



# Pharmaceuticals in Wastewater

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# Pharmaceuticals

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- ▶ When we use an antibiotic, typically between 30-90% of the active compound will get excreted and flushed down the toilet.
- ▶ Sewage plants are chock full of a city's medicines.
- ▶ Blanketing the environment results in conditions that encourage bacteria to evolve ways to protect themselves.
- ▶ Increase antibiotic resistance bacteria (ARB)
- ▶ Three pharmaceuticals: sulfamethoxazole (SMZ), azithromycin, and salicylic acid
- ▶ To better understand environmental effects, pollution sources, and current treatment efficiency

# Methods

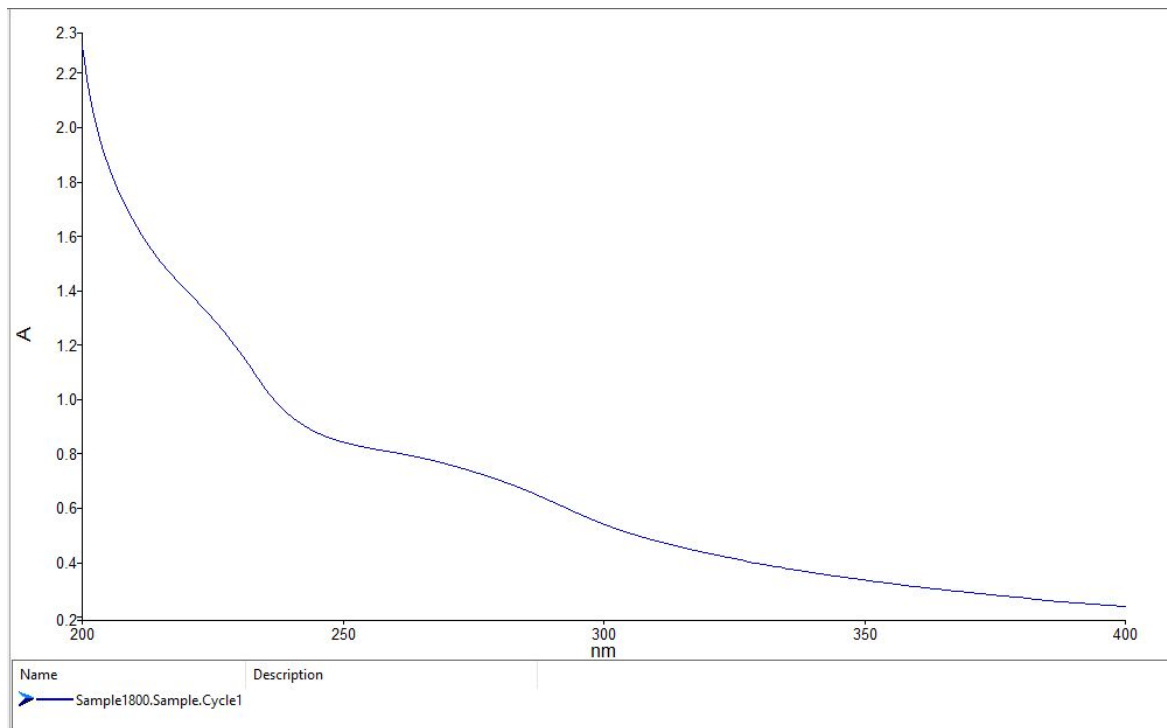
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- ▶ To detect and analyze the presence of antibiotics:
  - ▶ UV-Vis
  - ▶ LC-MS using solid-phase extraction (SPE)
  - ▶ General water quality tests



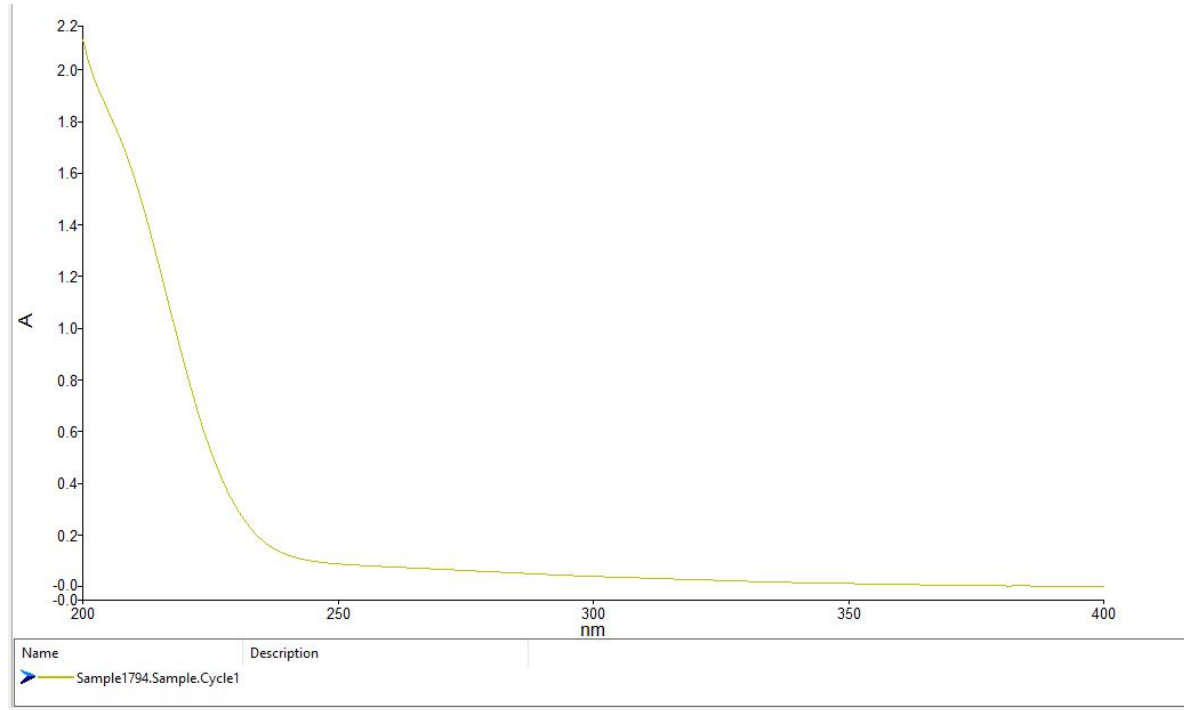
# UV-Vis & Water Quality

## Influent Spectra



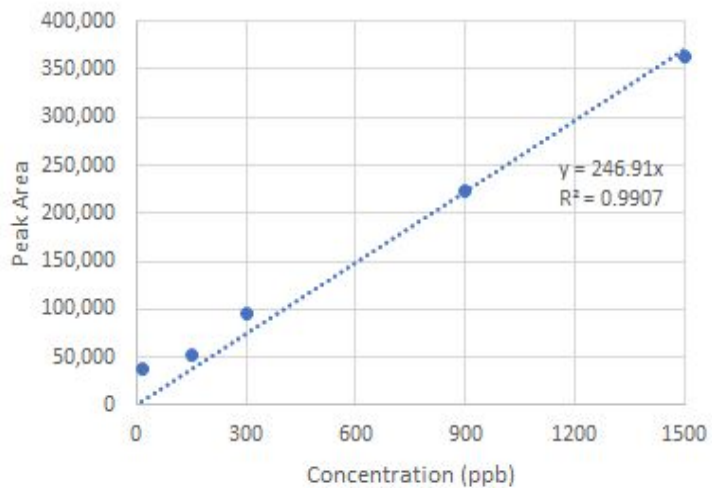
# UV-Vis & Water Quality

## Final Effluent Spectra

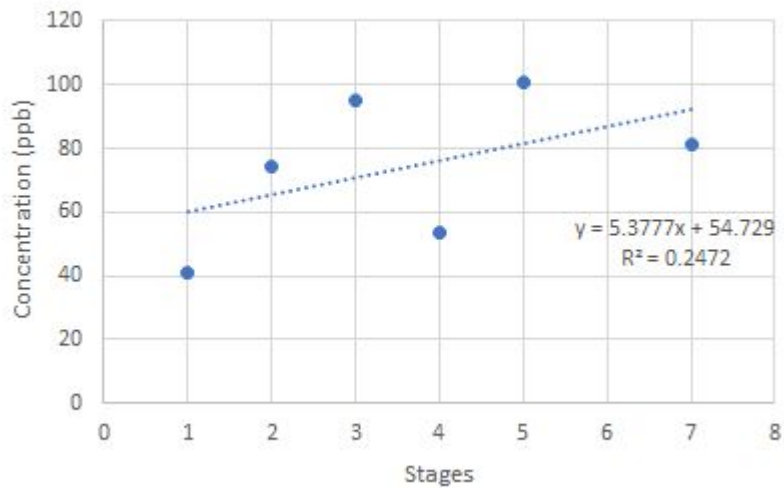


# LC-MS SMZ

## SMZ Calibration Curve

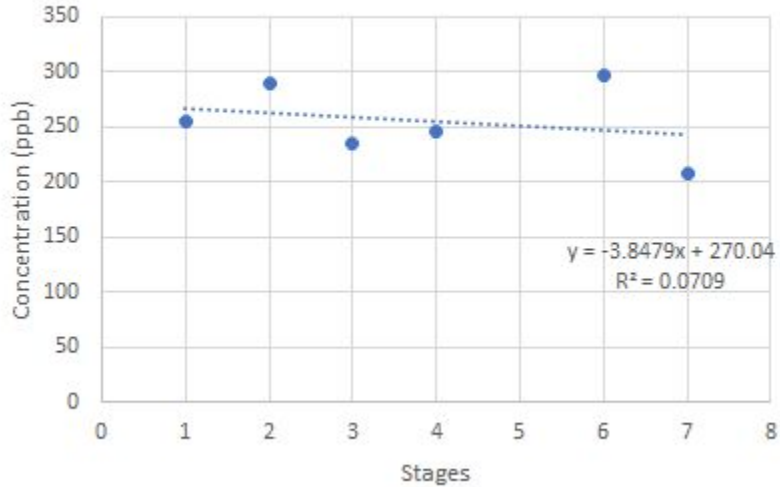


## Estimated SMZ at Each Stage

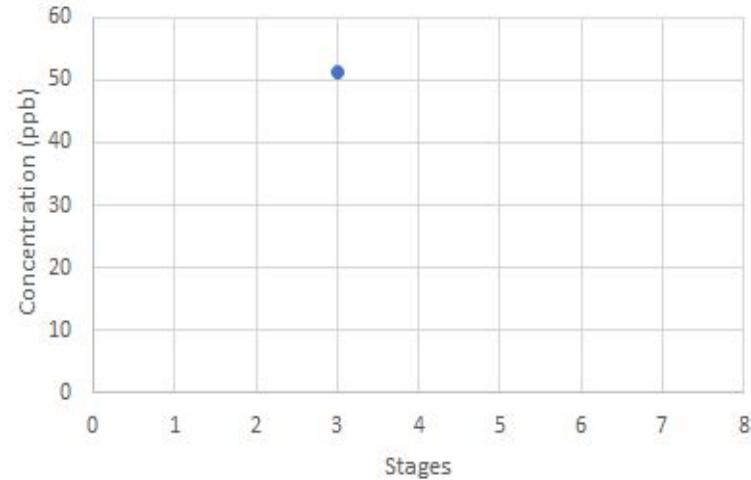


# LC-MS Azithromycin and Salicylic Acid

Estimated Azithromycin at Each Stage

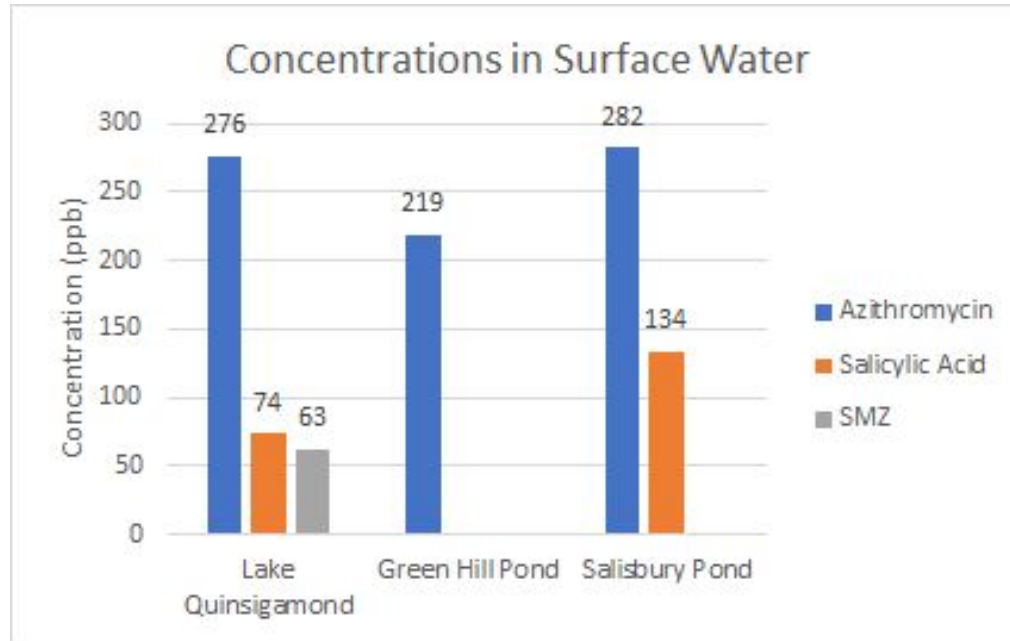


Estimated Salicylic Acid at Each Stage



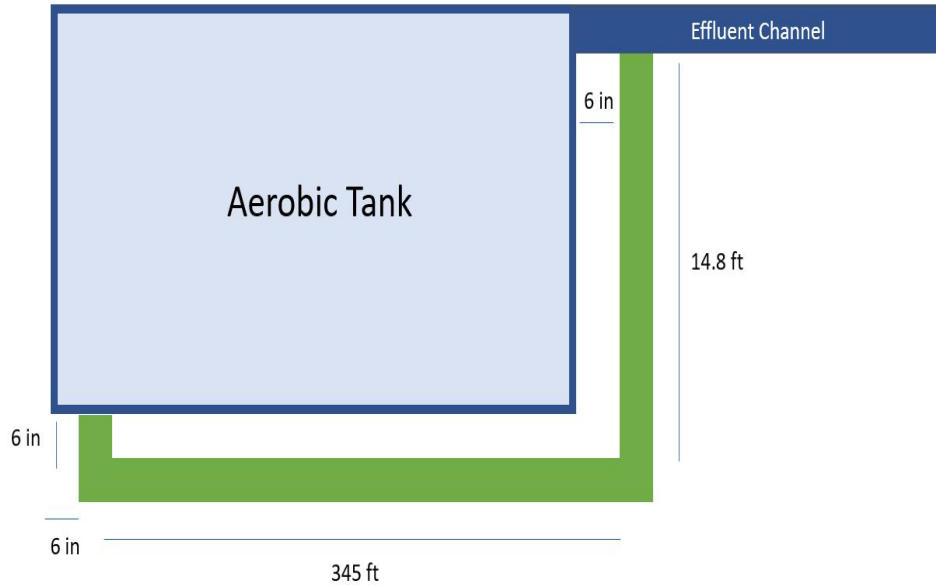
# LC-MS Surface Water

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# Design of a Recycling Stream



\* not drawn to scale

Pipe  $d=24$  in

Pipe corner  $r = 24$  in

----> leave 6 inches  
between pipe and tank

359.8 ft pipe total

# Conclusions

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- ▶ Pharmaceuticals are a rising concern due to a lack of proper disposal and treatment, and a near-constant presence in the environment
- ▶ Possible treatment method with a recycling stream through an aerobic tank

Thank You for Watching!