



# Water Quality and Artificial Recharge in Washington

Presented by

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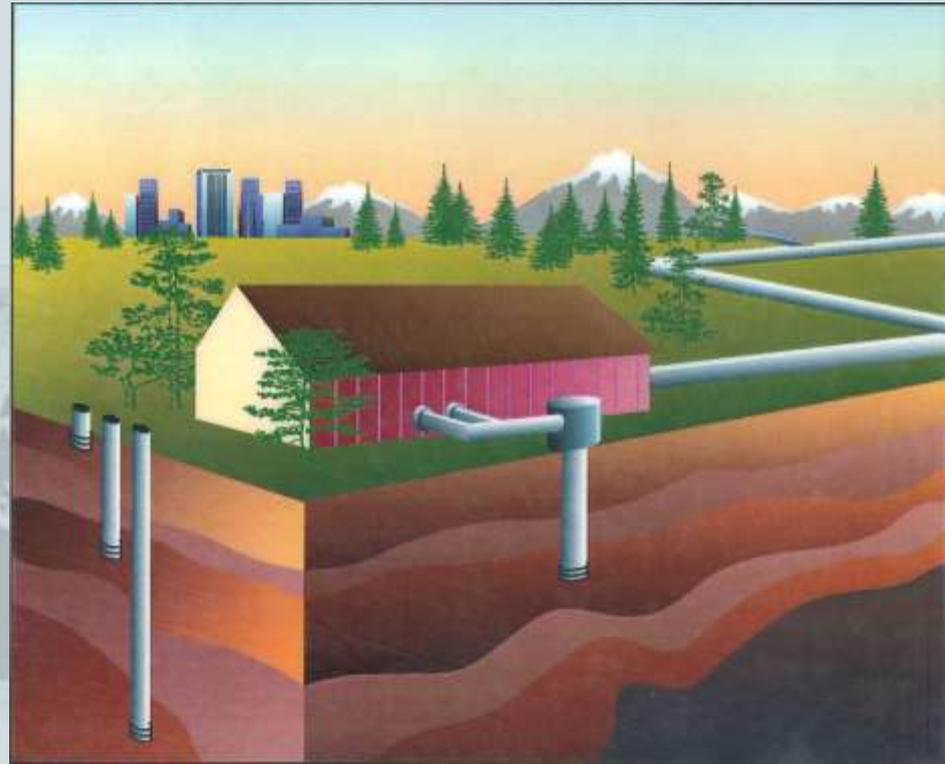
**Golder Associates Inc.**

**October 2009**



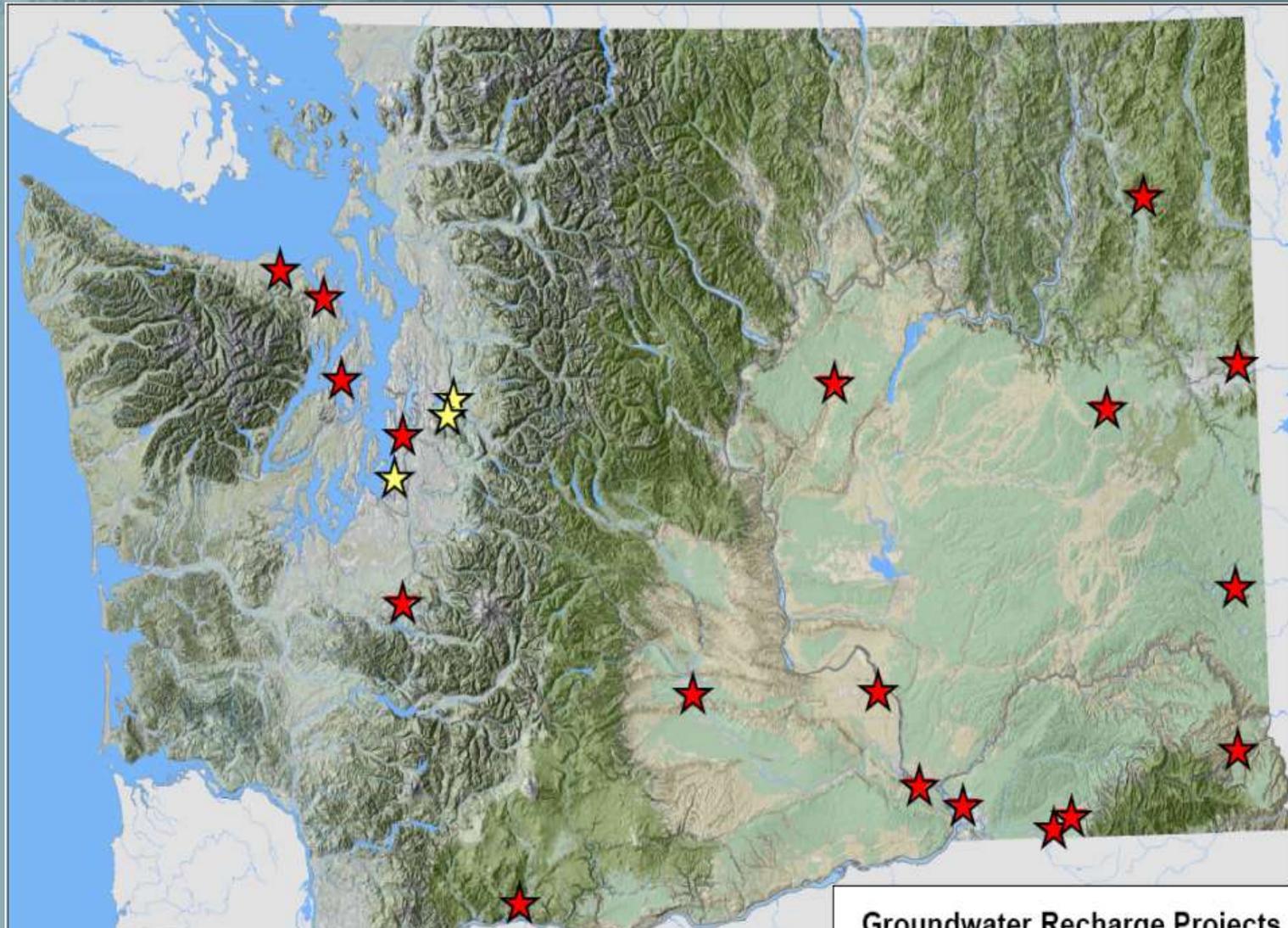
# Presentation Outline

- Artificial Recharge Concepts
- Water Quality Regulations
- Implications for Project Development



# Artificial Recharge in Washington

- 2 ASR permits
- 6 ASR in testing phase
- 12 ASR in study phase
- 11 Artificial Recharge Projects



*Courtesy WA  
Dept. of Ecology*



Groundwater Recharge Projects  
in Washington

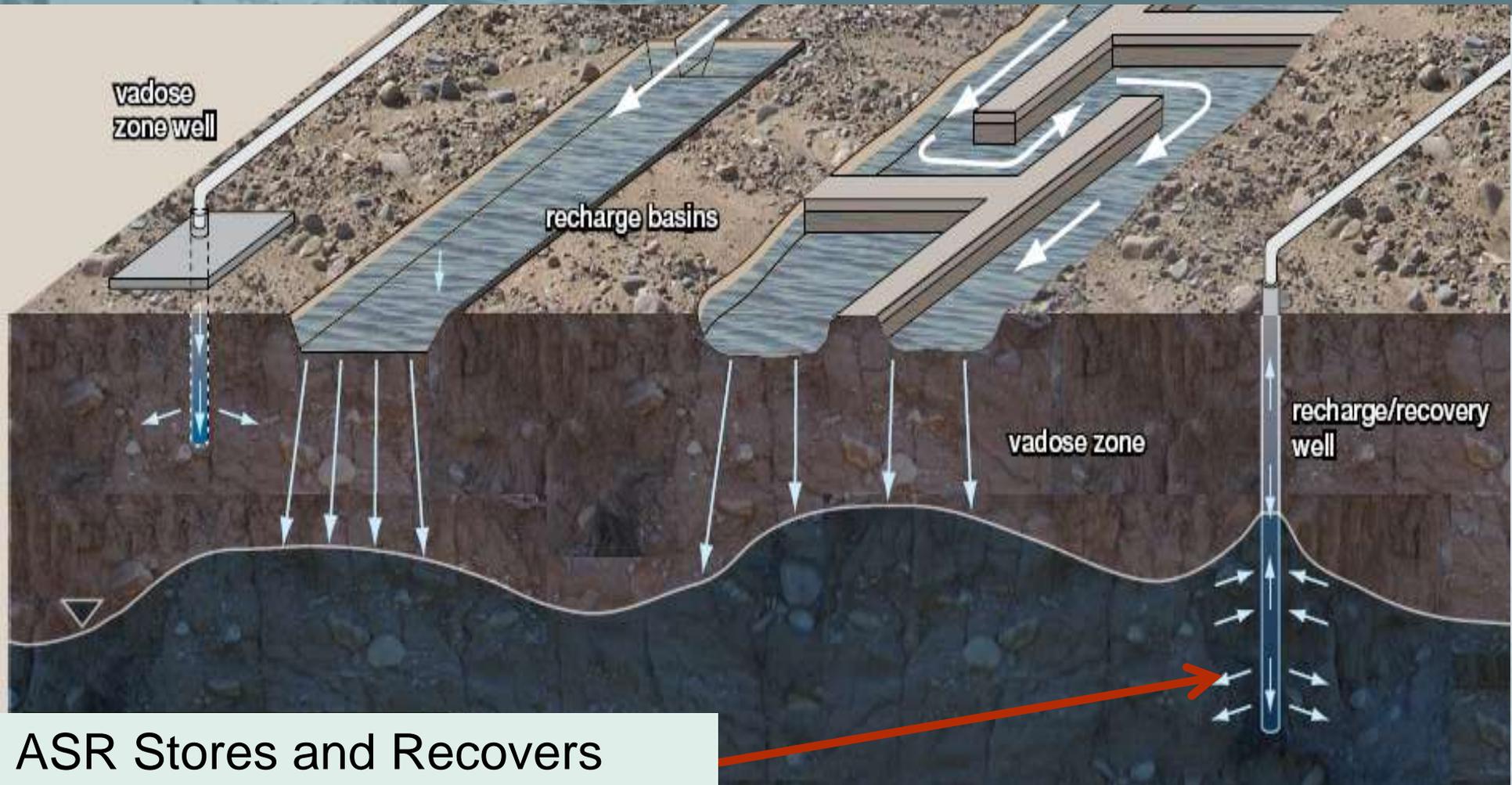
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October 2008

WASHINGTON STATE  
Department of Ecology

# Artificial Recharge



ASR Stores and Recovers  
from a well (or wells)

# Water Quality Implications

## **Artificial Recharge**

- Land application
- Above the water table
- Water treatment in the vadose zone
- Not (necessarily) required to meet WQ standards prior to infiltration

## **ASR**

- Subsurface direct Injection
- Annual recovery is typical
- Must meet drinking water standards prior to injection
- Anti-Degradation is an issue.....

Where is the best place to store water?

Will it be recoverable?

Will my stored water be degraded in the subsurface?

Will recharge affect groundwater quality?

# ASR Rulemaking

- 2000 Water Storage Task force identifies ASR as important tool with an associated Public Interest
- Legislature approved expansion of the definition of “reservoir” in RCW 90.03.370 to:

*“Any naturally occurring underground geological formation where water is collected and stored for subsequent use as part of an underground artificial storage and recovery project.”*

Adopted, and modified in 2003

*"The legislature recognizes the importance of sound water management. In an effort to promote new and innovative methods of water storage, the legislature authorizes the Department of Ecology to issue reservoir permits that enable an entity to artificially store and recover water in any underground geological formation, which qualifies as a reservoir under RCW 90.03.370" (codified at RCW 90.44.460).*

# Water Quality: ASR Perspective

WAC 173- 157-200(2):

Ecology "shall give strong consideration to the overriding public interest in its evaluation of compliance with ground water quality protection standards."

## ➤ Source Water Quality (ASR Rule):

*Water to be stored in an aquifer for an ASR project must meet water quality standards for ground waters of the state of Washington (Chapter 173-200 WAC). Beneficial use must be preserved (drinking water presumptive standard)*



# ASR Anti-Degradation Perspective

**WAC 173-200-030**

## **Anti-degradation policy:**

- Existing and future beneficial uses shall be maintained and protected.
- Groundwater quality will be preserved except where:
  - There is an overriding consideration of the public interest will be served; and
  - All contaminants proposed for entry into said ground waters shall be provided with all known, available, and reasonable methods of prevention, control, and treatment prior to entry.

# Direct Recharge Challenge:

- Source Water Must Meet Drinking Water Standards prior to direct injection
  - Surface water treated to drinking water is commonly chlorinated
  - Disinfection byproducts do form
  - Treated surface water can also contain some constituents not otherwise present in groundwater

*Does injecting drinking water constitute “degradation”?*

AKART is the process for addressing risk, cost, benefit, treatment, public interest, and compliance.



# City of Kennewick ASR Project

- Ecology funded project, Ecology directed approach
- Drilling, sampling, and water quality characterization are first steps
  - Columbia River (treated drinking water)
  - Deep ground water (CRBG basalt aquifer - 1,200 ft)
- First ASR Project in Northwest with a formal AKART analysis



## ***Antidegradation policy***

*“... beneficial uses shall be maintained and protected and degradation ... that would interfere with or become injurious to beneficial uses shall not be allowed.”*

*WAC 173-200-030*

- **Goal - Protection of Beneficial Uses**
  - Ground water quality
  - Drinking water supply
  - Public Interest
- **Objective - Establish Balance**
  - Recognize potential risks and risk reduction
  - Determine cost of treatment
- **AKART Steps**
  - Identify pollutants of concern
  - Evaluate treatment technology options
  - Determine feasibility

# AKART Approach

## AKART

*“all known, available, and reasonable methods of prevention, control and treatment”... “must be applied to all wastes prior to entry into ground water.” (DOE, 2005)*

- Evaluate treatment options
  - AKART should evaluate reductions necessary to meet criteria (e.g., drinking water standards and Kennewick goals)
  - Evaluate treatment options and cost
    - Effective treatment levels
    - Treatment cost estimates
  - Consider risk reduction and benefit to elimination of source water pollutant

# AKART Approach

- Evaluate Compliance Alternatives
  - Pre- and Post treat treated drinking water
  - Compliance Monitoring (APC)
  - Public Interest Waiver

## AKART

*“all known, available, and reasonable methods of prevention, control and treatment”... “must be applied to all wastes prior to entry into ground water.” (DOE, 2005)*

# Summary

- Water Quality Issues are the biggest regulatory challenge to ASR and AR projects.
- Treatment and other compliance alternatives are the biggest cost drivers in developing ASR projects
- The Kennewick project will set the benchmark for ASR compliance strategies in the future



*Thank you*

