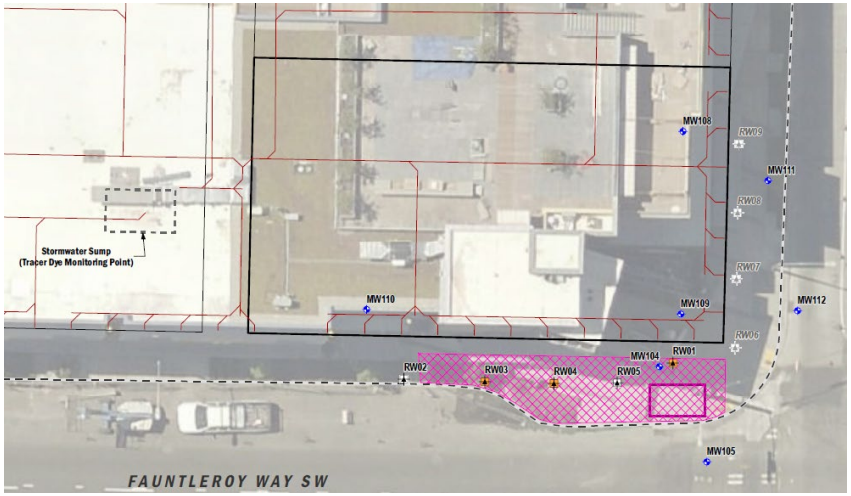

Department of Ecology

Injection Pilot Test Results and Effects

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Overview

- Injections Pilot Test:
  - Objectives and off-ramps
  - Results and conclusions
- Groundwater Monitoring Results Q1 2021:
  - Tracer dye effects
  - Conclusions
- RW Extraction Wells:
  - Installation timeframe
  - Construction and usage
- Recommended Path Forward

Injections Pilot Test: Objectives

- Overall Objective: Can well system support an ISCO injection program without interaction with the Whittaker storm drainage system?

- Evaluate:
  - Area of influence (transducers in adjacent wells)
  - Volume of Injection Solution (1,100 gal/well)
  - Surrounding Formation (minimum flow rate of 2gpm)
  - Solution interaction with Whittaker building storm drainage system (fluorescence monitoring at the sump)

- Off-Ramps for Pilot Test, if met at any well
  - Detection of fluorescent dye in the storm drainage system
  - Unable to maintain 2 gpm minimum flows

Injections Pilot Test: Summary

- January 5-12, 2021 active injections
- Dec. 29, 2020 to Feb. 9, 2021: sump monitoring
- Scope:
  - Approx. 1100 gal. of clean water was gravity fed to each well: RW03, RW04, RW05
  - Unique, conservative, fluorescent, nonreactive tracer dye applied as a slug ahead of water in each well
  - Packer placed in the well to concentrate injection in the upper 5 feet of saturated screen
  - Whittaker building stormwater sump monitored for fluorescence
  - Injected at 2-3 gpm

Injections Pilot Test: Results

- Tracer dye from RW05 detected in the sump approx. 48 hours after completing the injection
- Tracer dye from RW05 still present in the sump 28 days after completing the injection

Conclusion: Short circuiting pathway exists between the well network and the Whittaker storm drainage system, which could introduce oxidant to the stormwater system during an ISCO injection program.

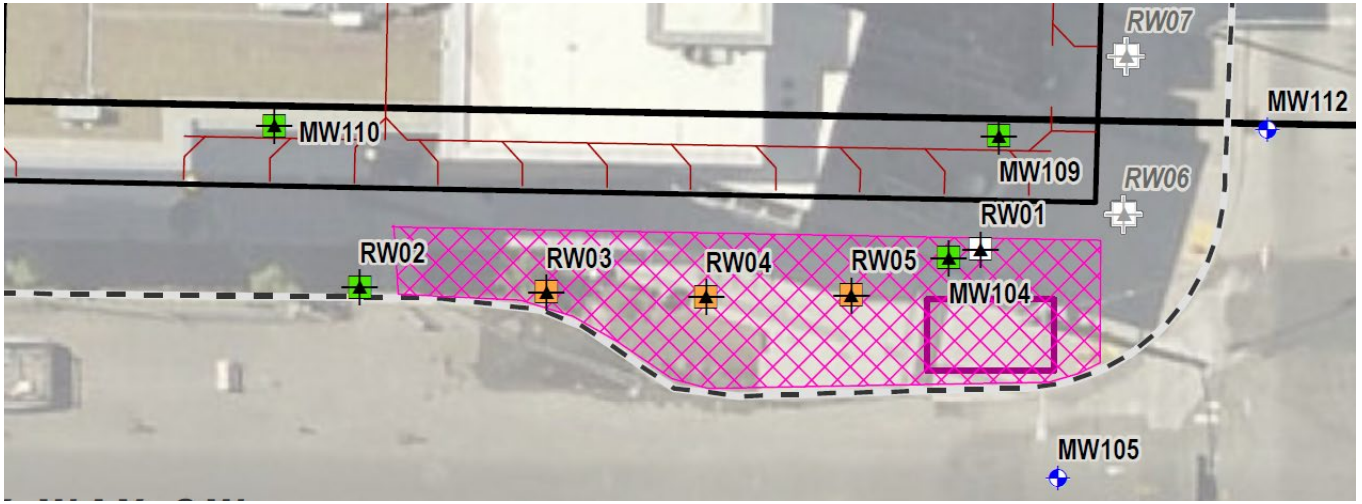
Tracer Dye in Wells After ~2 months of equilibrium (January 12, 2021 to March 8, 2021)

RW03

RW04

RW05

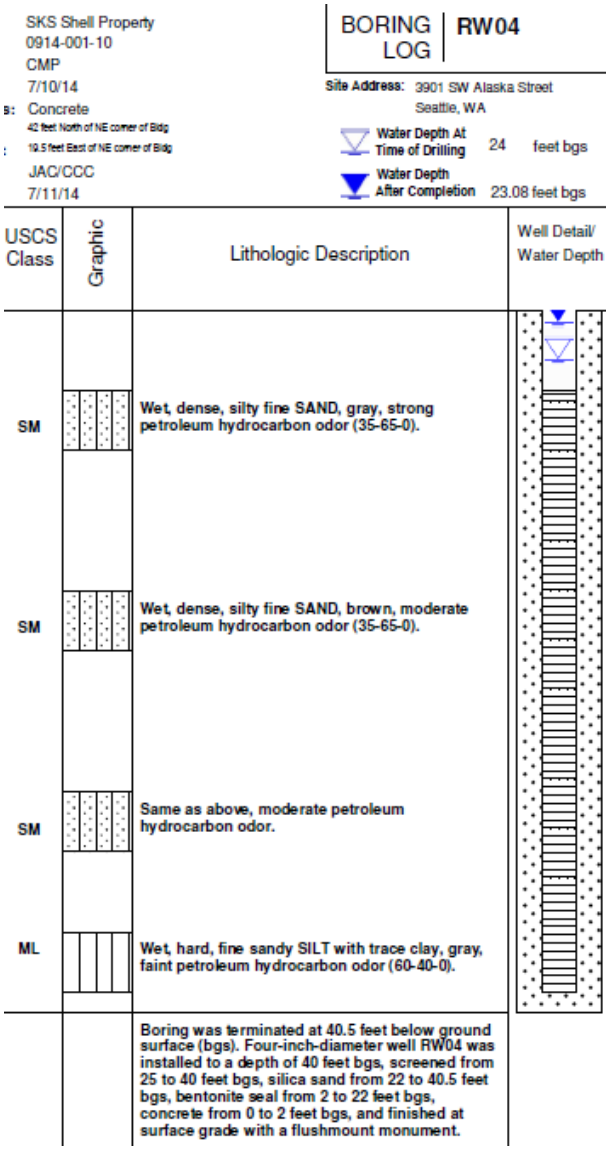
Q1 2021 Groundwater Results



- Abnormally high detections diesel-range hydrocarbons detected in RW wells; some concentrations are higher than ever detected before remediation – WHY? Was it the Pilot Test?
  - The laboratory reports that the TPH did not match the diesel standard, that there is significant interference, and silica gel indicates polar compounds (or not representative of a hydrocarbon which is non-polar).
  - The abnormal result is NOT the dye. A tracer-dye-only standard did not produce a similar chromatographic pattern.
  - Field equipment, injected water, dye, and water storage tanks were proven NOT to be sources of contamination.
- Highest concentration was detected in RW05, which has never exceeded MTCA Method A CULs during compliance gw monitoring - and nearby well MW104 (9 feet from RW05), contained expected concentration of diesel-range TPH.

RW Extraction Wells

- Groundwater dewatering/extraction was intended as part of the remediation approach
- RW01 through RW09 originally installed as extraction wells
- Target extraction rate from each wells was 0.5 gpm for a total system dewatering of 4.5 gpm (SES, Cleanup Action Plan, 2014)
- Dewatering of the Site was completed 3/2015 through 6/2017 (SES, Cleanup Action Report, 2017)
- Based on calculations made in the Cleanup Action Report, 4 gallons of dissolved phase gasoline and 0.18 gallons of benzene was removed in a total of over 135,000 gallons of water removed



RW Extraction Wells

- 2014: RW03 through RW09 installed
- 2015: Groundwater extraction occurs during Site redevelopment; RW06 through RW09 altered during construction
- 2016: Compliance groundwater monitoring begins using RW03
- 2017: Compliance groundwater monitoring begins using RW04 and RW05. Ecology deems RW06 through RW09 out of compliance
- Jan. 2021: Injection pilot test completed on wells RW03, RW04, and RW05
- Mar 2021: Q1 compliance groundwater monitoring occurs

Conclusions

- Pilot test was useful in establishing that the well network is not suitable for ISCO injections without short-circuiting to storm system beneath the building
- Q1 2021 hydrocarbon detections in RW wells are abnormal - likely due to interference possibly from historic rind in RW wells, or a substance washed into the wells from the casing, or interaction of dye in the subsurface.
- RW wells are not constructed for use as groundwater monitoring wells and should be discontinued as such. These wells were used to remove large volumes of contaminated groundwater from the excavation and may contain residual degraded organics and hydrocarbons – not representative of surrounding groundwater.

Recommended Path Forward

- Decommission remaining RW extraction wells
- Install proper compliance well in Fauntleroy Way
- Evaluate results after two quarters:
  - Targeted injections via probes?
  - Adjust monitoring frequency?

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