2011-2012 Air Monitoring Data

- Sampling by Shell to assess potential for soil vapors to intrude into homes, and public buildings, included outdoor air sampling. Outdoor air was sampled to provide a background concentration.

- Varying benzene concentrations found in the outdoor air between sites on different dates. Sampling began in April, 2011 and continued into 2012.

- Elevated levels of benzene were found occasionally in the outdoor air samples.

2012 Air/Soil Vapor Monitoring

- Designed to assist in identifying potential sources of benzene air emissions
- Conducted in mid-summer to early fall of 2012
- 3 separate sampling programs: IEPA/U.S.EPA, Shell, and Phillips 66
- Benzene concentrations did not mirror the elevated levels found in the earlier Shell sampling program.

Map of 2012 Air Sampling

What was the 2011 benzene source?

To address the potential for intrusion of vapors into homes in Roxana, Shell installed soil vapor wells to extract underground vapors. ICE (internal combustion engines) units were temporarily used to create a vacuum to pull the vapors from the soils and then burn them as fuel in the engines.

- The review continues, but IEPA believes this temporary soil vapor extraction system using the ICE units was the major contributor to the elevated benzene found in 2011.
- ICE units were removed in early 2012 after Shell installed a new larger SVE system.
- The new SVE system utilizes a thermal oxidizer as the means of destroying the vapors rather than ICE units.

1990 Radian Air Emissions Study

- Conducted while 3 refinery operations active in area (Amoco, Clark and WRR) between December 1990 and December 1991.
- Benzene concentrations at the Roxana and South Roxana sites in the study were consistently lower than the elevated levels from the 2011 and 2012 samples
- In the years following the Radian study, a number of actions have resulted in the reduction of benzene emissions at the refinery operations:

Description of Reductions

- National Emission Standards for Benzene Waste Operations were promulgated in 1992 forcing WRR to enhance control equipment at wastewater treatment and segregate high benzene wastewater beginning in 1993.
- 1999 -- Treatment plant installed to remove benzene from groundwater used for cooling at WRR. This substantially reduced benzene emissions to the atmosphere from cooling towers.
- 2005 --Signed Federal Global Consent Order requiring enhanced monitoring and recordkeeping associated with benzene waste operations at WRR.

Description of Reductions (cont'd)

- National Emission Standards for hazardous organic chemical processes was promulgated in 1994. WRR is subject to this set of Regulations.
- Amoco additives shutdown in the mid-1990s.
- Hartford refinery alkylation and catalytic reformer units have not been restarted since the refinery shutdown in 2003.

Moving Forward

- During May 2012, another sample showed elevated benzene in the outdoor air.
- Records from the operation of the thermal oxidizer indicated that its chamber temperatures did vary on that date.
- As a result, the unit is being required to undergo stack testing to determine its actual emissions and to develop a correlation between temperature, emissions and control efficiency.

Moving Forward (cont'd.)

- The Agency is concerned about the current and future use of ICE units at remediation sites.
- When burning gases containing varying concentrations of different chemicals, the stated destruction/control efficiencies for these units should be questioned.
- The Agency may seek to have stack testing done on ICE units.

Moving Forward(cont'd.)

- The 2012 Air/Soil Vapor monitoring had one site at which benzene was measured during a number of the sampling days.
- This site was due north of the WRR wastewater treatment plant.
- The most recent calendar semi-annual report submitted by WRR, as required by the 2005 consent order, indicated that three conservation vents in the primary area of the plant have likely been leaking to the atmosphere.
- The emissions from this area of the treatment plant should be controlled by the associated flare system.
- The Agency will review both the short and long-term steps WRR plans to take to eliminate these leaks.

Moving Forward (cont'd.)

- The refinery has funded an ambient air monitoring site which is operated by Washington University.
- Data began to be generated in 2012.
- A total three years of data for various pollutants, including benzene, is to be generated
- The website is http://raqs.seas.wustl.edu/