

Passively-Enhanced Lime Mixing and Dissolution

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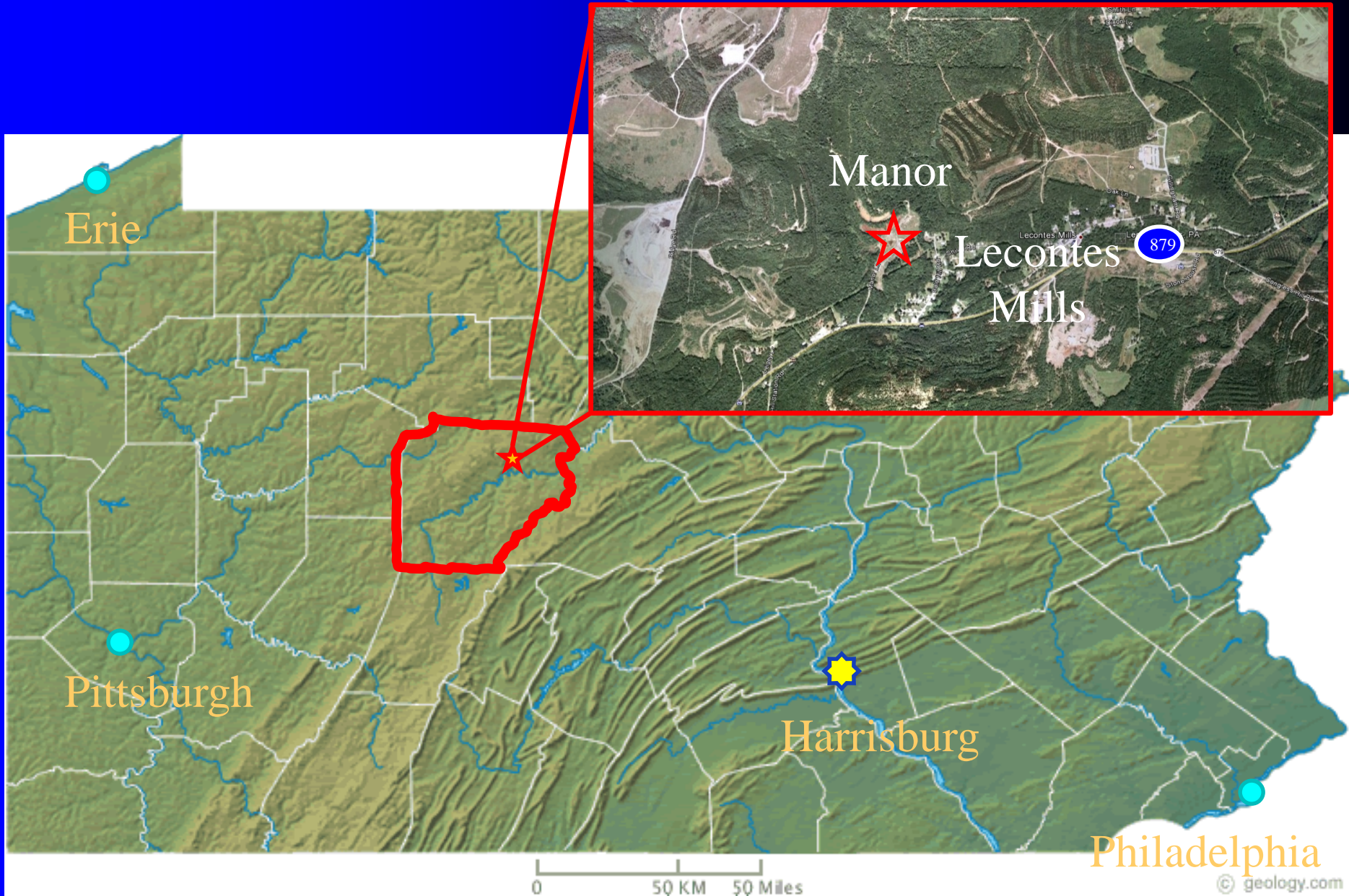
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Semi-Active Lime Dissolution

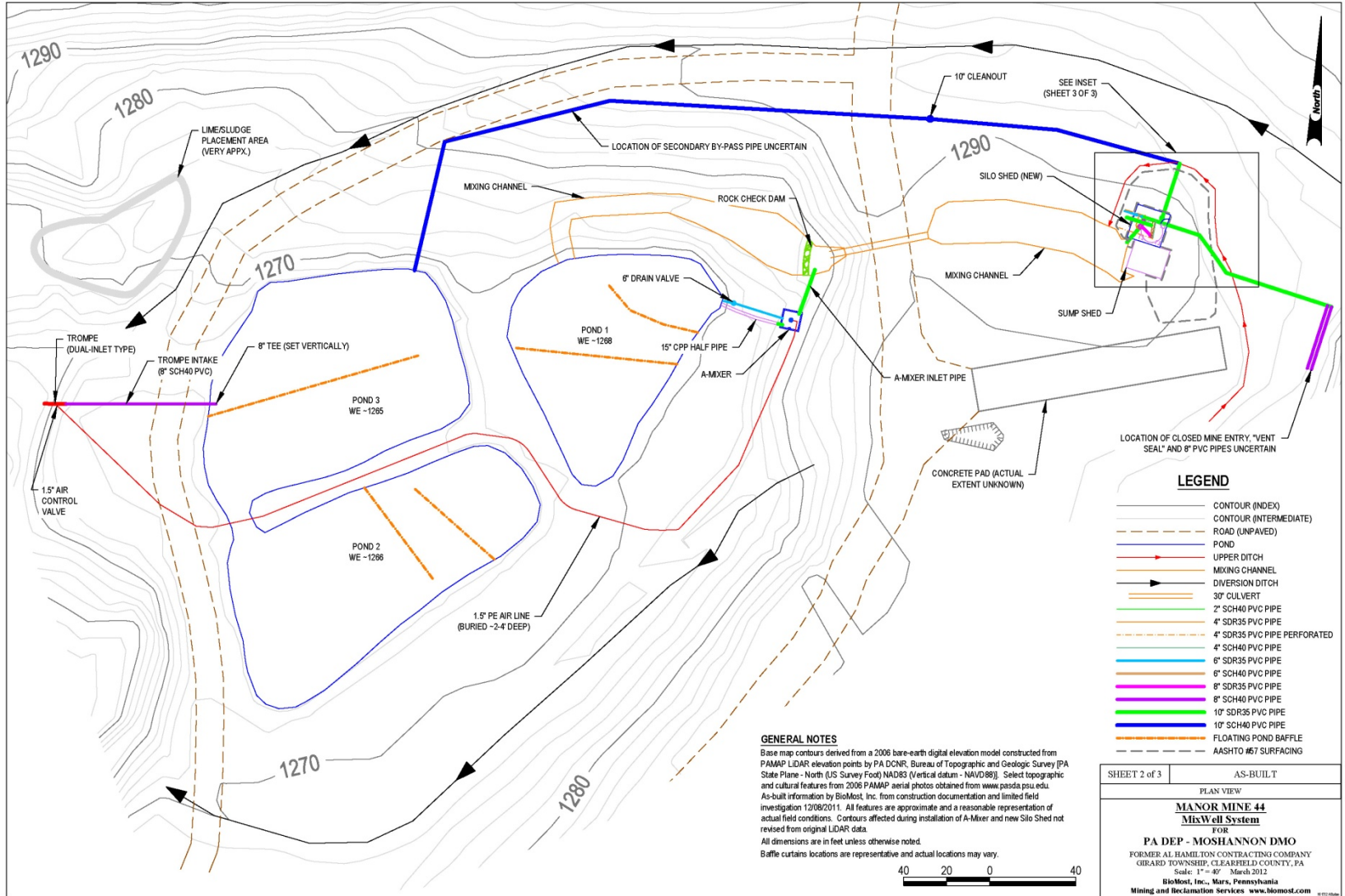
- Water powered Lime Dosers.
- Long Dissolution Channel.
- Lime Buildup in Channel or Ponds.
- Carbon Dioxide Reacts to Form Calcite.



Manor Site – Clearfield County, PA



Site overview



Raw Water Chemistry

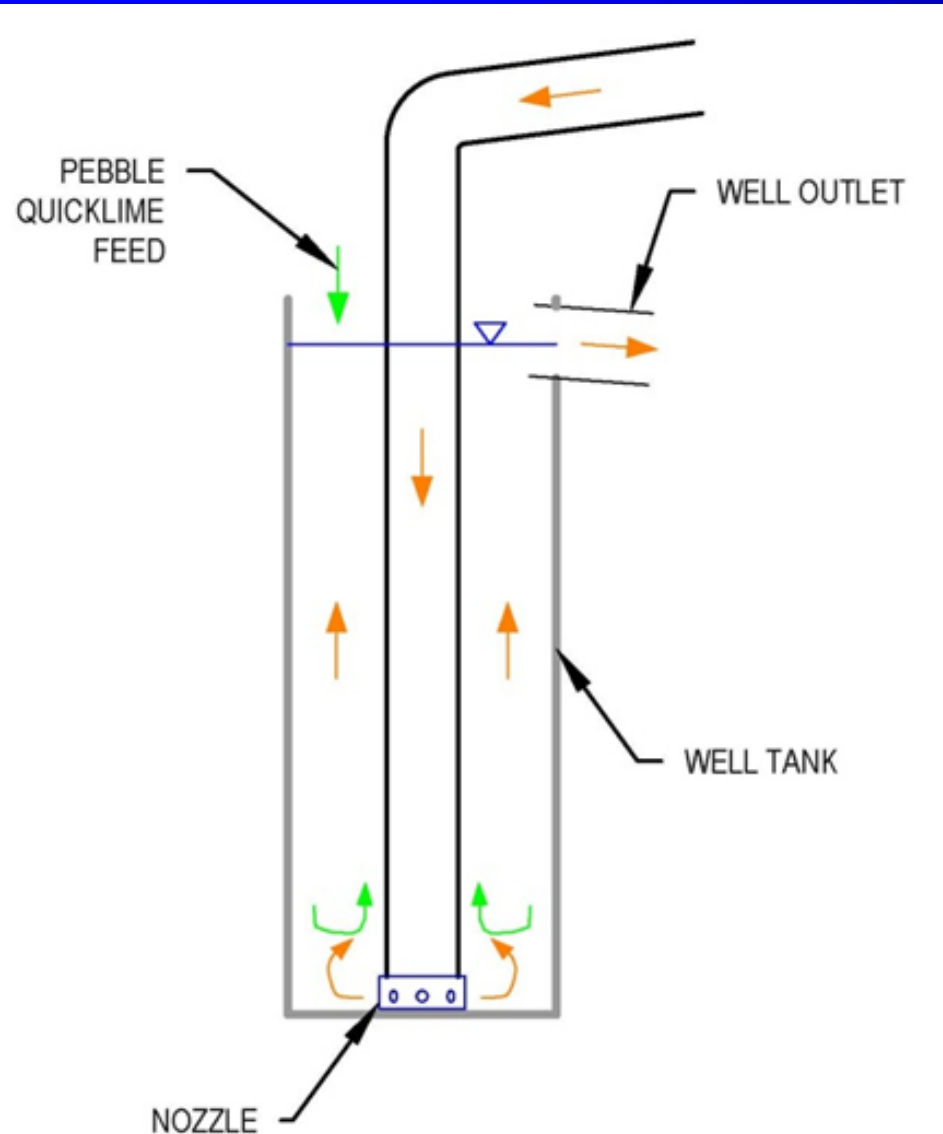
Parameter	Date							Units
Date	1-6-12	1-16-12	1-23-12	1-31-12	2-7-12	2-21-12	Avg.	
pH Field	3.48	3.43	3.53	3.38	3.45	3.69	3.48	S. U.
Acidity	466	468	458	445	422	417	446	mg/L
Iron	233	201	231	183	210	203	203	mg/L
Aluminum	19.3	22.3	15.6	12.9	11.4	16.8	16.8	mg/L
Manganese	3.62	2.99	3.13	3.23	3.43	3.40	3.4	mg/L
Calcium	166	140	160	138	145	141	141	mg/L
Magnesium	43.3	49.7	51.7	54.1	44.9	45.7	45.7	mg/L

Add Pebble Quicklime



MixWell

patent pending



- Raw water is feed to the bottom of the MixWell.
- Lime or lime slurry is added to the annulus and sinks to the bottom.
- The lime is agitated by the raw water.
- Only small particles rise to the discharge.

MixWell

patent pending



MixWell

(Video)



Particles Retained in MixWell

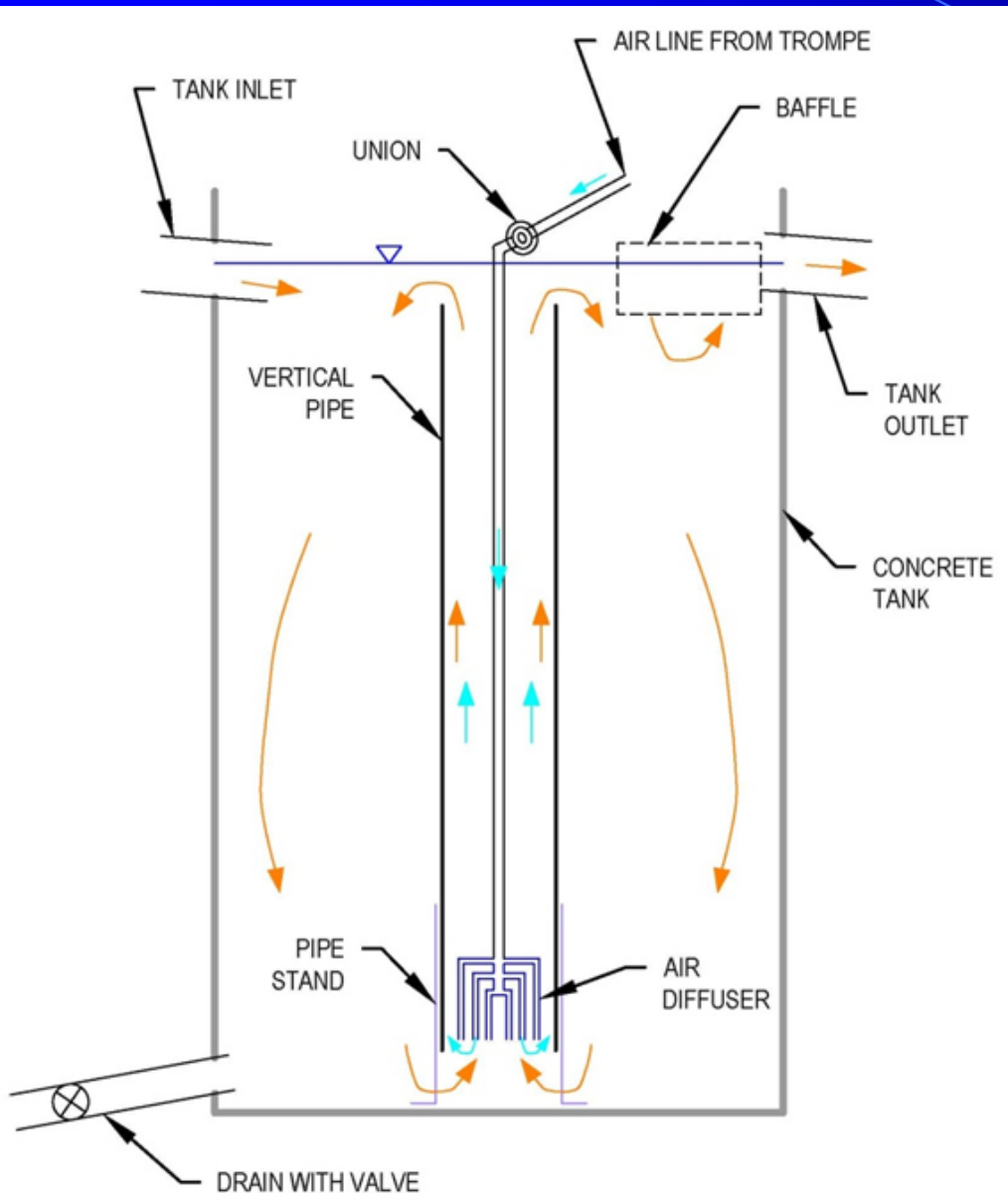


Lime Particles from MixWell



A-Mixer

patent pending



- Compressed Air supplied by Trompe.
- Airlift created in 12 inch pipe.
- Circulation in tank keeps small particles suspended.
- Airlift provides oxygen for iron oxidation.

A-Mixer

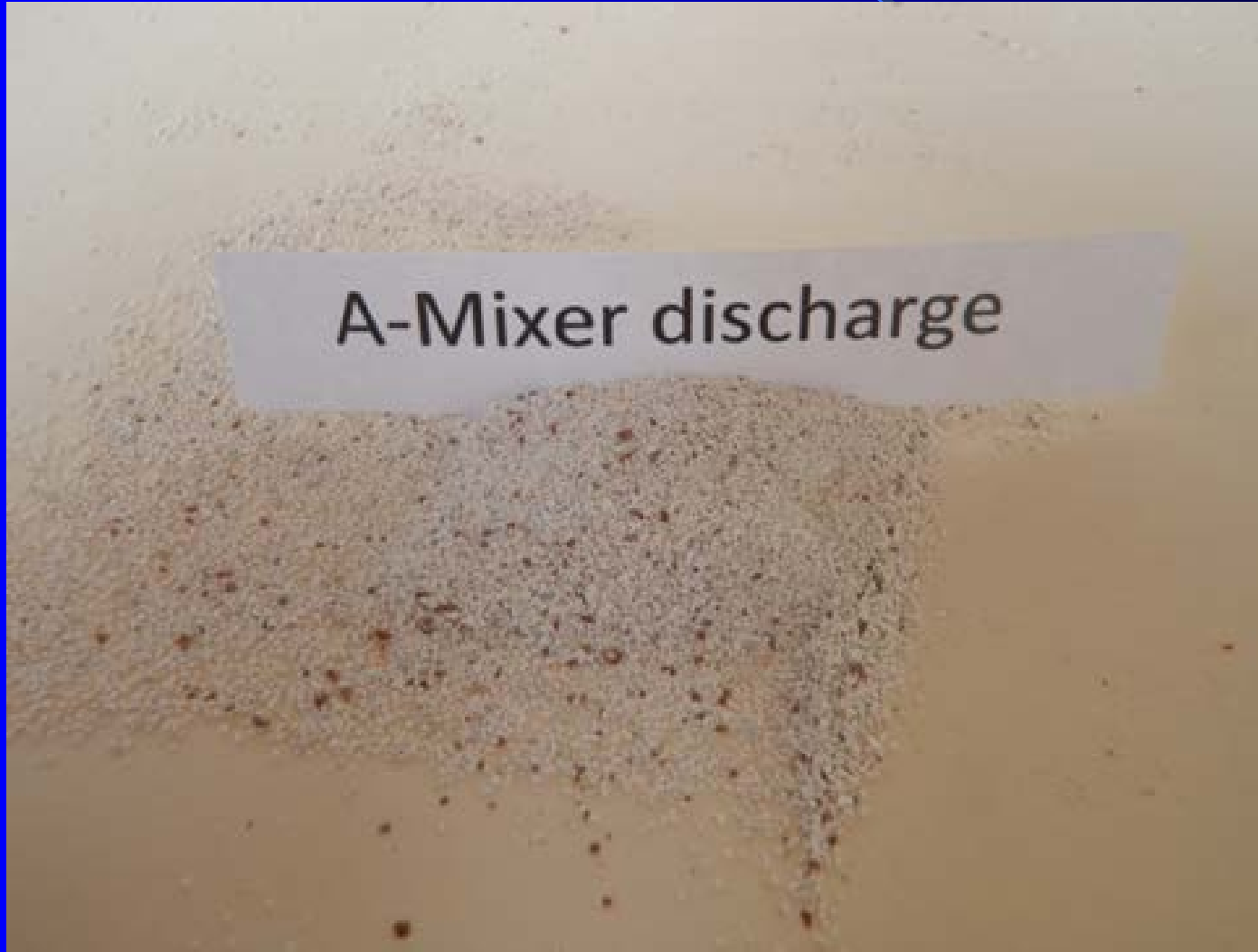


A-Mixer

(Video)



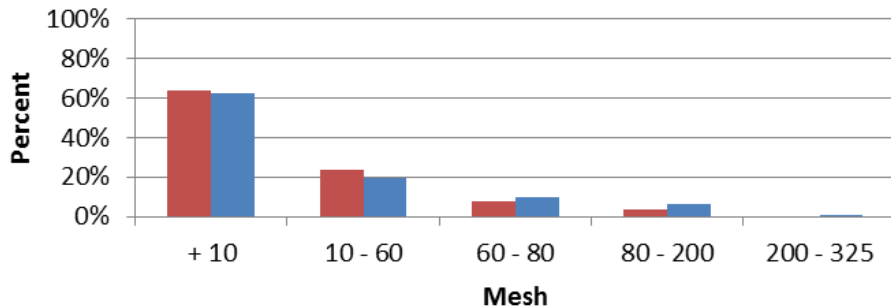
Lime Particles from A-Mixer



Pebble Quicklime

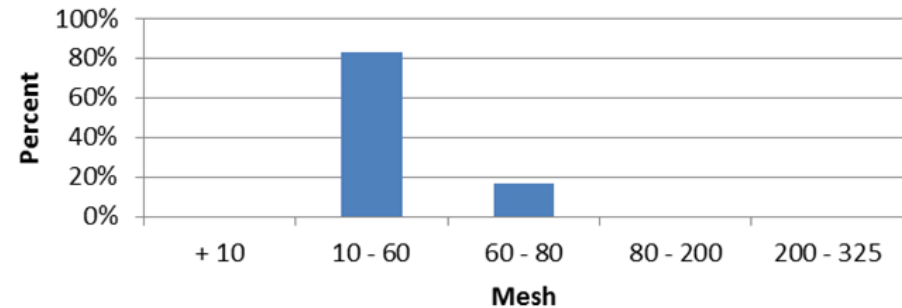
Raw Lime Particle Size Distribution

■ 1/16/2024 ■ 1/24/2012



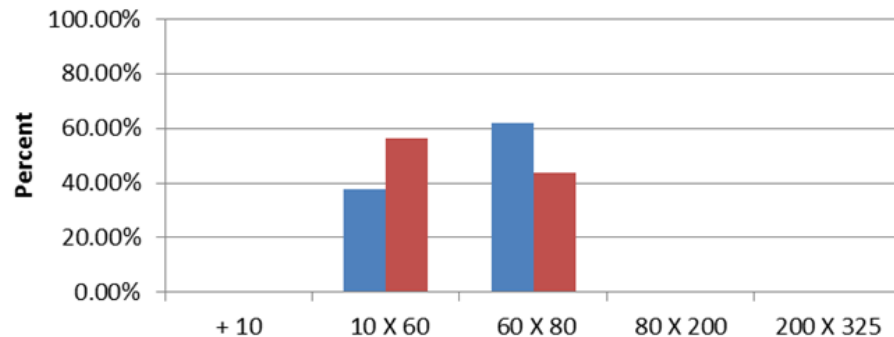
MixWell Lime Particle Size Distribution

■ 1/24/2012



A-Mixer Particle Size Distribution

■ 1/31/2012 ■ 2/21/2012



Chemical Reactions



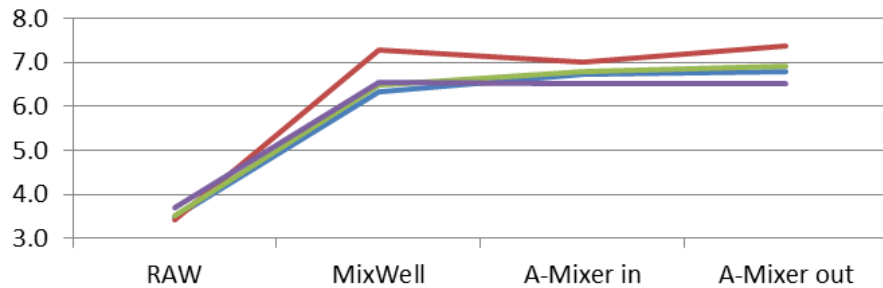
And / Or



Process Chemistry

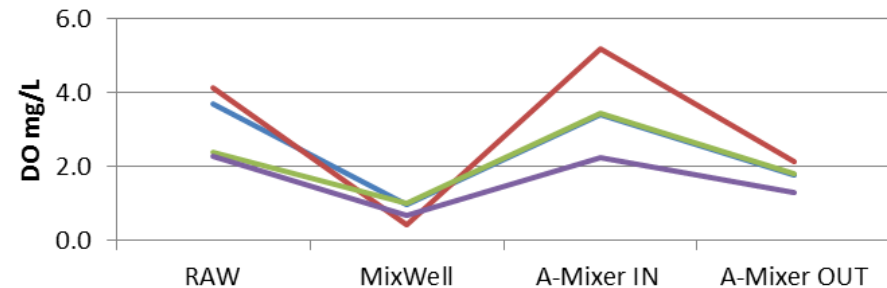
Manor pH Field

1/6/12 1/16/12 1/24/12 2/21/12



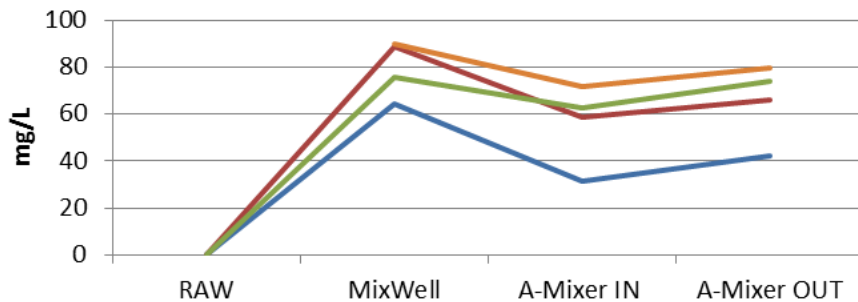
Manor DO Field

1-6-12 1/16/12 1/24/12 2/21/12



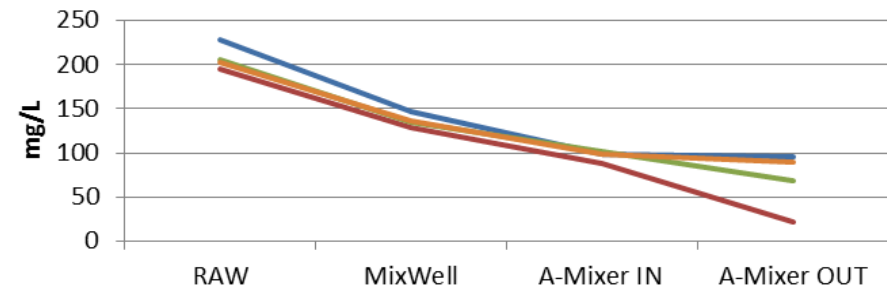
Alkalinity Field

1/6/12 1/16/12 1/24/12 2/21/12



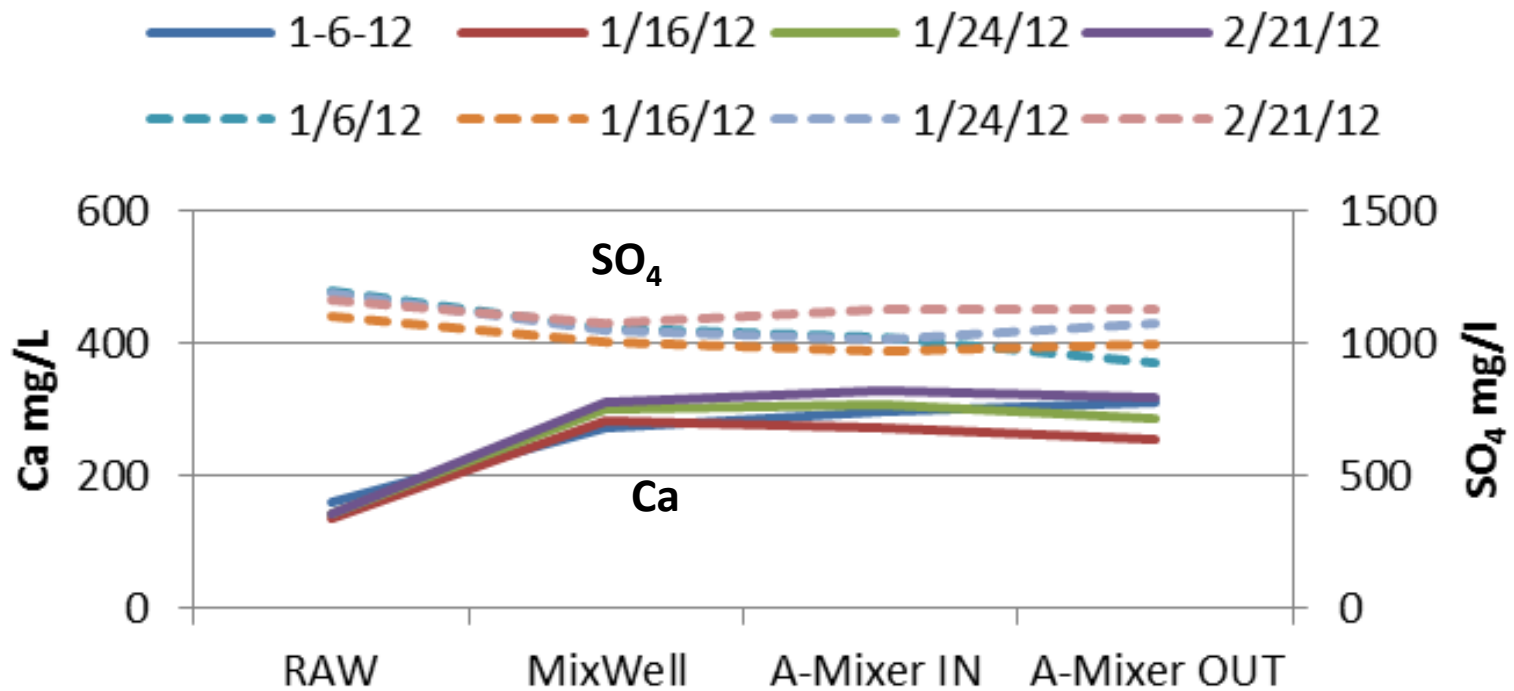
Iron Dissolved

1/6/12 1/16/12 1/24/12 2/21/12

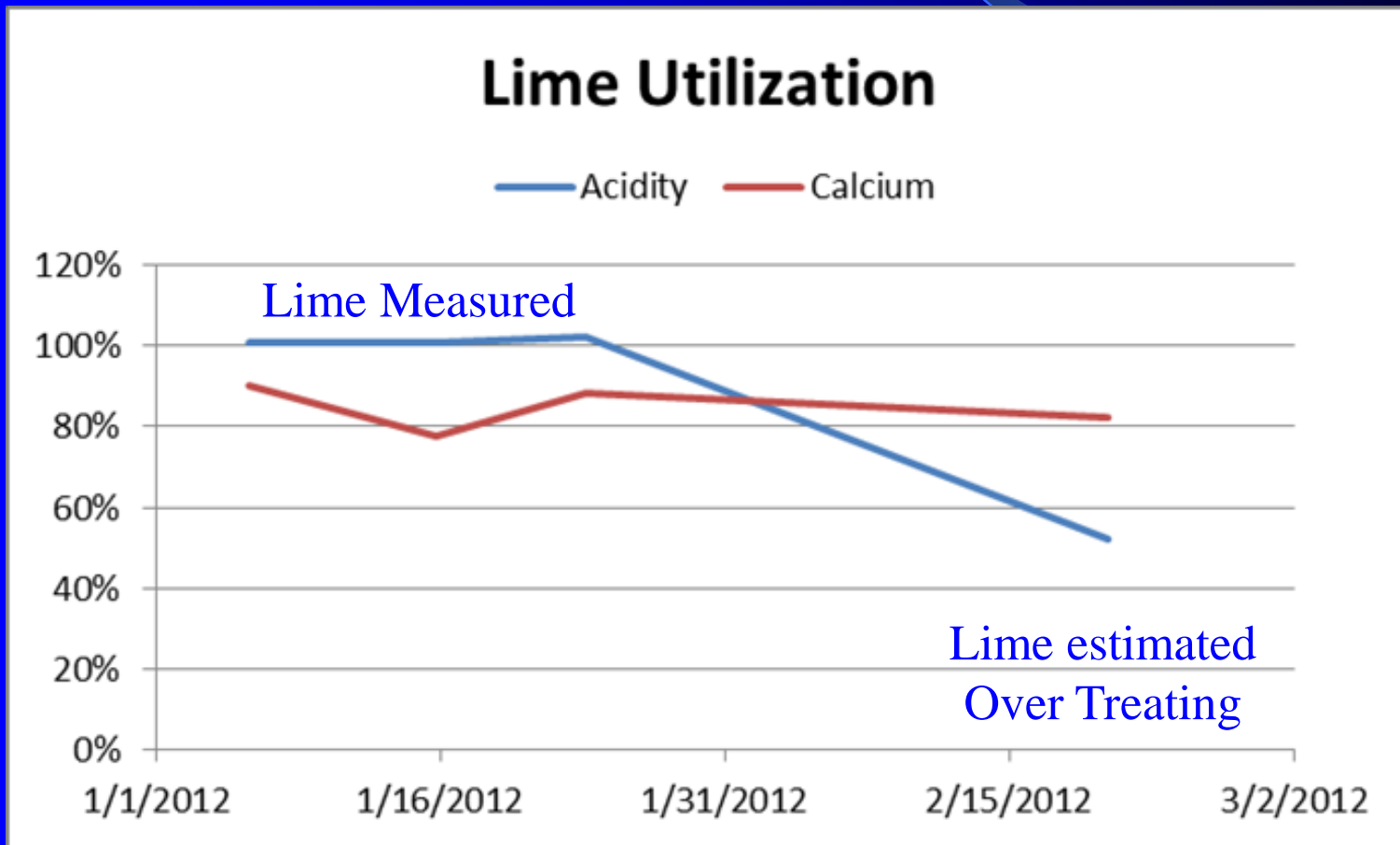


Gypsum Formation

Dissolved Calcium & Sulfate

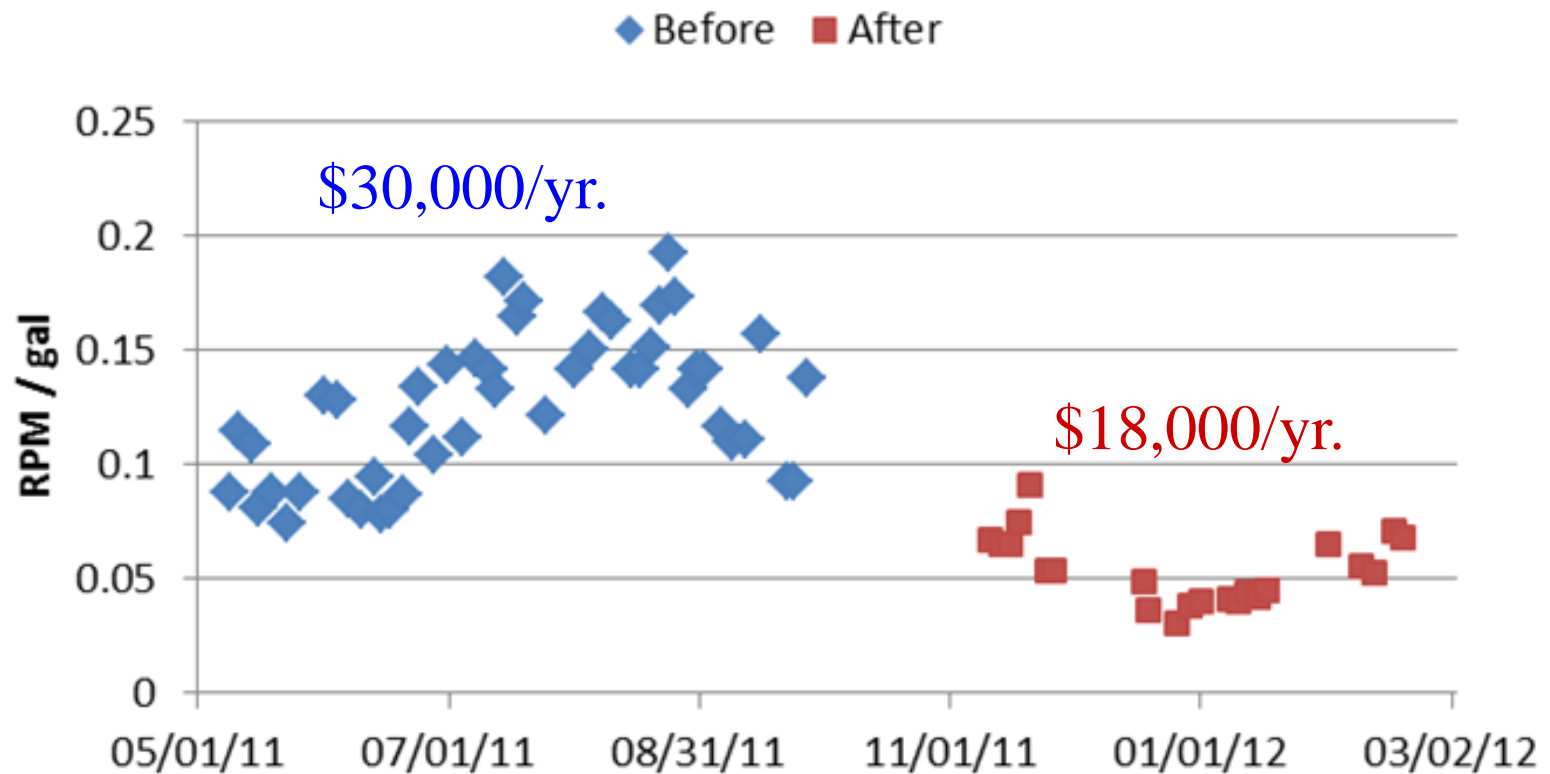


Calculated Lime Efficiency



40% Cost Reduction

Manor Lime Utilization



Conclusions

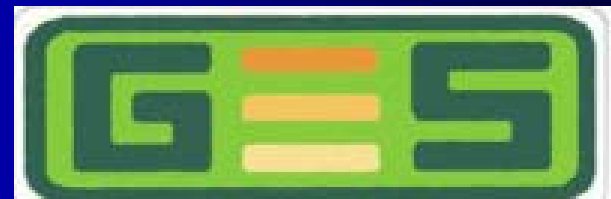
- Passive mixing technology can have a very significant improvement in lime utilization where pebble lime is the source of the alkalinity.
- The MixWell technology is very effective at dissolving pebble quicklime and reducing the particle size of its effluent.
- The A-Mixer*, if operated at pH 7 or above, can advance the oxidation of ferrous iron while maintaining pH.

(*A-Mixer can be applied at Hydrated Lime/other sites)

Acknowledgement

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Thanks guys!



Questions

