

OPTIMIZATION OF WASTEWATER NUTRIENT REMOVAL PROCESS

- Production of fertilizer from municipal and landfill wastewater -

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Sponsored By: City of Corvallis Wastewater Reclamation Plant



Project Objective:

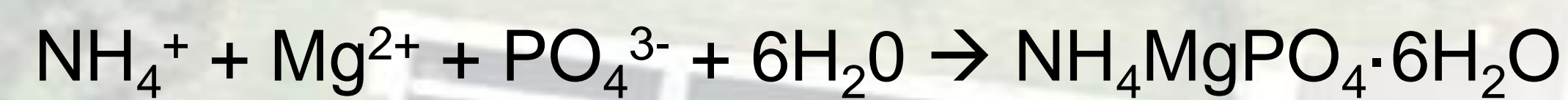
The primary objective of this project was to assist the City of Corvallis in optimizing the removal of magnesium from wastewater collected from Coffin Butte Landfill.

- The City of Corvallis is looking to increase the amount of landfill leachate accepted by their Wastewater Reclamation Plant
- The landfill leachate is high in magnesium ions, which cause scaling when mixed with municipal wastewater
- To avoid scaling, as much Mg^{2+} , PO_4^{3-} , and NH_4^+ needs to be removed in the form of struvite, as possible.
- Currently a pilot struvite reactor manufactured by Multiform Harvest, Inc is being installed and operated at the WWRP



What Is Struvite?

Ammonium magnesium phosphate hexahydrate



- Commonly forms in waste streams with experiencing super-saturated amounts of magnesium, phosphates, and ammonia
- Struvite can cause scaling inside of pipes to the point that a plant may have to shut down



Economic Breakdown:

Sources of Income:

- Leachate processing (\approx \$0.03 0.05/gallon)
- Created struvite (\approx at \$1,500/ton)

Expenses:

- Capital investment in project
- Chemical additives (ie. pH modifiers)
- Maintenance & operation

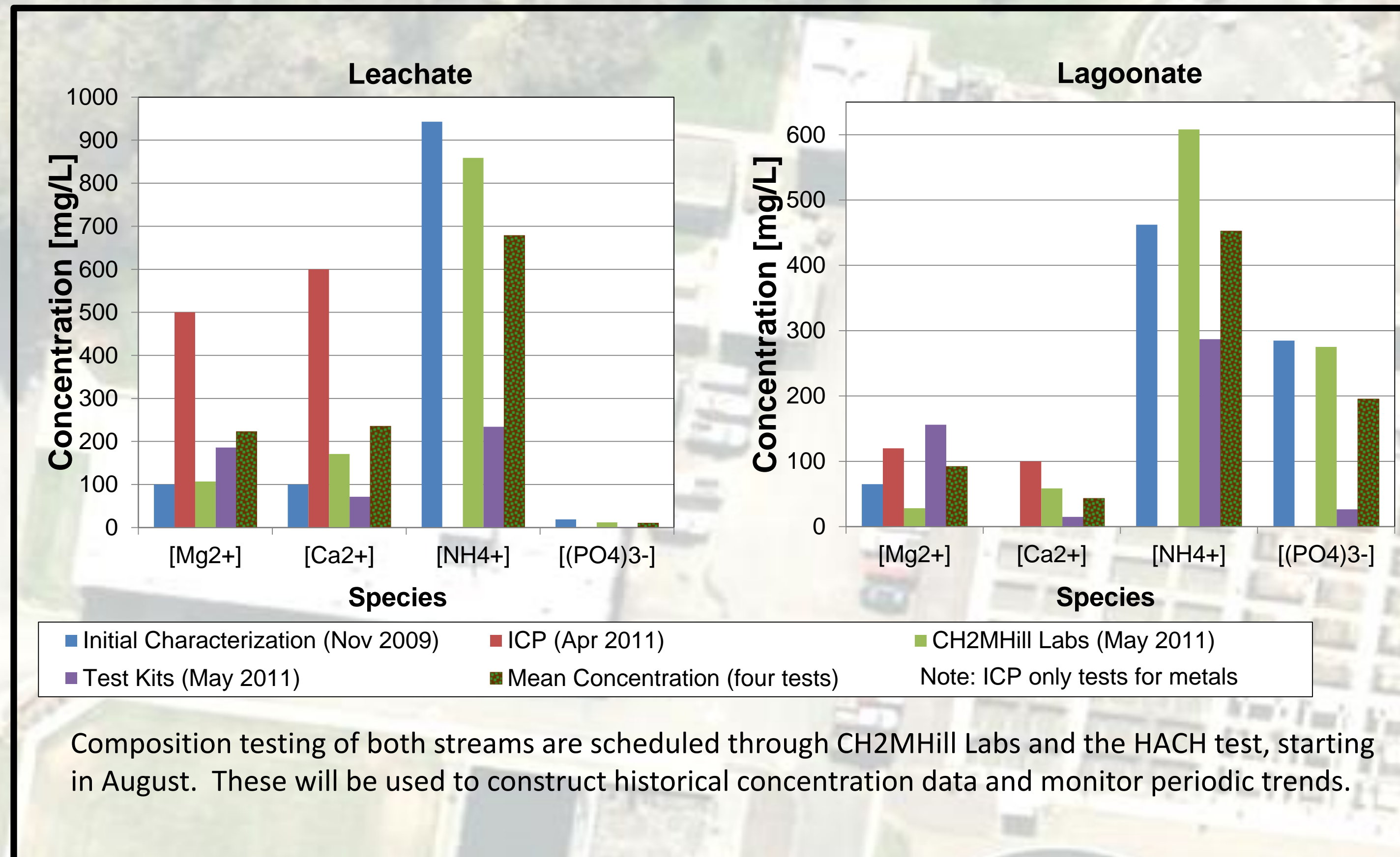
Acknowledgements:

We would like to thank the following people for their help and inspiration:

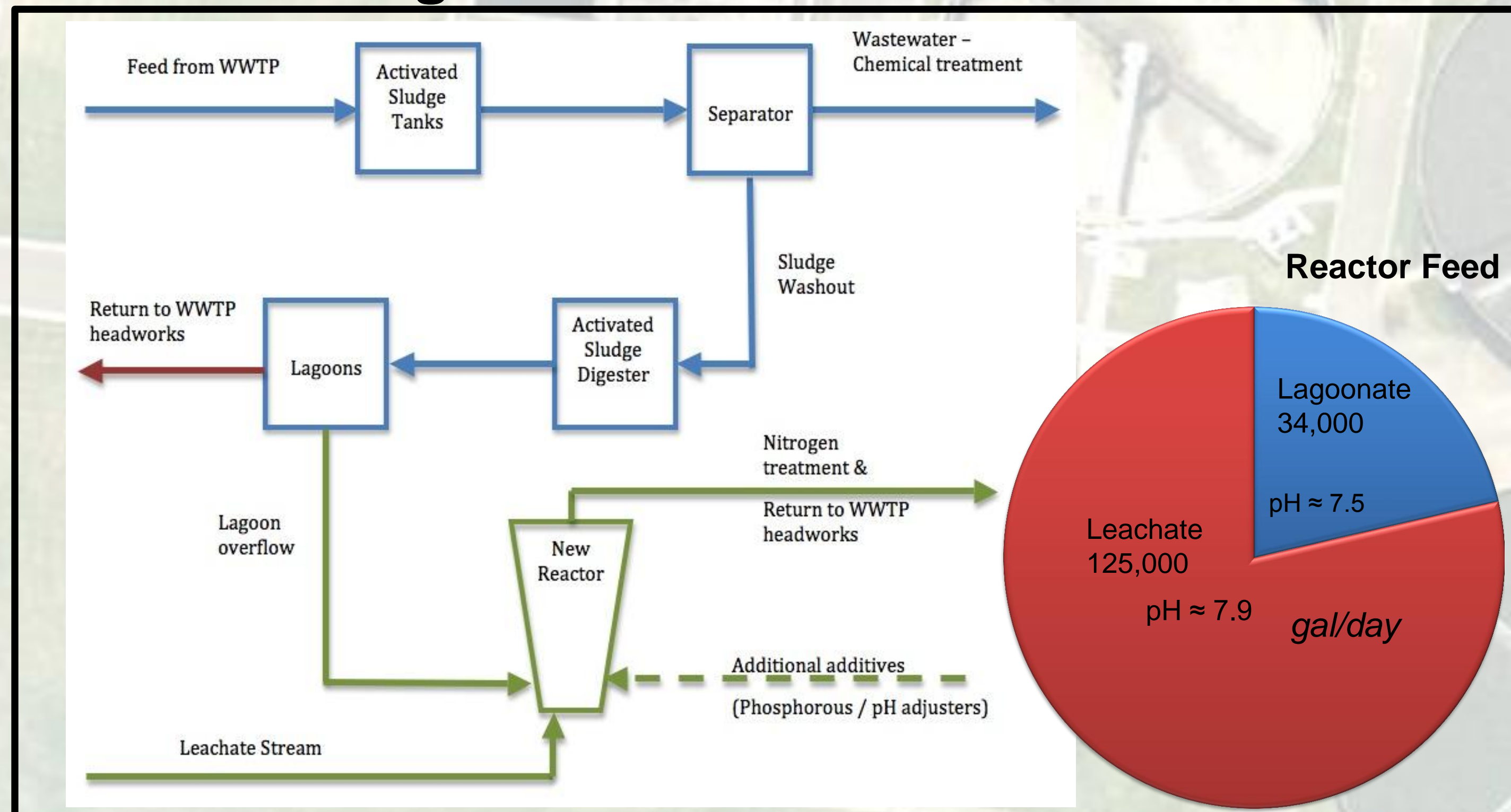
- Dan Hanthorn (City of Corvallis)
- Dr. Philip Harding (OSU)
- Dr. Keith Turner (City of Corvallis)
- Dr. Alex Yokochi (OSU)
- Shane Sinclair (City of Corvallis)
- Brian May (Valley Landfills, Inc.)
- Keith Bowers (Multiform Harvest, Inc.)
- Chris Kaufman (Valley Landfills, Inc.)

1. <http://www.mgacontrols.com/news/valves/valmatic-glass-lined-plug-valves-to-prevent-struvite-in-wastewater-application/>
2. http://www.vt.edu/spotlight/impact/2008-09-29_bay/M_621731.jpg
3. <http://www.multiformharvest.com/>

Stream Characterization:



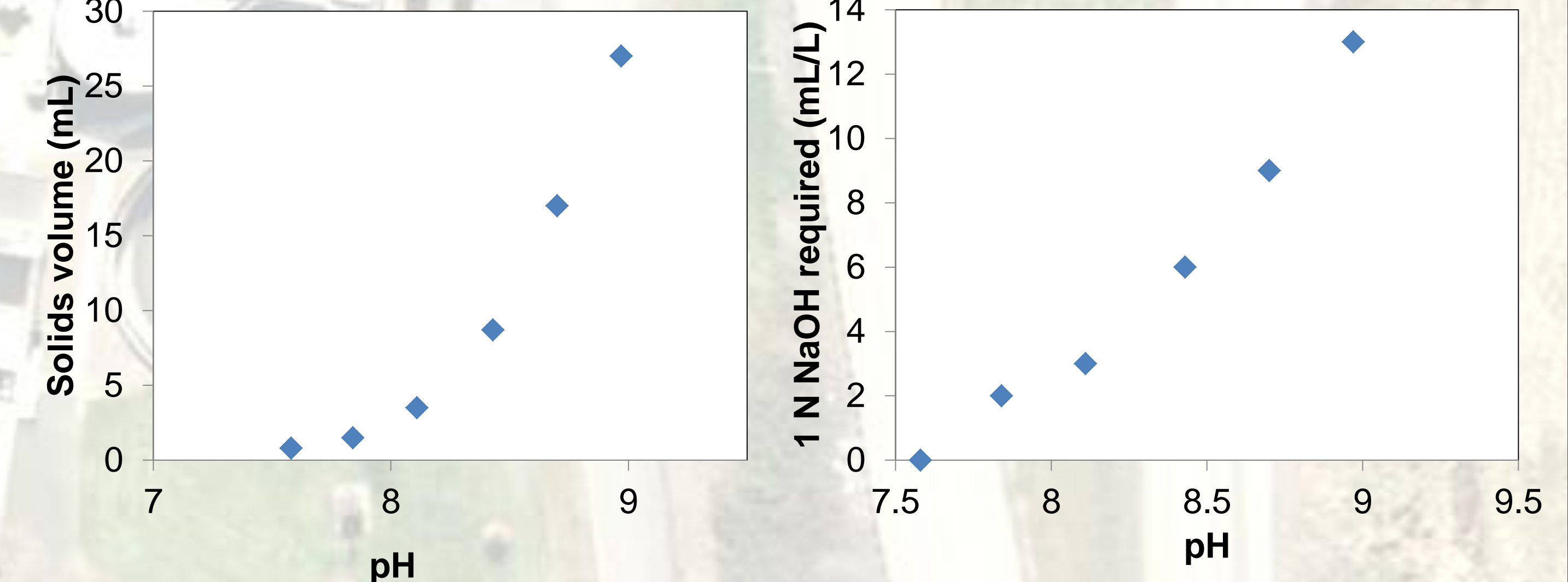
Process Design:



“Wastewater treatment is becoming a resource recovery process where clean water is the by-product.”
- Dan Hanthorn
Wastewater Operations Supervisor
City of Corvallis

Findings To Date:

- Jar testing of lagoonate and leachate was performed at a ratio similar to the full-scale reactor
- Test solutions were prepared across a pH range of 7-9
- Precipitate was settled in Imhoff cones to achieve maximum settling
- The remaining liquid was analyzed to calculate the percent removal of magnesium
- The precipitate was then dissolved to test the relative concentrations of Mg^{2+} and Ca^{2+} in order to determine the quantities of struvite and calcium phosphate formed



- Jar testing apparatus**
- A jar testing apparatus ensures simultaneous and identical mixing of multiple solutions



- Settling of solids in Imhoff cones**
- Imhoff cones allow the separation of fluid and settling

