

The Living Levee: assessment of wetland soil on trace organic compound removal



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Objective:

Understand the hydrology of the Living Levee and demonstrate the relationship between wetland soil adsorption capacity and depth

Background:

- The Living Levee performs tertiary waste water treatment at the Oro Loma Sanitary district in San Lorenzo, CA
- Originally built for nitrogen removal and flood management
- Suspected to remove Trace Organic Contaminants (TrOCs)
 - Pharmaceuticals and Personal Care Products
- Preliminary studies have shown >80% removal of TrOCs
- Exact fate of TrOCs is still unknown



Figure 1: Shown above is a close-up of the Living Levee. The Outlined cells were the cells that were studied.

Scope:

- Cells E, F, and G were chosen for their better performance
- Focused on four TrOCs: Carbamazepine, Atenolol, Metoprolol, Propranolol
 - Carbamazepine was chosen because it had higher than expected removal rates
 - Atenolol, Metoprolol, and Propranolol are beta-blockers
 - Chosen for their similar structure

Results:

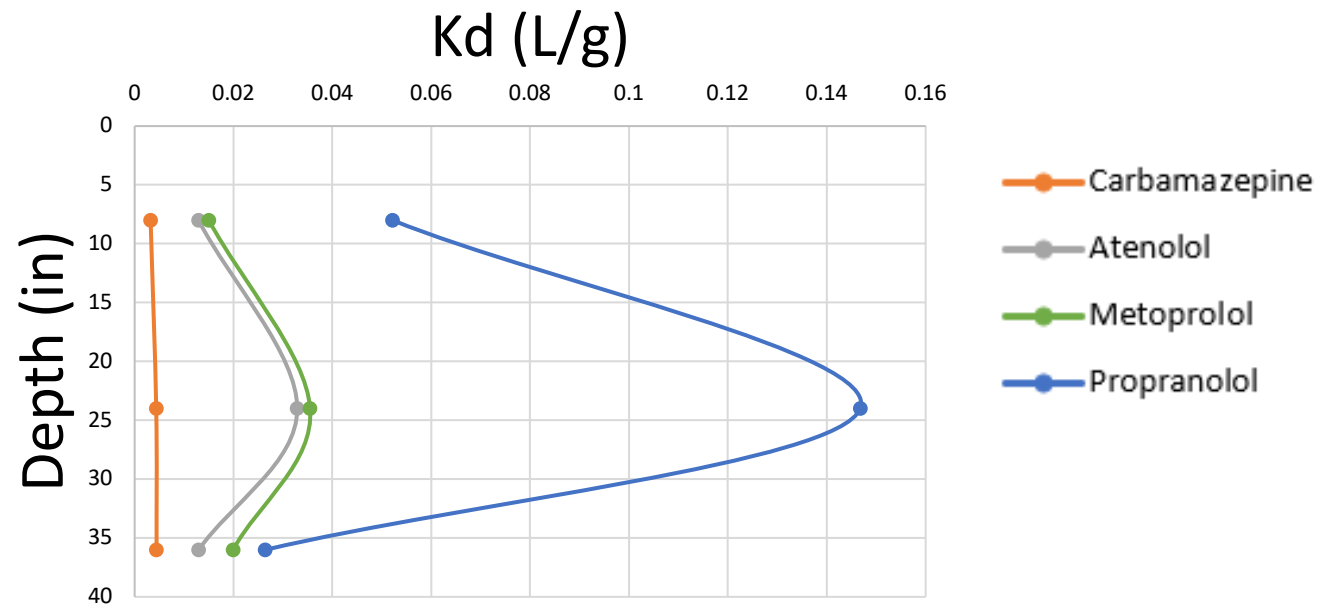


Figure 2: Change in adsorption capacity with depth

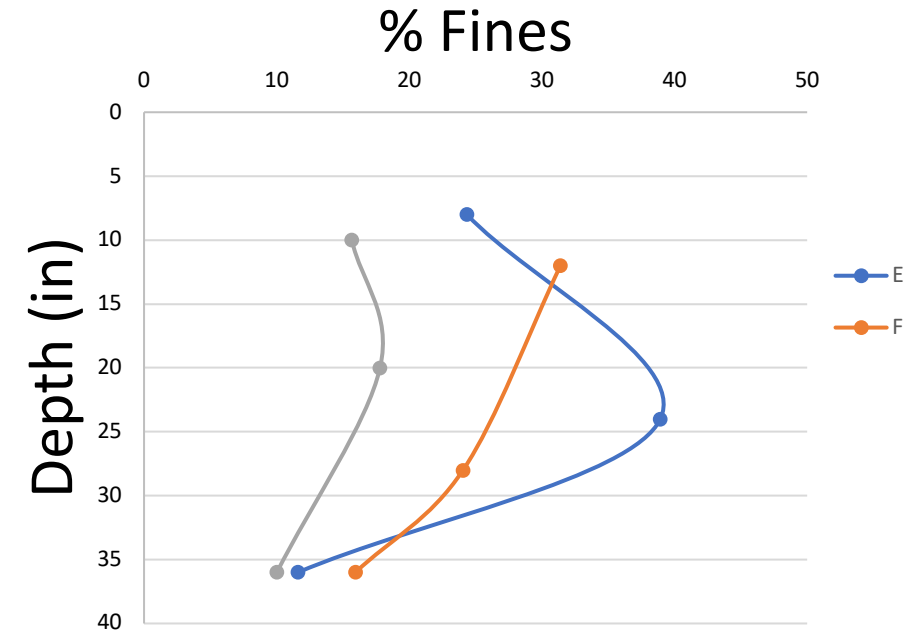


Figure 3: Hydraulic Retention Time

Discussion:

- Sorption of Carbamazepine has little or no change throughout the layers (*Figure 2*)
 - Predominant Mechanism: hydrophobicity
- Sorption of the beta-blockers increased (*Figure 3*) significantly in layers with high clay content
 - Predominant Mechanism: electrostatic interactions

Conclusion:

- Clay content may enhance adsorption
- However, clay content is not the only factor at work
 - Transport of organic matter
 - Minerology

Future Work:

- Conducting more tests on a specific cell
- Concentrate on soil chemistry
 - Organic Carbon-loss on ignition
 - Cation Exchange Capacity