WORKPLAN FOR DEVELOPING GROUNDWATER AND CHEMICAL MASS BALANCES OF THE ALLUVIAL AQUIFER IN THE VICINITY OF OU-2 IN SUPPORT OF THE BASELINE RISK ASSESSMENT

Purpose

The purpose of this project is to develop groundwater and chemical mass balance relationships for the alluvial aquifer (Rocky Flats Alluvium Formation) in the vicinity of OU-2. The results from this work will be used to support the baseline risk assessment for the alluvial aquifer of the OU-2 area. The methods used to calculate the groundwater flux terms will be based on applying first principles (continuity equation) with the major hydrologic source and sink terms to the groundwater flow system in the vicinity of OU-2. The methods used to calculate the chemical mass flux terms will be based on applying simple dilution relationships (derived from the groundwater balance) to chemical transport from the source areas to the groundwater discharge locations.

Approach

The technical approach to this work will include two basic elements; the first is a water balance calculation of the alluvial aquifer near OU-2, and the second is a chemical mass balance calculation from source areas to seepage discharge locations of the alluvial aquifer.

The water balance calculations will be based upon the major hydrologic inputs and outputs from the alluvial aquifer. The hydrologic inputs to the alluvial aquifer in the area include the net recharge from precipitation minus runoff and evapotranspiration. The other important hydrologic input is from groundwater migration from upgradient areas of the alluvial aquifer (areas located to the west of OU-2). The major hydrologic outputs from the alluvial aquifer include the surface seepage locations around the perimeter of the alluvial formation and the downward vertical migration into the underlying claystone formation.

The results of the water balance calculations will provide estimates of the annual average flow rates from the seepage locations and the total discharge to the underlying claystone. The estimated seepage rates can and should be compared with available qualitative estimates of seepage rates based on visual observations. It may also be useful to quantitatively

measure flow rates at selected seepage locations where the flow is large enough to measure.

A chemical mass balance approach will be used to estimate the concentration of chemicals in the seepage water. The concentration in groundwater at the source area will be used as the initial concentration and dilution effects between the source area and discharge location will be used to estimate the concentration at discharge locations. The dilution effects will be based upon the net additional recharge of clean water between the source area and discharge locations.

This approach is based upon the working hypothesis that existing groundwater concentrations are the highest that could exist in the future. The validity of this assumption is uncertain at this time. Therefore, we recommend that the existing soil chemistry characterization data be reviewed to determine if more highly retarded chemical species (e.g., plutonium, americium) are present in soil above the aquifer which may impact the aquifer in the future.

These two water balance and chemical mass balance approaches will be used to estimate the volume of water from the discharge locations and the chemical concentration in the seepage water. This simplified mass balance approach is expected to yield conservative results which tend to overpredict the true chemical mass fluxes from the aquifer system. These chemical mass flux estimates are intended for use as the chemical source term input to the surface water pathways in the risk assessment.

Deliverable Work Products

The deliverable work product from this project will be a summary report. The summary report will identify the specific data (and sources) used for the analysis, a summary of the calculations and assumptions used for the water and mass balances, the results of the evaluation, and conclusions. The results of the evaluation will provide estimates of the chemical mass fluxes to Woman and Walnut Creeks in the vicinity of OU-2. These mass flux estimates are required for evaluating the surface water exposure pathway.

Schedule

The anticipated schedule for this scope of work is to complete the work within a two month time frame. Several specific data requirements are required to initiate this work and we must collect these data immediately to start the work and meet this schedule. The preliminary list of anticipated data requirements are listed in the attached table.

Budget

The estimated budget for this scope of work is $25,000 based upon 300 hours of labor. The cost estimate does not include any travel to the Rocky Flats site. If on-site meetings are required, then this budget will need to be expanded to account for travel expenses.

Table I
Data Requirements to Complete Scope of Work

- ¥ Topographic maps
- ¥ Chemical plume maps
- ¥ Chemical distribution in soil borings
- ¥ Bedrock surface maps
- ¥ Monthly precipitation data
- ¥ Monthly temperature data
- ¥ Monthly evaporation data
- ¥ Precipitation intensity data (# of heavy precipitation events per month)
- ¥ Hydrographs from wells (with corresponding precipitation record)
- ¥ Qualitative description of seep locations (possible site walk to view seeps)
- ¥ Results of slug tests, permeameter studies or other means of assigning conductivity
- ¥ Well logs with lithologic descriptions
- ¥ Flow data from Woman and Walnut Creeks