

REGULATING DIRECT POTABLE REUSE

A CALIFORNIA PERSPECTIVE

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CALIFORNIA LEGAL FRAMEWORK WATER CODE

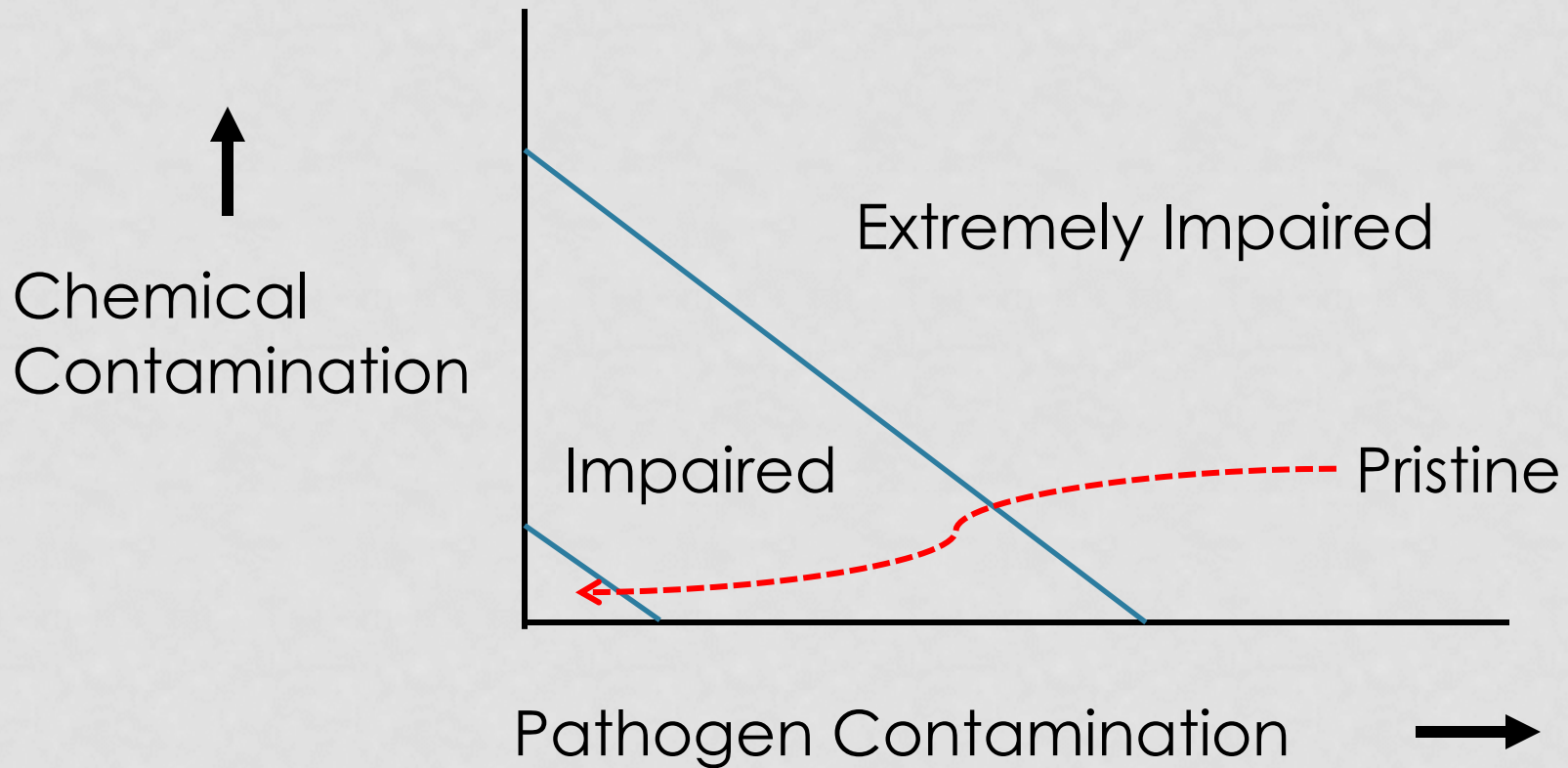
- California DPH develops reuse criteria
- Wastewater or reclaimed water activities that involve releases to the environment are permitted by the State Water Boards
- Potable reuse - Sections 13560-13569
 - Code requires a CDPH study of DPR feasibility by the end of 2016
 - Consider health effects, available treatment and reliability, monitoring needed, research needed, et cetera
 - Consult
 - Expert panel (water quality technical experts)
 - Advisory group (representing community interests)

CALIFORNIA LEGAL FRAMEWORK

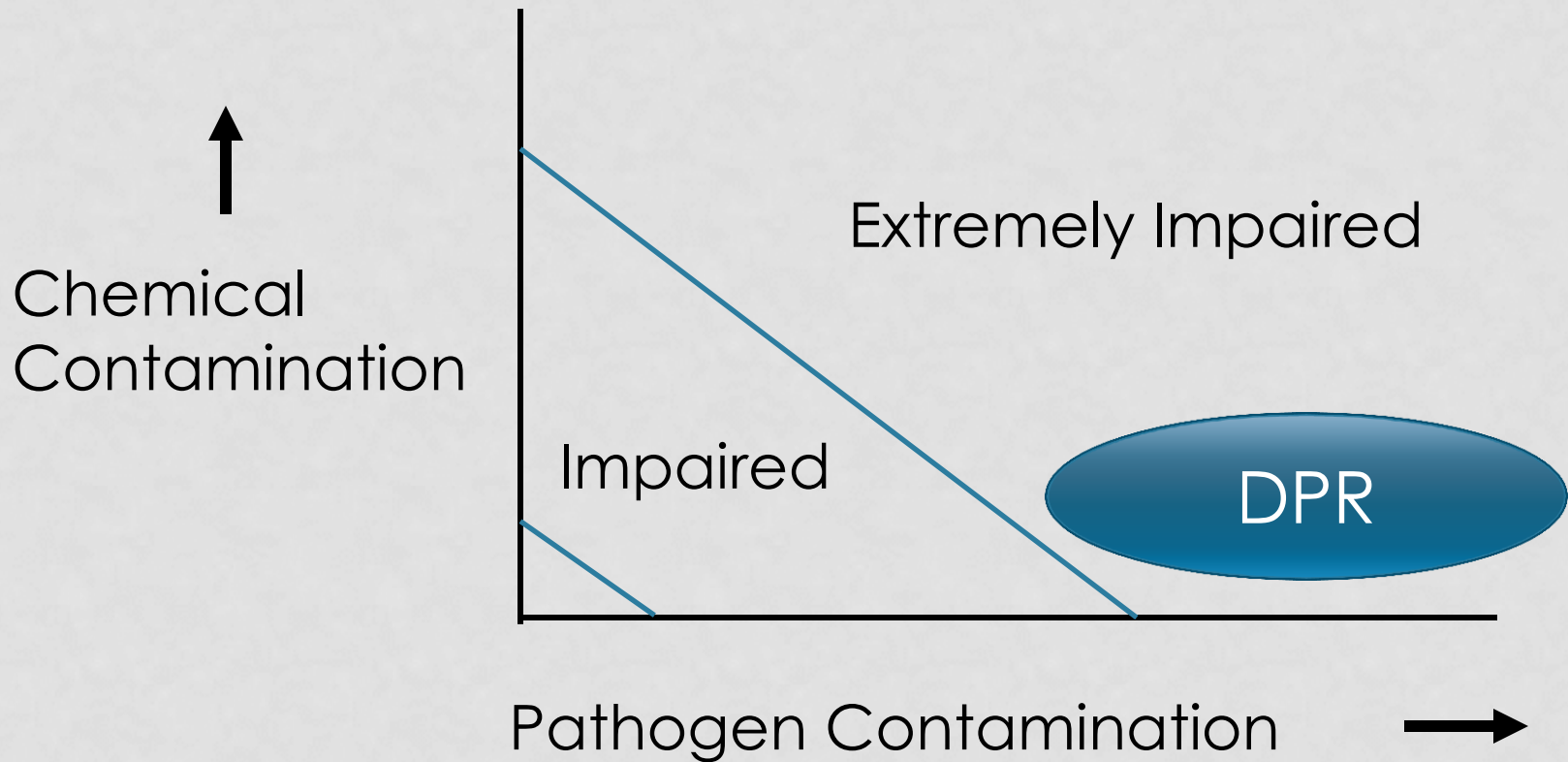
HEALTH AND SAFETY CODE

- Calif. Safe Drinking Water Act
 - CDPH permits Public Water Systems
 - Permit addresses individual water sources and prescribes suitable controls and treatment
 - CDPH has experience with:
 - Good water sources – standard treatment for source
 - Impaired sources - need extra evaluation/ treatment
 - Extremely impaired sources (Policy 97-005) – extensive study and treatment
 - Planned indirect potable reuse
 - DPR must comply with the State and Federal Safe Drinking Water Acts

SOURCE QUALITY



SOURCE QUALITY



DRINKING WATER STANDARDS

- Chemical Standards (MCLs)
- Surface Water Treatment Rule (SWTR)
 - A water system “using an approved surface water shall provide multibarrier treatment necessary to reliably protect users from the adverse health effects of microbiological contaminants ...”
 - Organism log reductions determined as part of source approval process

TRANSITION: WATER CODE TO SDWA WHEN “APPROVED SOURCE”?

Raw sewage



Secondary/tertiary effluent



Advanced treatment product



Engineered storage outlet



Drinking Water

A REGULATORY SCHEME FOR DPR

- Clean Water Act regulators could regulate what they have the authority, expertise, and operator certification program for:
 - Source control for the collection system
 - Treatment through secondary or tertiary
 - Disposition of inadequately treated wastewater
- Drinking Water Regulators could:
 - Approve secondary or tertiary effluent meeting the SWB permit as the “approved” surface water source
 - Specify advanced treatment and monitoring in the water system permit as it would for any impaired or extremely impaired source

PRINCIPLES

- Make a “safe” drinking water
- Low tolerable risk
 - 10^{-4} annual risk of infection
 - Drinking water standards
 - Unregulated chemical controlled to match good existing supplies
- No degradation of an existing drinking water supply
- Multiple barriers for contaminants

THREATS IN THE SOURCE WATER



Pathogens

Nitrate, Nitrite, ...

TOrCs?

PATHOGENIC MICROORGANISMS

- Acute risk
- Set a log reduction requirement
 - Raw sewage to drinking water
 - 12-log Virus
 - 10-log *Giardia*
 - 10-log *Cryptosporidium*

PATHOGENIC MICROORGANISMS - 2

- Start from highest levels found in wastewater
- End point is USEPA allowable drinking water levels (based on 10^{-4} annual risk of infection goal)
- Multi-barrier treatment required

PATHOGENS CONTROL ISSUES

- How consistently must the treatment meet the organism log-reduction goal?
 - mean time between failures or 6σ ?
- Is the monitoring sensitive enough to tell us when the organism reduction is not being met?
- Multiple barriers minimize the chance of a complete failure of treatment.
 - How do we determine the necessary number and capability of the barriers?

CALIFORNIA POTABLE REUSE COMMITTEE (1996)

- DPR is “unacceptable ... because of the lack of reliable real-time water quality monitoring methods and lack of time to react to accidental emergencies or system upsets. ‘

A PATHOGEN CONTROL APPROACH

- We can assure safe water by providing:
 - Reliable, real-time treatment monitoring for the required barriers, or
- Best available monitoring and redundant barriers to provide extra log reduction capacity to compensate for monitoring limitations
 - How do we determine the amount of redundant capacity?

TREATMENT FOR TOrCs

- Chronic risk
- CDPH is happy with the effectiveness of the full advanced treatment called for in the IPR draft regulation where 100% reclaimed water reaches a drinking water source.
- Full advanced treatment is continuous treatment of the entire flow with RO and AOP
- Alternatives may be allowed if they “assure at least the same level of protection to public health”

TREATMENT MONITORING AND CONTROL

- On-line monitoring with real-time control for each treatment barrier for acute contaminants
- Fault tolerant design of monitoring and control systems with a high availability (4+ nines)
- HACCP and other system reliability approaches should be investigated

RESPONSE: FAIL → SAFE

- A failure:
 - Treatment efficacy falls below some specified level
 - A loss of monitoring capability
- The response to a failure:
 - go to a safe condition – halt drinking water production
 - Identify and correct the fault
 - Restart per a start-up procedure

CONCLUSIONS

- Focus on acute risks (pathogens)
- Continuously verify treatment performance
- Provide sufficient barriers with:
 - Reliable, real-time monitoring, or
 - Best available monitoring and redundant barriers to strictly restrict the chance of inadequately treated product
- Fail-safe response to a system problem