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GENERAL COMMENTS ON IT SOUTHERN PLUME EE/CA REPORT

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GENERAL COMMENTS ON IT SOUTHERN PLUME EE/CA REPORT

(1) Based on our review of the field data and groundwater flow and uranium transport analysis presented in the IT report, we agree conceptually that the proposed groundwater extraction is consistent with the stated removal action objectives.

(2) The model application is too poorly documented in the IT report to permit a thorough understanding or review of the simulated results. A thorough documentation of the model and its underlying bases should be presented prior to selection of a final groundwater recovery design.

(3) As noted by IT, field data limitations hinder the ability to adequately assess the reliability and accuracy of the specific design of the proposed remedial action.

(4) The planned future field data acquisition during the RI/FS and refinement of the model should resolve issues relating to well placement, extraction rates and remedial action duration.

(5) IT proposes Alternative 4, rather than Alternative 5, due to:

- the cost of providing additional effluent treatment (Alternative 5);
- the redundancy of such an expense with plans to construct a more comprehensive and effective wastewater treatment facility at FMPC; and,
- the expectation that uranium concentrations in the extracted groundwater will be relatively low during the early years of pumping.

This rationale provokes the following questions:

- Can loadings to the effluent pipeline be reduced in a less costly manner by more effective use of existing treatment capabilities and/or by modification of current production and wastewater management practices?
- Can less costly effluent treatment processes be implemented that will not be redundant with future construction of a new wastewater facility?
- What happens if much higher-than-expected uranium concentrations are pumped prior to completion of the planned FMPC wastewater treatment facility?

DETAILED COMMENTS ON MODEL APPLICATION

(1) **There are twelve blocks in the northern section of the grid in which the block thickness of layer 3 is negative 1.0 feet.** This is, of course, incorrect, but probably does not impact the transport analysis because the waste is not near this area. The cause for the negative thickness probably results from an auxiliary calculation in a spreadsheet or other format in which elevation data are calculated from thicknesses or thicknesses from elevation files. Either way the result should be consistent and non-negative block thicknesses for input to the model.

(2) **The geologic structure is not presented.** There are numerous features in the layering of the grid (as interpreted from the input data files) that are not presented. It is important to present the geologic interpretation and conceptual model. As an example, the attached figure displays the grid through column 12 which corresponds approximately to section D-D'. While most of the hydrostratigraphic structure is very important to the flow and transport analysis; others features are unnecessarily included, but do not contribute to the realism of the model. For example, there is a crescent shaped anticlinal structure in layers 3, 4, and 5 in the southwest corner (J=12-30). The rise is approximately 13 feet. The impact of this feature on the assessment of the remedial alternative is probably minor.

(3) **Incomplete data files do not allow confirmation of the water supply wells.** The two wells AW-3 and AW-4 in the two files provided (no action and pump & treat) are pumping continuously at 112 gpm throughout the 5-year predictive simulation. The data file for an alternate water supply was not provided and could not be reviewed.

(4) **The choice of hydraulic conductivities is not documented in the report.**

(5) **The source term rates and positions are not documented or supported.** In the model a mass flux rate is imposed along Paddy's Run. The most significant mass is assumed to enter a section of the reach between Willey Road and New Haven Road (0.054 lbs/day at 27 blocks). This totals to 1.5 lbs per day.

(6) **The basis for 'present conditions' distribution of uranium in Figure A-2 is not defined.** It is not known whether the model was used to recreate the historical evolution of the plume. Possibly the concentrations were simply initialized by significantly extrapolating the Round 4 measurements (Figure 2-11). Because there is generally little movement over the next five years (Figures A-2 versus A-3 and A-7), the 'current conditions' overwhelm the additional sources applied along Paddy's Run.

(7) **The simulated vertical distribution of uranium is not presented.** It is not known how much simulated vertical spreading of uranium occurred and whether this significantly reduced simulated uranium concentrations in the uppermost layer.

(8) **The dispersivity value reported do not match with the data files.** The report indicated that a longitudinal and transverse dispersivities of 50. and 1.0 feet were used. The data set (F3DSOL9-OP.DAT) uses values of 10. and 0.5 feet.

(9) **The dispersivity values will probably cause oscillation.** The grid in the areal plane is uniformly chosen as 125 feet. The longitudinal dispersivity is 10.0 and the transverse is 0.5 feet. This results in a cell Peclet number of 12.5. Because a central difference in space is used, the concentration solution will probably cause severe oscillations. Switching to backwards-in-space is not recommended. The current modeling approach will probably result in significant artificial negative uranium concentrations around the edge of the plume. Mathematically the minimum longitudinal dispersivity is 62.5 feet. Based on our experience, a value as low as 30 may be acceptable, but not as low as 10 feet. Furthermore, it is not clear how such a low value is justified. However, dispersivities of 50. and 1.0 ft, if used in other runs as indicated in the report, are appropriate.

(10) **The uniform grid spacing is not very efficient.** The grid is composed of 78 x 102 blocks of equal spacing at 125 feet. Generally the flow solution requires greater extent than the transport equation in order to utilize sensible hydrologic boundaries. In the northern portion of the site source terms are introduced, but are not significant to this model demonstration. The grid layout and orientation seem to be simply a convenient mesh that nests with the regional flow model, but is not overly efficient in the transport analysis. The technique behind nested grids can easily accommodate rotated grids. It is strongly recommended that a rotation be included to reduce the total number of blocks. The edges of the grid could also be graded with increasing spacing at the edges. There are few field problems that require almost 40,000 grid blocks to adequately represent the physical system. With good engineering judgement, the number of grid blocks could be significantly reduced.

(11) **The choice of retardation is not well documented, justified and may not be conservative.** The retardation factor of 9 was used in the simulations. Attempts of using factors of 1, 6, and 12 were tried. Because the approach used to define the source loadings and initial plume distribution are not provided, it is difficult to assess the confidence and implications associated with presenting the one value of 9. A higher retardation causes an approximate linear increase in the remediation time required. A higher retardation also implies that a greater release of uranium is required when the source is calibrated with water concentrations.

(12) **The general travel time for uranium to reach the extraction wells is substantially greater than the simulation period.** The particle (unretarded) travel time from Paddy's Run to the extraction well is on the order of 5 years as evidenced by the particle position time markers and independently confirmed by Darcy calculations. Based on the assumed retardation, the uranium travel time is 9 times this value or approximately 50 years. The predicted concentration at the extraction wells (Figure A-8) display ever increasing concentration levels up to 5 years, at which time the simulations were terminated. It is not clear why siumlations were stopped at 5 years. The time required to remediate the site, based on current degree of adsorption, must be on the orders of a decades.