POST CERRO GRANDE FIRE CHANNEL MORPHOLOGY IN LOWER PUEBLO CANYON: AND STORM WATER TRANSPORT OF PLUTONIUM 239/240 IN SUSPENDED SEDIMENTS

FORD-SCHMID, Ralph, and ENGLERT, Dave, Department of Energy Oversight Bureau, New Mexico Environment Department, 2905 Rodeo Park Drive East, Santa Fe, New Mexico 87505, ralph_ford-schmid@nmenv.state.nm.us

After the May 2000 Cerro Grande fire, the New Mexico Environment Department characterized the shape and function of the channel in lower Pueblo Canyon. The stream channels in Pueblo Canyon, as well as other channels on the Pajarito Plateau, are adjusting to increased storm water flows. Peak flows and total discharge in canyons on the Pajarito Plateau have increased due to changes in forest-floor soil conditions resulting from the fire. The adjustments include channel geometry changes, increased sediment yield, and associated legacy contaminant transport from canyons within the Los Alamos National Laboratory.

We measured channel dimensions at 40 cross sections, established a 1.1-mile stream profile, and mapped the pattern of the channel bottom, and flood plain and terrace banks. These measurements were used to classify the existing stream channel and evaluate channel adjustments to impacts from the Cerro Grande fire. We assessed the channel dimensions, profile, and stream patterns in relationship to geomorphic units and plutonium concentrations and inventories measured by the Los Alamos National Laboratory Environmental Restoration Group. We also collected storm-water samples in Pueblo Canyon to determine the rate and volume of sediment and plutonium transport from this area.

We found the rates of normal channel adjustments, degradation, aggradation and subsequent sediment mixing; have accelerated since the Cerro Grande fire. Destabilized channel banks are mostly limited to the pre-fire active channel and lower flood plain banks, where legacy waste contaminant inventories are the smallest. In some areas, floodwaters have flowed over terraces, causing erosion, sediment mixing, and net deposition on them. Where the floodwaters return to the main channel, bank erosion of older sediment units that contain larger plutonium concentrations and inventories is common. We estimate 21 mCi of plutonium-239/240 in 5,800 tons of suspended sediment were transported out of Pueblo Canyon in 6 of 35 runoff events from 2000 to 2002. For the remaining 29 runoff events, the storm water data were insufficient to estimate the amount of plutonium or sediment transport.

Pueblo Canyon channel adjustments have accelerated since the Cerro Grande fire causing an increase of legacy waste transport. In response to our findings we recommend that efforts begin or continue in three categories; runoff controls, channel stabilization, and monitoring.

AQUEOUS GEOCHEMISTRY OF URANIUM, LOS ALAMOS AND SURROUNDING AREAS, NEW MEXICO

LONGMIRE, Patrick[1], COUNCE, Dale[1], KEATING, Elizabeth[1], and DALE, Michael[2]
[1]Los Alamos National Laboratory, MS D469, Los Alamos, NM 87545
[2]NMED DOE Oversight Bureau, 134 State Road 4, Suite A, White Rock, NM 87544

This presentation provides analytical results for groundwater obtained during four characterization-sampling rounds conducted at several regional aquifer and perched-intermediate wells at Los Alamos National Laboratory. Springs discharging in White Rock Canyon and in the Sierra de los Valles have also been sampled as part of this investigation. Uranium is a trace element of interest because natural background generally is less than 2 μg/L, depending on the reactive-phase mineralogy of aquifer material, aqueous chemistry, and age and residence time of groundwater. Uranium has been processed at Los Alamos National Laboratory since the early 1940s for a variety of purposes.

Analytical results for the wells near Los Alamos National Laboratory show that solute concentrations within the regional aquifer are presently below maximum contaminant levels (MCLs) established by the EPA, including those for uranium (MCL of 0.030 mg/L). Groundwater collected from the regional aquifer and perched zones at Los Alamos National Laboratory is dominantly a calcium-sodium-bicarbonate type and is relatively oxidizing. Natural uranium concentrations in the regional aquifer increase east of the Pajarito Plateau and Rio Grande.

Geochemical calculations using the computer programs PHREEQC2.2 and MINTEQA2 were performed to evaluate solute speciation, mineral equilibrium, and adsorption/desorption in assessing uranium aqueous chemistry and transport. Results suggest that the regional aquifer approaches equilibrium with respect to amorphous silica phases or volcanic glass and $CaCO_3$ and that the aquifer is undersaturated with respect to $USiO_4$, $UO_2(OH)_2$, $MnCO_3$, and $SrCO_3$. Groundwater shows variable saturation with respect to $Ca(UO_2)_2(Si_2O_5)_3 \cdot 5H_2O$ (haiweeite), based on silica activity and pH. Surface complexation modeling (diffuse layer) of U(VI) shows that ferrihydrite partly adsorbs uranyl carbonato species, which is in agreement with experimental and field observations.