WATER QUALITY REGULATION OF MANAGED AQUIFER RECHARGE IN WASHINGTON STATE

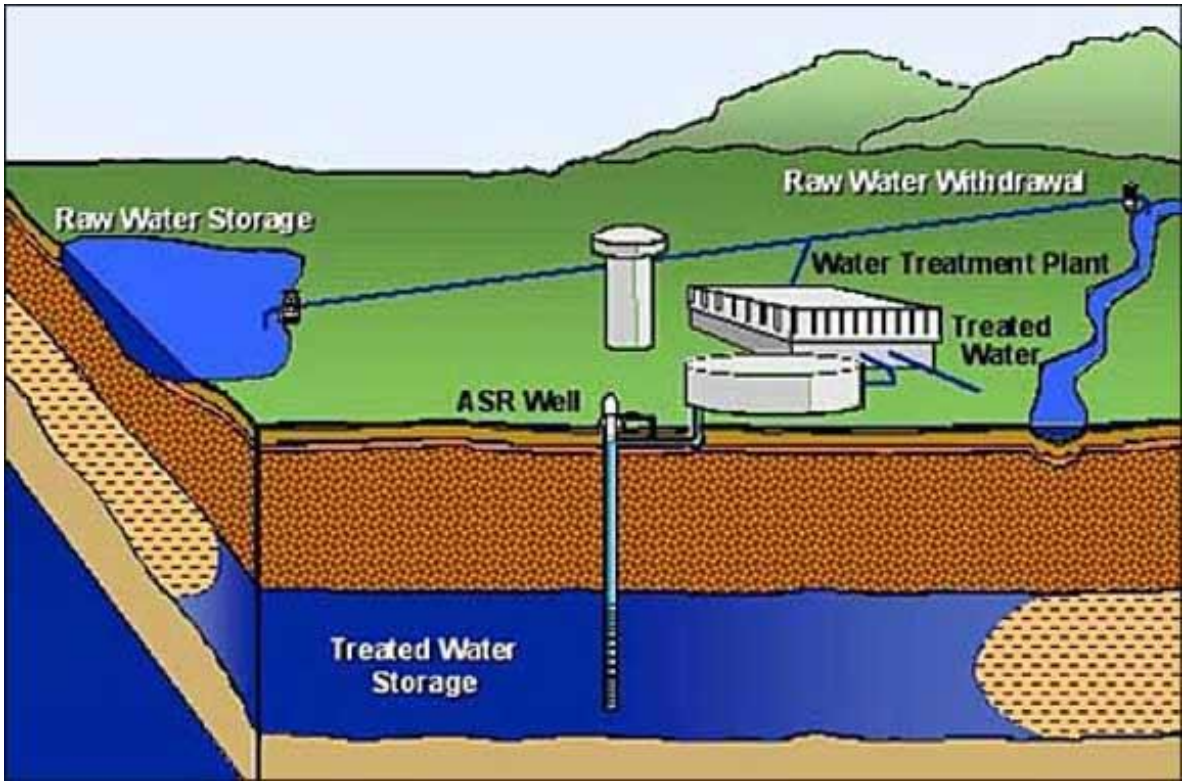
Llyn Doremus, Hydrogeologist, llyn.doremus@ecy.wa.gov
Water Quality Program, Washington Department of Ecology

Presentation Sequence

1. Managed Aquifer Recharge Components
2. ASR Permitting criteria
3. Regional considerations

ASR Components Regulation

- Source Water
- Injection well(s)
- Aquifer storage
- Monitoring wells
- Recovery wells



ASR Permitting Objective

Generate or gather sufficient information to ensure that ASR permit(s) conditions protect future water quality and availability for human and environmental purposes.

Ensure project compliance with the applicable laws, rules, policies and guidance.

Two Permitting Paths for Managed Aquifer Recharge Projects

Water Resources Program

- Surface Water source
- Multiple permits
  - Source water permit
  - Pilot testing approval
  - Aquifer storage permit
  - Aquifer Recovery permit
    - Designates beneficial use of recovered water

Water Quality Program

- Reclaimed Water Source
- 1 Reclaimed Water Permit
  - Water owned by entity that treats the reclaimed water
  - Ownership retained after treatment, during storage and recovery
  - Reclaimed Water Permit specifies treatment, storage, recovery & beneficial use

Applicable Washington ASR Regulations

ASR in Washington is governed by an amalgamation of existing rules and regulations

There is only guidance for ASR projects, no permitting criteria.

Water Resources

- Aquifer Storage and Recovery Rule
  - Chapter 173-157 WAC
- Water Code/ Reservoir permits
  - RCW 90.03.370
- Groundwater appropriation
  - RCW 90.44

Water Quality

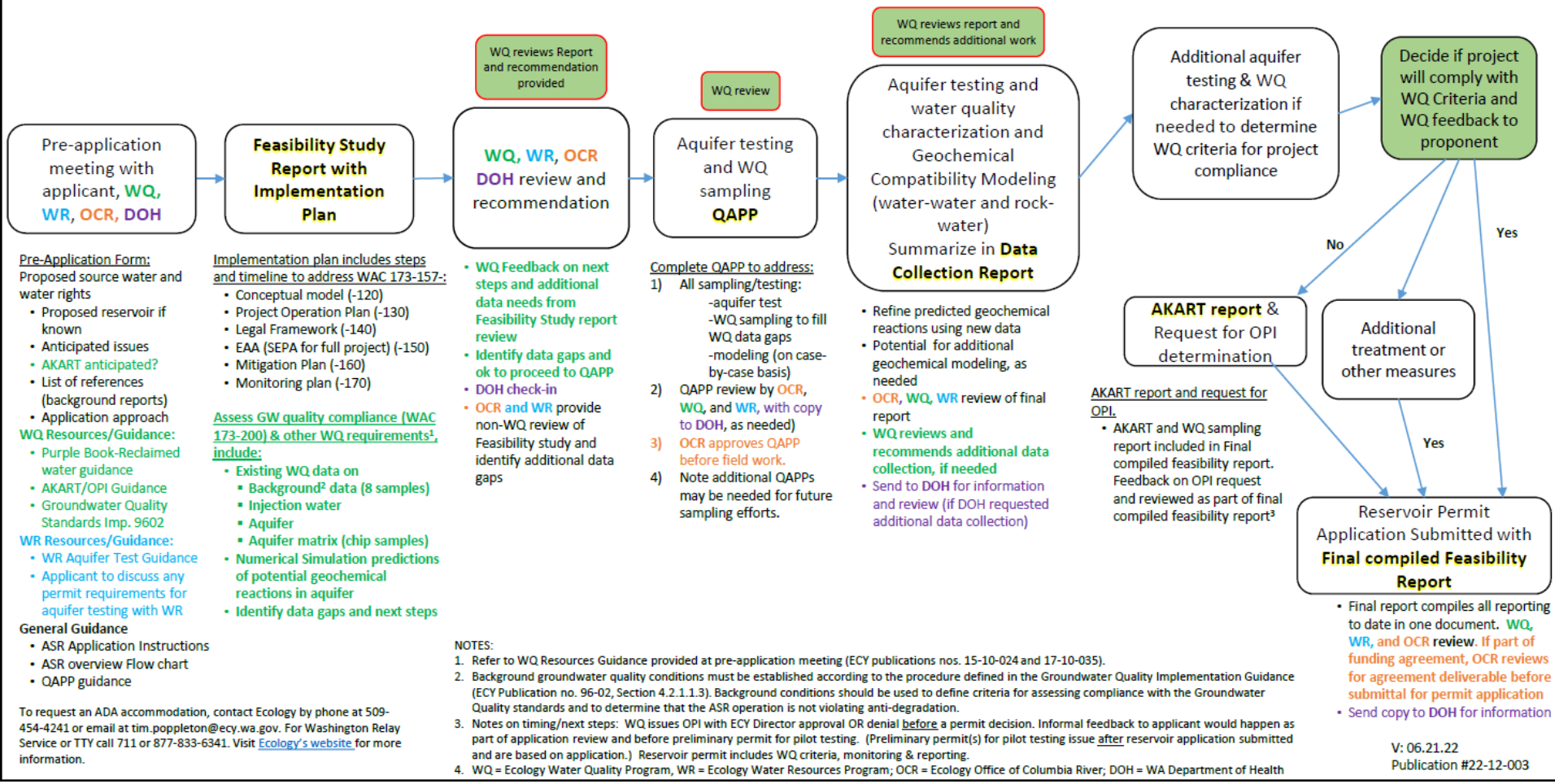
- Groundwater Quality Standards
  - Chapter 173-200 WAC
- State Waste Discharge permit program
  - Chapter 173-216 WAC
- Underground Injection Control (UIC) Regulation
  - Chapter 173-218 WAC
- Reclaimed water use authorization
  - RCW 90.46 (Chapter 173-219 WAC – 2017 adopted)

Underground Artificial Storage and Recovery Reservoir Permit Pre-Application Process

This is a working flow chart for coordination between OCR, WQ and WR Ecology programs during the pre-application period for potential Aquifer Storage and Recovery (ASR) projects with OCR funding agreements.

Note: Written reports in bold yellow highlight. Color coded roles: WQ in green, WR in blue and OCR in orange, DOH in purple

DEPARTMENT OF ECOLOGY
State of Washington



Pre-Application Form:
Proposed source water and water rights
- Proposed reservoir if known
- Anticipated issues
- AKART anticipated?
- List of references (background reports)
- Application approach

WQ Resources/Guidance:
- Purple Book-Reclaimed water guidance
- AKART/OPI Guidance
- Groundwater Quality Standards Imp. 9602

WR Resources/Guidance:
- WR Aquifer Test Guidance
- Applicant to discuss any permit requirements for aquifer testing with WR

General Guidance
- ASR Application Instructions
- ASR overview Flow chart
- QAPP guidance

Implementation plan includes steps and timeline to address WAC 173-157-:
- Conceptual model (-120)
- Project Operation Plan (-130)
- Legal Framework (-140)
- EAA (SEPA for full project) (-150)
- Mitigation Plan (-160)
- Monitoring plan (-170)

Assess GW quality compliance (WAC 173-200) & other WQ requirements[1], include:
- Existing WQ data on
  - Background[2] data (8 samples)
  - Injection water
  - Aquifer
  - Aquifer matrix (chip samples)
- Numerical Simulation predictions of potential geochemical reactions in aquifer
- Identify data gaps and next steps

- WQ Feedback on next steps and additional data needs from Feasibility Study report review
- Identify data gaps and ok to proceed to QAPP
- DOH check-in
- OCR and WR provide non-WQ review of Feasibility study and identify additional data gaps

Complete QAPP to address:
1) All sampling/testing:
   -aquifer test
   -WQ sampling to fill WQ data gaps
   -modeling (on case-by-case basis)
2) QAPP review by OCR, WQ, and WR, with copy to DOH, as needed)
3) OCR approves QAPP before field work.
4) Note additional QAPPs may be needed for future sampling efforts.

- Refine predicted geochemical reactions using new data
- Potential for additional geochemical modeling, as needed
- OCR, WQ, WR review of final report
- WQ reviews and recommends additional data collection, if needed
- Send to DOH for information and review (if DOH requested additional data collection)

AKART report and request for OPI.
- AKART and WQ sampling report included in Final compiled feasibility report. Feedback on OPI request and reviewed as part of final compiled feasibility report[3]

- Final report compiles all reporting to date in one document. WQ, WR, and OCR review. If part of funding agreement, OCR reviews for agreement deliverable before submittal for permit application
- Send copy to DOH for information

NOTES:
1. Refer to WQ Resources Guidance provided at pre-application meeting (ECY publications nos. 15-10-024 and 17-10-035).
2. Background groundwater quality conditions must be established according to the procedure defined in the Groundwater Quality Implementation Guidance (ECY Publication no. 96-02, Section 4.2.1.1.3). Background conditions should be used to define criteria for assessing compliance with the Groundwater Quality standards and to determine that the ASR operation is not violating anti-degradation.
3. Notes on timing/next steps: WQ issues OPI with ECY Director approval OR denial before a permit decision. Informal feedback to applicant would happen as part of application review and before preliminary permit for pilot testing. (Preliminary permit(s) for pilot testing issue after reservoir application submitted and are based on application.) Reservoir permit includes WQ criteria, monitoring & reporting.
4. WQ = Ecology Water Quality Program, WR = Ecology Water Resources Program; OCR = Ecology Office of Columbia River; DOH = WA Department of Health

To request an ADA accommodation, contact Ecology by phone at 509-454-4241 or email at tim.poppleton@ecy.wa.gov. For Washington Relay Service or TTY call 711 or 877-833-6341. Visit Ecology's website for more information.

V: 06.21.22
Publication #22-12-003

Feasibility Report Information

- **Chapter 173-157-110 WAC requires info on:**
  - Conceptual Model
  - Operation Plan
  - Legal framework
  - Environmental Analysis
  - Mitigation Plan
  - Monitoring Plan
- **Chapter 173-219 WAC requires same info**

ASR Reservoir Permits

***RCW 90.03.370(2)(a) and (b)* –establishes the right to store and withdraw water in groundwater**

1. Pre-approval for aquifer testing (includes QAPP)
2. Aquifer testing and data collection
3. Reservoir Permit application aquthorizes aquifer recharge operations

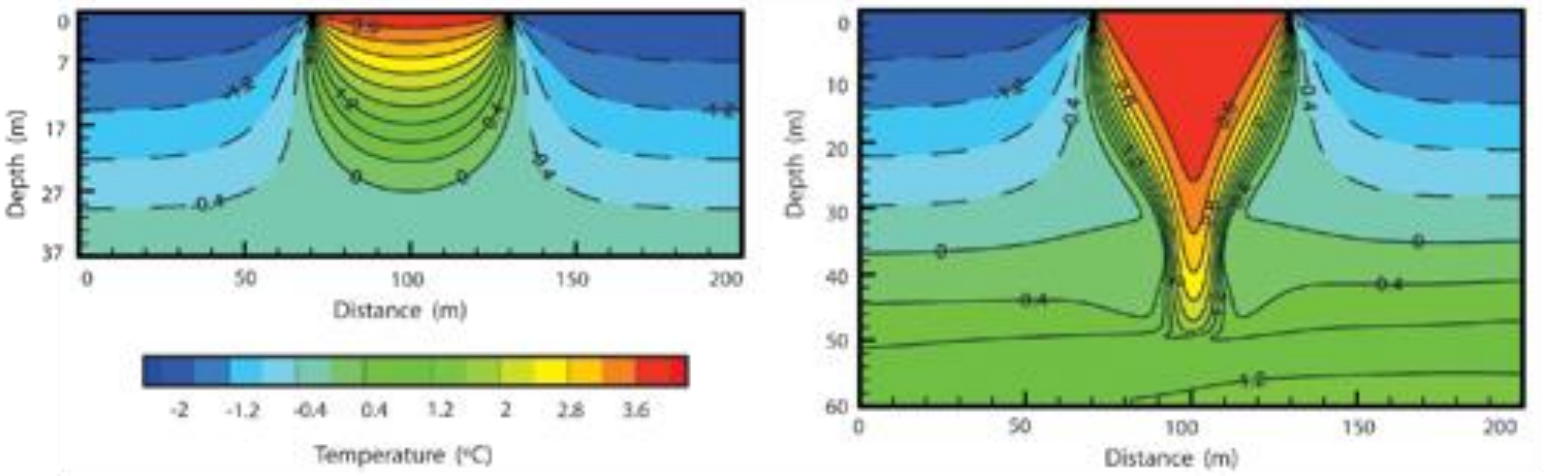
Groundwater Quality Regulation

Geochemical Reactions in Aquifers

- Biodegradation
- Oxidation or reduction
- Sorption and ion exchange
- Filtration
- Chemical precipitation
- Volatilization or photochemical reactions
- Acid – Base reactions

Groundwater Quality compliance assessed using criteria:

- ❑ Drinking water criteria
- ❑ Groundwater quality standards
- ❑ Antidegradation



Aquifer Recovery

- Water Resources Permitted recovery
- Pink drop in Pink drop out
  - Lateral and vertical extent of aquifer
  - Confined or unconfined
  - Total storage volume available
  - Groundwater movement in aquifer (flow direction and rate)
- Water Quality Permitted recovery
  - Reclaimed water source water

Columbia Basin Regional Source Water availability

1. Treated Wastewater from Agricultural Processing Operations

   Private Industry ownership and management (permitted by Dept of Ecology)

2. Columbia River Irrigation Project

   US Bureau of Reclamation & Irrigation District management

Agriculture Processors Daily discharge

Water Quality Name	City	County	average daily discharge (MGD)
JR SIMPLOT CO OTHELLO	Othello	Adams	2.1
MCCAIN FOODS INC	Othello	Adams	2.37
SVZ USA INC	Othello	Adams	0.1
LAMB WESTON Foods Pasco	Pasco	Franklin	4
CAREFREE MEATS	Basin City	Franklin	0.006
LAMB WESTON Foods Connell	Connell	Franklin	1.34
PASCO INDUSTRIAL	Pasco	Franklin	2.76
PACIFIC COAST CANOLA	Warden	Grant	0.028
BASIC AMERICAN FOODS	Moses Lake	Grant	1.42
JR SIMPLOT CO MOSES LAKE	Moses Lake	Grant	1.7
NATIONAL FROZEN FOODS - MOSES LAKE	Moses Lake	Grant	1.01
NATIONAL FROZEN FOODS - QUINCY	Quincy	Grant	0.21
JR SIMPLOT WALLULA	Wallula	Walla Walla	NA
TYSON FRESH MEATS	Wallula	Walla Walla	1.9
Dischargers to WARDEN/OB3 Treatment Operations			
LAMB WESTON BSW	Warden	Grant	0.63
WASHINGTON POTATO	Warden	Grant	0.52
COUNTRY MORNING FARMS	Warden	Grant	0.008
TOTAL ERO Daily Discharges (million gallons per day)			***20.102***

Reclaimed Water Permits

Information required for permit application

- Feasibility Analysis
- Conceptual Model Framework
- Pilot Test
- *Engineering Design*

Permit authorizes

- Discharge of reclaimed water to groundwater
- Reclaimed water recovery from groundwater
- Beneficial Use(s) of recovered water

Reclaimed Water Design Project

- Ecology Coordination with UW School of Public Health on EPA funding proposal
- Develop reclaimed water treatment WA Engineering Certification (CEU)
- Project proposal includes
  - demonstration of certification training
  - Engineering design of reclaimed water treatment systems
- Partnership with interested Columbia Basin communities to implement reclaimed water treatment (& potentially ASR) to address the declining water supplies
- Separate Federal infrastructure funding for reclaimed water treatment facility construction

EPA United States Environmental Protection Agency

MENU

Search EPA.gov

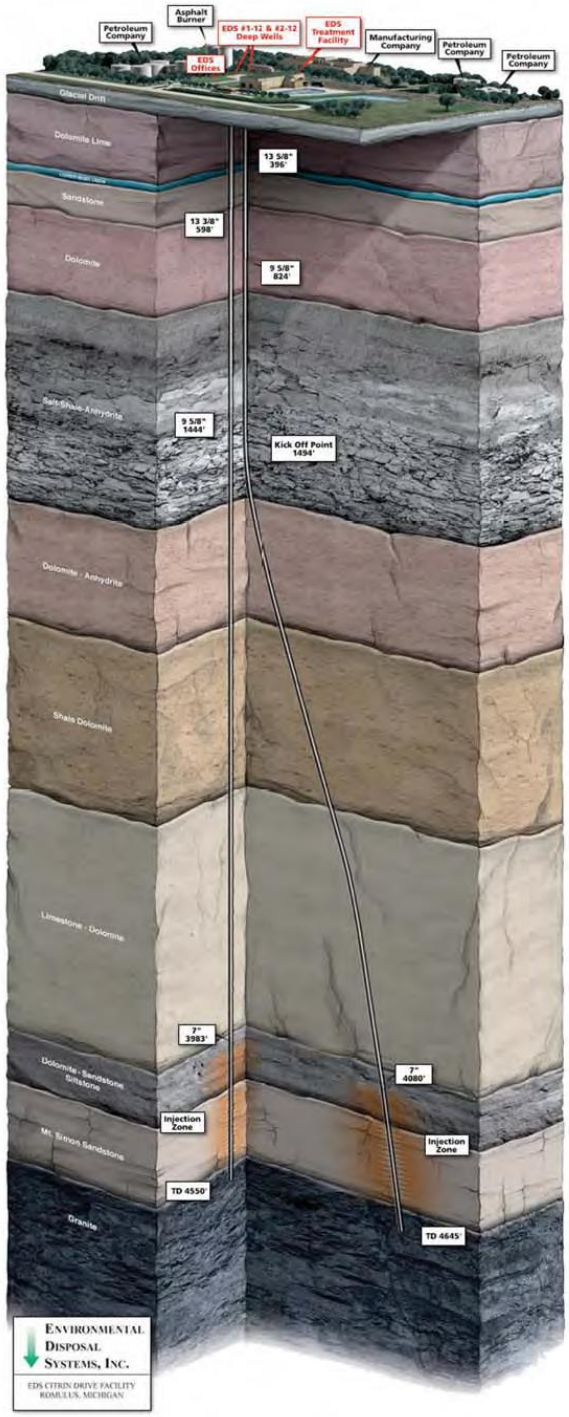
Water Infrastructure

CONTACT US <https://epa.gov/water-infrastructure/forms/contact-us-about-water-infrastructure>

Water Technical Assistance Request Form

OMB Control Number: 2030-0051

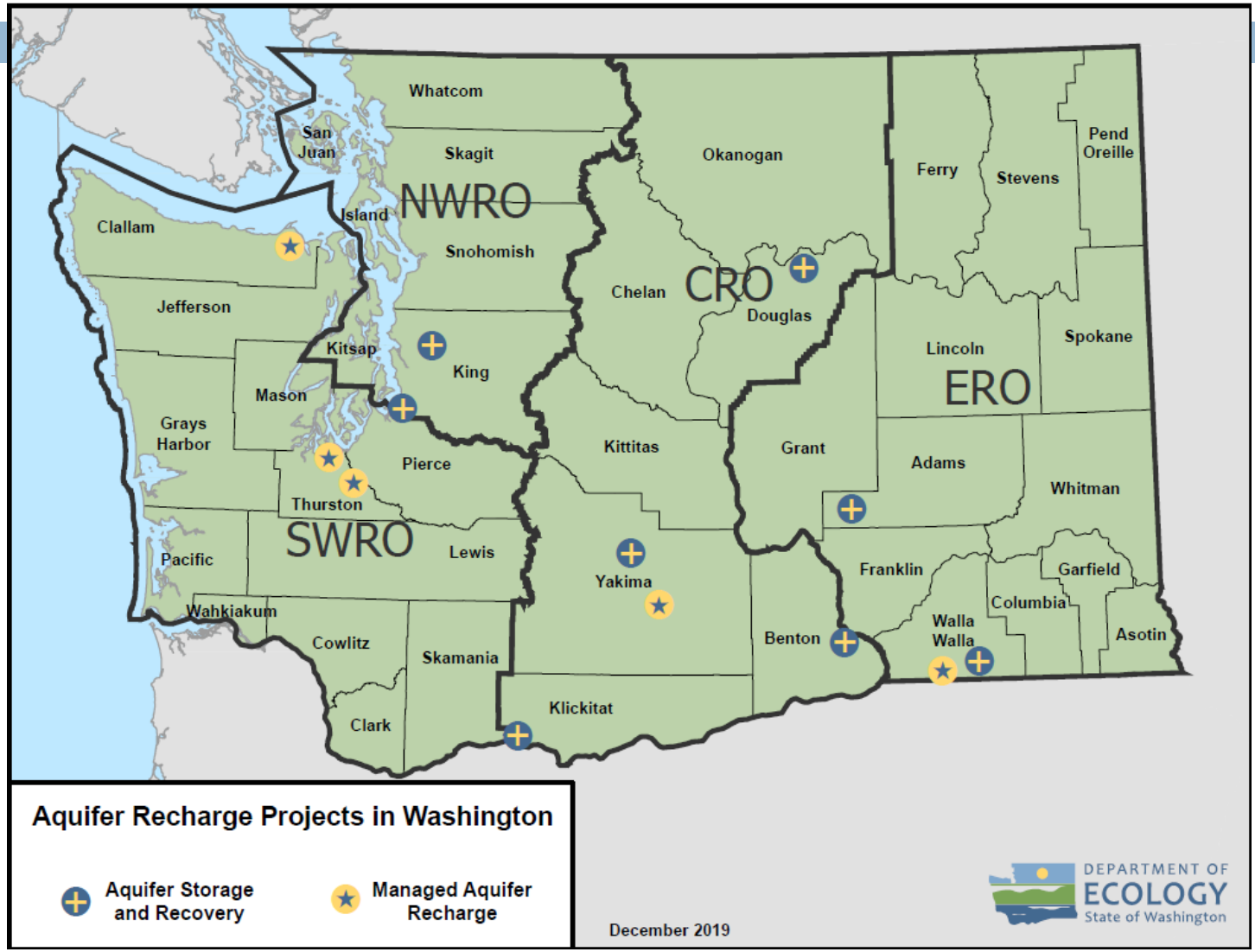
Expiration Date: 5/31/24



Washington Aquifer Recharge Projects in operation

1. **Othello ASR project–** testing underway
2. **Walla Walla ASR project –** permitted with10 years+ operation
3. **Kennewick ASR project–** permitted and operating for10 years
4. **Yakima ASR project -**
5. **Airway Heights MAR** - Reclaimed Water infiltration
6. **Walla Walla MAR –** Stiller Pond infiltration

Questions/ comments?



Overriding Public Interest Consideration

- Requires demonstration that AKART is met

  AKART *(derived from the Permit Writers Handbook Ch 4)*

  Excerpt from the Handbook's introduction to AKART states:

  "Because AKART encompasses a complex process of engineering and economic decision-making there can be no simple definition"

- Requires that at least 1 of 3 benefits exists:
  1. Alleviation of a public health concern
  2. Net improvement to the environment
  3. Socioeconomic benefits to the community
- The balance between water quality impacts and project benefits must justify greater project benefits than detriments
- Re-evaluate with new monitoring data every 5 years