



Sloping Sand Bed for Mineral Sand Plant Effluent Clarification

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OUTLINE

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- The Site
- The Problem
- The Options
- Sub-Aerial Tailings Deposition Model
- Bench Testing
- Full Scale Design
- Other Applications (Revisited)



Other Applications

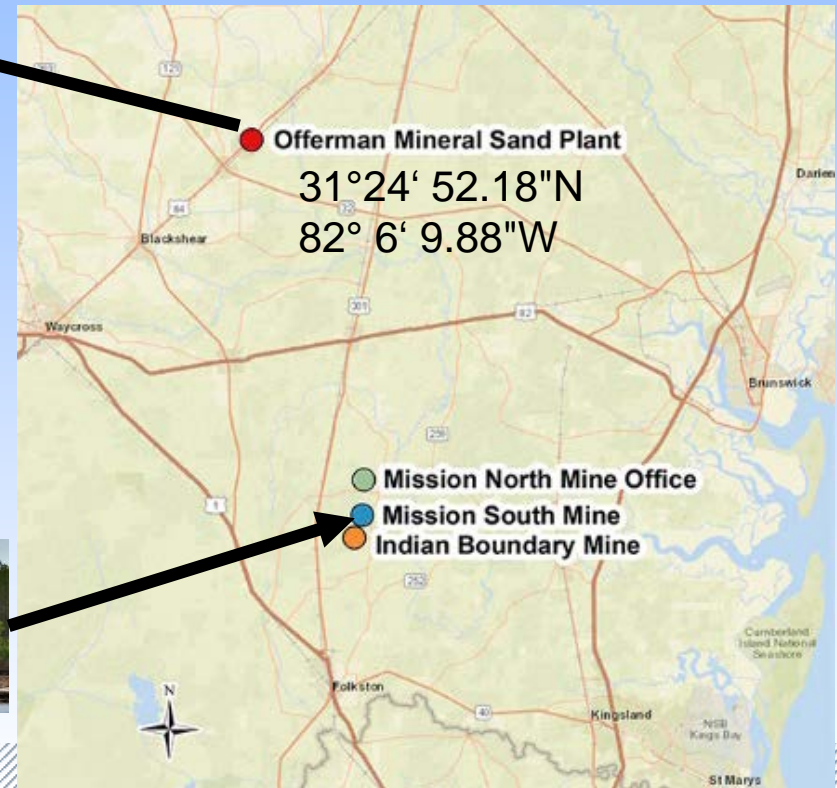
(If Space Is Available)

- Drying AMD sludge (in drier portions of underground mines)
- Drying AMD sludge on surface of fine coal refuse impoundments
- Fine coal refuse
- Replacing settling ponds
- Replacing clarifiers and filter presses
- Managing any sludge that is slow-settling with minimum flocculation



The Site

At its Mission Mine in Southeast Georgia, Southern Ionics Minerals (SIM) extracts high-quality Zircon sand that has unique properties of strength and endurance, enabling SIM's U.S. customers to produce high end products that are important to our country's security and economy. Titanium-bearing minerals are also recovered.



See: www.southernionicsminerals.com

The Problem

- ❑ The raw mineral ore sand contains a naturally-occurring, low-density organic **humate** fraction that is liberated in the milling process at the Offerman Plant.
- ❑ Due to its low-density characteristic, the humate is difficult to de-water even with chemical flocculation and plant process modifications to minimize its liberation.
- ❑ A low-cost but efficient de-watering process was needed to remove humate particles (400 ppm TSS) that resisted settling.



The Problem

**Full scale design
flow rate:**

190 to 950 m³ per day or
35 to 175 gpm

Suspended humates (post-coagulant & flocculent) quickly blind a traditional sand filter



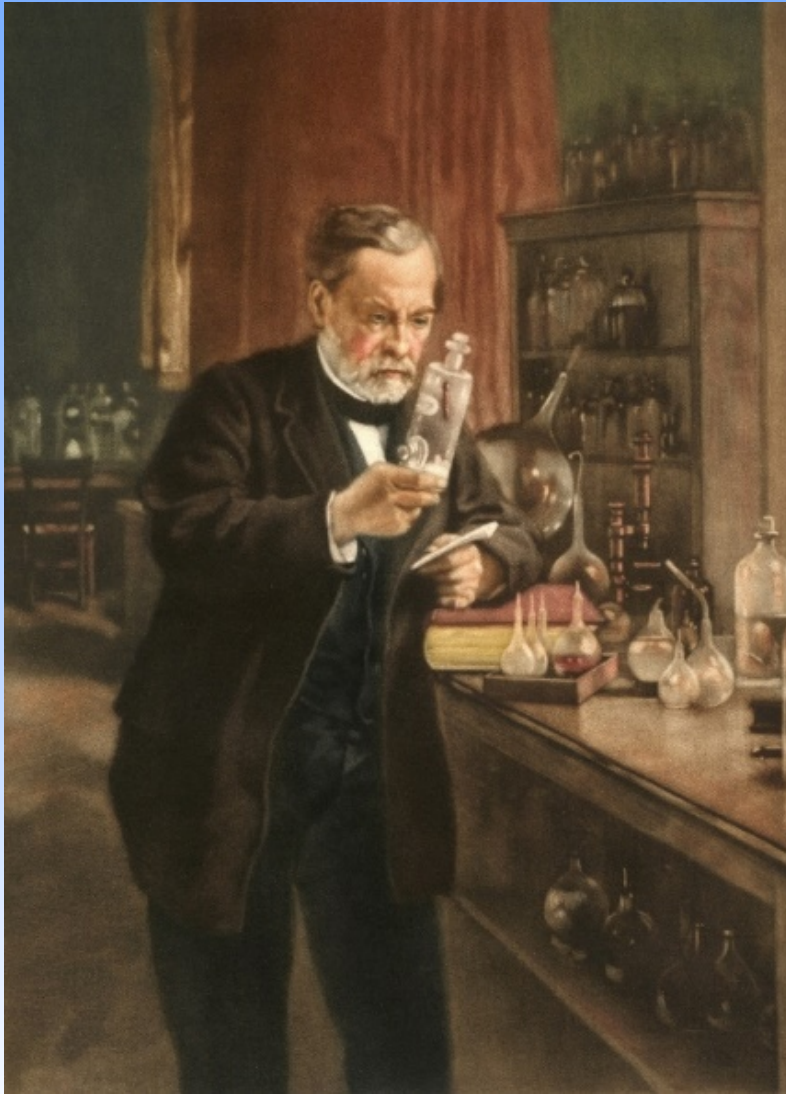
The Options

- Slow sand bed filtration,**
- Settling ponds,**
- Nanofiltration**
- Reverse osmosis, and**
- Commercial sand filters**

All were considered and rejected due to excessive costs and maintenance concerns associated with repeated back-flushing and/or membrane fouling.



And Now for Something Completely Different

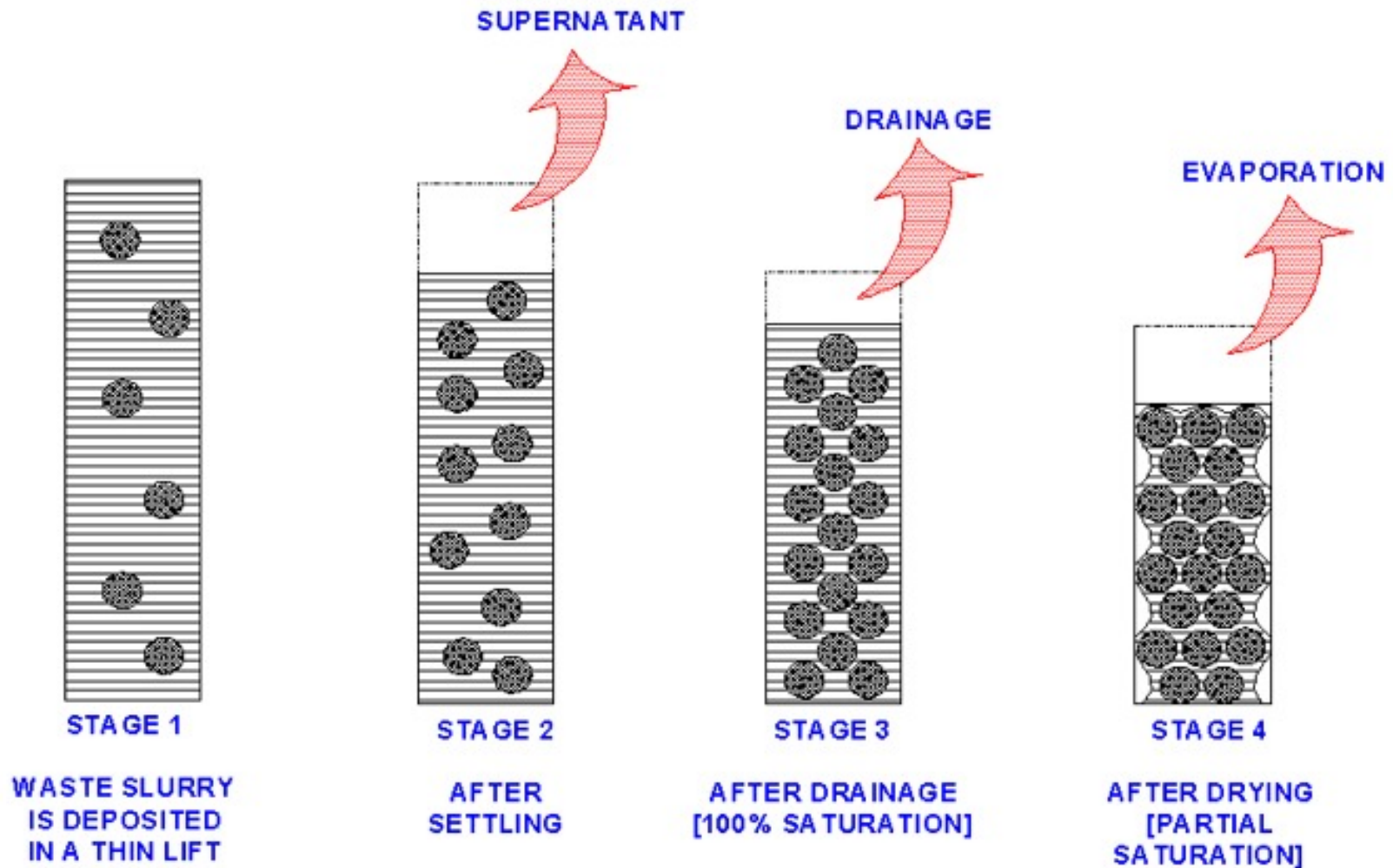


*Chance favors the
prepared mind...*

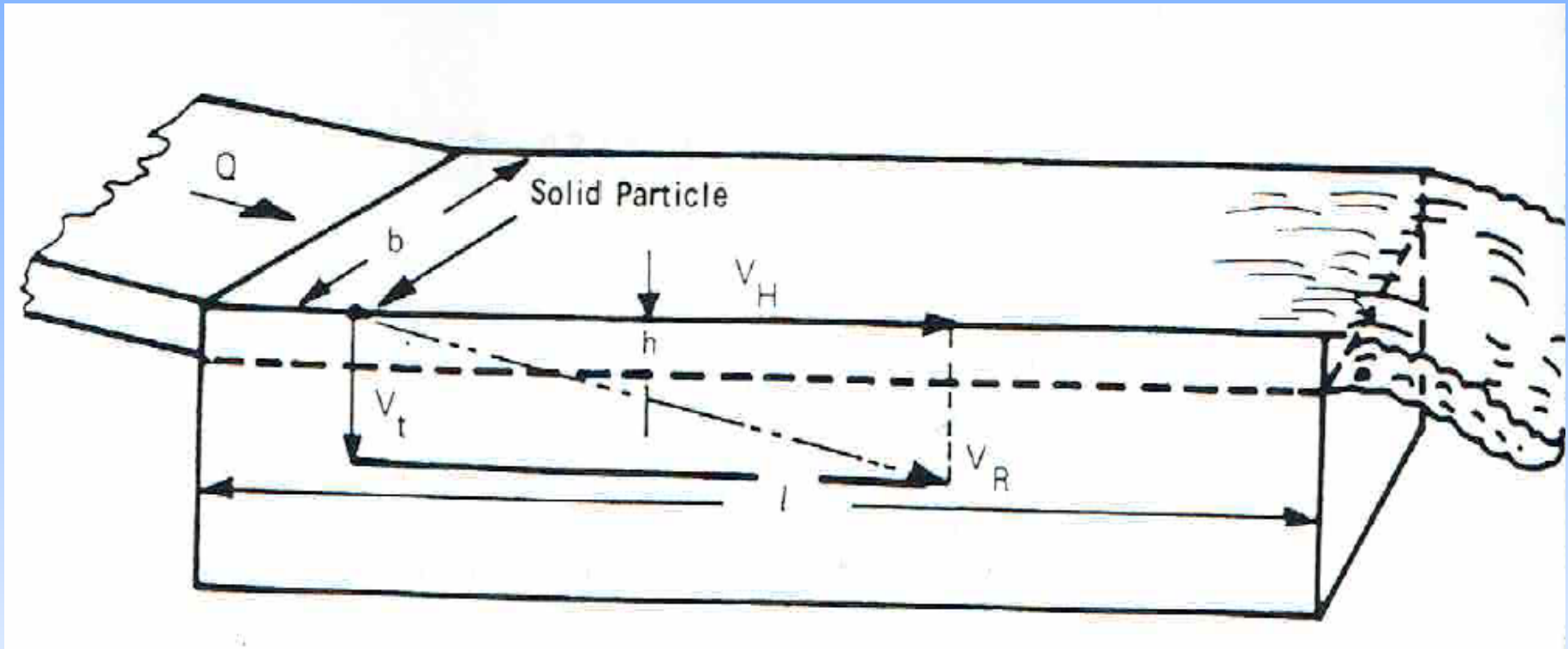
- L. Pasteur



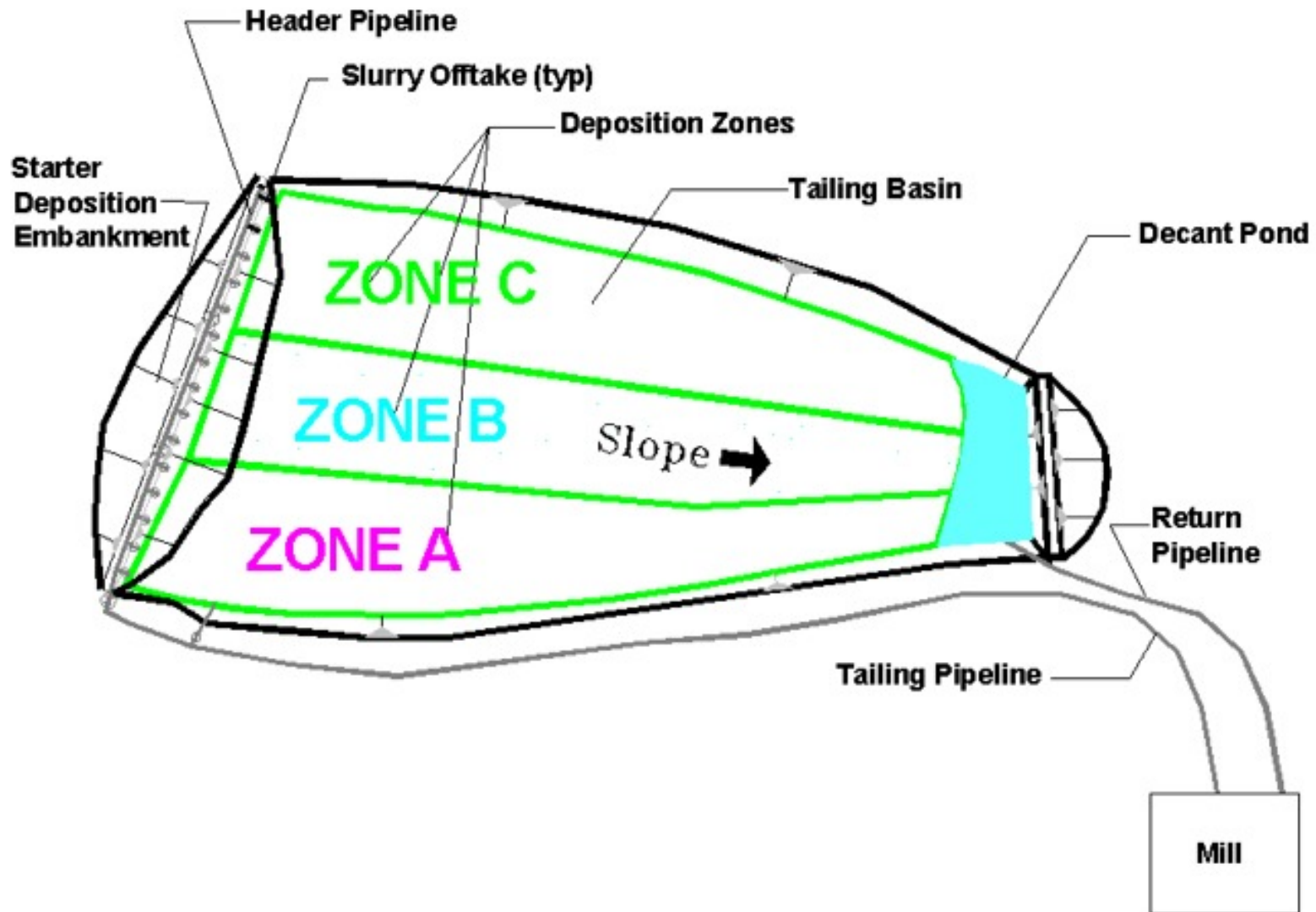
Sub-Aerial Tailings Deposition Model



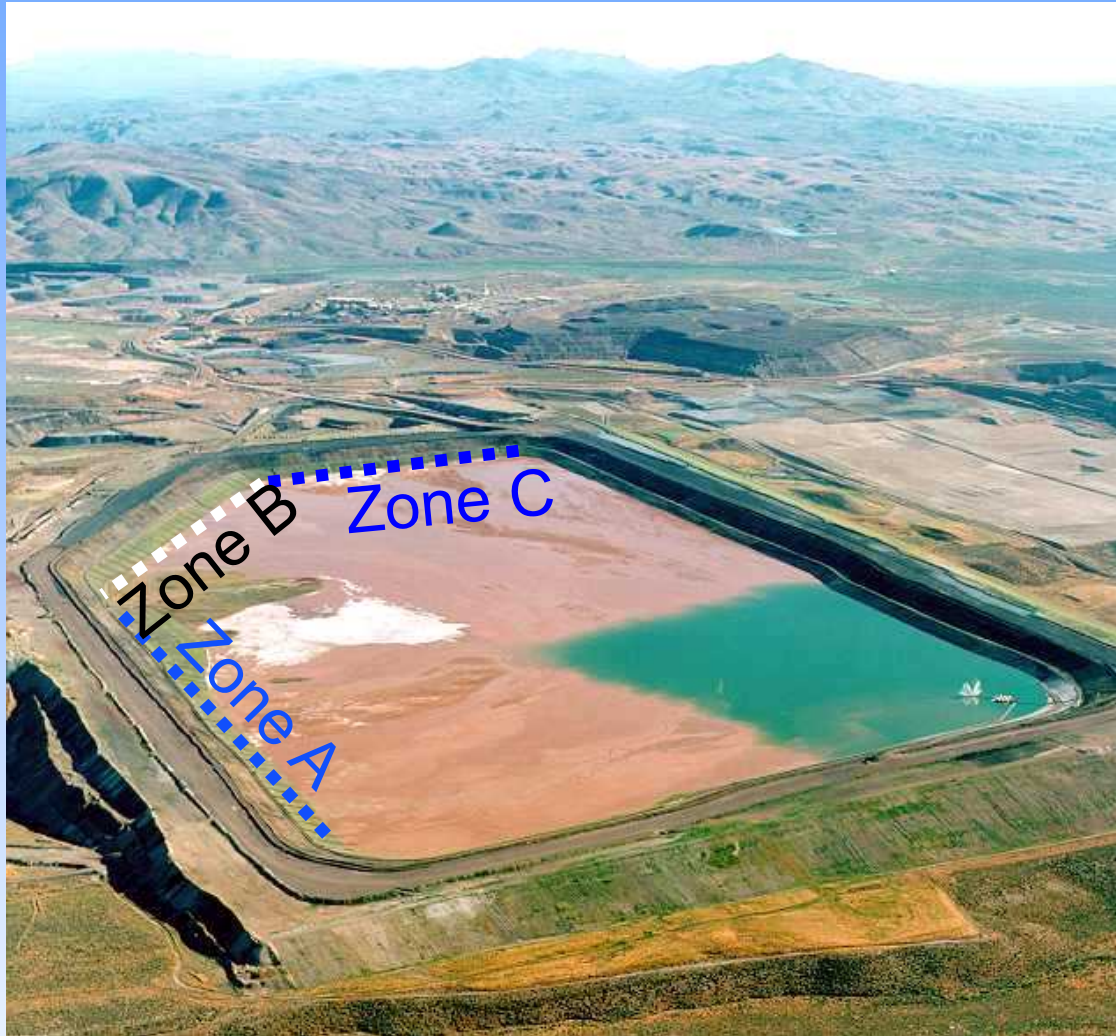
Thin Film Settling



Sub-Aerial Tailings Deposition Model



Sub-Aerial Tailings Deposition



Rubber-tired equipment can drive on sub-aerial deposited tailings within a week or two of cessation of placement



Bench Testing – May 2016



Bench Testing #1 – May 2016



Bench Testing #1 - May 2016



Bench Testing #2 - May 2016



Bench Testing #2 - May 2016



Bench Testing #3 - June 2016



Bench Testing #3 - June 2016



Full Scale Design

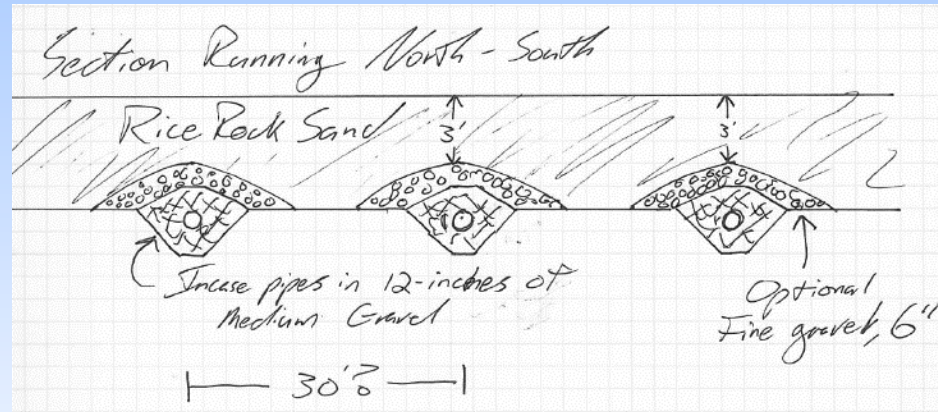
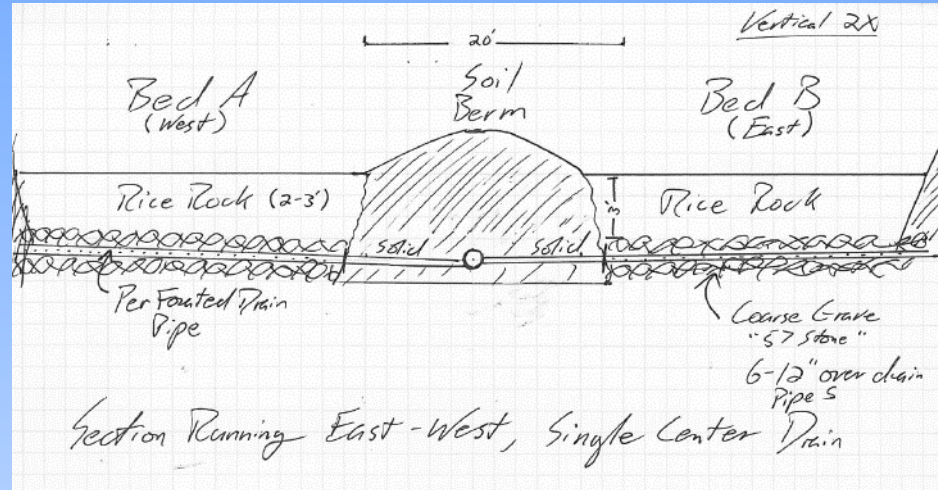
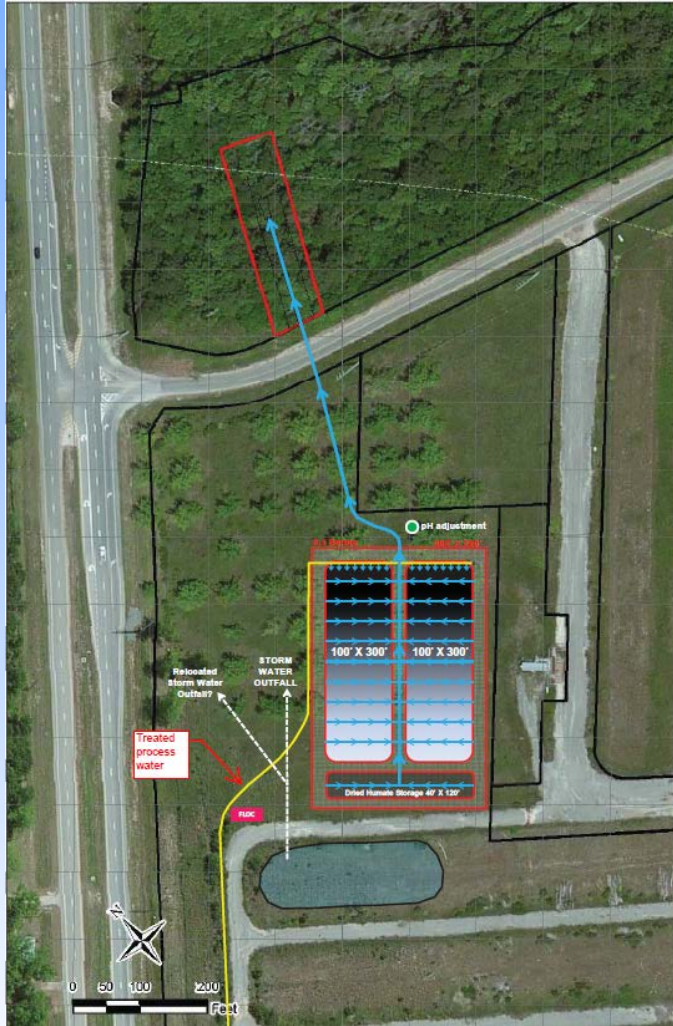
Full scale design flow rate:

190 to 950 m³ per day or 35 to 175 gpm



Full Scale Design

Single center drain for 2 separate sand beds



Full Scale As-Built

Spare – Not Used



Construction – Winter 2017



Commissioning – Spring 2017



Operation – Summer 2017



Operation – Summer 2017



Operation – Spring 2018



DRIED HUMATE



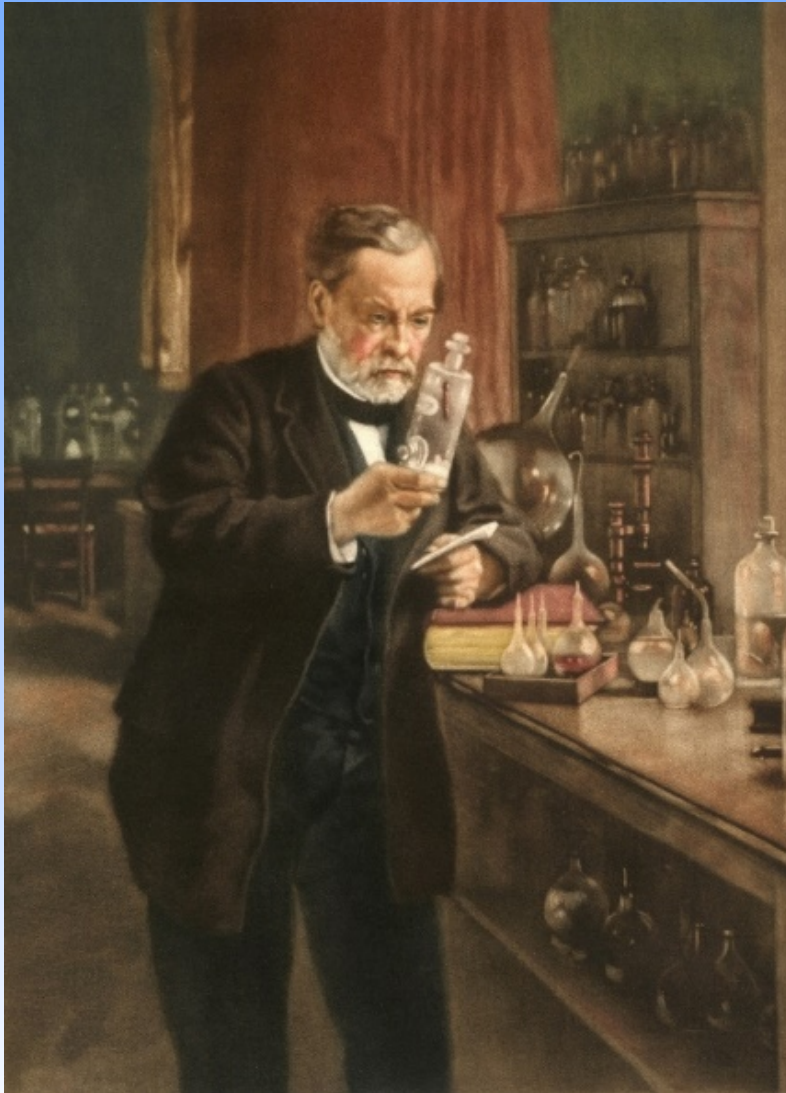
Other Applications - Revisited

(If Space Is Available)

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- Fine coal refuse itself
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Thank You



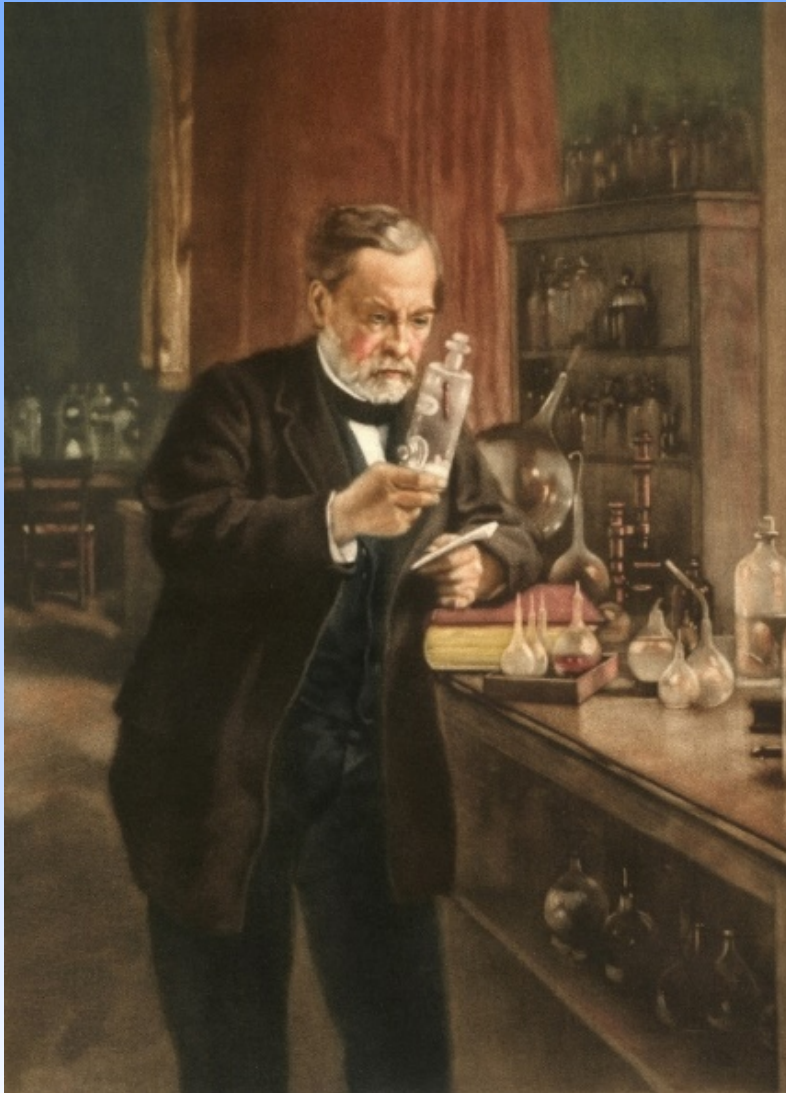
*Nihil simul
inventum est
et perfectum*

- Latin Proverb

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Thank You



*Nothing is
invented and
perfected at
the same time.*

- Latin Proverb

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