



C39 When Timing Is Everything: How Historical Aerial Photography Established Timing of Industrial Activities Resulting in Environmental Damage

Kristen K. Stout, BA, Environmental Research, Inc., 5267 John Marshall Highway, Suite C, Linden, VA 22642*

After attending this presentation, attendees will understand the value of using historical aerial photography in environmental litigation.

The presentation will introduce the community to a cost-effective, unbiased source of information that can be used to determine the timing of environmental damage for allocating costs associated with environmental remediation.

Learning Objectives: This abstract presents two examples in which historical aerial photography was used to determine the timing of environmental damage in Areas-of-Concern (AOCs) at a large chemical manufacturing facility.

Method: Comparative stereoscopic analysis of a series of historical aerial photographs to determine when specific chemical manufacturing activities started. Using geo-referenced digital images to precisely track changes in the deposition and removal of materials over time to determine when contaminated soil was placed in a specific area.

This abstract illustrates how the timing of waste disposal and industrial activity at a major chemical manufacturing facility was determined through detailed stereoscopic analysis of historical aerial photography. The photographic analysis was conducted in support of litigation resulting from the chemical company's claims against insurance companies for costs associated with environmental investigations and remediation. The insurance policies were in effect during specific time periods; claims associated with activities or events outside those time periods would not be covered.

The chemical manufacturing facility is located in the Mississippi River flood plain in Louisiana. A series of levees, canals and ditches control periodic flooding that occurs along the river. Operations at the facility began in 1958 with chemical production and storage infrastructure located in the southern and southeastern portion of the property. Over the course of several decades, additional production plants and storage infrastructure, rail lines, and canals were constructed, primarily moving in a north to northwesterly direction across the property.

Sixty-five dates of photographic coverage spanning the time period from 1952 to 2001 were acquired and reviewed to document features and conditions of interest and to study change over time. Many of the photographic images were geo-referenced to aid in a detailed sequential comparison of specific areas.

The aerial photographic analysis focused on specific AOCs at the facility. One of the major AOCs was a vinyl chloride plant reportedly constructed in the mid to late 1970s. Leaks in storage and feed tanks were discovered in the late 1980s and early 1990s, along with free phase product in the ground. The company asserted that the leaks resulted from faulty tank construction and would have occurred shortly after the plant went on-line; however, it did not provide any definitive documentation as to when the plant went on-line.

Based on the analysis of several dates of aerial photography flown in the 1974 to 1980 time period, it was concluded that the plant was still under construction as late as July 1977. High resolution aerial imagery flown on July 6, 1977, provided the critical visual evidence. Various plant structures and pipe galleries were not completed. Stacks of pipes, beams and other construction material were visible in many locations around the new vinyl chloride plant, along with construction equipment. Furthermore, two impoundments at the plant were still under construction.

As of July 6, 1977, much of the ground surrounding the structures appeared rough and uneven, with several mounds of earthen material. In later dates of photography, the plant yard had been graded and a cover material of some type (probably gravel or crushed shell) had been applied.

The insurance policy ended before July 6, 1977 (i.e., before the plant went on-line); and therefore, the release occurred outside the policy period.

Another AOC was located south of the main chemical manufacturing facility on the river side of a levee. Contaminated soil was discovered adjacent to two borrow pits. The two borrow pits were separated by a narrow strip of land that served as an access road from time to time. The entire area was flooded on a regular basis and was highly susceptible to erosion during these periods.

In 1986, the company discovered contaminated soils in the area between and to the east of the two borrow pits. A portion of the area was excavated and backfilled. Analysis of the contaminated soil indicated the presence of organic compounds. Three follow-on soil boring investigations were conducted in 1986, 1987 and 1993 to define the vertical and horizontal extent of the contaminated soil.

The company indicated that sporadic dumping had occurred in the general area located along the riverside of the levee during the 1950s and 1960s. Initial review of historical aerial photographs from the 1960s showed filling and dumping of unconsolidated material in several locations. However, further analysis of later dates of photography revealed that this fill material was physically removed and/or eroded away during river flooding.



Engineering Sciences Section – 2004

The approximate areal extent of the contaminated soil, as derived from maps produced during the three investigations, was registered to a 1984 geo-referenced digital image of the AOC. This was the closest date of aerial photography that pre-dated the initial investigation and subsequent partial source removal. The resulting composite map was digitized to create a geo-referenced spatial foot print of the contaminated soil. This spatial foot print was overlain to earlier dates of geo-referenced imagery, from which changes in the terrain due to anthropogenic activity and natural forces were tracked. From this detailed and precise comparison of sequential dates of aerial photography, it was ascertained that the contaminated soil identified in the investigations was placed in the AOC in the early 1980s, and possibly, to a lesser extent, in 1974. This was significantly later than originally purported.

These are but two examples in this case where detailed analysis of historical aerial photography was used to determine the timing of environmental damage for environmental cost recovery litigation.

Aerial Photography, Environmental Damage, Cost Recovery Litigation