



● We will begin shortly.

Water for All: Water Conservation and Emerging Issues

6th World Water Summit & Expo 2022

25 August 2022

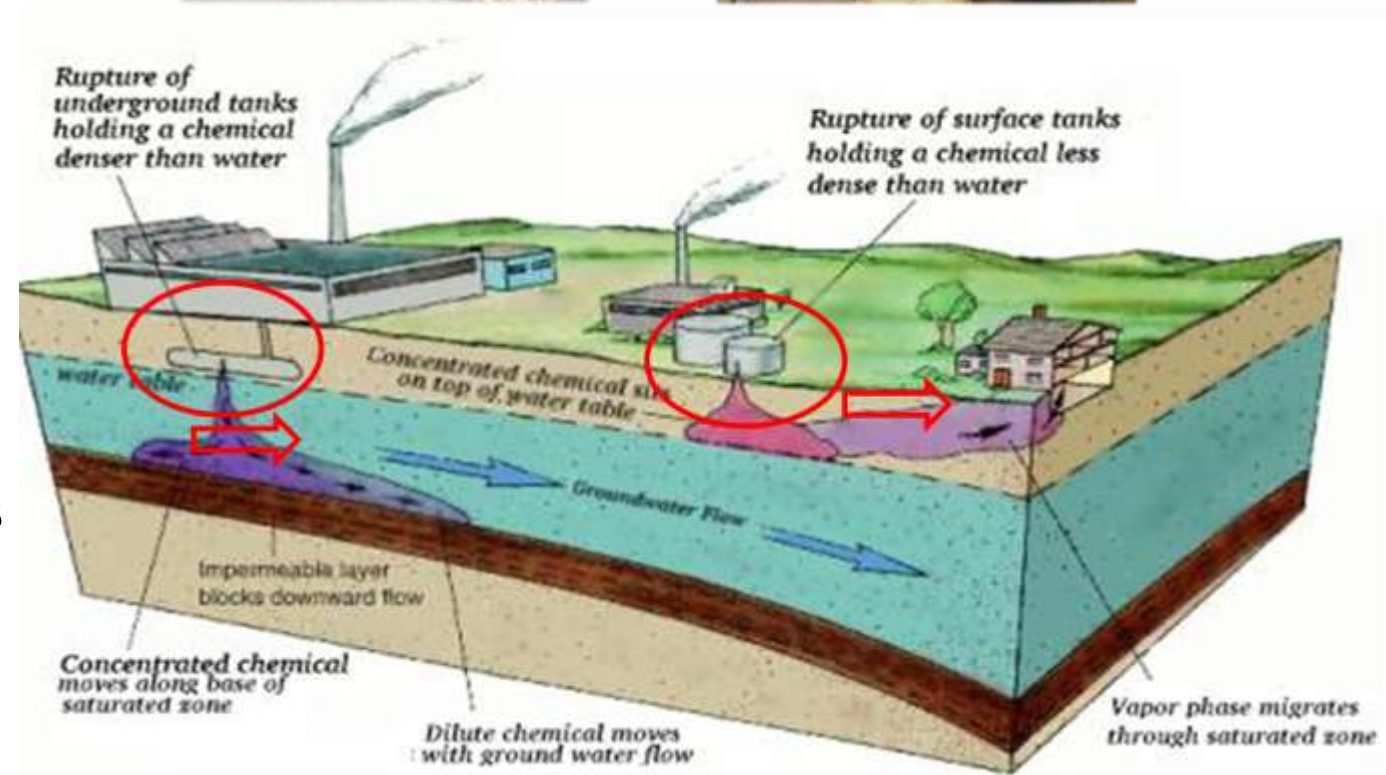
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The business of sustainability



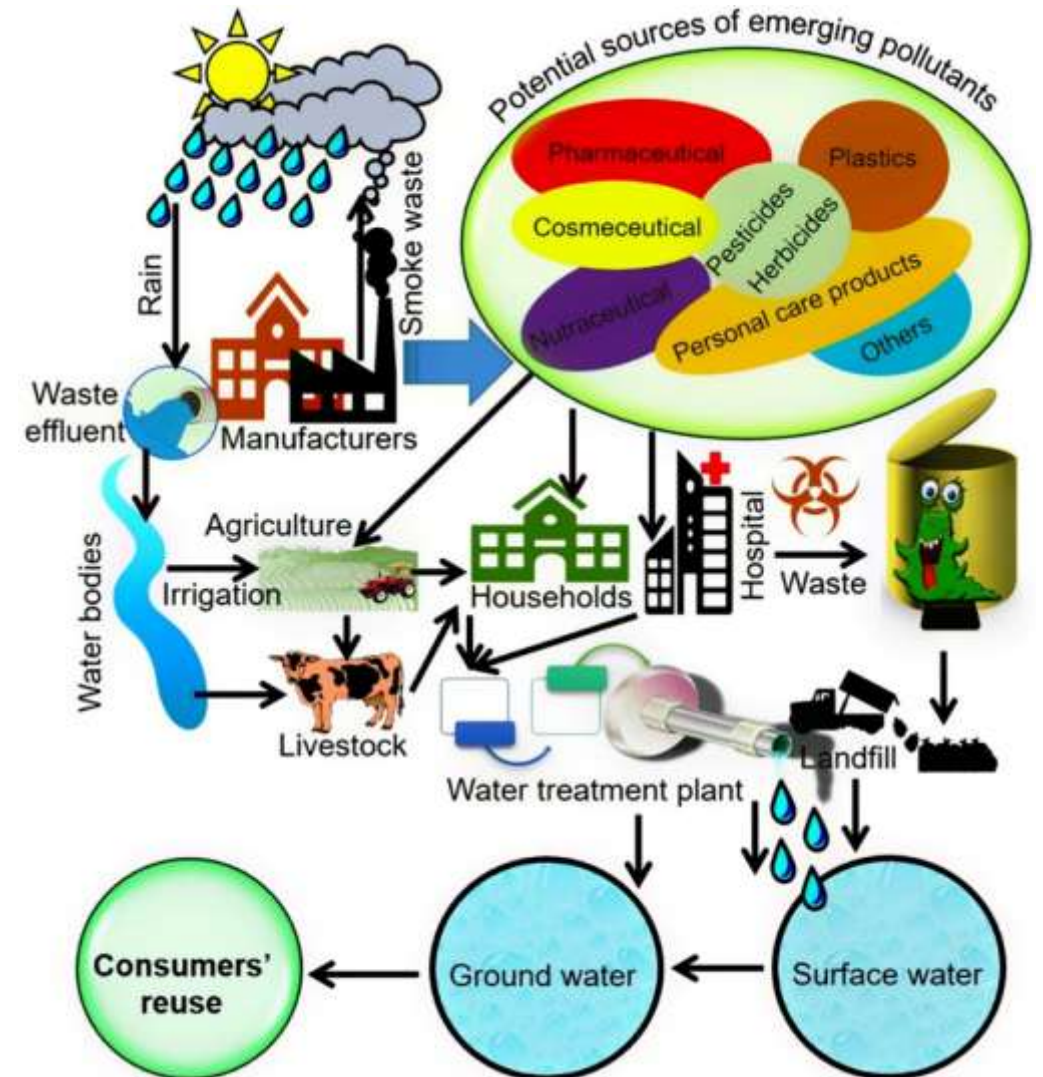
Groundwater Contamination

- Groundwater Contamination
 - Heavy metals
 - Cations and Anions
 - Volatile and Semi-Volatile Organic Compounds
 - Organochlorine and Organophosphate pesticides;
 - **Emerging Organic Compounds**



Emerging Organic Compounds

- Per- and polyfluoroalkyl substances (PFAS)
 - >6,000 compounds
 - PFAS are soluble, mobile and persistent
 - Possibly, Carcinogenic; Restrict development foetus & in children, Decrease fertility...



PFAS – where are they found?

Everywhere....PFAS Uses (including but not limited to):

- Chemical Industry: Fluor-polymer production
- Textile Industry: Coated papers, food packaging
- Other industries/processes: Semiconductor, metal plating and etching, oil & gas, aerospace, automotive, building/construction, etc.
- Fire fighting foams → fire fighting/training areas (chemical industry, airports, refineries, Army/Navy/Air Force)
- Other Sites: Waste water treatment plants, landfills, Dust deposition, Irrigation

Spot The Contaminated Water



PHOTO 1



PHOTO 2



PHOTO 3

Pathway to Addressing Contamination

Investigate

- Assess the nature and extent of contamination

Evaluate

- Assess risks to human health and environment

Strategize

- Develop a risk-based remediation strategy

Address

- Implement the remedy, and monitor the performance

Remediation

The process of lowering impacts in groundwater to agreed levels of risk.

- Mode of action – Physical, Chemical, Biological
- Place of action – In situ / Ex situ
- Their point of action – Source or Plume

Pilot Scale

In Situ Thermal

**In Situ Chemical Oxidation
(ISCO)**

In Situ Bioremediation

Permeable Reactive Barrier

Full Scale

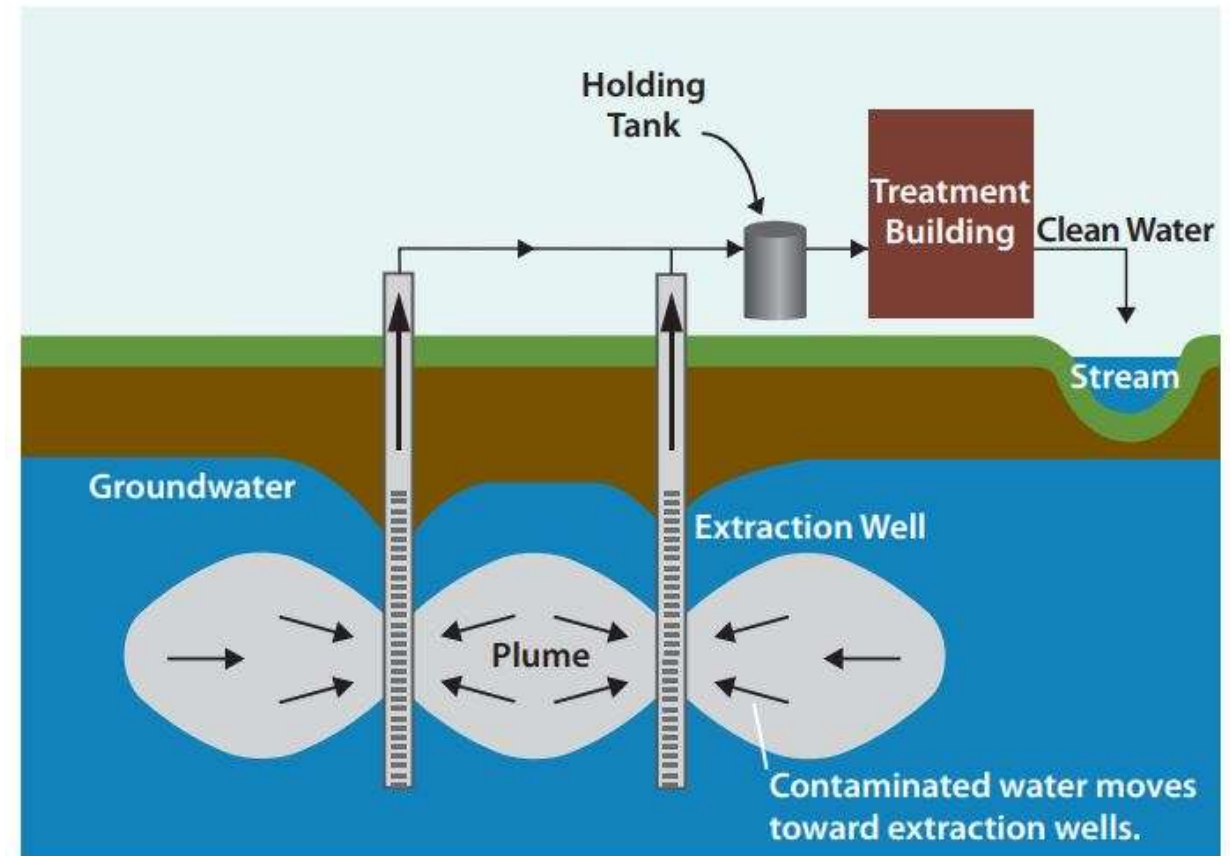
Pump and Treatment

- Activated Carbon
- Ion Exchange
- Reverse Osmosis
- Flocculation and Sedimentation

Processes of Pump & Treat

A groundwater treatment/ containment technology generally comprising of following principal elements:

- Abstraction through a series of extraction wells (capture zone)
- Treatment above ground
 - Activated carbon, air stripping, RO, Oxidation.
 - Precipitation, sedimentation and filtration.
- Disposal and/or re-injection



Pump & Treat

- P&T has been one of most used treatment technologies over last 20 years
- Groundwater extraction and treatment is simple and well understood.
- High Capital and Operating Cost.
- Duration of remediation is long – up to 30 years in some cases.



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In-Situ Chemical Oxidation (ISCO) Technology

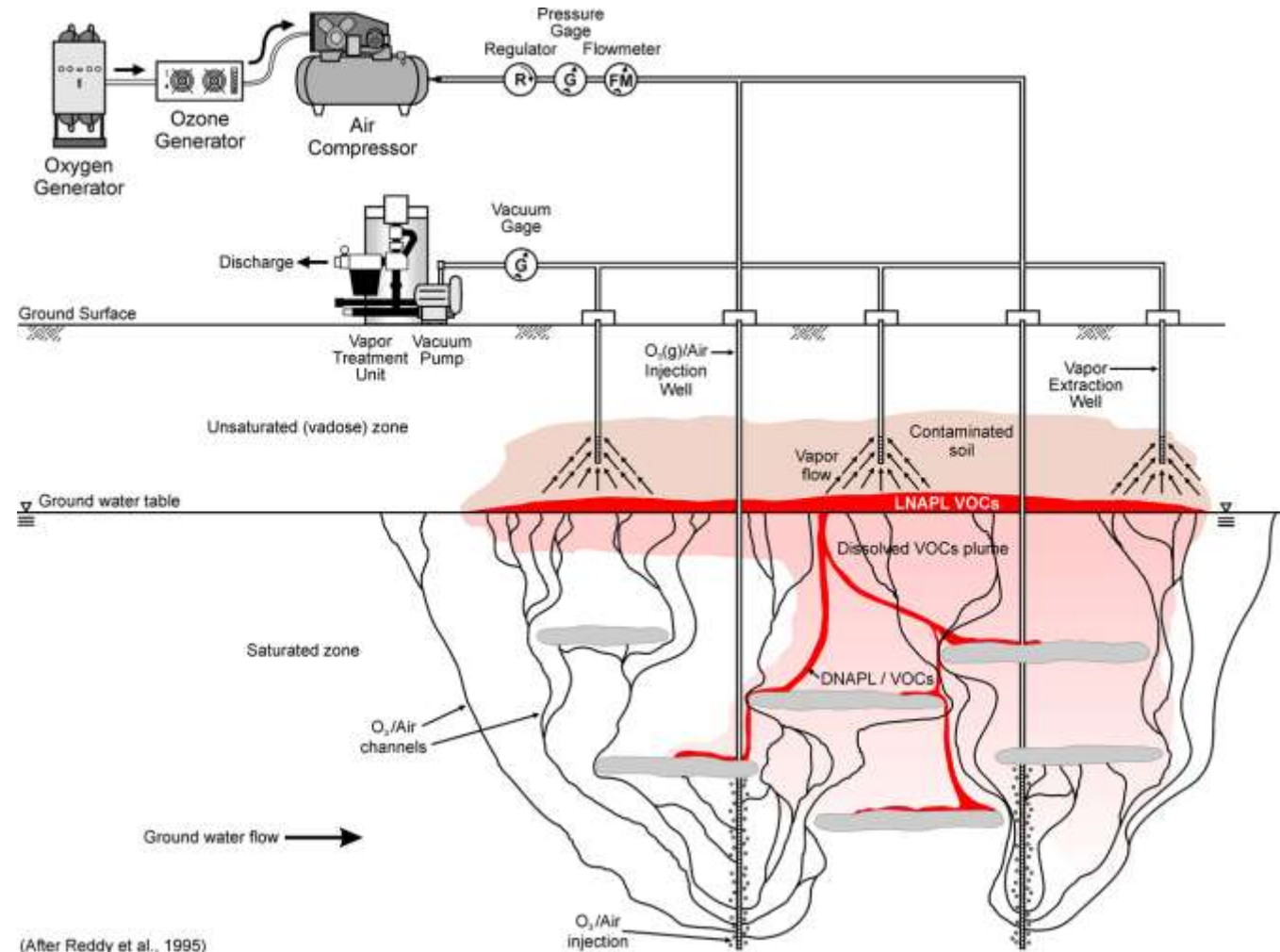
Reaction between the oxidant and target compound

- Chemistry
- Oxidant selection

Physical contact

- Delivery
- Enough oxidant to achieve the treatment objectives

Sustainable as minimum waste is generated



ISCO System

Air Compressor



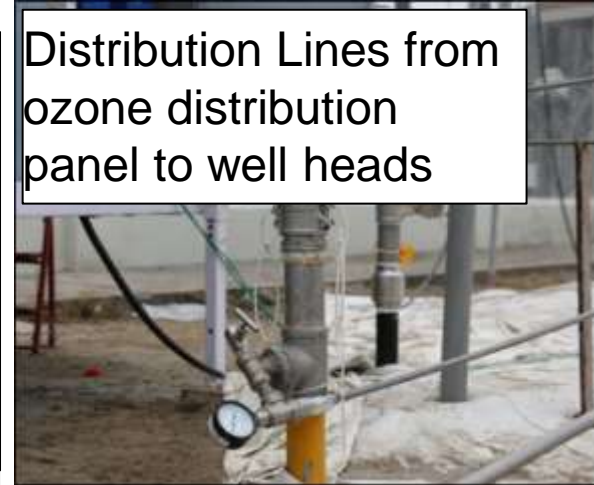
Oxygen Generators



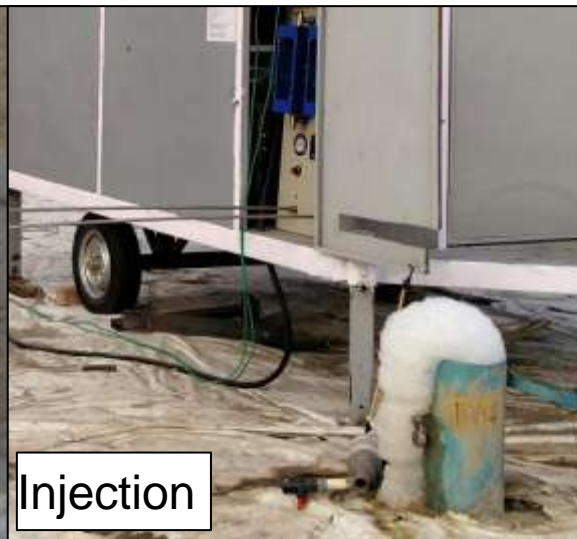
Ozone Distribution Panel



Distribution Lines from ozone distribution panel to well heads



Well Head



Injection



Well Head Monitoring

GW Monitoring



Conclusion

Addressing Emerging Contaminants requires:

- New laboratory testing methods for identifying contaminants;
- Emerging Technologies for treatment;
- Regulatory divers to identify impact and develop remediation goals.



Thank you for your attention.

Any questions?