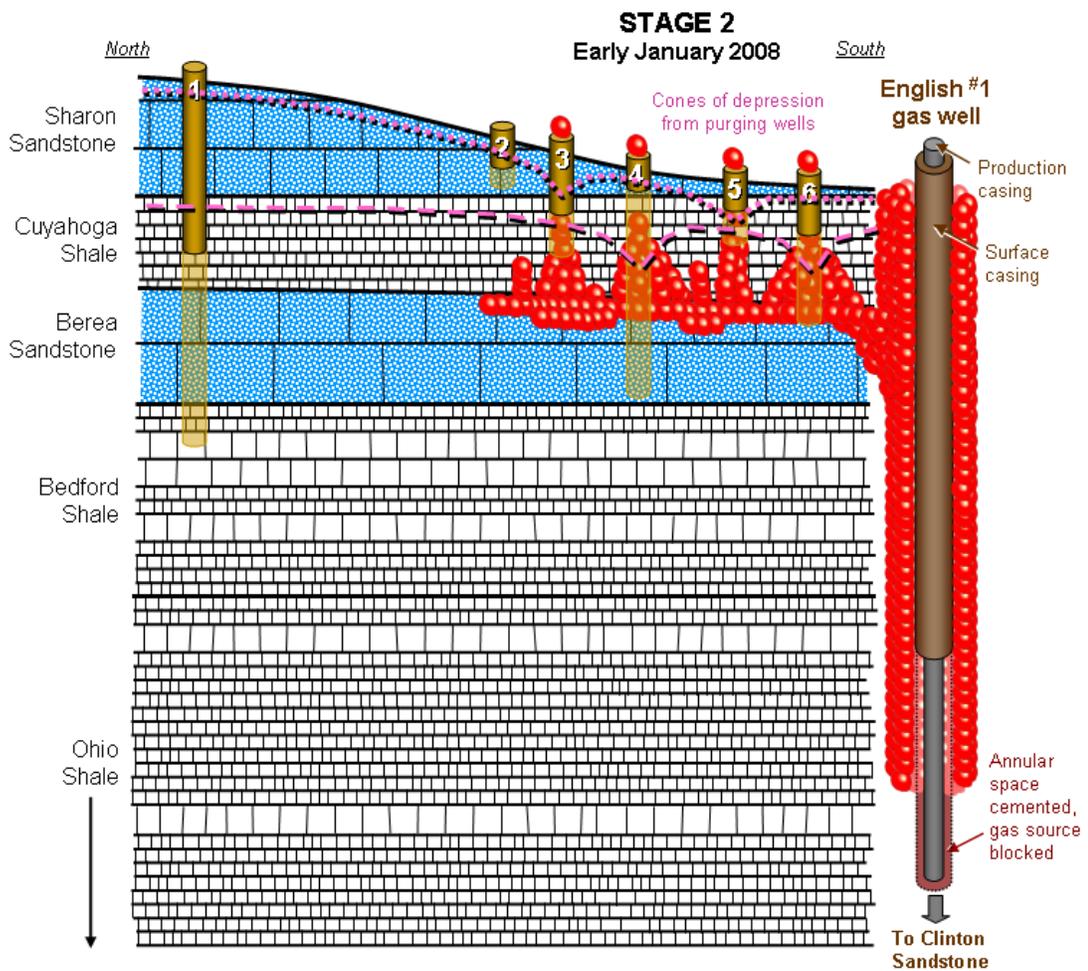


Expert Panel Technical Report
Subsurface Gas Invasion
Bainbridge Township, Geauga County, Ohio

June 2010



written by

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submitted to

Ohio Department of Natural Resources
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Acknowledgements

The expert panel could not have completed its work without the expertise and assistance of other people. We appreciate the technical field assistance of Tom Benko, Tom Tomastik, Tom Hill, and Rick Simmers (ODNR-DMRM), Dwight Williams (KU Consultants), and Mike Fletcher (Harper Well & Pump). Coordination of all the field activities requested by the panel with homeowners and contractors was done by Rick Simmers, Tom Tomastik, and Tom Hill (ODNR-DMRM) in conjunction with Gina Miller and Barry Tancer (OVE). We are grateful for their efforts.

We appreciate the patience of the homeowners in Bainbridge and Chester townships who we inconvenienced during our field investigations. We are especially grateful for the hospitality and kindness shown us by Lydia Komocki, Jack & Patsy Phipps, and James & Frances McGee, who served us cold drinks on hot days and hot drinks on cold days.

The format, appearance, and ease of downloading the report and its attachments from the DMRM website at www.ohiodnr.com/mineral are due to the expertise of Beth Wilson (ODNR-DMRM). Lisa Van Doren (ODNR-DGS) produced the beautiful, poster-size maps used as attachments to the report.

Preface

Our report is a comprehensive treatment of the disputed issues related to the subsurface migration of fugitive gas created by overpressurization of the annular space in the surface-production casing in the English #1 gas well. We did not write the report for a technical audience in the manner of consultant-to-consultant or academic-to-academic. We wrote the report in the style of a college textbook in a freshman science class. It contains an abundance of figures and diagrams, lots of data tables, several appendices, and a few equations. We progressively introduce concepts and then apply them to the Bainbridge investigation using local photographs and diagrams. Whenever possible the text and diagrams refer to street names and locations in Bainbridge Township. Although the content becomes technical in a few sections, we present these materials using diagrams to display concepts, tables to present data, and graphs inserted with labels and arrows to convey our interpretations, which are presented in the text. By writing the report in this manner, we hope to reach readers with as many different learning styles as we see in our freshman science classes.

We cite the professional literature throughout the report. There are three equally important reasons for this. The first is to explicitly reference the technical foundations of the concepts and methods we employ and to demonstrate they are among those established as standards in our disciplines. The second is to provide readers with the information needed to locate and examine the original documents. The third is to show that similar interpretations and conclusions have been reached by others who successfully submitted them for editorial evaluation, technical review, and publication in the professional scientific and engineering literature. A complete reference to each citation is presented in the back of the report. Like most reports, we lapse into ubiquitous use of uncommon acronyms and unusual notations. The report contains a list of these on the next page.

S.B., D.F., J.S.

Notations and Acronyms

bbls/d – barrels per day

cc – cubic centimeter

cm – centimeter

DGS – Division of Geological Survey, ODNR

DGES – Department of Geology and Environmental Science

DH – Department of Health

DMRM – Division of Mineral Resource Management, ODNR

d – day

E&A – Eckstein & Associates, Inc.

EDS – energy dispersive x-ray spectroscopy

ESEM – environmental scanning electron microscope

ft – feet

gal – gallon

gpm – gallons per minute

LEL – lower explosive level (methane)

m – meters

mD – millidarcies

mg/L – milligrams per liter

µg/L – micrograms per liter

ml – milliliter, 1 ml = 1 cc

Mcf – 1000 cubic feet

Mscf – 1000 standard cubic feet

MMcf – 1 million cubic feet

MMscf – 1 million standard cubic feet

MPN – most probable number

ODNR – Ohio Department of Natural Resources

OEPA – Ohio Environmental Protection Agency

OVE – Ohio Valley Energy Systems Corp.

ppb – parts per billion

ppm – parts per million

psi – pounds per square inch

SRB – Sulfate-reducing bacteria

TD&D – Thrasher, Dinsmore & Dolan

WRS – Wilcoxon rank sum

XRD – x-ray diffraction

yr – year