SGW-66242-VA
Revision 0

FY2022 Rebound Study for the 100-H North Subarea of the HR-3 Operable Unit

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract 89303320DEM000030

P.O. Box 1464
Richland, Washington 99352

Approved for Public Release;
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Date Published
March 2021

Deparment of Energy, Richland Office
Richland, WA

03/29/2021

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APPROVED
By Lynn M Ayers at 6:13 am, Mar 30, 2021

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FY2022 Rebound Study for the 100-H North Subarea of the HR-3 Operable Unit

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Presented to: Department of Energy, Richland Office (DOE/RL) and Washington State Department of Ecology (Ecology)

Date: March 29, 2021

Purpose of Presentation

- Propose a groundwater rebound study within the 100-H North Subarea
- Describe the historical remediation activities
- Describe updates made to the Principal Study Question (PSQs) for the parent rebound Sampling and Analysis Plan (SAP)
- Discuss the relevant PSQs
- Present the rebound study sampling design
- Discuss compliance issues associated with Record of Decision (ROD) cleanup levels and path forward (with DOE/RL and Ecology) for FY2022

Outcomes of Planning Meeting

Reach agreement on:

- Data needs for the 100-H North subarea
  - Sample location and frequency
  - Rebound study duration
- Permissible rebound levels and conditions upon which the rebound study would be terminated early
- Post-rebound monitoring

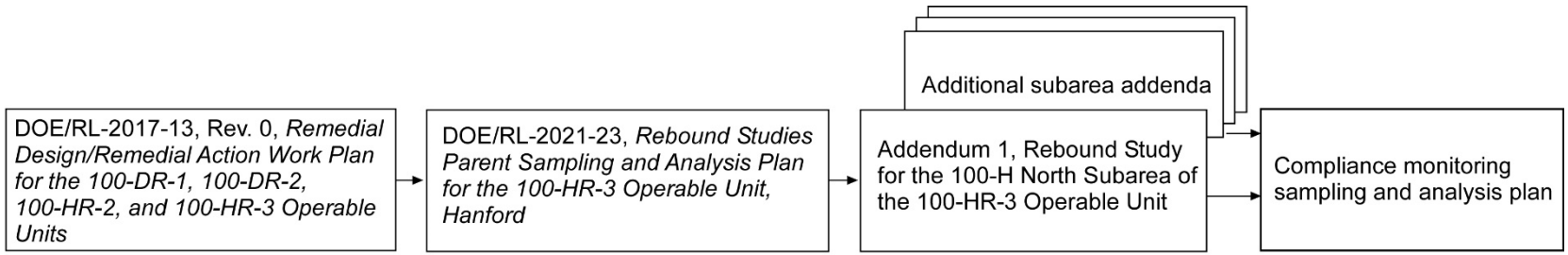
Objectives of Rebound Study

A rebound study involves the partial or complete shutdown of the Pump & Treat (P&T) system for a duration of time, allowing for the evaluation of Cr(VI) concentrations under ambient (no pumping or injecting of groundwater) aquifer conditions. The proposed subarea rebound study will occur within the unconfined aquifer

The subarea rebound study objectives include:

- Evaluation of Cr(VI) concentrations to determine if groundwater remediation activities have met or are on track to meet cleanup goals and timelines identified in the final ROD
- Determine how the unconfined aquifer changes (hydraulically and hydrochemically) during shutdown
- Provide additional information for continuing source evaluation and remediation

Document Organization Background



Current Status	Revision 0	Decisional Draft	Internal Draft	Draft Planned FY22
DOE-RL Transmit Draft A to Ecology		4/28/2021	7/6/2021	TBD

FY = fiscal year TBD = to be determined DOE-RL = U.S. Department of Energy, Richland Operations Office

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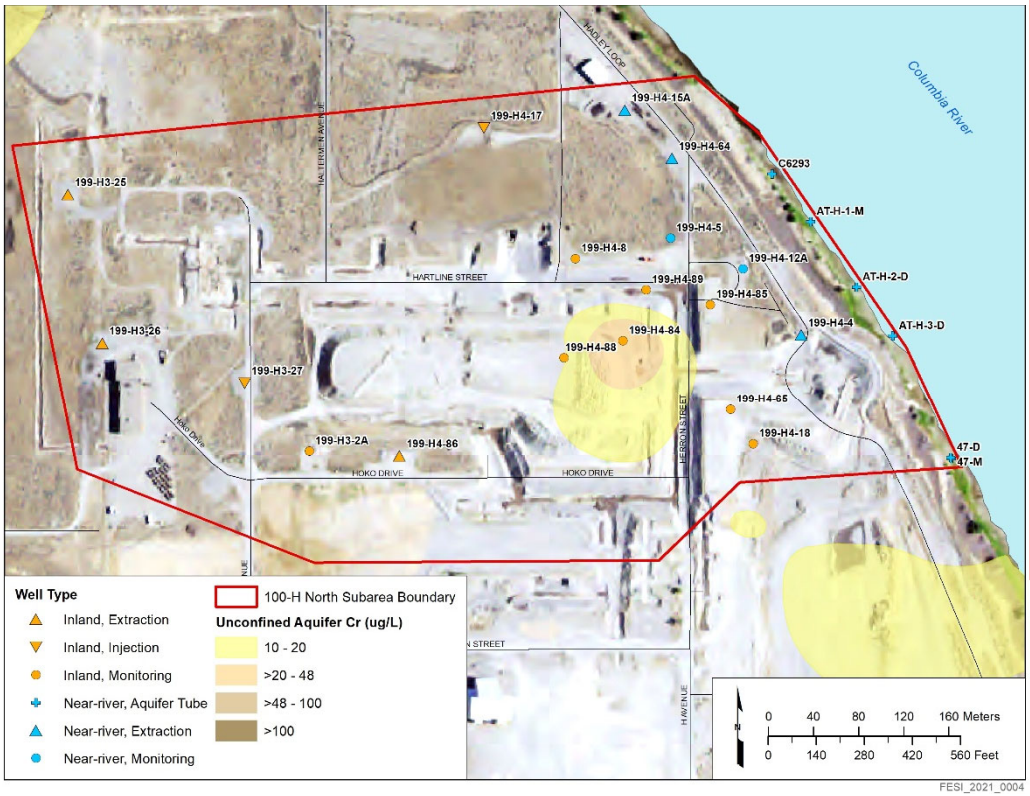
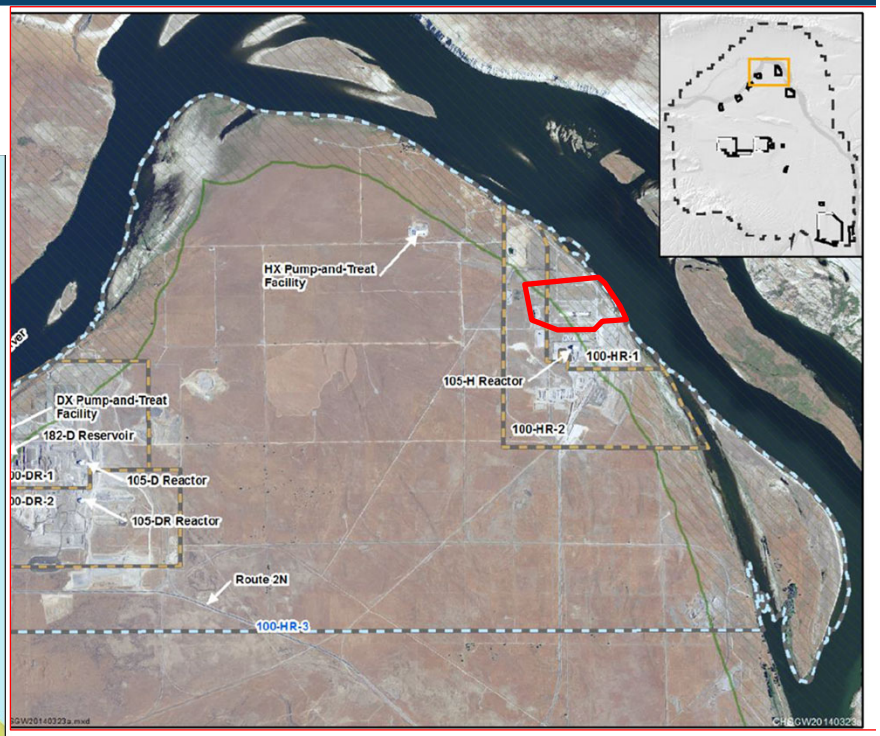
100-H North Subarea



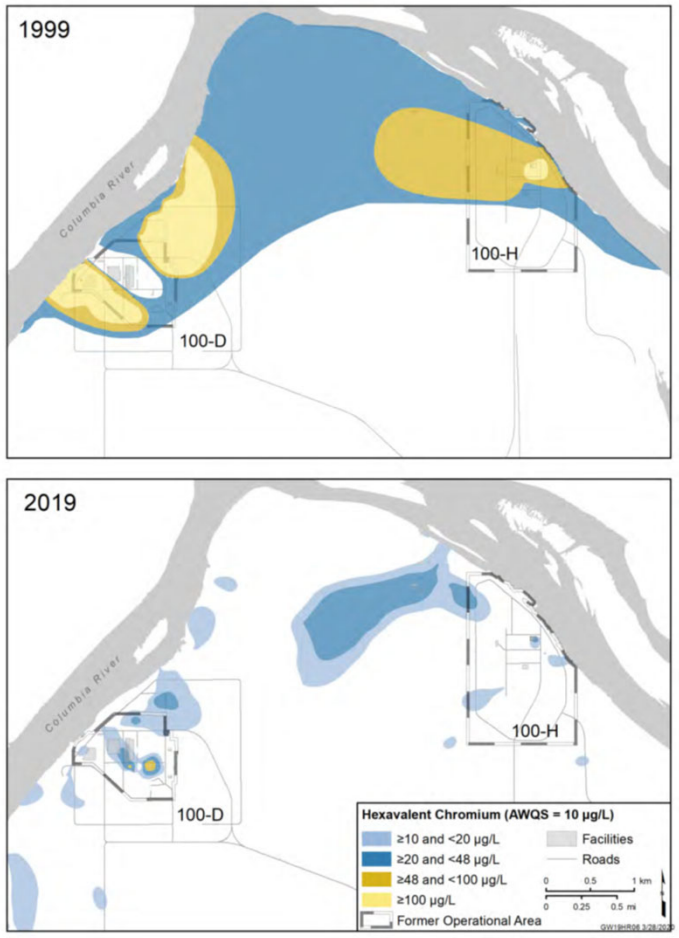


Plume extent and concentrations are from DOE-RL-2019-66, *Hanford Site Groundwater Monitoring Report for 2019*

Status of Cr(VI) plume in 100-HR-3 Operable Unit (OU)

Cr(VI) plume size and concentration comparison, 1999-2019

- Comparison figure shows plume in 1999 (2 years after the first P&T system began operating) and in 2019
- Plume size and concentrations of areas at >100 µg/L and 48 µg/L in the unconfined aquifer have been reduced due to continued P&T system operation, particularly in the 100-H North subarea



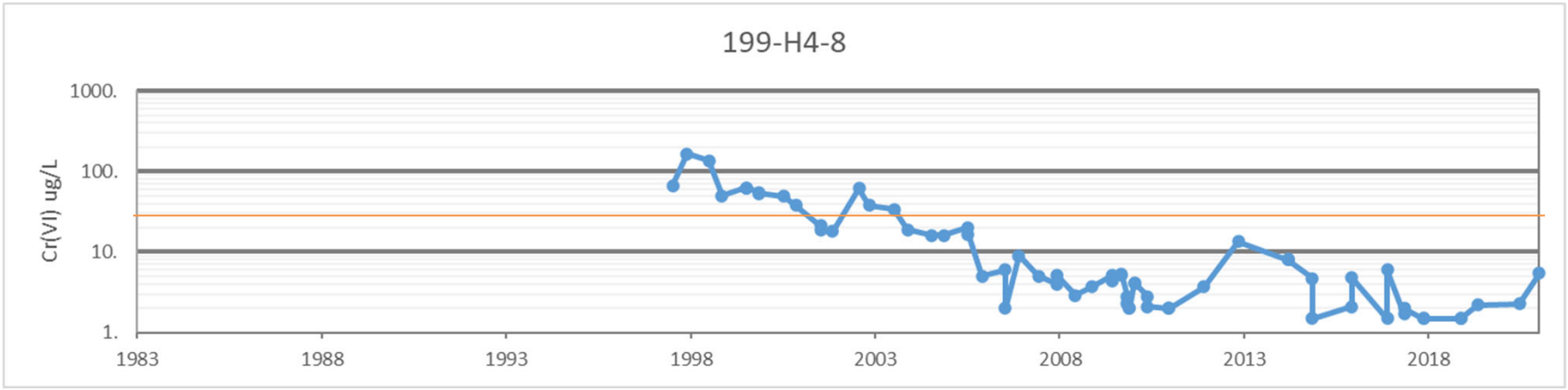
DOE-RL-2019-66, *Hanford Site Groundwater Monitoring Report for 2019*

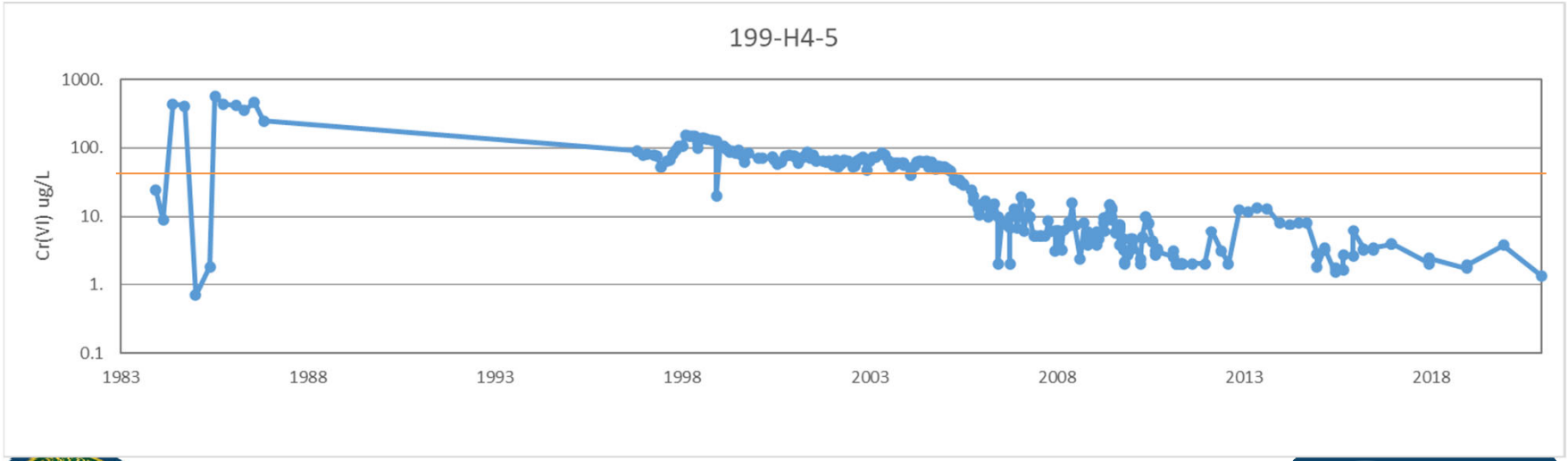
100-H North Subarea Rebound Study

Extent of Cr(VI) Contamination and Considerations for Rebound Study

- Cr(VI) concentrations largely under 48 µg/L inland cleanup level within subarea
- Cr(VI) concentrations along shoreline below 10 µg/L creating buffer zone
- Cr(VI) concentrations have been stable largely below 48 µg/L
- Subarea located away from areas of scheduled P&T realignment activities
- Extensive network of wells in place for monitoring the rebound
- Adequate extraction and injection well network for contingent river protection in case of Cr(VI) rebound
- Evaluate continuing sources impact (if any) on the unconfined aquifer in the absence of pumping

Cr(VI) Time Series Plots





Updates to PSQs from Parent SAP DQO

After the December 3, 2020 DQO workshop the following changes were made:

- PSQ 3 was not changed, but is not relevant to the 100-H North subarea
- PSQ4 was re-worded to specify unconfined aquifer hydraulics is the parameter of interest
- PSQ 4a was reworded to address changes in hydrochemistry and was combined with PSQ 5
- PSQ 4b was re-numbered as PSQ 6
- PSQ 6 was renumbered PSQ 7

These changes were made to clarify the purpose of each PSQ and will not impact how the rebound studies are designed

Principal Study Questions for 100-H North Subarea

- PSQ 1: What is the magnitude and spatial extent of Cr(VI) concentration rebound in the absence of P&T?
- PSQ 2: In the absence of P&T operations, are Cr(VI) concentrations below OR anticipated to meet the ROD inland cleanup level of 48 µg/L and surface water cleanup level of 10 µg/L and expected to remain below cleanup levels?
- PSQ 4: How is the aquifer within the rebound study areas affected hydraulically following shutdown of P&T?

Principal Study Questions for 100-H North Subarea (continued)

- PSQ 5: Has groundwater hydrochemistry reverted to ambient conditions?
- PSQ 6. What are the seasonal effects in groundwater Cr(VI) concentrations within the rebound study area due to river stage?
- PSQ 7: Can the project use the data to supplement compliance monitoring?

Data Needs and Key Issues

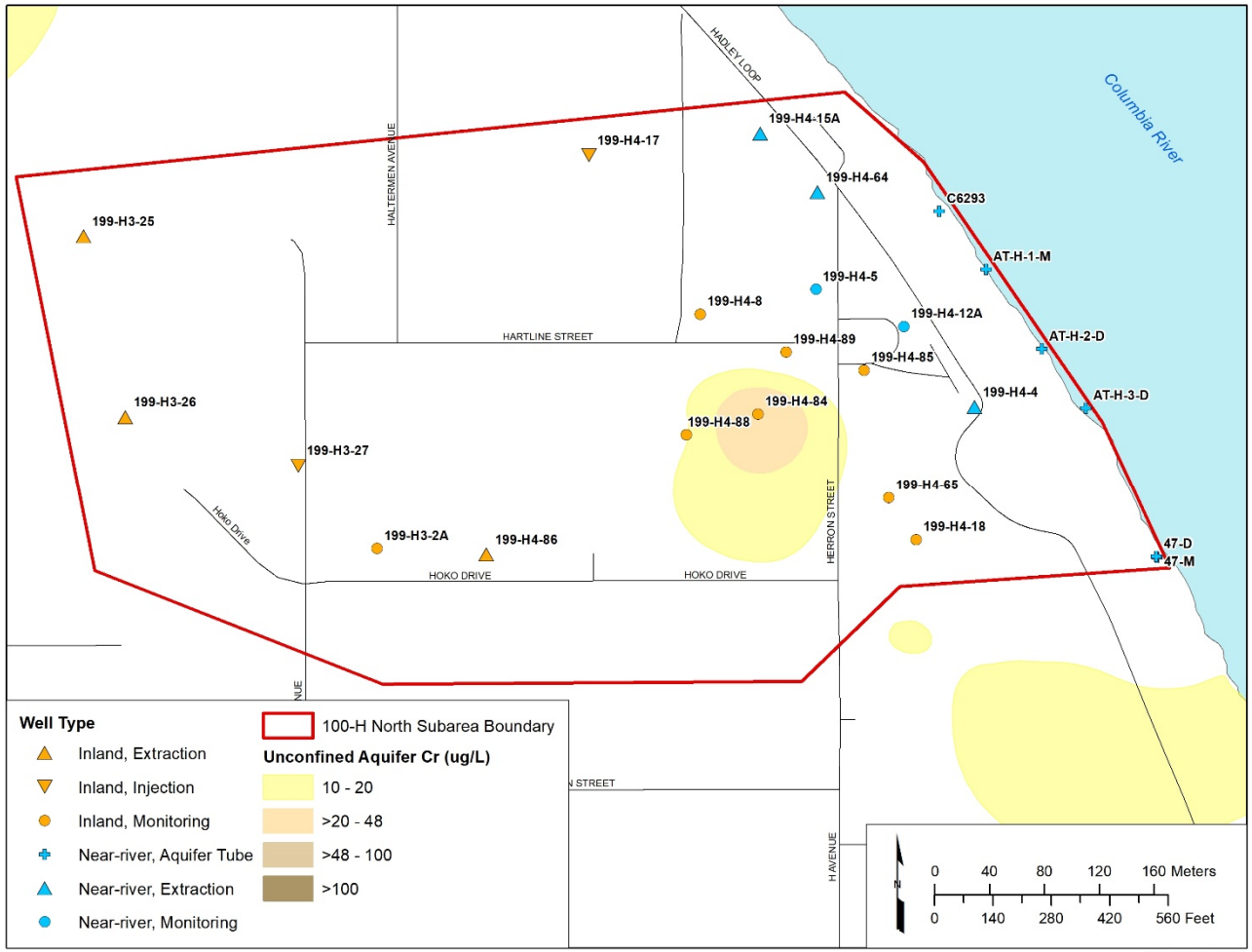
Data Needs:

- Water Level Measurements (manual collection, Automated Water Level Network (AWLN) and pressure sensor)
- Cr(VI) concentration measurements
- Major ion hydrochemistry

Key issues to be addressed:

- Progress/status on ROD cleanup goals
- Time equivalent water level measurements essential for accurate hydraulic gradient and groundwater flow path estimation; AWLN ensures synchronous measurements
- Groundwater hydrochemistry (ionic strengths, etc) to indicate river stage effects on plume migration and Cr(VI) concentrations
- Incidental insight into continuing sources within the periodically rewetted zone (PRZ)

Inland and Near-River Monitoring Network

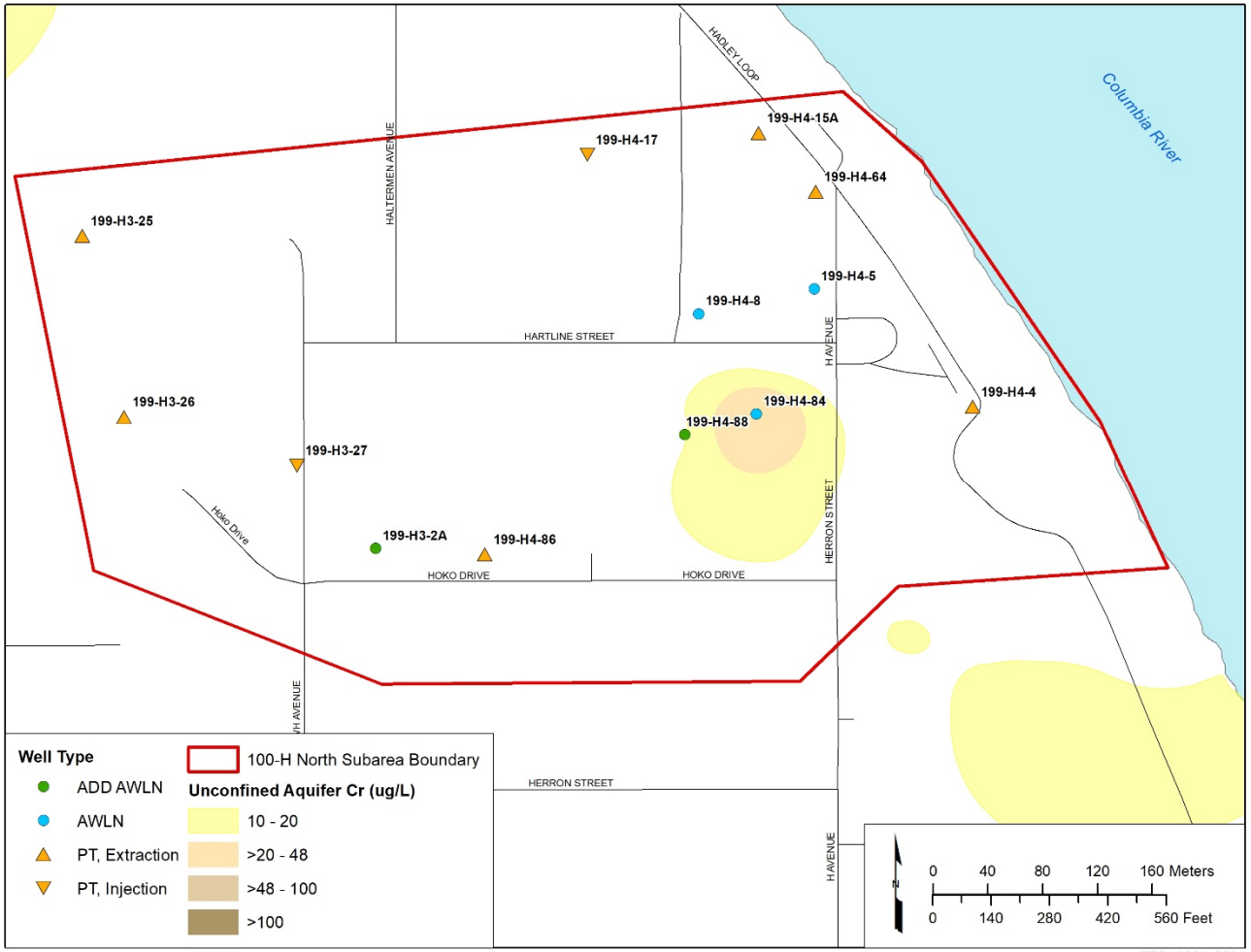


Duration and Sampling Frequency

One year study beginning October 2021; evaluate after first year for extended duration, as needed

- **Inland wells**
  - Includes Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and shut-down P&T wells
  - Sampling frequency - First month of the rebound study, then every other month. Contingency to go monthly.
- **Near-river wells and aquifer tubes**
  - Sampling frequency - Monthly

Locations of Current and Planned AWLN Wells and P&T Wells with Continuous Monitoring of Water Levels



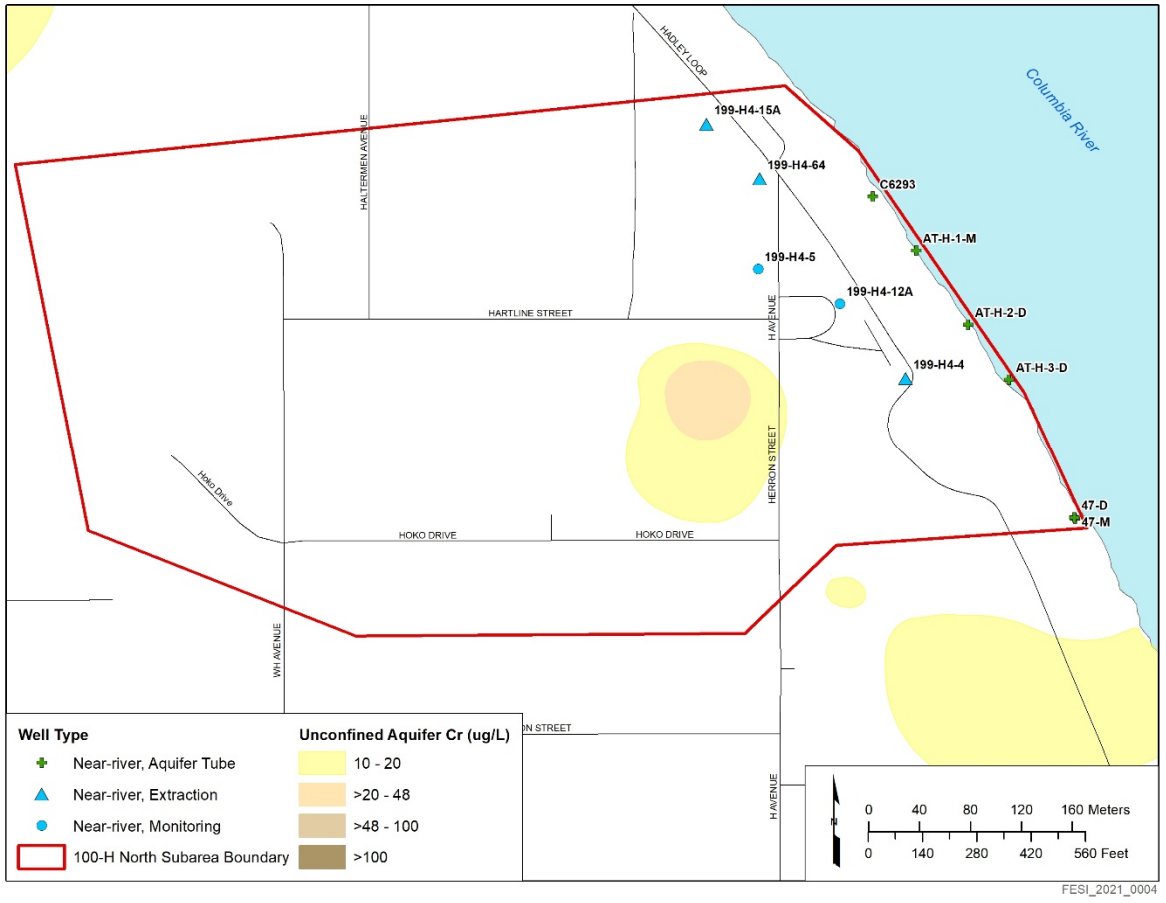
Summary of Scope, Schedule and Duration

- One year study beginning October 2021; evaluate after first year for extended duration, as needed
- In addition to 10 monitoring wells and 6 aquifer tubes, 6 extraction and 2 injection wells in the unconfined aquifer system will be turned off and sampled
- Sampling frequency at wells and aquifer tubes at least every other month and, at most, monthly along shoreline locations
- Monitoring will include Cr(VI) concentrations, water levels, and hydrochemical parameters from field measurements and AWLN data

Early Termination of Rebound Study

In the event ROD cleanup levels are exceeded at critical locations, Ecology will be notified, results discussed, and possible discontinuation of study.

- Near-river wells >48 µg/L for 3 consecutive measurements
- Aquifer tubes >10 µg/L for 3 consecutive measurements



Post-Rebound Monitoring

PSQ 7: Can the project use the data to supplement compliance monitoring?

If a compliance monitoring SAP is approved by the end of the rebound study, then evaluate data usability under that SAP, else consider post-rebound study monitoring frequency:

- Less frequent monitoring under current performance and monitoring SAP or
- Sample under rebound study SAP but reduce monitoring frequency to quarterly at all locations.

After the 12-month monitoring period, pumps will remain off while data are evaluated to support a decision on permanent shutdown of P&T operations at this subarea.

Outcomes/Expectations from 100-H North Rebound Study

- In the event Cr(VI) concentrations are fully expected to be compliant with ROD cleanup goals
  - Continue shut-down of P&T system with continued subarea groundwater monitoring with possibly reduced sampling frequency (e.g., quarterly)
  - Evaluate transition to compliance monitoring phase.
- If Cr(VI) concentrations are not expected to comply with ROD cleanup levels
  - End rebound study
  - Implement Remedial Process Optimization (RPO) to P&T system and resume active remediation
- If Cr(VI) concentrations indicate a continuing source further evaluation for remedial action will be undertaken

Path Forward for the Initial Rebound Study at 100-HR-3 OU

- Primary workshop objective: concurrence on final rebound study design. Includes: duration, agreement on subarea, sample locations, data types, and frequency
- Prepare the 100-H North subarea rebound study SAP addendum. The addendum is planned to be transmitted to Ecology by July 6, 2021
- Plan and perform any preparation work needed before the rebound study can begin (e.g., update monitoring network)

Summary

- Subarea extent
- Rebound study duration
- Data needs for the 100-H North subarea
- Sample location and frequency
- Conditions upon which the rebound study would be terminated
- Post-rebound monitoring