



Fact Sheet

Radon in Soil Vapor Extraction Systems

Air Force Base Conversion Agency, McClellan

No. 2-04

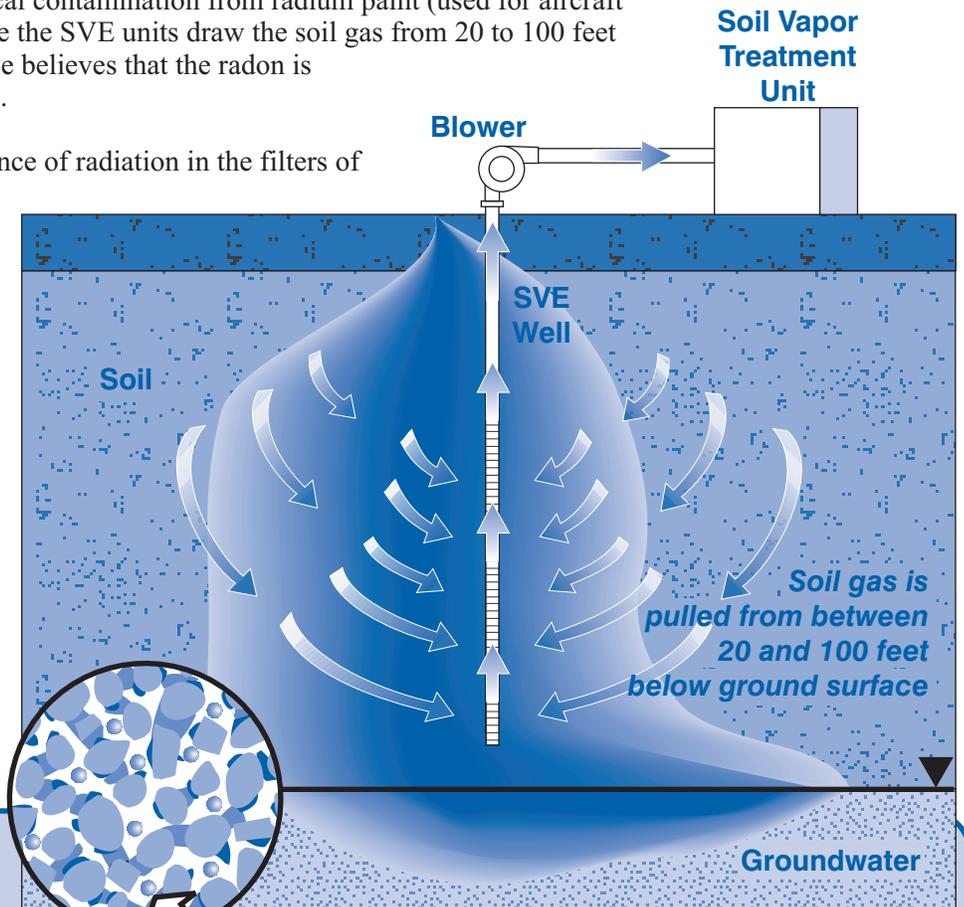
June 2002

Soil Vapor Extraction (SVE) units are used at the former McClellan Air Force Base to remove contaminated vapor gases trapped between soil particles. The SVE systems are designed to remove contamination caused by solvents, degreasers and fuels that have leaked into the soil from tanks, pipes and spills. The systems work by inserting slotted pipes deep into the soil and vacuuming the vapor to a treatment unit above ground. Used at McClellan since 1993, this system allows contamination to be cleaned up quicker, cost effectively and prevents the contamination from reaching the groundwater.

Because the SVE units vacuum the air and gases between the soil particles at a greater volume than would naturally come to the surface, a team from McClellan of Air Force, federal and state regulators wanted to determine if naturally-occurring radon gas was being drawn up and concentrating in the units. They also wanted to find out if it was possible that radon was coming from radiological contamination from radium paint (used for aircraft dials) which gives off radon gas. Since the SVE units draw the soil gas from 20 to 100 feet below the ground surface, the Air Force believes that the radon is primarily coming from natural sources.

The preliminary study found the presence of radiation in the filters of SVE units that use granulated activated carbon to absorb the organic vapor contaminants. Those units were immediately turned off until testing and analysis was completed. Further analysis confirmed that the radiation was identified as coming from radon.

The McClellan cleanup team includes representative of the Air Force, U.S. EPA, California Department of Toxic Substances Control and the Regional Water Quality Control Board. They monitor and test all cleanup systems to ensure cleanup goals are being met while continuing to protect the health and safety of the public and the workers at McClellan.



What is radon?

Radon is a naturally occurring colorless, odorless and tasteless radioactive gas. This gas generally comes from the decay of naturally-occurring uranium, an element that is present in rocks and soil. Radon gas gets trapped in the same spaces between the soil particles as the

Close-up of Soil

*Radon is an invisible gas

Contaminant (such as solvents or fuels)

Radon*

Soil Particle

contamination from the solvents, degreasers and fuels. Radon moves up to the ground surface as a gas and mixes in the atmosphere at very low levels. Generally the hazard associated with radon gas is when it is trapped in occupied buildings and becomes concentrated. There are federal guidelines governing radon exposure indoors, but no federal or state regulations for outdoor exposure.

What is soil vapor extraction?

There are three types of SVE units used at McClellan. One type of SVE unit passes the vacuumed contaminated air through granulated activated carbon that absorbs the contaminants. These filters become saturated with contaminants and are replaced and disposed of properly. The second type are flameless thermal oxidation units that heat the contaminated vapors and burn off the contamination turning vapor into carbon dioxide and water. The third type of SVE unit uses catalytic oxidation. This process uses a chemical catalyst which eliminates the contaminants at a lower temperature than the thermal unit.

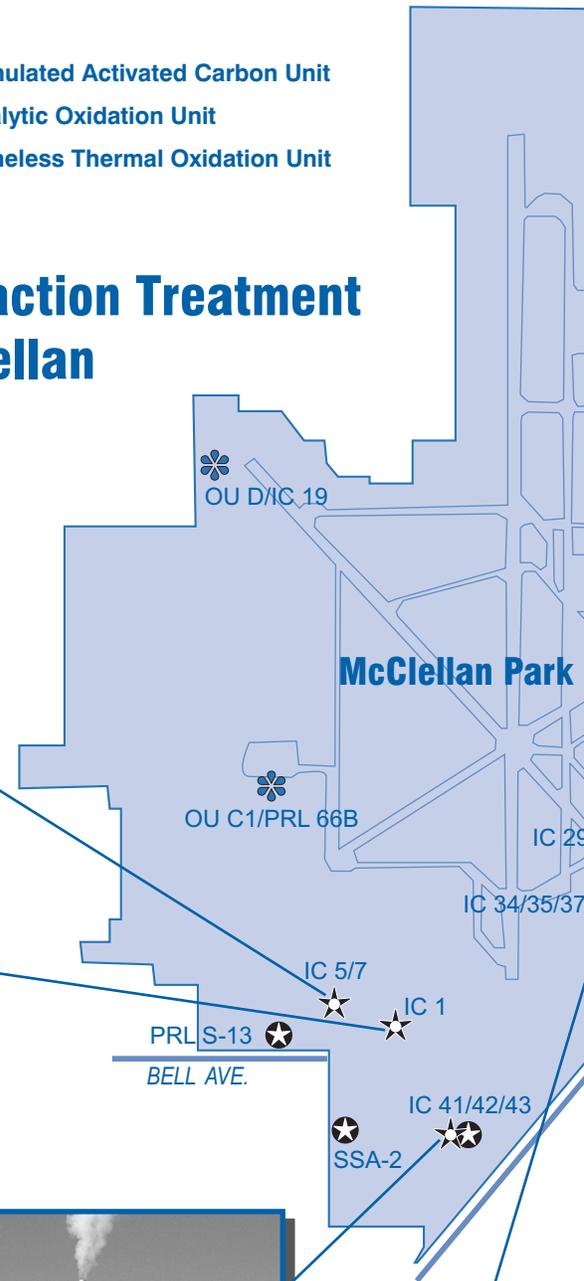
What happens to radon gas at SVE units?

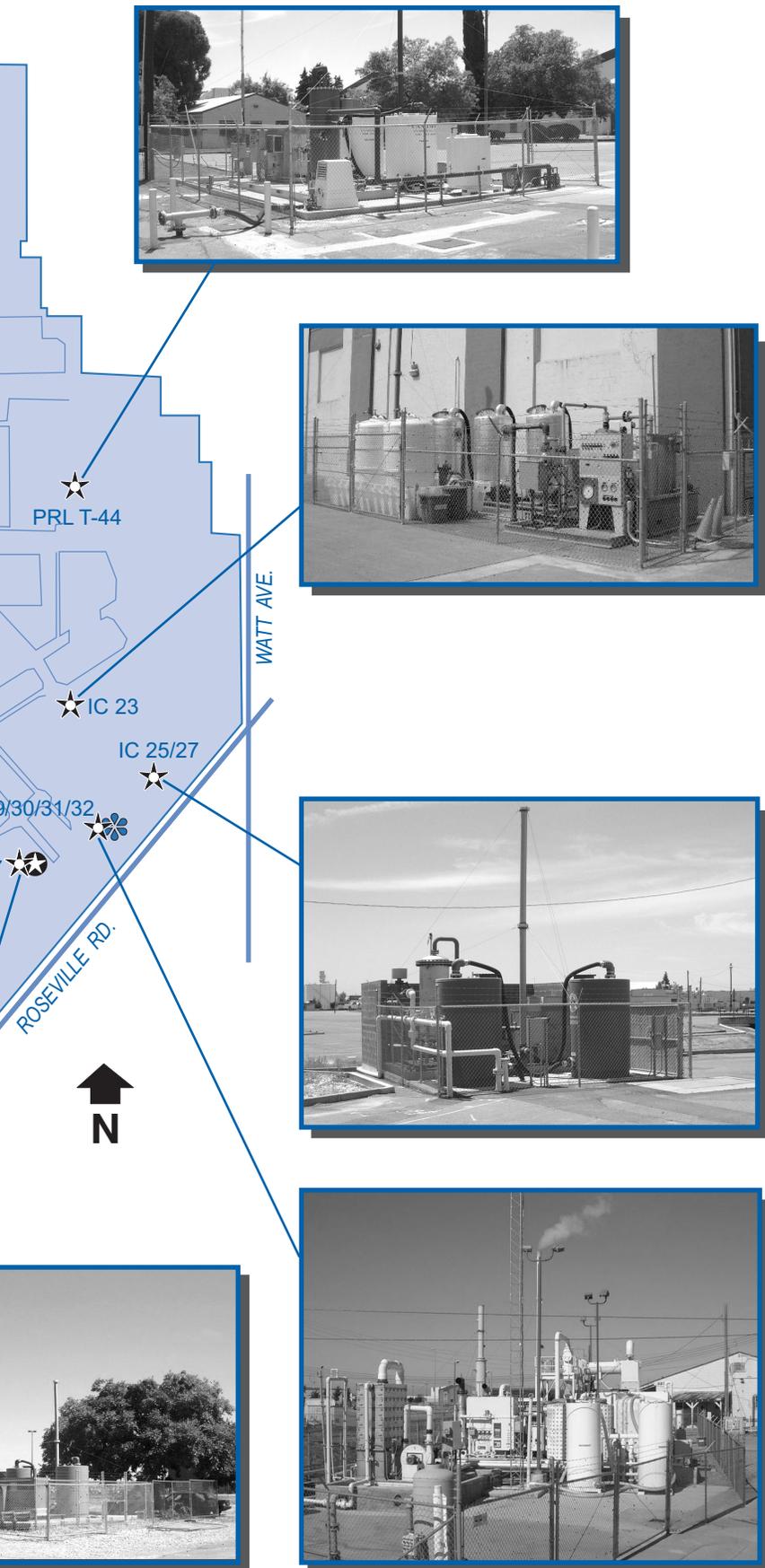
Even though there are no regulations governing radon gas outdoors, the Air Force wanted to further explore what happens to radon gas at the SVE units. At McClellan, radiological experts used specialized instruments to scan the SVE units. Measurements were taken in the area around the units, at the fence line and beyond. Measurements were also collected to determine if any radon gas was being emitted from the vent stacks.

The results of the measurements at all the SVE units indicate that the concentration of radon emitting from the stacks does not present a health risk to the public. SVE units that use thermal and chemical treatment were shown not to capture any radon and thus do not present a problem. However, the SVE units using granulated activated carbon were capturing the radon and had radiation readings above what would naturally come up from the ground, but do not exceed radiation worker exposure levels. As a precaution, the fence boundaries at some units were adjusted to ensure public safety.

- ★ Granulated Activated Carbon Unit
- ✿ Catalytic Oxidation Unit
- ⊛ Flameless Thermal Oxidation Unit

Soil Vapor Extraction Treatment Plants at McClellan





There are three general ways to protect against any type of radiation:

Distance: The farther away a person is from a radiation source, the less exposure he or she will receive. For example, when you receive a medical x-ray, the technician stands a certain distance away from the equipment. This distance protects the technician who operates x-ray equipment on a daily basis.

Time: If a person limits the amount of time spent near a source of radiation, the amount of radiation exposure is less. The same x-ray technician is monitored so their potential exposure time is limited.

Shielding: If the shielding around a radiation source is increased, the exposure is decreased. The lead apron the dentist uses shields the rest of your body from the x-rays minimizing your exposure.

What is the next step?

The Air Force has taken a conservative approach to this issue to ensure that workers and the public are safe. Although the levels of radon concentrating in the granulated activated carbon are very low, they are above what naturally comes up from the ground.

The Air Force has taken the following protective actions to ensure worker and public safety. All Air Force personnel and contractors working directly on the units received radiation occupational safety training. Where necessary, fences were moved farther from carbon SVE units to ensure there is an adequate protective distance and to restrict access. Radiation levels at the SVE units will continue to be monitored. The Air Force will look at other protective measures if necessary. ●

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