[DRAFT—JANUARY 17, 2017]

EXHIBIT E

Inactive Extraction Well Ext-9 Longer-Term Pumping Tests Proposed Data Quality Objectives

Overview

Work to be performed includes a longer-term groundwater extraction demonstration for previously installed inactive extraction well Ext-9. This document presents background information and details of Ext-9 pumping test Data Quality Objectives (DQOs), which were drafted based on EPA's five criteria: specific, measureable, realistic, assignable, and time bound.

Background

Extraction wells Ext-7 and Ext-9 were installed to evaluate the potential of pumping groundwater from within (i.e., Ext-7) and near (i.e., Ext-9) areas of higher-pH and high-dissolved silica concentrations. To date, studies have been conducted by the University of Washington (UW) on the groundwater with higher-pH and high-dissolved silica concentrations including from Ext-7, and short-term pumping tests have been completed at Ext-9.

The purpose of the UW studies was to determine the physical and chemical properties of the groundwater with higher-pH and high-dissolved silica concentrations including at Ext-7, and more importantly determine if there is a means of reducing the amount of solids that may be generated from treating groundwater with higher-pH and high-dissolved silica concentrations. The UW study has not determined a method to reduce the amount of solids expected to be produced during above-ground treatment of groundwater with higher-pH and high-dissolved silica concentrations. Based on the UW Study, it was estimated that approximately 4,530 lbs of solids would be produced per day from pumping groundwater with higher-pH and high-dissolved silica concentrations at an approximate rate of 7 gallons per minute. As a result, a viable method to treat this groundwater has not been identified. Additionally, the January 11, 2017 Feasibility Study (FS) identified that pumping groundwater from areas of higher-pH and high-dissolved silica concentrations is not necessary to achieve the Site's containment objectives or Remedial Action Goals (RAGs). Therefore, additional pumping tests at Ext-7 are not necessary for completion of the FS and selection of a viable remedy.

Higher-pH groundwater migrating to extraction well locations presented in the FS in response to groundwater extraction is a potential concern. It should be noted that measured pH over time in the groundwater pumped by the existing groundwater extraction and treatment system has been consistent (i.e., groundwater pumping has not drawn in the higher pH groundwater) over time (i.e., decades).

A longer-term pumping test at Ext-9 appears to be viable based on the completed shorter-term tests. The longer-term pumping test would potentially provide additional data for the design of a groundwater extraction and above-ground treatment system that includes pumping in close proximity to groundwater with higher-pH and high-dissolved silica concentrations. However, the results of the longer-term pumping test at Ext-9 will not materially affect the alternatives in the FS, which include groundwater extraction.

Objectives

The overall objective for the Ext-9 longer-term pumping test is to evaluate the feasibility of pumping in close proximity to higher-pH and high-dissolved silica concentration areas and to provide data and information to evaluate long-term effectiveness, permanence, and implementability of the Ext-9 location.

The Ext-9 longer-term pumping test will address the following specific questions:

1. Can groundwater in close proximity to higher-pH and high-dissolved silica concentration areas be pumped without causing plugging in the well or aquifer?
2. Does the rate of pumping affect well efficiency or the tendency for plugging?
3. If well plugging does occur, can the well be rehabilitated and brought back into service?
4. What volume of solids will be generated during treatment of the extracted groundwater? What are the physical and chemical characteristics of the solids?
5. Can a pumping rate equivalent to that modeled be maintained?

Proposed Work

The longer-term pumping test will be conducted over a one-month period or longer if treating the extracted groundwater in the existing above-ground treatment system does not create any operational issues. The longer-term pumping test may be shortened if plugging occurs and the extraction well cannot be rehabilitated or if excessive solids or other chemistry results in operational issues in the existing above-ground treatment system. If plugging occurs during the longer-term pumping test, options for mitigation will be evaluated and recommendations included in the summary report.

The longer-term pumping test will be conducted using an estimated pumping rate of 20 gallons per minute, which is based on the recommended mass reduction by strategic groundwater pumping (MSP) alternative in the January 11, 2017 FS. The rate may be adjusted based on observed water levels in the well during the test.

Water levels in the pumping well and in nearby monitoring wells will be monitored, prior to, during, and after the pumping test. These data will be used to estimate aquifer and well parameters (e.g., well efficiency, hydraulic conductivity, and storage coefficients) and to evaluate if these parameters change as a result of pumping. Water quality data will be collected from the extracted groundwater and selected nearby monitoring wells, as follows:

1. Field parameters including pH, conductivity, oxidation-reduction potential, dissolved oxygen, turbidity, temperature, and salinity will be measured daily
2. Laboratory parameters including pH, specific gravity, Site volatile organic compounds (VOCs), select geochemistry, and select metals will be analysed weekly

A work plan providing additional detail will be developed prior to conducting the longer-term pumping test and will specify the parameters to be measured at each selected well. This work plan should specifically include tasks to address Question 2 above. If well plugging occurs, a follow-up work plan will be developed to address Question 3 above.

References and Bibliography

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