Surface Water-Groundwater Interactions as a Critical Component of Uranium Plume Persistence

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Session 2.1 – Groundwater Compliance Challenge
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“How does a mill site’s history relate to surface water-groundwater interactions? Can it contribute to U plume persistence?”

Courtesy: Alan Yoder; Story City, IA
Mill legacy and residual U contamination

- 8-month snapshot (2011) emblematic of past 20 years \(\rightarrow\) *largely persistent plume*
- Do certain components of the system have outsized impact on U persistence?
Surface Water-Groundwater Interactions
“A key component?”

CO River Discharge vs. GW Elevation


Calendar days from January 1, 2007

Discharge (cfs; blue)

Groundwater elevation (ft; red)
Reclamation: Supplemental Standards
Reclamation: Supplemental Standards

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This Supplemental Standards Application pertains to the mill tailings contamination contained in the road berm at the north side of the Old Rifle Processing site. Supplemental Standards Drawings RFL-SSOR-0002 through RFL-SSOR-0008, located at the back of this application, depict the assessed deposits of tailings in the areas for which Supplemental Standards are being considered. Remediation of the tailings deposits adjacent to the road berm was performed to the maximum extent possible. The excavation was stopped as close to the edge of the road as possible without endangering workers by de-stabilizing the slope.

B.2.1 Location Description

The Supplemental Standards Application is within Garfield County, Colorado. A portion of the State Highway 6 and 24 berm is located within the Old Rifle processing site boundary. The berm is adjacent and parallel to the site’s north boundary. The site’s north boundary is also the limit of the Highway 6 and 24 right-of-way (Figure RFL-SSOR-0009). A portion of the berm, about 1600 ft long, contains contaminated material buried under clean fill, which is the area proposed for application of supplemental standards.
Supplemental Standards and GW

Site wide groundwater gradient and flow direction [2014]

- Average annual flow direction: S-SW or ca. 185-195° azimuthal from north
- Variation in flow direction during hydrograph excursion
Supplemental Standards and GW

May 2013 Uranium Map

Uranium (ppb)

Value
High : 300
Low : 20

average GW flow direction

SY02
SY08

0 62.5 125 250 375 500 Feet

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Supplemental Standards and GW

June 2013 Uranium Map

Uranium (ppb)

Value

High : 300

Low : 20

average GW flow direction

SY02

SY08

average GW flow direction

0 62.5 125 250 375 500 Feet

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Supplemental Standards and GW

July 2013 Uranium Map

Uranium (ppb)
Value
High: 300
Low: 20

SY08
SY02
average GW flow direction
average GW flow direction

0 62.5 125 250 375 500 Feet
Seasonally stable U concentrations → GW elevations always higher than base of Supplemental Standards @ 5297-ft
Surface Water – GW Interactions: SY02 Uranium

Calendar days from January 1, 2013
SY02 Uranium Isotopes vs. Time

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Surface Water-Groundwater Interactions

CO River Discharge vs. GW Elevation

From 2007-2015, two drought years where max. GW elevation <5305-ft
Drought & Low Flow Year: 2018

- Minimal contact with supplemental standards at SY02 (<5305-ft)
- Persistent contact with standards at SY08 (>5297-ft)
Drought & Low Flow Year: 2018

Uranium Activity Ratios

- SY02 UAR ~1.25 – 1.3 vs. ~1.1-1.15 previous years during peak [U]
- SY08 UAR ~1.1 which is seasonally & annually stable
Putting things in a wider DOE-LM/-EM context:

“Is Old Rifle an anomaly?”

Courtesy: Russ McCallister

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Putting things in a wider DOE-LM/-EM context:

“Is Old Rifle an anomaly?”

Thank you.

Questions or comments?