



# earth

Environmental & Remedial Technology Holdings

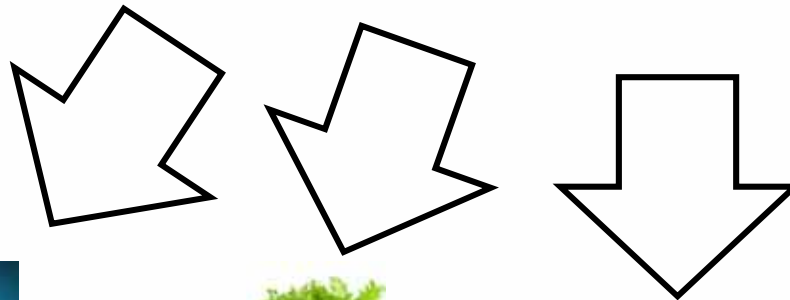
## **Proposal to Coaltech Research Association:**

The use of ion exchange for conversion of AMD and AMD brine from reverse osmosis to saleable products

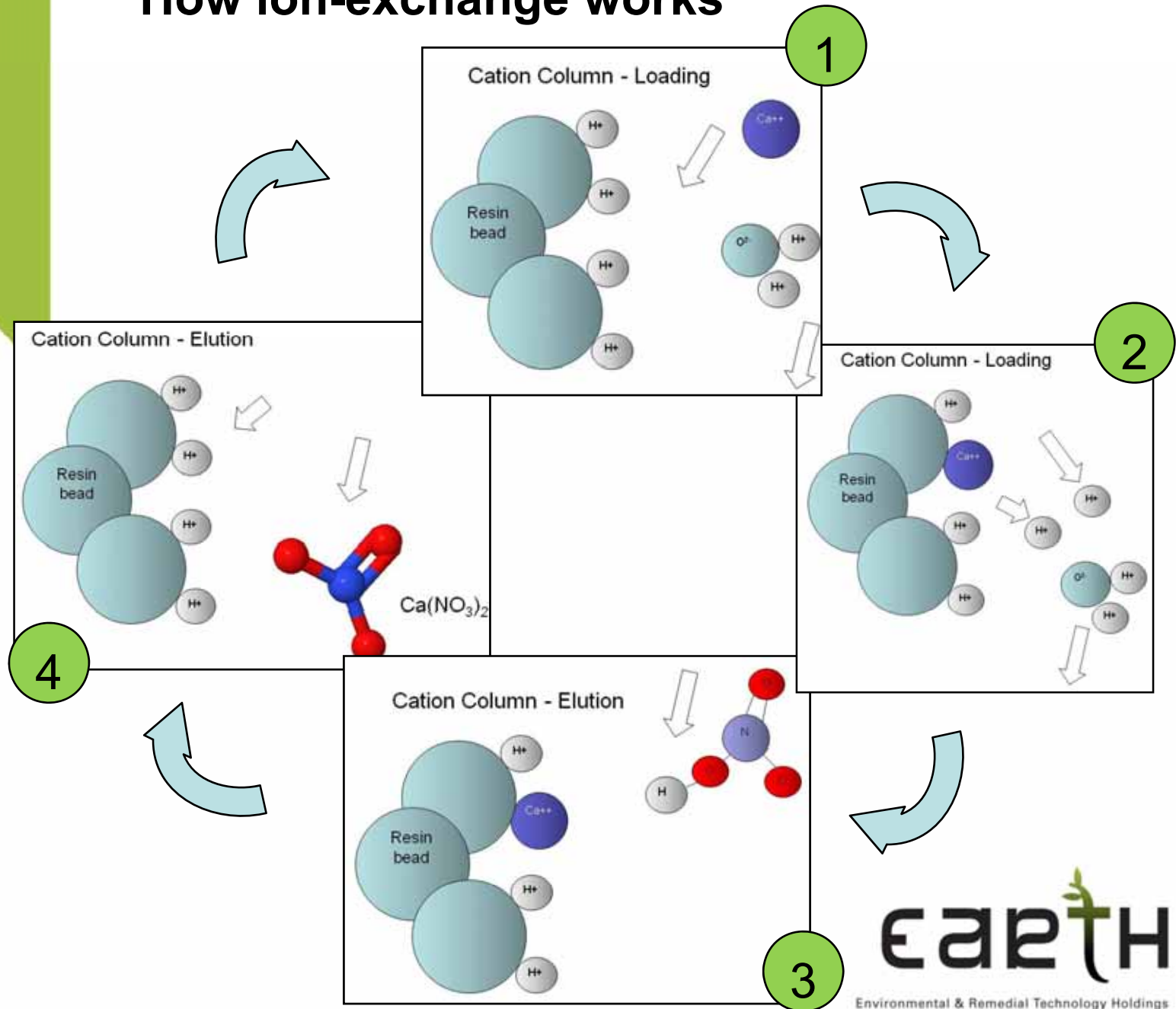
**27<sup>th</sup> November 2009**



# How ion-exchange works – making soup in reverse



# How ion-exchange works





# What it looks like

Cation columns

Anion columns



Resin beads in column



*Ion exchange disassembles the liquor/brine into cations and anions and we then reconstitute these as saleable products*

potable water



fertiliser



explosive



***A brine - and effluent free*** solution for AMD...



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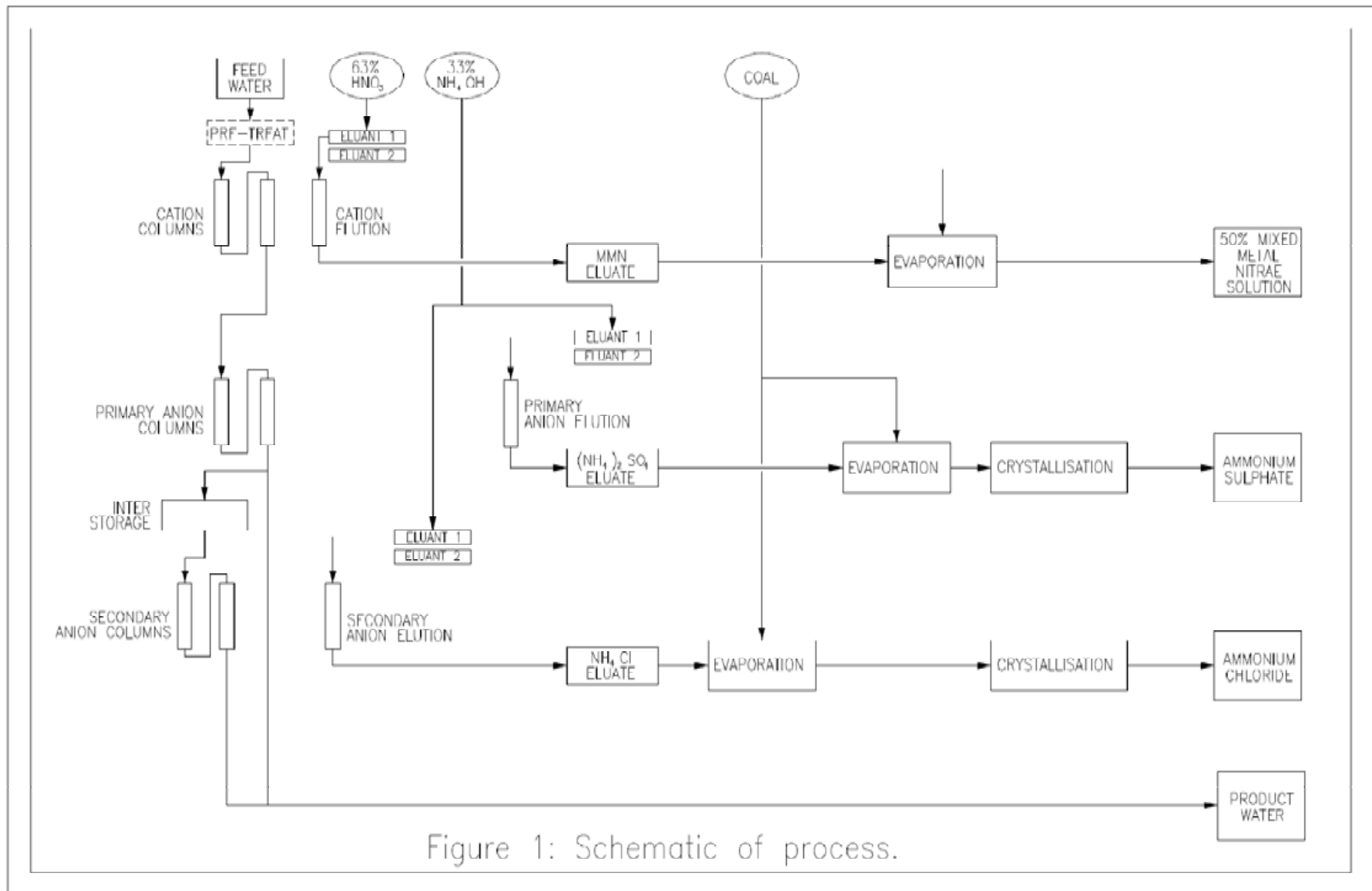
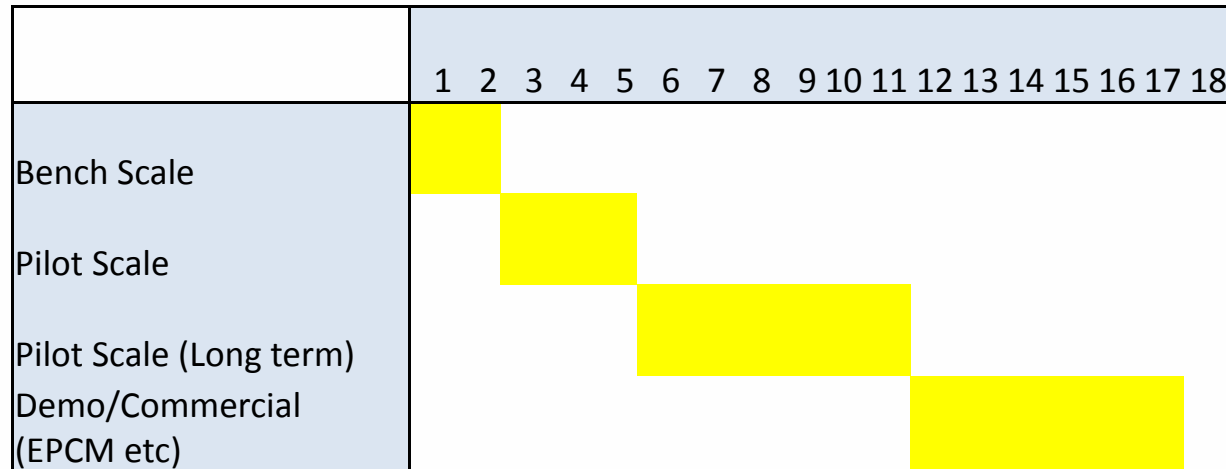


Figure 1: Schematic of process.

# Timelines



Completed  
November  
2009

Assumes “brown-field”  
brine plant of about  
0.5-1 Ml/day

Believe we can break ground on a demo/commercial plant within 15 months from sign off on pilot work





## “Gaps” to Demo Scale

- Economics – indicative numbers look good but need  $\pm 25\%$  numbers from, for example, Keyplan or similar
- Product qualities – need to produce product at volumes where we can analyse, get customer testing, iterate technology to meet requirements and then obtain in-principle off-take agreements
- Market volumes and mix – need to understand market size and diversify to avoid saturation or look at export markets

## Cost for each Phase

	Benchscale	Pilot	Long-term Pilot	Demo / Commercial (0.5Mℓ/day)
<b>Cost</b>	R250k	R2.2m	R1.5m	R5m – R10m.
<b>Comments</b>	Done for 8 streams from Emalahleni, Brugspruit, Landau, New Denmark, Sasol, BECSA	Current proposal	Current proposal. Assume 6 months	Raw AMD not brine. Excludes engineering/ EPCM costs. Toyota not Rolls Royce

## Cost benefit of EARTH approach

	Capex	Opex by vol.	Opex by month	Brine
Brine pond	R70M	-	-	170 kℓ/day
Freezing	R42M	R25/kℓ	R129k	52 kℓ/day
Evap/Xtal.	R37M	R20/kℓ	R103k	Solid waste
EARTH	R22M	R0.02/kℓ	R103.00	None

Based on proposal to Exxaro to treat RO from Keyplan HiPRO at Matla (5Mℓ/day) – substantially similar to Emalahleni Phase 2b TDS/Volume flow.



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## Summary and motivation

Zero brine (post-mine closure) solution

Close collaboration with Keyplan – significant expertise

Knowledge of liquors from benchwork

Focus on optimising “hybrid” approach (not just selling another approach)

South African invention and patents