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Soil Gas Information Summary
Sparton Technology, Inc.
Coors Road Plant
Albuquerque, New Mexico

1. The Sparton Plant began operation in 1961 to manufacture electronic components. The manufacturing process generated an aqueous metal plating waste and a solvent waste. These wastes were accumulated in on-site surface impoundments located in what is now referred to as the pond/sump area on the northeast side of the building.
2. In 1983, several groundwater monitoring wells were installed around the pond/sump area. Analytical results from groundwater samples obtained from these wells indicated concentrations of TCE and TCA above state standards.
3. In Spring of 1984, Tracer Research Corporation conducted a limited soil gas survey to a) assist in delineating the extent of off-site groundwater impacts and b) determine if there was a source upgradient from the Sparton property. Over 50 sampling points were utilized on-site and 9 sampling points were utilized along Irving Boulevard south of the property. Highest constituent concentrations were observed in the sampling transect nearest the pond/sump area (near current monitoring well MW-17). Soil gas TCE concentrations ranged from 720 ug/l (161 ppm_v) to less than 0.25 ug/l. TCA concentrations ranged from 440 ug/l (97 ppm_v) to less than 0.25 ug/l.

The Tracer study concluded a) that soil gas concentrations decreased radially in all directions from the pond/sump area and b) that concentration isopleths are skewed to the southwest in the direction of groundwater movement (RFI, Attachment 7, Appendix B). Results were also included in Appendix 2 of the CMS Report.

4. The use of soil gas as a "tracer" for groundwater contamination was an evolving technology. The 1984 Sparton soil gas/groundwater investigation was summarized in a paper by Eric Lappalla in 1984 and was included in the 1989 EPA Seminar Publication "Corrective Action: Technologies and Applications" (EPA/625/4-89/020).

5. In September 1985, a vadose zone investigation was conducted on site-- primarily in the pond/sump area. At EPA's request, a report containing the results and discussion of this investigation was not included in the RFI; however, boring logs and analytical results were included in Attachment 6 of the RFI. A total of 13 borings (including groundwater monitoring well MW-18) were used. Soil samples were obtained at approximately 5-foot intervals. These samples were screened using a PID to select samples for laboratory testing. A total of 126 soil samples were subsequently analyzed for TOX. The 21 samples with positive TOX detection were further tested for target VOC previously identified in groundwater samples. Voc was detected in only 6 of these samples (RFI, p. 82-83).

The results of the field screening and analytical testing showed that highest concentrations occurred in the immediate pond/sump area and were associated with silt/clay and/or the water table. At the time of the investigation (9/85), it appeared that the bulk of any contaminant release had completed its migration to the water table leaving behind only scattered residual VOC sorbed onto fine-grained silts and clays. Consistent with the 1984 soil gas survey, concentration isopleths were centered on the pond/sump area.

6. In July 1987, an extensive soil gas survey of over 100 sampling points was made. The purpose of the soil gas survey was to determine the extent and magnitude of groundwater impacts--particularly off-site (At this point in time, 25 groundwater monitoring wells had been installed on-site). The soil gas investigation indicated that on-site concentrations had dropped well over an order of magnitude since the 1984 survey. The 1987 results were also consistent in pattern with the 1984 soil gas study and the 1985 vadose zone investigation--the isopleths were still centered on the pond/sump area. The 1987 study is included in Attachment 7 of the RFI and Appendix 2 of the CMS.
7. A third soil gas survey using 63 sampling points was conducted in June 1991. The 1991 investigation covered approximately the same area as the 1987 survey, so valid comparisons could be made. A report was included in Attachment 9 to the RFI Report and the results were included in Appendix 2 of the CMS Report.

In this third survey, both TCE and TCA were found over the same area as in the 1987 survey, but concentrations had dropped approximately an order of magnitude (RFI, p. 97 and CMS p. III-28 and III-29). The concentration pattern was consistent with previous work. At a single location on the southwest side of the building TCE concentration was a maximum 24 ug/l (5 ppm_v) and TCA was a maximum 12 ug/l (3 ppm_v). Moving away from the plant, concentrations dropped over 4 orders of magnitude.

8. The RFI Report was approved by EPA on July 1, 1992.
9. In April 1996, soil gas data was obtained from 13 monitoring wells screened across the water table. Soil gas samples were obtained from the monitoring wells and analyzed for VOC. The soil gas results were consistent with previous investigations. Highest soil gas concentration occurred on-site near the pond/sump area. Soil gas concentration decreased rapidly moving away from the source area and concentrations were negligible off-site. The obtained soil gas results were compared to predicted equilibrium soil gas concentrations calculated using Henry's Law and the groundwater concentration at each well location. The comparisons indicated that, with the possible exception of TCA at monitoring well MW-17, soil gas is not a source of constituents to the groundwater and, in fact, groundwater is probably the source of VOC detections in soil gas at locations distant from the pond/sump area (CMS, p. III-29 - p. III-30, Appendix 2).
10. In June 1996, a vapor probe cluster was installed in the immediate vicinity of the solvent sump area. This was the first intrusive investigation in the source area since the pond/sump area had been closed and capped with pavement in 1986. The vapor probe cluster consisted of six individual probes screened at approximately 10-foot intervals down to just above the water table. Subsurface materials ranged from clay and very fine sand to scattered cobble gravel. As expected because of the location beneath the sump area, soil gas constituent concentrations were very high, ranging from 24,000 to 27,000 ug/l TCE (5376 to 6048 ppm_v) in fine sand to cobble gravel zone at 60 feet (Soil Gas Report, p. 14 & Appendix 2). These results were consistent with previous data.

11. In February 1997, 5 vapor recovery wells were installed in and around the pond/sump area. Recovery well VR-1 was installed through the center of the original solvent sump and the remaining wells were installed at varying radial distances up to 100 feet. All wells were screened from 10 feet bgs to just above the water table (approximately 55-foot screen). During installation, headspace soil gas readings were obtained from soil samples at 5-foot intervals. Well VR-1 had the highest headspace readings of 280 ppm with the higher readings corresponding to silt/clay zones. In the remaining wells, headspace readings were in the single digit to fractional ppm range. Subsequent sampling and analysis gave consistent information with the established pattern. VOC concentrations were highest at VR-1 and dropped off an order of magnitude at a radial distance of 100 feet from the sump location (Soil Gas Report, pp. 1-7, Appendix 1).
12. A soil vapor extraction (SVE) pilot test was conducted on site in February 1997. The pilot test was conducted in VR-1 and demonstrated a useable radius of influence of 175 to 200 feet at a flow of 65 cfm and an extraction well vacuum of five inches of water. The effects of the clay zones could be easily seen in the vapor probe cluster vacuum readings some six feet away from the recovery well (Soil Gas Report, pp. 16-21, Appendix 3).
13. In lieu of any soil gas data, the areal extent of soil gas outside the source area could be inferred from the areal extent of the groundwater plume. Assuming that soil gas constituent concentrations are in equilibrium with aqueous-phase concentrations at the groundwater surface, Henry's Law could be used to calculate soil gas concentrations. As given in Appendix 2 of the CMS:
TCE gas concentration in $\text{ppm}_v = 0.072$ water concentration in ug/l
TCA gas concentration in $\text{ppm}_v = 0.030$ water concentration in ug/l
At equilibrium, the 10 ppm_v soil gas limit would correspond to groundwater concentrations of 139 ug/l for TCE and 333 ug/l for TCA.
However, as the April 1996 deep soil gas investigation showed, actual soil gas concentrations (with the single exception of TCA at MW-17) are significantly below predicted equilibrium concentrations--particularly with distance from the pond/sump area.

14. From 1984 through the present date, soil gas information has been obtained through a variety of investigations; however, the information provides a consistent description.
- a) The area of elevated soil gas concentration (>10 ppm_v) is finite and within the boundaries of the Sparton Property.
 - b) Primary constituents are TCE and TCA.
 - c) Soil gas concentrations are highest in the immediate vicinity of the original solvent sump.
 - d) Concentrations decrease rapidly with increasing horizontal distance from the original solvent sump area.
 - e) Soil gas impact occurs through the entire unsaturated vadose zone with highest constituent concentrations corresponding to silt/clay layers with sorbed residual VOC.
 - f) Soil gas does not appear to be a source of contamination to groundwater.
 - g) All data (and regression analyses) indicate that elevated (>10 ppm_v) soil gas concentrations may extend out approximately 200 feet from the sump area--at least on the north side of the building.
 - h) Because of the capping effect of the building and the pavement around the building, elevated concentrations may extend slightly beyond the south side of the building.