and construction of a vertical flow wetland for TSF seepage from a base-metal mine.
- Feasibility design of stormwater treatment wetlands.
- Concept design for a Vertical Flow Wetland (VFW) to treat, low pollutant load, metalliferous drainage from a derelict mine site.
- Design and implimentation of inert atmosphere systems at the decommissioned Sunny Corner and Nevada underground mines, NSW, Australia.
- Multiple alkalinity ponds and oxidic limestone drains at a base-metal mine.
- Review & re-design of a passive treatment system at a base-metal mine.



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