

## **Nuclear Explosion Test Bed for OSI/IMS Gas Release Scenarios: Phase I, Chemical Tracer Experiment**

The Non-Proliferation Experiment (NPE) involved detonating 1 kiloton of chemical explosive in a subsurface cavity which also contained bottles of tracer gases. As an alternative to performing large chemical detonations to simulate gas transport from underground nuclear explosions (UNE), we have developed a new test bed for gas transport, release and detection studies using a former UNE cavity. The test bed allows for the opportunity to evaluate pathways to the surface created by the UNE as well as possible transport mechanisms including barometric pumping and cavity pressurization. We have monitored long-term chemical tracers as well as newly injected tracers. In order to perform high temporal resolution tracer gas monitoring, we have also developed a Subsurface Gas Smart Sampler (SGSS) which has potential application during an actual On Site Inspection (OSI) and will be available during IFE14. Deployment of five SGSS at the remote test bed has provided unparalleled detail concerning the relationship between tracer gas transport to the surface, barometric fluctuations and temporal variations in the natural radon concentration. We anticipate that the results of our tracer experiments will support the development of improved noble gas technology for OSI and IMS applications.

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**Track Classification:** Theme 2: Events and Their Characterization