



## Ames Vapor Intrusion Study Results- Understanding NASA Ames Groundwater Contamination and Clean up Efforts

(Part 3 of 4) July 2008

*Throughout the past six years, the Environmental Services Division has been conducting indoor air sampling for vapor intrusion in various buildings located over a contaminated groundwater plume at NASA Ames Research Center. The purpose of the study was to determine risk to indoor workers in buildings where vapor intrusion could affect indoor air quality, based on the Environmental Protection Agency's (EPA) standards to protect public health.*

*This is the third in a four part series produced by the Environmental Services Division to describe the measures being taken to deal with the environmental effects of groundwater contamination and vapor intrusion at NASA Ames.*

*Part 3 is intended to discuss vapor intrusion and what we are doing now to address groundwater issues.*

Fact Sheet

Since 1999, the Environmental Services Division has been conducting vapor intrusion sampling in various buildings at NASA Ames Research Center. The buildings selected for sampling are located above the Regional Contaminated Groundwater Plume. The purpose of the study is to determine risk to indoor workers in buildings where vapor intrusion could affect indoor air quality.

The primary environmental medium of concern related to vapor intrusion is groundwater contaminated with hydrocarbon and halogenated hydrocarbon Volatile Organic Compounds (VOCs). VOCs in groundwater can migrate, via soil air space, into buildings overlying a contaminated groundwater plume. Measurement of air concentrations directly assesses the extent to which any of the VOCs are present in the indoor airspace. While measurement of air concentration eliminates uncertainties related to modeling, other factors must be accounted for if the results are to accurately reflect exposure risk. The measured concentration of any chemical in air can be due to a multitude of sources, such as

background air (the air not impacted by the regional contaminated groundwater plume) or indoor sources of chemical use. To associate the measured indoor air concentrations with vapor intrusion of chemicals in the groundwater with a high degree of certainty, the Division collected and evaluated data on background concentrations of chemicals in the air, and groundwater concentrations in the vicinity of the buildings in question. The Division also reviewed surveys of chemicals and products used indoors.

Since 1999, the Division has collected more than **1,500 indoor, outdoor ambient and background samples** using Summa® canisters. Both 24-hr and sequential 8-hr samples were collected at the following buildings: B-2, B-3, B-6, B-12, B-15, B-16, B-17, B-18, B-19, B-20, B-21, B-22, B-26, B-76, B-107, B-111, B-126, B-148, B-154, B-156, B-476, B-510, B-543, B-555, B-556, B-566, B-583C, Hangar 1, N-210, N-211, N-237, N-239, N-239A, N-243, N-258 (outdoor), N-259, and N-269. The study results indicated that indoor concentrations of VOCs in buildings N-210, 6, 15, 16, 20, 107, 126, 148, 156, 566, and

Hangar 1, were elevated relative to the outdoor ambient and background air samples, and were above the EPA risk level of 2.7 micrograms per cubic meter (ug/m<sup>3</sup>).

### **What's Being Done to Address Vapor Intrusion Problems**

In occupied buildings where indoor air concentrations exceeded EPA's acceptable risk levels for human health, remedial actions were taken in order to reduce the risk to indoor occupants. Repairs to bring air quality in affected buildings back to EPA acceptable levels have been completed in Buildings N-210, B-15, and B-16.

Results from follow-up sampling in Buildings 15, 16 and N-210 showed that modification to the Heating Ventilation and Air Conditioning (HVAC) system operating parameters could be effective in reducing these indoor concentrations. Mitigation is currently being implemented in Building 20. Length of occupancy is being controlled in Building 566, which along with Building 156, is scheduled for demolition when the NASA Research Park is redeveloped. Mitigation options will be evaluated for Buildings 107 and 126, which were just sampled in 2008. Buildings 6, 148, and Hangar 1 are unoccupied.

### **Building N-210 Specifics**

As part of the study, the Division conducted two one-week sampling events in Building N-210 during June 2004. The Division collected follow-up samples from N-210 in September and October 2004. Results for two locations within the building showed significantly elevated cis-1, 2-dichloroethene (DCE) and Trichloroethylene (TCE) concentrations, which were thought to be either a result of poor air flow or of collecting samples adjacent to preferential vapor intrusion pathways. In May 2005, the EPA conducted a walk-through survey of N-210 using its Trace Atmospheric Gas Analyzer mobile laboratory. These results confirmed the previous SUMA canister samples.

During two weeks in July 2005, the Division collected 65 24-hr SUMA canister samples from

buildings N-210, N-211, N-239A and N-259, as well as outdoor ambient and background sample locations. These results showed elevated TCE concentrations in N-210 in some of the breathing zone sample locations, as well as in some of the pathway sample locations.

To confirm these results, the Division collected an additional 19 samples from the indoor breathing zone, pathway, outdoor and background locations in September 2005. Based upon these results, the elevated TCE concentration in Room 143 was confirmed to be the result of the configuration of the HVAC fresh air supply. The ventilation system in the adjacent space, Room 145, was similar to that in Room 143.

The September sampling was designed to evaluate concentrations in the breathing zone and sub-floor within Room 145. These samples showed that the concentration of TCE in Room 145 was lower than that in Room 143. In December 2005, the HVAC system was modified to re-route the supply air duct and to provide separate ventilation for the sub-floor space.

After modifications were made to the N-210 HVAC system in December 2005, the Division collected 29 breathing zone, pathway, outdoor ambient and background samples in January 2006. Then 106 breathing zone, pathway, outdoor ambient and background samples were collected in February 2006. These samples indicated that *the HVAC modifications had significantly reduced the indoor breathing zone TCE levels to within acceptable EPA risk levels.*

The Ames Environmental Services Division will continue to conduct vapor intrusion sampling in selected buildings, and as directed by EPA. For more information, contact 650-604-5602.

*Some of the TCE in the groundwater beneath Ames evaporates, moves through the soil and eventually into the overlying buildings. Please look for Part 4 in this series, which will discuss the future plans for groundwater clean up and investigation at Ames.*