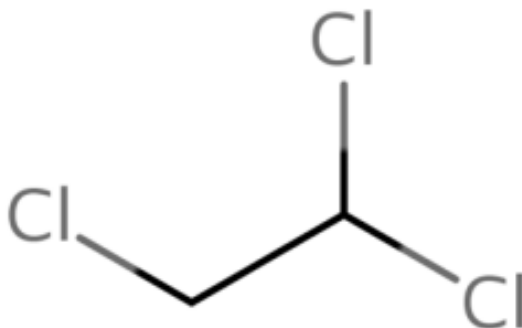

**Draft Data Quality Evaluation Information for
General Population, Consumer, and Environmental Exposure for
1,1,2-Trichloroethane**

Systematic Review Support Document for the Draft Risk Evaluation

CASRN: 79-00-5



May 2026

This supplemental file contains information regarding the data quality evaluation results for data sources that met the PECO screening criteria for the *Draft Chemistry, Fate, Release, and Exposure Assessment for 1,1,2-Trichloroethane*. EPA conducted data quality evaluation and extraction based on author-reported descriptions and results; additional analyses (e.g., statistical analyses) potentially conducted by EPA are not contained in this supplemental file. EPA performs data quality evaluation as a part of the TSCA systematic review process described in the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances*. The systematic review steps are further described in the *Draft Systematic Review Protocol for 1,1,2-Trichloroethane*.

Additionally, the overall quality determination (OQD) for each reference represents the data as a whole for each evidence stream, not for individual scenarios described within a study. For example, a reference that has both monitoring and experimental data would have OQDs using the data quality evaluation metrics for monitoring and experimental data, respectively. An OQD utilizing the data quality evaluation metrics for monitoring data, or any other single evidence stream, would consider all data pertinent to that evidence stream in the reference. Acronyms and abbreviations used within this supplemental file are defined in the table at the end of this file. This supplemental file may also be referred to as *Draft Data Quality Evaluation Information for General Population, Consumer, and Environmental Exposure for 1,1,2-Trichloroethane*.

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HERO ID	Reference	Page
Monitoring		
16086	Plumacher, J., Schroder, P. (1994). Accumulation and fate of C1/C2-chlorocarbons and trichloroacetic acid in spruce needles from an Austrian mountain site. <i>Chemosphere</i> 29(9-11):2467-2476.	14
16105	Von Sydow, L., Boren, H., Grimvall, A. (1999). Chloroacetates in snow, firn and glacier ice. <i>Chemosphere</i> 39(14):2479-2488.	15
21711	Wallace, L. A., Pellizzari, E., Hartwell, T., Rosenzweig, M., Erickson, M., Sparacino, C., Zelon, H. (1984). Personal exposure to volatile organic compounds I Direct measurements in breathing-zone air, drinking water, food, and exhaled breath. <i>Environmental Research</i> 35(1):293-319.	16
22428	Pellizzari, E. D., Perritt, K., Hartwell, T. D., Michael, L. C., Whitmore, R., Handy, R. W., Smith, D., Zelon, H. (1987). The total exposure assessment methodology (TEAM) study: Selected communities in northern and southern California: Volume III.	17
23081	Wallace, L. A. (1986). Personal exposures, indoor and outdoor air concentrations, and exhaled breath concentrations of selected volatile organic compounds measured for 600 residents of New Jersey, North Dakota, North Carolina, and California. <i>Toxicological and Environmental Chemistry</i> 12(3-4):215-236.	18
24793	Wallace, L., Pellizzari, E., Hartwell, T., Zelon, H., Sparacino, C., Perritt, R., Whitmore, R. (1986). Concentrations of 20 volatile organic compounds in the air and drinking water of 350 residents of New Jersey compared with concentrations in their exhaled breath. <i>Journal of Occupational Medicine</i> 28(8):603-608.	19
25107	Hartwell, T. D., Pellizzari, E. D., Perritt, R. L., Whitmore, R. W., Zelon, H. S., Sheldon, L. S., Sparacino, C. M., Wallace, L. (1987). Results from the total exposure assessment methodology (TEAM) study in selected communities in northern and southern California. <i>Atmospheric Environment</i> 21(9):1995-2004.	20
27381	Michael, L. C., Pellizzari, E. D., Perritt, R. L., Hartwell, T. D., Westerdahl, D., Nelson, W. C. (1990). Comparison of indoor, backyard, and centralized air monitoring strategies for assessing personal exposure to volatile organic compounds. <i>Environmental Science & Technology</i> 24(7):996-1003.	21
29196	Westrick, J. J., Mello, J. W., Thomas, R. F. (1984). The groundwater supply survey. <i>Journal of the American Water Works Association</i> 76(5):52-59.	22
33739	Lee, L. J. H., Chan, C. C., Chung, C. W., Ma, Y. C., Wang, G. S., Wang, J. D. (2002). Health risk assessment on residents exposed to chlorinated hydrocarbons contaminated in groundwater of a hazardous waste site. <i>Journal of Toxicology and Environmental Health, Part A: Current Issues</i> 65(3-4):219-235.	23
44391	Field, R. A., Phillips, J. L., Goldstone, M. E., Lester, J. N., Perry, R. (1992). Indoor/outdoor interactions during an air pollution event in central London. <i>Environmental Technology</i> 13(4):391-408.	24
56224	Serrano-Trespacios, P. I., Ryan, L., Spengler, J. D. (2004). Ambient, indoor and personal exposure relationships of volatile organic compounds in Mexico City metropolitan area. <i>Journal of Exposure Analysis and Environmental Epidemiology</i> 14 Suppl 1(S1):S118-S132.	25
73618	Wallace, L. A., Pellizzari, E. D., Hartwell, T. D., Sparacino, C., Whitmore, R., Sheldon, L., Zelon, H., Perritt, R. (1987). The TEAM study: Personal exposures to toxic substances in air, drinking water, and breath of 400 residents of New Jersey, North Carolina, and North Dakota. <i>Environmental Research</i> 43(2):290-307.	26
79120	De Bortoli, M., Knöppel, H., Pecchio, E., Peil, A., Rogora, L., Schauenburg, H., Schlitt, H., Vissers, H. (1985). Measurements of indoor air quality and comparison with ambient air: A study on 15 homes in northern Italy.	27
79425	Campbell, M. E., Benson, B. A., Muir, M. A. (1995). Urban air quality and human health: A Toronto perspective. <i>Canadian Journal of Public Health</i> 86(5):351-357.	28
80110	Mukund, R., Kelly, T. J., Spicer, C. W. (1996). Source attribution of ambient air toxic and other VOCs in Columbus, Ohio. <i>Atmospheric Environment</i> 30(20):3457-3470.	29

104106	Weissflog, L., Elansky, N., Putz, E., Krueger, G., Lange, C. A., Lisitzina, L., Pfennigsdorff, A. (2004). Trichloroacetic acid in the vegetation of polluted and remote areas of both hemispheres - Part II: Salt lakes as novel sources of natural chlorohydrocarbons. <i>Atmospheric Environment</i> 38(25):4197-4204.	30
119800	Okochi, H., Kataniwa, M., Sugimoto, D., Igawa, M. (2005). Enhanced dissolution of volatile organic compounds into urban dew water collected in Yokohama, Japan. <i>Atmospheric Environment</i> 39(33):6027-6036.	31
120063	Odabasi, M., Ongan, O., Cetin, E. (2005). Quantitative analysis of volatile organic compounds (VOCs) in atmospheric particles. <i>Atmospheric Environment</i> 39(20):3763-3770.	32
194932	Bove, F. J., Fulcomer, M. C., Klotz, J. B., Esmart, J., Dufficy, E. M., Savrin, J. E. (1995). Public drinking water contamination and birth outcomes. <i>American Journal of Epidemiology</i> 141(9):850-862.	33
195913	Lesage, S., Jackson, R. E., Priddle, M. W., Riemann, P. G. (1990). Occurrence and fate of organic solvent residues in anoxic groundwater at the Gloucester Landfill, Canada. <i>Environmental Science & Technology</i> 24(4):559-566.	34
632318	Choi, D. W., Moon, K. W., Byeon, S. H., Lee, E. I., Sul, D. G., Lee, J. H., Oh, E. H., Kim, Y. H. (2009). Indoor volatile organic compounds in atopy patients' houses in South Korea. <i>Indoor and Built Environment</i> 18(2):144-154.	35
632484	Ohura, T., Amagai, T., Senga, Y., Fusaya, M. (2006). Organic air pollutants inside and outside residences in Shimizu, Japan: Levels, sources and risks. <i>Science of the Total Environment</i> 366(2-3):485-499.	36
644836	Götz, R., Bauer, O., Friesel, P., Roch, K. (1998). Organic trace compounds in the water of the River Elbe near Hamburg: Part I. <i>Chemosphere</i> 36(9):2085-2101.	37
644857	Dewulf, J. P., Van Langenhove, H. R., Van der Auwera, L. F. (1998). Air/water exchange dynamics of 13 volatile chlorinated C1- and C2-hydrocarbons and monocyclic aromatic hydrocarbons in the southern North Sea and the Scheldt estuary. <i>Environmental Science & Technology</i> 32(7):903-911.	38
644898	Kawata, K., Tanabe, A., Saito, S., Sakai, M., Yasuhara, A. (1997). Screening of volatile organic compounds in river sediment. <i>Bulletin of Environmental Contamination and Toxicology</i> 58(6):893-900.	39
645755	Rockwell, D. C., Claff, R. E., Kuehl, D. W. (1984). 1981 Buffalo, New York, area sediment survey (Bass).	40
645789	Yamamoto, K., Fukushima, M., Kakutani, N., Kuroda, K. (1997). Volatile organic compounds in urban rivers and their estuaries in Osaka, Japan. <i>Environmental Pollution</i> 95(1):135-143.	41
647145	Van Zoest, R., Van Eck, G. T. M. (1991). Occurrence and behavior of several groups of organic micropollutants in the Scheldt estuary (Netherlands and Belgium). <i>Science of the Total Environment</i> 103(1):57-72.	42
658661	Bell, J., Melcer, H., Monteith, H., Osinga, I., Steel, P. (1993). Stripping of volatile organic compounds at full-scale municipal wastewater treatment plants. <i>Water Environment Research</i> 65(6):708-716.	43
658797	Stubin, A. I., Brosnan, T. M., Porter, K. D., Jimenez, L., Lochan, H. (1996). Organic priority pollutants in New York City municipal wastewaters: 1989-1993. <i>Water Environment Research</i> 68(6):1037-1044.	44
659066	Huybrechts, T., Thas, O., Dewulf, J., Van Langenhov, H. (2002). How to estimate moments and quantiles of environmental data sets with non-detected observations? A case study on volatile organic compounds in marine water samples. <i>Journal of Chromatography A</i> 975(1):123-133.	45
659075	Martinez, E., Llobet, I., Lacorte, S., Viana, P., Barcelo, D. (2002). Patterns and levels of halogenated volatile compounds in Portuguese surface waters. <i>Journal of Environmental Monitoring</i> 4(2):253-257.	46
659768	Assmuth, T. W., Strandberg, T. (1993). Ground water contamination at Finnish landfills. <i>Water, Air, and Soil Pollution</i> 69(1-2):179-199.	47
659943	Dyer, M. (1995). The water quality at Lago Di Vico during 1992-1993. <i>Science of the Total Environment</i> 171(1-3):77-83.	48
660069	Herbarth, O., Rehwagen, M., Ronco, A. E. (1997). The influence of localized emittants on the concentration of volatile organic compounds in the ambient air measured close to ground level. <i>Environmental Toxicology and Water Quality</i> 12(1):31-37.	49
660097	Huybrechts, T., Dewulf, J., Van Langenhove, H. (2004). Spatial and temporal variability of priority volatile organic compounds in the Scheldt estuary. <i>Water Research</i> 38(14-15):3241-3250.	50

660779	Assmuth, T., Kalevi, K. (1992). Concentrations and toxicological significance of trace organic compounds in municipal solid waste landfill gas. <i>Chemosphere</i> 24(9):1207-1216.	51
661103	Lorah, M. M., Olsen, L. D. (1999). Degradation of 1,1,2,2-tetrachloroethane in a freshwater tidal wetland: Field and laboratory evidence. <i>Environmental Science & Technology</i> 33(2):227-234.	52
661596	Wilson, S. C., Burnett, V., Waterhouse, K. S., Jones, K. C. (1994). Volatile organic compounds in digested United Kingdom sewage sludges. <i>Environmental Science & Technology</i> 28(2):259-266.	53
661846	Schrab, G. E., Brown, K. W., Donnelly, K. C. (1993). Acute and genetic toxicity of municipal landfill leachate. <i>Water, Air, and Soil Pollution</i> 69(1-2):99-112.	54
664358	Huff, G. F., Braun, C. L., Lee, R. W. (2000). Assessment of potential for natural attenuation of chlorinated ethenes and ethanes in ground water at a petrochemical reclamation site, Harris County, Texas.	55
664403	Fast, T., Kliest, J., Boleij, J. S. M., Slingerland, P. (1988). The influence of soil pollution on the indoor air quality. 1:441-449.	56
697407	Sakai, K., Kamijima, M., Shibata, E., Ohno, H., Nakajima, T. (2009). Annual transition and seasonal variation of indoor air pollution levels of 2-ethyl-1-hexanol in large-scale buildings in Nagoya, Japan. <i>Journal of Environmental Monitoring</i> 11(11):2068-2076.	57
724484	Sabel, G. V., Clark, T. P. (1984). Volatile organic compounds as indicators of municipal solid waste leachate contamination. <i>Waste Management & Research</i> 2(2):119-130.	58
737432	Blount, B. C., McElprang, D. O., Chambers, D. M., Waterhouse, M. G., Squibb, K. S., Lakind, J. S. (2010). Methodology for collecting, storing, and analyzing human milk for volatile organic compounds. <i>Journal of Environmental Monitoring</i> 12(6):1265-1273.	59
789748	Jang, Y. C., Townsend, T. G. (2001). Occurrence of organic pollutants in recovered soil fines from construction and demolition waste. <i>Waste Management</i> 21(8):703-715.	60
824416	Yamaguchi, T., Nakajima, D., Ezoe, Y., Fujimaki, H., Shimada, Y., Kozawa, K., Arashidani, K., Goto, S. (2006). Measurement of volatile organic compounds (VOCs) in new residential buildings and VOCs behavior over time. <i>Journal of UOEH</i> 28(1):13-27.	61
1024050	Donnelly, C. A. (1995). The spatial analysis of covariates in a study of environmental epidemiology. <i>Statistics in Medicine</i> 14(21-22):2393-2409.	62
1255270	Logue, J. M., Small, M. J., Stern, D., Maranche, J., Robinson, A. L. (2010). Spatial variation in ambient air toxics concentrations and health risks between industrial-influenced, urban, and rural sites. <i>Journal of the Air and Waste Management Association</i> 60(3):271-286.	63
1270143	AT&T, (1990). Letter from AT&T to USEPA submitting enclosed initial submission concerning the preliminary soil contamination study with attachments.	64
1313544	Takigawa, T., Wang, B. L., Saijo, Y., Morimoto, K., Nakayama, K., Tanaka, M., Shibata, E., Yoshimura, T., Chikara, H., Ogino, K., Kishi, R. (2010). Relationship between indoor chemical concentrations and subjective symptoms associated with sick building syndrome in newly built houses in Japan. <i>International Archives of Occupational and Environmental Health</i> 83(2):225-235.	65
1316229	Hazleton Labs, (1986). Pollutant analyses on effluent discharge - phenol - with cover letter dated 072387.	66
1316232	Ciba-Geigy, (1987). Briefing for the assistant administrator - Record for decision on the Lone Pine Landfill.	67
1316237	Geraghty & Miller Inc, (1990). Phase II - Site investigation: Borden site Carson, California (volume I) with attached appendices and cover letter dated 032790.	68
1316245	Ecology and Environment, (1991). Letter from Vulcan Chemicals to USEPA submitting enclosed final report concerning RCRA facility assessment with tetrachloroethylene and trichloromethane with attachments.	69
1332944	Rohm and Haas, (1981). Landfill monitoring wells and stream survey attach cover letter.	70
1332986	ERM, (1988). Hydrogeological investigation at the Union Carbide solvents and materials coating plant with cover letter dated 070688.	71
1335577	Enwright Associates, (1985). Groundwater & wastewater monitoring report with cover letter dated 120385.	72
1335585	NUS, (1987). Preliminary investigation at the Hranica waste disposal site - Sarver, Penn.	73

1335590	Chem-Dyne, (1987). CRA sampling and analytical tables on nine chemicals with attachments.	74
1356129	Hargis, (1986). Phase III: Investigation of groundwater quality and hydrogeologic conditions, Summa Corporation Facility, Culver City, California (final report) with attach and letter dated 013192.	75
1356133	Westinghouse Electric Corporation, (1991). Hydrogeological investigation of the Hoechst Celanese facility Spartanburg, South Carolina - Westinghouse project 4122-90-022A with attachments and cover letter dated 052291.	76
1356151	ERT, (1990). Results of site investigation at the Cleveland Service Center Solon, Ohio with attachments, cover sheet and letter dated 020690.	77
1356167	ERM, (1989). Endangerment assessment, on-site conditions on seven chemicals with cover letter dated 022489.	78
1356178	Great Lakes Chemical Corp, (1987). Exposure assessment for hazardous waste landfill with cover letter dated 072187.	79
1358515	Ghassemi, M., Quinlivan, S., Bachmaier, J. (1984). Characteristics of leachates from hazardous waste landfills. Journal of Environmental Science and Health, Part A: Environmental Science and Engineering 19(5):579-620.	80
1441890	U.S. EPA OTS, (1982). Hexachlorobutadiene with attachment. :7-10.	81
1444237	Juang, D. F., Yuan, C. S., Hsueh, S. C., Chiou, L. J. (2009). Distribution of volatile organic compounds around a polluted river. International Journal of Environmental Science and Technology 6(1):91-104.	82
1481067	Harding Lawson Associates, (1986). Site assessment report - amphenol products (Garden Grove, California) with cover letter dated 050986.	83
1481333	Geraghty & Miller Inc, (1980). Hydrogeologic investigation at Allied Chemical Corporation Syracuse works Solvay, New York.	84
1481739	ICI Americas Inc, (1990). Letter from ICI Americas Inc to USEPA submitting initial submission concerning phenol in groundwater with attachments.	85
1486654	Kraut, A., Chan, E., Lioy, P. J., Cohen, F. B., Goldstein, B. D., Landrigan, P. J. (1991). Epidemiologic investigation of a cancer cluster in professional football players. Environmental Research 56(2):131-143.	86
1488836	Bi, E., Liu, Y., He, J., Wang, Z., Liu, F. (2012). Screening of emerging volatile organic contaminants in shallow groundwater in East China. Ground Water Monitoring and Remediation 32(1):53-58.	87
1489889	Srivastava, A., Som, D. (2007). Hazardous air pollutants in industrial area of Mumbai - India. Chemosphere 69(3):458-468.	88
1629033	Shell Oil, (1986). Fate of some specific compounds in the Norco chemical biotreater and their effect on the outcome of effluent bioassays.	89
1738909	Olandsandan, Amagai, T., Matsushita, H. (1999). A passive sampler-GC/ECD method for analyzing 18 volatile organohalogen compounds in indoor and outdoor air and its application to a survey on indoor pollution in Shizuoka, Japan. Talanta 50(4):851-863.	90
1740826	Westinghouse Savannah River Company, (1997). Sanitary landfill groundwater monitoring report. Fourth quarter 1996 and 1996 summary. 14(GRA and I):506.	91
1740870	Westinghouse Savannah River Company, (1992). Sanitary Landfill 1991 annual groundwater monitoring report.	92
1741389	ATSDR, (1994). Petitioned public health assessment: E. I. du Pont de Nemours, Pompton Lakes, Passaic County, New Jersey.	93
1742362	Harkov, R., Kebbekus, B., Bozzelli, J. W. (1987). Volatile organic compounds at urban sites in New Jersey. :69-90.	94
1742404	Yamasaki, T., Oki, N., Okuno, T. (1992). Cycle of halocarbons in the air-water phase. Water Science and Technology 25(11):33-39.	95
1745520	Geraghty & Miller Inc, (1983). Hydrogeology of the Hill Site: The Bendix corporation: Sidney, New York with cover letter.	96
1745530	Allied, (1984). Hydrogeologic investigation summary report with cover letter.	97
1745594	DEE, (1984). State purgeable organic testing program (spot) quarterly report from April 1, 1987 to July 31, 1987 with cover letter dated 080387.	98
1745597	Ciba-Geigy, (1987). Annual report on results of water quality monitoring water year 1985-86 with cover letter dated 082887.	99

1745610	CA State Dept of Health Services, (1986). Organic chemical contamination of large public water systems in California April 1986 on seven chemicals with attachments.	100
1745613	SC DHEC, (1987). Investigation of groundwater at South Carolina Recycling and Disposal Company Bluff Road site, Richland County, South Carolina.	101
1745619	Geraghty & Miller Inc, (1988). Results of the second phase of a hydrogeologic investigation at the Allied-Signal Inc facility, Morristown, New Jersey with cover letter dated 012089.	102
1745621	Dames & Moore, (1989). Ground water and soils data summary report with attachments, appendices, cover sheets and letter dated 080989.	103
1745640	Aeroject General Corp, (1979). Letter from Aeroject general corporation to USEPA regarding information on trichloroethylene with attachments.	104
1745693	HSWMR, (1993). Toxicological evaluation of sampling data for Little Rocky Creek, Greenville, South Carolina with cover letter dated 050793.	105
1745841	ERM-Northeast, (1994). Hydrogeologic investigation (including ground water quality) north of Husky Brook Eatontown, New Jersey, with cover letter dated 011894.	106
1787932	Shin, S. H., Jo, W. K. (2012). Volatile organic compound concentrations, emission rates, and source apportionment in newly-built apartments at pre-occupancy stage. Chemosphere 89(5):569-578.	107
1938385	Guo, P., Yokoyama, K., Piao, F., Sakai, K., Khalequzzaman, M., Kamijima, M., Nakajima, T., Kitamura, F. (2013). Sick building syndrome by indoor air pollution in Dalian, China. International Journal of Environmental Research and Public Health 10(4):1489-1504.	108
1941262	Boillot, C., Bazin, C., Tissot-Guerraz, F., Droguet, J., Perraud, M., Cetre, J. C., Trepo, D., Perrodin, Y. (2008). Daily physicochemical, microbiological and ecotoxicological fluctuations of a hospital effluent according to technical and care activities. Science of the Total Environment 403(1-3):113-129.	109
1946147	Oldaker G B, III, Taylor, W. D., Parrish, K. B. (1995). Investigations of ventilation rate, smoking activity and indoor air quality at four large office buildings. Environmental Technology 16(2):173-180.	110
1947427	Fox, R. B. (2000). Air quality and comfort measurement aboard a commuter aircraft and solutions to improve perceived occupant comfort levels. American Society for Testing and Materials special technical publication 1393:161-186.	111
1947616	Helmig, D., Apel, E., Blake, D., Ganzeveld, L., Lefer, B. L., Meinardi, S., Swanson, A. L. (2009). Release and uptake of volatile inorganic and organic gases through the snowpack at Niwot Ridge, Colorado. Biogeochemistry 95(1):167-183.	112
1973128	T A Gleason Assoc, (1986). Hydrological and groundwater quality investigations (final report) with cover letter dated 071587.	113
1973144	Bookman-Edmonston, (1985). Annual report on results of water quality monitoring water year 1983-84 on seven chemicals with attachments.	114
1973153	T A Gleason Assoc, (1990). Letter from Allied Signal Inc to US EPA regarding well water test result data from a closed landfill site with attachment.	115
1992664	Buhamra, S. S., Bouhamra, W. S., Elkilani, A. S. (1998). Assessment of air quality in ninety-nine residences of Kuwait. Environmental Technology 19(4):357-368.	116
2048254	Monsanto Chemical Company, (1995). Whole effluent and chemical specific evaluation (o-dichlorobenzene) of Monsanto's Antwerp plant aqueous discharge, with cover letter dated 07/10/95.	117
2048351	Dames & Moore, (1988). Report of hydrogeologic and environmental assessment for sixteen chemicals at the former Allied Automotive Plant with cover letter dated 033188.	118
2095300	Yoshida, T., Matsunaga, I. (2006). A case study on identification of airborne organic compounds and time courses of their concentrations in the cabin of a new car for private use. Environment International 32(1):58-79.	119
2127874	Brenner, D. (2010). Results of a long-term study of vapor intrusion at four large buildings at the NASA Ames research center. Journal of the Air and Waste Management Association (1990-1992) 60(6):747-758.	120

2310570	Yamamoto, K., Fukushima, M., Kakutani, N., Tsuruho, K. (2001). Contamination of vinyl chloride in shallow urban rivers in Osaka, Japan. <i>Water Research</i> 35(2):561-566.	121
2382561	Yu, C. H., Zhu, X., Fan, Z. H. (2014). Spatial/temporal variations and source apportionment of VOCs monitored at community scale in an urban area. <i>PLoS ONE</i> 9(4):e95734.	122
2443355	Chin, J. Y., Godwin, C., Parker, E., Robins, T., Lewis, T., Harbin, P., Batterman, S. (2014). Levels and sources of volatile organic compounds in homes of children with asthma. <i>Indoor Air</i> 24(4):403-415.	123
2443817	Ras-Mallorqui, M. R., Marce-Recasens, R. M., Borrull-Ballarin, F. (2007). Determination of volatile organic compounds in urban and industrial air from Tarragona by thermal desorption and gas chromatography-mass spectrometry. <i>Talanta</i> 72(3):941-950.	124
2529812	Kuo, M. C. T., Chen, C. M., Lin, C. H., Fang, H. C., Lee, C. H. (2000). Surveys of volatile organic compounds in soil and groundwater at industrial sites in Taiwan. <i>Bulletin of Environmental Contamination and Toxicology</i> 65(5 (Nov 2000)):654..	125
2532227	He, Z., Yang, G., Lu, X., Ding, Q., Zhang, H. (2013). Halocarbons in the marine atmosphere and surface seawater of the south Yellow Sea during spring. <i>Atmospheric Environment</i> 80:514-523.	126
2799637	Bookman-Edmonston, (1986). Annual report on results of water quality monitoring water year 1984-85 on 4 chemicals with attachments.	127
2801793	Uhler, A. D., Diachenko, G. W. (1987). Volatile halocarbon compounds in process water and processed foods. <i>Bulletin of Environmental Contamination and Toxicology</i> 39(4):601-607.	128
2802879	Rogers, H. R., Crathorne, B., Watts, C. D. (1992). Sources and fate of organic contaminants in the Mersey estuary: Volatile organohalogen compounds. <i>Marine Pollution Bulletin</i> 24(2):82-91.	129
2803418	Dawes, V. J., Waldock, M. J. (1994). Measurement of volatile organic compounds at UK national monitoring plan stations. <i>Marine Pollution Bulletin</i> 28(5):291-298.	130
2834618	Uchiyama, S., Tomizawa, T., Tokoro, A., Aoki, M., Hishiki, M., Yamada, T., Tanaka, R., Sakamoto, H., Yoshida, T., Bekki, K., Inaba, Y., Nakagome, H., Kunugita, N. (2015). Gaseous chemical compounds in indoor and outdoor air of 602 houses throughout Japan in winter and summer. <i>Environmental Research</i> 137:364-372.	131
2859218	Nikolaou, A. D., Golfinopoulos, G., Kostopoulou, M. N., Kolokythas, G. A., Lekkas, T. D. (2002). Determination of volatile organic compounds in surface waters and treated wastewater in Greece. <i>Water Research</i> 36(11):2883-2890.	132
2952692	Wallace, L. A., Pellizzari, E. P., Hartwell, T. D., Whitmore, R., Zelon, H., Perritt, C., Sheldon, L. (1988). The California TEAM study: Breath concentrations and personal exposures to 26 volatile compounds in air and drinking water of 188 residents of Los Angeles, Antioch, and Pittsburg, CA. <i>Atmospheric Environment</i> 22(10):2141-2164.	133
2956688	Liu, B., Chen, L., Huang, L., Wang, Y., Li, Y. (2015). Distribution of volatile organic compounds (VOCs) in surface water, soil, and groundwater within a chemical industry park in Eastern China. <i>Water Science and Technology</i> 71(2):259-267.	134
3024658	Dohoo, C., Read Guernsey, J., Gibson, M. D., Vanleeuwen, J. (2015). Impact of biogas digesters on cookhouse volatile organic compound exposure for rural Kenyan farmwomen. <i>Journal of Exposure Science & Environmental Epidemiology</i> 25(2):167-174.	135
3227643	Wallace, L., Zweidinger, R., Erickson, M., Cooper, S., Whitaker, D., Pellizzari, E. (1982). Monitoring individual exposure. Measurements of volatile organic compounds in breathing-zone air, drinking water, and exhaled breath. <i>Environment International</i> 8(1/6):269-282.	136
3364193	Kingsbury, J. A., Delzer, G. C., Hopple, J. A. (2008). Anthropogenic organic compounds in source water of nine community water systems that withdraw from streams, 2002–05. <i>Scientific Investigations Report</i> 2008-5208 :68.	137
3449325	Gallego, E., Roca, F. J., Perales, J. F., Guardino, X., Gadea, E., Garrote, P. (2016). Impact of formaldehyde and VOCs from waste treatment plants upon the ambient air nearby an urban area (Spain). <i>Science of the Total Environment</i> 568:369-380.	138
3488897	Ma, H., Zhang, H., Wang, L., Wang, J., Chen, J. (2014). Comprehensive screening and priority ranking of volatile organic compounds in Daliao River, China. <i>Environmental Monitoring and Assessment</i> 186(5):2813-2821.	139
3637110	Tucker, R. K. (1981). Groundwater quality in New Jersey: An investigation of toxic contaminants.	140
3975066	Hopple, J. A., Delzer, G. C., Kingsbury, J. A. (2009). Anthropogenic organic compounds in source water of selected community water systems that use groundwater, 2002-05. <i>SIR</i> 2009-5200 :76.	141

4213875	OBG, (1987). Waste disposal sites assessment.	142
4213876	UT Austin, (1987). Analysis and interpretation of batch equilibrium and column studies of the partitioning of chlorinated hydrocarbons to soil materials from the PPG Lake Charles site.	143
4213877	Ken E Davis Assoc, (1984). Investigation of contamination at the North Dock Storage Area phase I - PPG Industries, Lake Charles, LA.	144
4213878	Ken E Davis Assoc, (1983). Field investigation in the northeast portion of the south terminal - Addendum I to phase VI.	145
4213880	ESC, (1985). Groundwater monitoring summary - Hranica Landfill, Sarver, Penn.	146
4213973	ERM-Northeast, (1992). ECRA sampling and analysis plan report - AlliedSignal Aerospace Company Bendix Electric Power Division with cover letter dated 111693.	147
4214163	Geraghty & Miller Inc, (1982). Ground-water quality conditions in the vicinity of waste oil disposal facilities at the Sidney, New York, plant.	148
4214323	Allied Signal, (1990). Letter from Allied-Signal Inc notifying USEPA of their intentions to conduct an environmental assessment pursuant to the Environment Cleanup Responsibility Act with attachments.	149
4214419	ICI Americas Inc, (1991). Letter from ICI Americas Inc to USEPA submitting follow-up information concerning phenol and other chemicals in groundwater at the facility in Hopewell, Virginia with attachments.	150
4214480	Battelle Ocean Sciences, (1987). Draft final report on the fate and effects of produced water discharges in nearshore marine waters (volume I & II) with cover letter dated 091187.	151
4215637	Ciba-Geigy, (1984). Memo from S. Workman to C. Staton on Scrdi Dreyfus street site dated September 24, 1984 on one chemical.	152
4215684	Geraghty & Miller Inc, (1990). Investigation of ground-water conditions in the vicinity of Western Electric Company Princeton, New Jersey with attachments, cover sheet and letter dated 020690.	153
4215685	ENSR, (1987). Environmental soil investigation AT&T Kansas City works & quality assurance plan for identifying contaminants around underground storage tanks w-attachments, cover sheet & letter.	154
4215688	Allied Signal, (1990). Results of the phase III hydrogeologic investigation report with attachments and cover letter dated 020890.	155
4290379	NJ DEP, (1987). Data generated from three water departments on untreated well water, plant delivered water and distribution system with cover letter dated 030387.	156
4412645	Geosciences Research Assoc, (1987). Identification of ground water characteristics at the Knauf Fiberglass Company plant - Shelbyville, Indiana (final report).	157
4506342	Buszka, P. M., Barber, L. B., Schroeder, M. P., Becker, L. D. (1994). Organic compounds downstream from a treated-wastewater discharge near Dallas, Texas, March 1987.	158
4697151	Xing, L., Wang, L., Zhang, R. (2018). Characteristics and health risk assessment of volatile organic compounds emitted from interior materials in vehicles: a case study from Nanjing, China. Environmental Science and Pollution Research 25(15):14789-14798.	159
4697228	Grosjean, E., Rasmussen, R. A., Grosjean, D. (1999). Toxic air contaminants in Porto Alegre, Brazil. Environmental Science & Technology 33(12):1970-1978.	160
4727403	Wallace, L., Nelson, W., Ziegenfuss, R., Pellizzari, E., Michael, L., Whitmore, R., Zelon, H., Hartwell, T., Perritt, R., Westerdahl, D. (1991). The Los Angeles TEAM Study: personal exposures, indoor-outdoor air concentrations, and breath concentrations of 25 volatile organic compounds. Journal of Exposure Analysis and Environmental Epidemiology 1(2):157-192.	161
5066259	Assmuth, T. W. (1996). Comparative risk analysis of waste site toxicants by indices based on concentration distributions, fluxes, environmental fate and critical effects. Journal of Hazardous Materials 48(1-3):121-135.	162
5096383	Williams, D. T., Coburn, J. A., Bancsi, J. J. (1984). Study of total organic halogen as a means to detect groundwater contamination. Environment International 10(1):39-44.	163

5239410	Kliest, J., Fast, T., Boley, J. S. M., van de Wiel, H., Bloemen, H. (1989). The relationship between soil contaminated with volatile organic compounds and indoor air pollution. <i>Environment International</i> 15(1-6):419-426.	164
5245153	Kuo, H. W., Lo, I. I., Chan, C. C., Lai, J. S., Wang, J. D. (1996). Volatile organic compounds in water near petrochemical factories in Taiwan. <i>Chemosphere</i> 33(5):913-920.	165
5245498	Harkov, R., Gianti, S. J., Bozzelli, J. W., Laregina, J. E. (1985). Monitoring volatile organic compounds at hazardous and sanitary landfills in New Jersey. <i>Journal of Environmental Science and Health, Part A: Environmental Science and Engineering</i> 20(5):491-502.	166
5255865	Purtymun, W. D., Ferenbaugh, R. W., Maes, M. (1988). Quality of surface and ground water at and adjacent to the Los Alamos National Laboratory: Reference organic compounds.	167
5258475	Zimmerman, M. J., Massey, A. J., Campo, K. W. (2005). Pushpoint sampling for defining spatial and temporal variations in contaminant concentrations in sediment pore water near the ground-water / surface-water interface. :1-75.	168
5276359	Pellizzari, E. D., Hartwell, T. D., Perritt, R. L., Sparacino, C. M., Sheldon, L. S., Zelon, H. S., Whitmore, R. W., Breen, J. J., Wallace, L. (1986). Comparison of indoor and outdoor residential levels of volatile organic chemicals in five usa geographical areas. <i>Environment International</i> 12(6):619-624.	169
5431563	Huang, Y., Su, T., Wang, L., Wang, N., Xue, Y., Dai, W., Lee, S. C., Cao, J., Ho, S. S. H. (2019). Evaluation and characterization of volatile air toxics indoors in a heavy polluted city of northwestern China in wintertime. <i>Science of the Total Environment</i> 662:470-480.	170
5433584	Lorah, M. M., Olsen, L. D., Smith, B. L. (1997). Natural attenuation of chlorinated hydrocarbons in a freshwater wetland. 4(3)(3):207-212.	171
5434129	Giger, W., Molnar-Kubica, E., Wakeham, S. (1978). Volatile chlorinated hydrocarbons in ground and lake waters. :101-123.	172
5436115	Roy F. Weston Inc, (1986). Installation restoration program phase ii-confirmation/quantification, stage 1. Final report for Burlington Air national guard base, Burlington, Vermont.	173
5436763	Buzska, P. M. (1987). Relation of water chemistry of the Edwards aquifer to hydrogeology and land use, San Antonio Region, Texas.	174
5437962	Fusillo, T. V., Voronin, L. M. (1981). Water-quality data for the Potomac-Raritan-Magothy aquifer system, Trenton to Pennsville, New jersey, 1980.	175
5438106	Glass, R. L. (1996). Hydrologic and water-quality data for U.S. Coast Guard Support Center Kodiak, Alaska, 1987-89. :1-73.	176
5438210	Guimaraes, W. B. (1995). Water quality in the Withers Swash Basin, with emphasis on enteric bacteria, Myrtle Beach, South Carolina, 1991-93. :1-102.	177
5438509	Heck, B. A., Myers, N. C., Hargadine, D. A. (1992). Hydrogeology and ground-water quality conditions at the Reno County Landfill, South-Central Kansas, 1990-91.	178
5438705	Hunt, J., Birch, G., Warne, M. S. J. (2007). Deriving trigger values for, and assessing hazard posed by, volatile chlorinated hydrocarbons in a sydney estuary. <i>Australasian Journal of Ecotoxicology</i> 13(1):33-42.	179
5440304	Mack, T. J. (1997). Design of monitoring wells, hydrogeology, and ground-water quality beneath Country Pond, Kingston, New Hampshire.	180
5440660	Miermans, C. J. H., Van Der Velde, L. E., Frintrap, P. C. M. (2000). Analysis of volatile organic compounds, using the purge and trap injector coupled to a gas chromatograph ion-trap mass spectrometer review of the results in Dutch surface water of the Rhine, Meuse, Northern Delta area and Westerscheldt, over the period 1992-1997. <i>Chemosphere</i> 40(1):39-48.	181
5440990	Naber, S., Verducci, J. (1988). Statistical analysis of ground water contamination of the Alert Apron and northern landfill areas of Wurtsmith AFB, Michigan.	182
5443237	Van Luin, A. B., Van Starkenburg, W. (1985). Hazardous Substances in Waste Water. <i>Water Science and Technology</i> 17(6-7):843-853.	183
5443295	USGS, (1989). Inorganic and organic ground-water chemistry in the Canal Creek area of Aberdeen Proving Ground, Maryland.	184
5443405	Watts, K. R., Ortiz, R. F. (1990). Geohydrology and ground-water quality at the pueblo depot activity landfill near Pueblo, Colorado.	185
5449639	Bigsby, P. R., Myers, N. C. (1989). Hydrogeology and ground-water-quality conditions at the Geary County landfill, northeast Kansas, 1988.	186

5451873	Demas, C. R., Demcheck, D. K. (1989). Uptake of manmade organic compounds by <i>Rangia cuneata</i> in the lower Calcasieu River, Louisiana. :309-319.	187
5452031	Westinghouse Savannah River Company, (1993). Mixed Waste Management Facility (MWMF) groundwater monitoring report (U): Fourth quarter 1992 and 1992 summary.	188
5471921	Van Zoest, R., Van Eck, G. T. M. (1991). Occurrence and behaviour of several groups of organic micropollutants in the Scheldt estuary. <i>Science of the Total Environment</i> 103(1):57-71.	189
5471952	Dreisch, F. A., Gower, M., Munson, T. O. (1980). Survey of the Huntington and Philadelphia River water supplies for purgeable organic contaminants.	190
5489294	Campbell, T. R. (1997). Soil, water, and streambed quality at a demolished asphalt plant, Fort Bragg, North Carolina, 1992-94.	191
5553456	Rowe, B. L., Toccalino, P. L., Moran, M. J., Zogorski, J. S., Price, C. V. (2007). Occurrence and potential human-health relevance of volatile organic compounds in drinking water from domestic wells in the United States. <i>Environmental Health Perspectives</i> 115(11):1539-1546.	192
5608960	Garcia, C., Tiedra, P. G., Ruano, A., Gomez, J. A., Garcia-Villanova, R. J. (1992). Volatile halo-organic compounds in treated waters of the province of Salamanca (Spain). <i>European Water Pollution Control</i> 2(4):46-49.	193
5639273	Landmeyer, J. E., Campbell, B. G. (2014). Assessment of ethylene dibromide, dibromochloropropane, other volatile organic compounds, radium isotopes, radon, and inorganic compounds in groundwater and spring water from the Crouch Branch and McQueen Branch aquifers near McBee, South Carolina, 2010-2012.	194
5736601	Li, Y., Cakmak, S., Zhu, J. (2019). Profiles and monthly variations of selected volatile organic compounds in indoor air in Canadian homes: Results of Canadian national indoor air survey 2012-2013. <i>Environment International</i> 126:134-144.	195
5755270	Dodson, R. E., Udesky, J. O., Colton, M. D., Mccauley, M., Camann, D. E., Yau, A. Y., Adamkiewicz, G., Rudel, R. A. (2017). Chemical exposures in recently renovated low-income housing: Influence of building materials and occupant activities. <i>Environment International</i> 109:114-127.	196
5885319	LTI Limno-Tech, (1993). Preliminary evaluation of Dow Corning Carrollton, Kentucky environmental effects to surface waters with cover letter dated 04/20/94.	197
6033301	Miksch, R. R., Anthon, D. W., Barnes, M., Fanning, L. Z., Glanville, J., Schmidt, H., Tashima, M. (1979). Energy efficient buildings program: Organic contaminants. <i>American Industrial Hygiene Association Journal</i> 41(11):851-853.	198
6229881	Cooke, K. M., Hassoun, S., Pilling, M. J., Saunders, S. M. (2001). Identification and quantification of volatile organic compounds found in a eucalyptus forest during FIELDVOC'94 in Portugal. <i>Chemosphere - Global Change Science</i> 3(3):249-257.	199
6307465	Bechtel Environmental, (1988). Final site investigation report for the Rohm and Haas Redwood City Facility.	200
6311565	Hargis & Montgomery Inc, (1984). Phase I Investigation of Groundwater Quality and Hydrogeological Conditions Summa Corporation Facility Culver City, California.	201
6574972	McKesson Environmental Services, (1984). Priority pollutant analysis.	202
6952657	Vu, D. C., Ho, T., Vo, P. H., Bayati, M., Davis, A. N., Gulseven, Z., Carlo, G., Palermo, F., McElroy, J. A., Nagel, S. C., Lin, C. H. (2019). Assessment of indoor volatile organic compounds in Head Start child care facilities. <i>Atmospheric Environment</i> 215:116900.	203
6968122	Han, F., Chen, J., Jiang, Z., Chen, L., Ji, W. (2013). Volatile and semi-volatile organic compounds in the lower Yangtze River and surface waters of three Chinese provinces. <i>Polish Journal of Environmental Studies</i> 22(3):683-690.	204
6985025	U.S. EPA, (1977). Evaluation and wastewater characterization: Northeast Philadelphia water pollution control plant, Philadelphia, Pennsylvania (September 16-23, 1976).	205
11273432	CTEH, (2021). Shell Puget Sound Refinery 9-29-2020 flaring event: Supplemental report.	206
11273457	U.S. EPA, (2006). Air toxics field investigation report: EPA Method TO-15/Cerex UV Sentry comparison.	207

12795200	Bugher, N. A., Xiong, B., Gentles, R. I., Glist, L. D., Siegel, H. G., Johnson, N. P., Clark, C. J., Deziel, N. C., Saiers, J. E., Plata, D. L. (2024). Domestic groundwater wells in Appalachia show evidence of low-dose, complex mixtures of legacy pollutants. <i>Environmental Science: Processes & Impacts</i> 26(12):2250-2263.	208
Experimental		
1512515	Kim, S., Kim, J. A., An, J. Y., Kim, H. J., Kim, S. D., Park, J. C. (2007). TVOC and formaldehyde emission behaviors from flooring materials bonded with environmental-friendly MF/PVAc hybrid resins. <i>Indoor Air</i> 17(5):404-415.	209
5465286	Popescu, M., Ghosh, T. K. (1999). Dehumidification and simultaneous removal of selected pollutants from indoor air by a desiccant wheel using a 1M type desiccant. <i>Journal of Solar Energy Engineering</i> 121(1):1-13.	210
5967010	Kim, S., Park, J. C. (2010). Environment-friendly Hwangtoh composite materials using water soluble resin for indoor air quality and human health. <i>Journal of Composite Materials</i> 44(8):905-913.	211
Database		
10709393	U.S. EPA, U.,S.G.S. and National Water Quality Monitoring Council (2022). 1,1,2-Trichloroethane (1,1,2-TCA) (CAS RN: 79-00-5): WQP Output (NWIS, STEWARDS & STORET), Site data & sample results (physical/chemical metadata).	212
11195094	U.S. EPA, (2022). Ambient Monitoring Technology Information Center (AMTIC) - Ambient Monitoring Archive for HAPs.	213
Completed Assessment		
625736	Chung, Y., Shin, D., Park, S., Lim, Y., Choi, Y., Cho, S., Yang, J., Hwang, M., Park, Y., Lee, H. (1997). Risk assessment and management of drinking water pollutants in Korea. <i>Water Science and Technology</i> 36(12):309-323.	214
666891	PRC Environmental Management, (1995). Final baseline risk assessment for the Jayhawk Plant in Jayhawk, Kansas, with cover letter dated 02/22/95.	215
1316231	Monsanto, (1988). Monsanto Pensacola plant ground water assessment feasibility study on nineteen chemicals with attachments and cover letter dated 02/03/1989.	216
1333011	Geraghty & Miller Inc, (1994). Risk assessment for the BFGoodrich chemical division facility, Henry, Illinois with cover letter dated 05/06/94.	217
1356137	Radian Corp, (1991). Air toxic hot spots - AB 2588 health risk assessment (volume I & II) (final reports) with attachments and cover letter dated 032991. 910000774:#86-910000774.	218
1481091	Chemical Manufacturers Association, (1988). Petitioners and exhibits to petitioners memorandums in support of their motion for a remand with attachments and cover letter dated 012389 (Part b).	219
1482017	Radian Corp, (1995). Initial submission: Baseline risk assessment for the Jayhawk site Galena, Kansas with attachments and cover letter dated 030195.	220
1745617	Rohm and Haas, (1988). Biological risk assessment for the Redwood City facility & final site investigation report for the Rohm and Haas Redwood City facility with attachments & cover letter dated 092588 (Part a).	221
4214360	Envirologic Data, (1992). Assessment of risks from potential exposure to airbourne facility emissions under California AB 2588 for the Rohr Inc Facility Riverside, Calif (vol. 1) (final report) w-letter.	222
5113338	U.S. EPA, (2015). Technical support document, EPA's 2011 National-scale Air Toxics Assessment, 2011 NATA TSD.	223
5155643	California Office of Environmental Health Hazard Assessment (OEHHA) (2006). Public health goals for chemicals in drinking water: 1,1,2-trichloroethane.	224
5185306	OECD, (2000). SIDS initial assessment profile: 1,1,2-Trichloroethane, CAS No.: 79-00-5.	225
5478191	Anderson, D., Dicianna, D., Yance, J., Tarnay, A. (1989). Preliminary data summary for the solvent recycling industry.	226
Modeling		

37058	Schauer, J. J., Fraser, M. P., Cass, G. R., Simoneit, B. R. T. (2002). Source reconciliation of atmospheric gas-phase and particle-phase pollutants during a severe photochemical smog episode. <i>Environmental Science & Technology</i> 36(17):3806-3814.	227
2048254	Monsanto Chemical Company, (1995). Whole effluent and chemical specific evaluation (o-dichlorobenzene) of Monsanto's Antwerp plant aqueous discharge, with cover letter dated 07/10/95.	228
3449325	Gallego, E., Roca, F. J., Perales, J. F., Guardino, X., Gadea, E., Garrote, P. (2016). Impact of formaldehyde and VOCs from waste treatment plants upon the ambient air nearby an urban area (Spain). <i>Science of the Total Environment</i> 568:369-380.	229

Study Citation:		Plumacher, J., Schroder, P. (1994). Accumulation and fate of C1/C2-chlorocarbons and trichloroacetic acid in spruce needles from an Austrian mountain site. Chemosphere 29(9-11):2467-2476.		
HERO ID:		16086		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported
	Metric 2:	Analytical Methodology	Medium	Recovery samples not reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Austria
	Metric 5:	Currency	Low	Samples collected in 1991 to 1992
	Metric 6:	Spatial and Temporal Variability	High	>10 samples; replicates
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	raw data not reported
	Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported
Overall Quality Determination			Medium	

Study Citation:		Von Sydow, L., Boren, H., Grimvall, A. (1999). Chloroacetates in snow, firn and glacier ice. Chemosphere 39(14):2479-2488.		
HERO ID:		16105		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Well described sampling methods. Methods, equipment, and storage detailed.
	Metric 2:	Analytical Methodology	Medium	Methods are detailed but LOD and recoveries are missing
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Antartica, Russia, Scandinavia
	Metric 5:	Currency	Low	Sampling in 1994
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7:	Exposure Scenario	Medium	Data may represent a relevant exposure scenario but a population or scenario of interest is not specified
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Reported individual sample concentrations, missing summary statistics
	Metric 9:	Quality Assurance	Low	Limited details about QA/QC
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Characterization of variability is absent, key uncertainties and limitations are not discussed
Overall Quality Determination			Uninformative	

Study Citation:		Wallace, L. A., Pellizzari, E., Hartwell, T., Rosenzweig, M., Erickson, M., Sparacino, C., Zelon, H. (1984). Personal exposure to volatile organic compounds I Direct measurements in breathing-zone air, drinking water, food, and exhaled breath. Environmental Research 35(1):293-319.		
HERO ID:		21711		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Limited description of sampling methods , cited previously published work
	Metric 2:	Analytical Methodology	High	Limited description of analytical methods, reported LOD
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Sampling in 1980
	Metric 6:	Spatial and Temporal Variability	Low	9 study individuals whose samples were taken in 3 visits for a total of 230 air samples, 170 drinking water samples, 66 breath samples and 4 food samples
	Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics
	Metric 9:	Quality Assurance	High	Described QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Did not characterize variability, limitations only briefly discussed
Overall Quality Determination			Medium	

Study Citation:		Pellizzari, E. D., Perritt, K., Hartwell, T. D., Michael, L. C., Whitmore, R., Handy, R. W., Smith, D., Zelon, H. (1987). The total exposure assessment methodology (TEAM) study: Selected communities in northern and southern California: Volume III.		
HERO ID:		22428		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Well described sampling methodology
	Metric 2:	Analytical Methodology	High	Well described analytical methods, reported LOD
	Metric 3:	Biomarker Selection	N/A	Biomarkers not used
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Sampling in 1984
	Metric 6:	Spatial and Temporal Variability	Low	118 study participants (52 with duplicates)
	Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Limited summary statistics
	Metric 9:	Quality Assurance	High	Described QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Did not characterize variability of concentrations, discussed uncertainties and limitations
Overall Quality Determination			Medium	

Study Citation:		Wallace, L. A. (1986). Personal exposures, indoor and outdoor air concentrations, and exhaled breath concentrations of selected volatile organic compounds measured for 600 residents of New Jersey, North Dakota, North Carolina, and California. Toxicological and Environmental Chemistry 12(3-4):215-236.		
HERO ID:		23081		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Well described sampling methodology
	Metric 2:	Analytical Methodology	Medium	Limited description of analytical methods, LOD mentioned but not reported
	Metric 3:	Biomarker Selection	N/A	Selection of biomarker of exposure not applicable for monitoring study
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Sampling began in 1981
	Metric 6:	Spatial and Temporal Variability	Medium	700 samples from 600 study participants. EPA: duplicate analysis conducted, though unclear what portion of 30% of samples are duplicate versus blanks and spikes.
	Metric 7:	Exposure Scenario	High	Data closely represents relevant exposure scenarios
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics
	Metric 9:	Quality Assurance	High	QA/QC techniques were described, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability was not characterized, uncertainties were discussed. EPA: coefficients of variation are assess for the duplicate analysis, with CV ranging from 20-40% for air and breath samples and less than 10% CV for water samples.
Overall Quality Determination			Medium	

Study Citation:		Wallace, L., Pellizzari, E., Hartwell, T., Zelon, H., Sparacino, C., Perritt, R., Whitmore, R. (1986). Concentrations of 20 volatile organic compounds in the air and drinking water of 350 residents of New Jersey compared with concentrations in their exhaled breath. Journal of Occupational Medicine 28(8):603-608.		
HERO ID:		24793		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Scientifically sound sampling methods
	Metric 2:	Analytical Methodology	Low	Analytical methods only briefly described, reported a general LOD for all compounds (footnote in table 2)
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	NJ, USA
	Metric 5:	Currency	High	1980
	Metric 6:	Spatial and Temporal Variability	Low	705 personal air samples, 183 outdoor air samples, 358 breath samples, with 200 duplicates
	Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics
	Metric 9:	Quality Assurance	High	Described QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Characterized variability, did not discuss uncertainties and limitations
Overall Quality Determination			Medium	

Study Citation:	Hartwell, T. D., Pellizzari, E. D., Perritt, R. L., Whitmore, R. W., Zelon, H. S., Sheldon, L. S., Sparacino, C. M., Wallace, L. (1987). Results from the total exposure assessment methodology (TEAM) study in selected communities in northern and southern California. Atmospheric Environment 21(9):1995-2004.			
HERO ID:	25107			
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Good description of sampling methodology
	Metric 2:	Analytical Methodology	Medium	Limited description of analytical methods, cited previous work, LOD was not reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Sampling in 1984
	Metric 6:	Spatial and Temporal Variability	Low	117 sampling sites, 81 with duplicates
	Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Limited summary statistics
	Metric 9:	Quality Assurance	High	Described QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Did not characterize variability, or discussed uncertainties and study limitations
Overall Quality Determination			Medium	

Study Citation:		Michael, L. C., Pellizzari, E. D., Perritt, R. L., Hartwell, T. D., Westerdahl, D., Nelson, W. C. (1990). Comparison of indoor, backyard, and centralized air monitoring strategies for assessing personal exposure to volatile organic compounds. Environmental Science & Technology 24(7):996-1003.		
HERO ID:		27381		
Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	well described sampling methods
	Metric 2:	Analytical Methodology	High	Well described analytical methods, reported LOD
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Published in 1990
	Metric 6:	Spatial and Temporal Variability	Low	43 households sampled, no site replicates
	Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw or average values reported in a table
	Metric 9:	Quality Assurance	High	Described QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Characterized variability, limited discussion of uncertainties and limitations
Overall Quality Determination			Medium	

Study Citation:	Westrick, J. J., Mello, J. W., Thomas, R. F. (1984). The groundwater supply survey. Journal of the American Water Works Association 76(5):52-59.			
HERO ID:	29196			
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	sampling equipment, log procedure, and map included
	Metric 2:	Analytical Methodology	High	USEPA methods 502.1 and 503.1; quantitation limits in tables
	Metric 3:	Biomarker Selection	N/A	groundwater
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	U.S.
	Metric 5:	Currency	Low	published 1984
	Metric 6:	Spatial and Temporal Variability	High	n = ~500 broken into groups, replicates for a percent of samples
	Metric 7:	Exposure Scenario	Medium	groundwater
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	median and max
	Metric 9:	Quality Assurance	High	QA discussed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	variability discussed
Overall Quality Determination			High	

Study Citation:		Lee, L. J. H., Chan, C. C., Chung, C. W., Ma, Y. C., Wang, G. S., Wang, J. D. (2002). Health risk assessment on residents exposed to chlorinated hydrocarbons contaminated in groundwater of a hazardous waste site. Journal of Toxicology and Environmental Health, Part A: Current Issues 65(3-4):219-235.		
HERO ID:		33739		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	groundwater sampling from off-site residential wells located 50m to 1KM away from factory; collected samples both upstream and downstream; water drawn directly from wells with a bailer and stored in brown bottles (completely filled) containing 30mg preadded ascorbic acid; stored at 4C; timing of sampling not discussed
	Metric 2:	Analytical Methodology	Medium	purge and trip device used to collect analytes; GC/MS; calibration by internal standard; LOD ranged from 0.01 to 0.1 ug/L
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Taoyuan City, Taiwan
	Metric 5:	Currency	Low	1999-2000
	Metric 6:	Spatial and Temporal Variability	High	49 off-site residential wells; downstream - 69 samples from 44 wells with 1 sample per well for 32 wells and 2 to 3 samples per well for the other 12; upstream - 2 samples from 2 wells south of factory and another 3 samples from 3 wells west of factory; 74 groundwater samples total; samples over a year
	Metric 7:	Exposure Scenario	High	groundwater at a hazardous waste site contaminated by manufacturing of electronic appliances after on-site remediation
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Table 1 provided concentration data; geometric mean and range; arithmetic mean and 95% UCL; description of data set not summarized
	Metric 9:	Quality Assurance	Low	reproducibility was evaluated with 9 set of samples and calculated from 2 duplicate analyses; relative mean deviation of duplicates was 20% for most of the VOCs
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	no discussion of variability or uncertainty
Overall Quality Determination			Medium	

Study Citation:		Field, R. A., Phillips, J. L., Goldstone, M. E., Lester, J. N., Perry, R. (1992). Indoor/outdoor interactions during an air pollution event in central London. Environmental Technology 13(4):391-408.		
HERO ID:		44391		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sampling methodology was adequately described.
	Metric 2:	Analytical Methodology	Low	Limits of detection or quantification were not reported.
	Metric 3:	Biomarker Selection	N/A	This metric is not applicable for this study.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	This study was conducted in London, UK.
	Metric 5:	Currency	Low	The data was collected in 1991.
	Metric 6:	Spatial and Temporal Variability	Medium	The samples were collected for 25 minutes every hour. No replicates were utilized.
	Metric 7:	Exposure Scenario	High	Indoor and outdoor dynamics (vapor intrusion) were described in ventilated offices and close to roadsides.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data was reported, but data summary statistics were adequately presented.
	Metric 9:	Quality Assurance	Low	Limited information was provided on quality assurance.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Limited information was provided on gaps and limitations
Overall Quality Determination			Medium	

Study Citation:		Serrano-Trespalcacios, P. I., Ryan, L., Spengler, J. D. (2004). Ambient, indoor and personal exposure relationships of volatile organic compounds in Mexico City metropolitan area. Journal of Exposure Analysis and Environmental Epidemiology 14 Suppl 1(S1):S118-S132.		
HERO ID:		56224		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sampling methodology was described.
	Metric 2:	Analytical Methodology	Medium	Method detection limits, but not limits of detection, were reported.
	Metric 3:	Biomarker Selection	N/A	This metric is not applicable for this study.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	This study was conducted within the Mexico City Metropolitan Area.
	Metric 5:	Currency	Low	Data was collected between March 1998 and February 1999.
	Metric 6:	Spatial and Temporal Variability	Medium	This study adequately described the number of samples, but did not conduct replicate sampling.
	Metric 7:	Exposure Scenario	High	Personal exposure for families living within 5 km radius of 5 central monitoring sites was detailed as well as indoor and outdoor exposures dynamics.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics were adequately described, however raw data was not reported.
	Metric 9:	Quality Assurance	High	Quality assurance samples and analytical quality control procedures were provided and described.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Sources of variability were discussed with respect to study goals.
Overall Quality Determination			High	

Study Citation:		Wallace, L. A., Pellizzari, E. D., Hartwell, T. D., Sparacino, C., Whitmore, R., Sheldon, L., Zelon, H., Perritt, R. (1987). The TEAM study: Personal exposures to toxic substances in air, drinking water, and breath of 400 residents of New Jersey, North Carolina, and North Dakota. Environmental Research 43(2):290-307.		
HERO ID:		73618		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Well described sampling methodology
	Metric 2:	Analytical Methodology	Medium	Limited description of analytical methods, mentioned LOD but values were not reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Published in 1986
	Metric 6:	Spatial and Temporal Variability	Medium	5000 air, water and breath samples, including 1500 control samples, no replicates
	Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics; raw data not reported
	Metric 9:	Quality Assurance	High	Described QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Did not characterize variability or discussed uncertainties and limitations
Overall Quality Determination			Medium	

Study Citation:		De Bortoli, M., Knöppel, H., Pecchio, E., Peil, A., Rogora, L., Schauenburg, H., Schlitt, H., Vissers, H. (1985). Measurements of indoor air quality and comparison with ambient air: A study on 15 homes in northern Italy.		
HERO ID:		79120		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Detailed sampling methodology in II.1.
	Metric 2:	Analytical Methodology	Medium	Some analytical methods not reported, such as recovery samples. Otherwise detailed analytical methodology in II.1.
	Metric 3:	Biomarker Selection	N/A	Only monitoring for parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Northern Italy
	Metric 5:	Currency	Low	Data collected in 1983 and 1984
	Metric 6:	Spatial and Temporal Variability	Medium	No replicate samples collected
	Metric 7:	Exposure Scenario	High	Indoor and outdoor air at homes
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data reported in Table 1
	Metric 9:	Quality Assurance	Low	Limited QA/QC reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No gaps nor limitations reported
Overall Quality Determination			Medium	

Study Citation:		Campbell, M. E., Benson, B. A., Muir, M. A. (1995). Urban air quality and human health: A Toronto perspective. Canadian Journal of Public Health 86(5):351-357.		
HERO ID:		79425		
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Sampling Methodology	Low	Few sampling methods were reported.
		Metric 2: Analytical Methodology	Critically Deficient	Analytical methods were not described.
		Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness		Metric 4: Geographic Area	High	The study was conducted in Toronto, Canada
		Metric 5: Currency	Low	Sampling was conducted in 1990 and the study was published in 1995.
		Metric 6: Spatial and Temporal Variability	Medium	The sample size was reported as n=100, but no replicate sampling was conducted.
		Metric 7: Exposure Scenario	Medium	The source of exposure was not well characterized.
Domain 3: Accessibility/Clarity		Metric 8: Reporting of Results	Medium	Raw data was not reported.
		Metric 9: Quality Assurance	Low	Quality assurance and quality control procedures were implied.
Domain 4: Variability and Uncertainty		Metric 10: Variability and Uncertainty	Low	No gaps or study limitations were reported.
Overall Quality Determination			Uninformative	

Study Citation:		Mukund, R., Kelly, T. J., Spicer, C. W. (1996). Source attribution of ambient air toxic and other VOCs in Columbus, Ohio. Atmospheric Environment 30(20):3457-3470.		
HERO ID:		80110		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sample storage conditions and sampler calibration
	Metric 2:	Analytical Methodology	Low	LOD nor LOQ reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Columbus, OH
	Metric 5:	Currency	Low	Study published in 1996, data from 1989
	Metric 6:	Spatial and Temporal Variability	Medium	six site sampled three times each from June to July 1989
	Metric 7:	Exposure Scenario	Medium	Exposure source is categories of source contribution rather a specified source(s)
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	raw data not reported
	Metric 9:	Quality Assurance	Medium	Some QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Some gaps and limitations reported
Overall Quality Determination			Medium	

Study Citation:		Weissflog, L., Elansky, N., Putz, E., Krueger, G., Lange, C. A., Lisitzina, L., Pfennigsdorff, A. (2004). Trichloroacetic acid in the vegetation of polluted and remote areas of both hemispheres - Part II: Salt lakes as novel sources of natural chlorohydrocarbons. Atmospheric Environment 38(25):4197-4204.		
HERO ID:		104106		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling methodology is discussed and is generally appropriate (i.e., scientifically sound), however, one or more pieces of sampling information is not described such as the sampling equipment and procedure or sampling storage duration.
	Metric 2:	Analytical Methodology	Medium	Analytical methodology is discussed and is clear and appropriate, however, instrument calibration and recovery samples are not discussed.
	Metric 3:	Biomarker Selection	N/A	Study tested for the decarboxylated products from the parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Russia
	Metric 5:	Currency	Low	Samples collected between 1999-2003.
	Metric 6:	Spatial and Temporal Variability	Medium	Table 1 lists 21 samples. Unclear if replicate samples were collected.
	Metric 7:	Exposure Scenario	Medium	The data likely represent the relevant exposure scenario. Populations of concern not described.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Raw data were not reported. Values presented in Table 1 are based on the average of two analytical determinations. Summary statistics are missing most parameters.
	Metric 9:	Quality Assurance	Low	QA/QC techniques and results were not directly discussed, but no indication that there were issues.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No measure of variance provided. Uncertainties and study limitations are not discussed.
Overall Quality Determination			Low	

Study Citation:		Okochi, H., Kataniwa, M., Sugimoto, D., Igawa, M. (2005). Enhanced dissolution of volatile organic compounds into urban dew water collected in Yokohama, Japan. Atmospheric Environment 39(33):6027-6036.		
HERO ID:		119800		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling procedure, equipment, and matrix were described.
	Metric 2:	Analytical Methodology	Medium	Analytical method (GC/MS) was used; no LOD was mentioned.
	Metric 3:	Biomarker Selection	N/A	Dew water/ambient air
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Japan
	Metric 5:	Currency	Low	1998-2000
	Metric 6:	Spatial and Temporal Variability	High	Sample size was reported to be 46.
	Metric 7:	Exposure Scenario	Medium	ambient air (dew water)
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Volume-weighted mean concentration was reported.
	Metric 9:	Quality Assurance	High	The study included discussion of QA details.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study discussed future direction for the study and presented factors that contributed to the variability in dew water and rainwater.
Overall Quality Determination			Medium	

Study Citation:		Odabasi, M., Ongan, O., Cetin, E. (2005). Quantitative analysis of volatile organic compounds (VOCs) in atmospheric particles. Atmospheric Environment 39(20):3763-3770.		
HERO ID:		120063		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The sampling procedure, equipment, matrix characterizations were included.
	Metric 2:	Analytical Methodology	High	Sample preparation and analysis were described. GC-MS was used to analyze the chemicals. LOD was reported for analytes.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Izmir, Turkey
	Metric 5:	Currency	Low	Sampling took place in 2004.
	Metric 6:	Spatial and Temporal Variability	Medium	Most chemicals have 10 samples with number of samples ranging from 2 to 10.
	Metric 7:	Exposure Scenario	High	The exposure scenario was well described (ambient air).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Supplementary or raw data (i.e., individual data points) are not reported, and therefore summary statistics cannot be reproduced.
	Metric 9:	Quality Assurance	High	Quality assurance measures were applied. Blanks were used, and overall average recoveries were high (80+).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The report had discussion about sampling artifact of how it affect the results. It lacked discussion on other variability of data.
Overall Quality Determination			Medium	

Study Citation:		Bove, F. J., Fulcomer, M. C., Klotz, J. B., Esmart, J., Dufficy, E. M., Savrin, J. E. (1995). Public drinking water contamination and birth outcomes. American Journal of Epidemiology 141(9):850-862.		
HERO ID:		194932		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling locations described. Samples collected by water companies. Missing description of processes
	Metric 2:	Analytical Methodology	Low	LOD provided. Samples evaluated by certified labs. Missing description of methodology
	Metric 3:	Biomarker Selection	N/A	isomer in water samples
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	U.S.
	Metric 5:	Currency	Low	1985-1998
	Metric 6:	Spatial and Temporal Variability	Medium	n = 75, no replicates
	Metric 7:	Exposure Scenario	High	drinking water
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	maximum ppb
	Metric 9:	Quality Assurance	Low	QA not discussed, but analysis performed by certified lab
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns
Overall Quality Determination			Low	

Study Citation:		Lesage, S., Jackson, R. E., Priddle, M. W., Riemann, P. G. (1990). Occurrence and fate of organic solvent residues in anoxic groundwater at the Gloucester Landfill, Canada. Environmental Science & Technology 24(4):559-566.		
HERO ID:		195913		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	groundwater collected in May from selected monitoring wells (Fig 3); set of 5 samples collected from piezometers; others from bundle-type multilevel samples by peristaltic pumps; collected in glass vials and kept on ice
	Metric 2:	Analytical Methodology	Low	EPA method 624; GC/MS; no detection limits provided
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Ottawa, Ontario, Canada (Fig 1)
	Metric 5:	Currency	Low	May 1988
	Metric 6:	Spatial and Temporal Variability	Medium	37 samples, collected in May, from selected monitoring points within the monitoring well network (Fig 3)
	Metric 7:	Exposure Scenario	High	contaminated aquifer from disposal of organic chemicals (incinerated laboratory organic solvents and wood preservatives) in trenches at a waste disposal site; disposal took place from 1969-1980
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 1 provides a range and DF; Table III provides concentration per monitoring well; individual data not provided; no SI
	Metric 9:	Quality Assurance	Low	QA/QC not discussed but implied by standard lab protocols
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	minimal discussion of variation p.564
Overall Quality Determination			Medium	

Study Citation: Choi, D. W., Moon, K. W., Byeon, S. H., Lee, E. I., Sul, D. G., Lee, J. H., Oh, E. H., Kim, Y. H. (2009). Indoor volatile organic compounds in atopy patients{\textquoteright} houses in South Korea. Indoor and Built Environment 18(2):144-154.				
HERO ID: 632318				
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Detailed sampling methodology
	Metric 2:	Analytical Methodology	Medium	Limited description of analytical methods, mentioned LOD but it is not reported
	Metric 3:	Biomarker Selection	N/A	Indoor air sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	South Korea
	Metric 5:	Currency	Medium	Sampling in 2006
	Metric 6:	Spatial and Temporal Variability	Medium	114 sampling sites, no replicates
	Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not directly discussed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Characterized variability, limited discussion of uncertainties and study limitations

Overall Quality Determination	Medium
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Study Citation:		Ohura, T., Amagai, T., Senga, Y., Fusaya, M. (2006). Organic air pollutants inside and outside residences in Shimizu, Japan: Levels, sources and risks. Science of the Total Environment 366(2-3):485-499.		
HERO ID:		632484		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology detailed and included sampler preparation, sampling time, and sample transport and storage conditions.
	Metric 2:	Analytical Methodology	Medium	Key analytical methods reported. Recoveries supposedly measured but not identified for each chemical.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in indoor and outdoor air.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected in Shimizu, Japan.
	Metric 5:	Currency	Low	Samples collected in 2001.
	Metric 6:	Spatial and Temporal Variability	Medium	There were greater than 10 samples, but no replicates mentioned.
	Metric 7:	Exposure Scenario	High	The source of exposure well characterized. Samples measured pollutants inside and outside residences in Japan.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported. Summary statistics provided, including mean, standard deviation, and 10th and 90th percentile.
	Metric 9:	Quality Assurance	Medium	Key QA reported but no recoveries listed or applied.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported. Variation, such as SD, reported.
Overall Quality Determination			Medium	

Study Citation:		Götz, R., Bauer, O., Friesel, P., Roch, K. (1998). Organic trace compounds in the water of the River Elbe near Hamburg: Part I. Chemosphere 36(9):2085-2101.		
HERO ID:		644836		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling procedure, sample storage, site characteristics are described in detail.
	Metric 2:	Analytical Methodology	High	analytical methods well described. LOD reported.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in surface water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The two locations of sampling in Germany are well described.
	Metric 5:	Currency	Low	Samples were collected in 1992-1993.
	Metric 6:	Spatial and Temporal Variability	Medium	20 samples were collected over the two year period in each of the two locations. No replicates
	Metric 7:	Exposure Scenario	High	The River Elbe is an appropriate site for environmental exposures.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	The median, minimum and maximum concentrations are provided. The raw data is not provided.
	Metric 9:	Quality Assurance	High	The study provided QA/QC measures.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Some variability discussed in Tables 2a, 2b, and 5, but limited discussion of uncertainties.
Overall Quality Determination			High	

Study Citation:		Dewulf, J. P., Van Langenhove, H. R., Van der Auwera, L. F. (1998). Air/water exchange dynamics of 13 volatile chlorinated C1- and C2-hydrocarbons and monocyclic aromatic hydrocarbons in the southern North Sea and the Scheldt estuary. Environmental Science & Technology 32(7):903-911.		
HERO ID:		644857		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The authors described the sampling site and included a map. The authors also described the sampling equipment and sampling procedures. Sample storage conditions were described but not storage duration times. The performance and calibration of the sampler for the air samples was not reported.
	Metric 2:	Analytical Methodology	High	The authors described the analytical procedures used for water and air samples. The authors described recovery experiments and limits of detection for water sample analysis. The authors described calibration and recovery experiments and limits of detection for air samples.
	Metric 3:	Biomarker Selection	N/A	Water and air, no biomarkers
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The authors identified the study site as the North Sea in the Scheldt Estuary.
	Metric 5:	Currency	Low	Samples were collected between September 1994 through December 1995.
	Metric 6:	Spatial and Temporal Variability	High	Authors reported collected 38 samples from multiple sites over different temporal sampling campaigns. Replicate air samples were collected.
	Metric 7:	Exposure Scenario	Medium	The samples were collected from an estuary without specific known contamination.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Authors report the sample size, mean, 25th, 75th and median concentrations for air and water. They also report the frequency of detection. No standard deviation was reported nor was the individual sample concentrations.
	Metric 9:	Quality Assurance	Medium	Authors did not report collecting control air or water samples. Recovery experiments were reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	A standard deviation was not reported. There was also no discussion on study limitations however the study did present the mean, 25th, 75th and median concentrations.
Overall Quality Determination			Medium	

Study Citation:		Kawata, K., Tanabe, A., Saito, S., Sakai, M., Yasuhara, A. (1997). Screening of volatile organic compounds in river sediment. Bulletin of Environmental Contamination and Toxicology 58(6):893-900.		
HERO ID:		644898		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling details lacking. Sample storage described but no description of how sediment samples were collected.
	Metric 2:	Analytical Methodology	High	GC/MS method described and LODs reported with results.
	Metric 3:	Biomarker Selection	N/A	River sediment
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Niigata, Japan
	Metric 5:	Currency	Low	Samples collected in September 1995.
	Metric 6:	Spatial and Temporal Variability	Medium	7 samples were prepared per sediment.
	Metric 7:	Exposure Scenario	Medium	VOCs from sediment were measured in headspace.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Raw data not provided but summary data is adequate.
	Metric 9:	Quality Assurance	High	Recoveries listed in detail.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limitations were discussed briefly.
Overall Quality Determination			Medium	

Study Citation:		Rockwell, D. C., Claff, R. E., Kuehl, D. W. (1984). 1981 Buffalo, New York, area sediment survey (Bass).		
HERO ID:		645755		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sediment sampling methodology was well described.
	Metric 2:	Analytical Methodology	Medium	The analytical methods were described, including the LOD but not recoveries.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	United States.
	Metric 5:	Currency	Low	Samples were collected in 1981.
	Metric 6:	Spatial and Temporal Variability	Low	Over 150 samples were collected from different sites along the river bank sites were rarely sampled more than once. Not all site samples were analyzed. The data reported used 77 samples from 65 sites.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenarios related to polluted sediments.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	The raw data is presented in the supplemental materials in table 1 (Appendix C). Summary statistics were not reported.
	Metric 9:	Quality Assurance	High	Methods detailed in Appendix F.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability was not characterized, nor is uncertainty discussed or characterized.
Overall Quality Determination			Medium	

Study Citation:		Yamamoto, K., Fukushima, M., Kakutani, N., Kuroda, K. (1997). Volatile organic compounds in urban rivers and their estuaries in Osaka, Japan. Environmental Pollution 95(1):135-143.		
HERO ID:		645789		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Site description was provided in details. But the sampling process lacked the description about calibration of sampler.
	Metric 2:	Analytical Methodology	Low	Analytical method was described (GC-MS). MDLs were reported in Figure 1 for select chemicals. However, no MDLs were available for 1,2-dichlorobenzene, 1,4-dichlorobenzene, trans-1,2-dichloroethene (TDCE), and 1,1,2-trichloroethane.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in urban rivers and their estuaries.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Osaka, Japan
	Metric 5:	Currency	Low	August 1993 to February 1995
	Metric 6:	Spatial and Temporal Variability	Medium	30 sites all over the rivers and their estuaries. No replicates
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenario: drinking water and wastewater were identified.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Supplementary or raw data were not reported.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study’s method and protocol.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study has limited characterization of variability in the population/media studied and discussion of uncertainties, limitations, or gaps.
Overall Quality Determination			Medium	

Study Citation:		Van Zoest, R., Van Eck, G. T. M. (1991). Occurrence and behavior of several groups of organic micropollutants in the Scheldt estuary (Netherlands and Belgium). Science of the Total Environment 103(1):57-72.		
HERO ID:		647145		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some methods not reported such as sampler calibration
	Metric 2:	Analytical Methodology	High	Key analytical methods reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Netherlands and Belgium
	Metric 5:	Currency	Low	Samples collected from 1986 to 1989
	Metric 6:	Spatial and Temporal Variability	Medium	<10 sampling scenarios, replicates for some
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported; summary statistics provided
	Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Few gaps and limitations reported
Overall Quality Determination			Medium	

Study Citation:		Bell, J., Melcer, H., Monteith, H., Osinga, I., Steel, P. (1993). Stripping of volatile organic compounds at full-scale municipal wastewater treatment plants. Water Environment Research 65(6):708-716.		
HERO ID:		658661		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Appropriate methodology and clearly described
	Metric 2:	Analytical Methodology	High	Appropriate methodology and clearly described
	Metric 3:	Biomarker Selection	N/A	Testing for parent chemical in environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Geographic area clearly reported
	Metric 5:	Currency	Low	Sampling date not reported, but likely between 1988 and 1993.
	Metric 6:	Spatial and Temporal Variability	Medium	8 (4 in duplicate) samples, each 24-hour composites, at each of 4 sampling locations to account for variability.
	Metric 7:	Exposure Scenario	Medium	Primarily addresses air pathway, additional monitoring of wastewater effluent, both routes of potential exposure.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Raw data not reported
	Metric 9:	Quality Assurance	Medium	More thorough QA documentation previously published (Bell et al. 1988)
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	More thorough QA documentation previously published (Bell et al. 1988)
Overall Quality Determination			Medium	

Study Citation:		Stubin, A. I., Brosnan, T. M., Porter, K. D., Jimenez, L., Lochan, H. (1996). Organic priority pollutants in New York City municipal wastewaters: 1989-1993. Water Environment Research 68(6):1037-1044.		
HERO ID:		658797		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling procedure was well described (sampling condition, equipment, storage, study site description).
	Metric 2:	Analytical Methodology	Low	Analytical method was described, however, method detection limit was not provided.
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	New York City water pollution control plants
	Metric 5:	Currency	Low	Sampling was performed from 1989 to 1993.
	Metric 6:	Spatial and Temporal Variability	High	Volatile samples were collected 3 times within the same 24-hr period. Semi-volatile samples were collected 8 times within the course of 24-hr.
	Metric 7:	Exposure Scenario	Medium	The data likely represent the relevant exposure scenario.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Supplementary or raw data were not reported.
	Metric 9:	Quality Assurance	Medium	The study applied and documented quality assurance/quality control measures.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study has limited characterization of variability in the population/media studied.
Overall Quality Determination			Medium	

Study Citation: Huybrechts, T., Thas, O., Dewulf, J., Van Langenhov, H. (2002). How to estimate moments and quantiles of environmental data sets with non-detected observations? A case study on volatile organic compounds in marine water samples. Journal of Chromatography A 975(1):123-133.

HERO ID: 659066

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Critically Deficient	The sampling methodology is not discussed. Only the locations and amount of samples detailed.
Metric 2:	Analytical Methodology	Low	Analyzed by purge-and-trap/gas chromatography–mass spectrometry. Little other details given and no LOD reported.
Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	North Sea and Scheldt estuary
Metric 5:	Currency	Low	Samples from 1998-2000.
Metric 6:	Spatial and Temporal Variability	Medium	47 marine, 84 estuary water samples, over the course of 3 years (no details about replicates).
Metric 7:	Exposure Scenario	Medium	Sampling marine waters. Missing details about the microenvironment and population of interest.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Only summary statistics (Mean, SD, Median, IQR). Individual points not reported.
Metric 9:	Quality Assurance	Low	QA/QC techniques only briefly described, analyzed control samples. No recoveries reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Discusses methods to calculate statistical information about chemical concentration in sample.

Overall Quality Determination

Uninformative

Study Citation:		Martinez, E., Llobet, I., Lacorte, S., Viana, P., Barcelo, D. (2002). Patterns and levels of halogenated volatile compounds in Portuguese surface waters. Journal of Environmental Monitoring 4(2):253-257.		
HERO ID:		659075		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	surface water samples collected manually from shore and bridge at middle of river; glass vials immersed in water, capped, placed in freezer; 46 sampling points during 14 months; map or description of sampling locations not provided
	Metric 2:	Analytical Methodology	High	EPA Method 502, purge and trap techniques; GC-ECD; quantification by external standard using calibration data (Table 1); LOD and recoveries presented in Table 1
	Metric 3:	Biomarker Selection	N/A	Surface water sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Portugal
	Metric 5:	Currency	Low	April 1999-May 2000
	Metric 6:	Spatial and Temporal Variability	High	644 samples; 46 sites over 14 months
	Metric 7:	Exposure Scenario	Low	sampling surface waters to determine "hot spots" in relation to activities of each area; studying influence site (agriculture or industrial); location of sampling sites and description of each not provided
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 2 provides percentage and number of detected positive samples; Fig 1 provides the mean, max, and min throughout the monitoring study; p. 256 has a paragraph discussing results; individual results not provided
	Metric 9:	Quality Assurance	High	percentage recovery (R) provided in Table 1 (90%)
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	standard deviation reported in Table 1; discusses variance on p.256
Overall Quality Determination			Medium	

Study Citation:		Assmuth, T. W., Strandberg, T. (1993). Ground water contamination at Finnish landfills. Water, Air, and Soil Pollution 69(1-2):179-199.		
HERO ID:		659768		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The groundwater sampling methods were described but did not include details about the sampler calibration.
	Metric 2:	Analytical Methodology	Medium	The analytical methods were discussed but did not include LOD or recoveries.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed groundwater samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study was conducted in Finland.
	Metric 5:	Currency	Low	The study was published in 1992.
	Metric 6:	Spatial and Temporal Variability	Medium	No replicate samples were collected (n=16 sampling sites).
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenarios related polluted groundwater in Southern and Central Finland.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics were reported. Raw data was not provided.
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not described.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability was characterized (max, CV) Uncertainties and limitations were not discussed.
Overall Quality Determination			Medium	

Study Citation:		Dyer, M. (1995). The water quality at Lago Di Vico during 1992-1993. Science of the Total Environment 171(1-3):77-83.		
HERO ID:		659943		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Standard sampling methods were referenced, but some details about sample storage, repeat sampling, and season are lacking.
	Metric 2:	Analytical Methodology	High	Some details are not reported, but standard analytical methods were referenced.
	Metric 3:	Biomarker Selection	N/A	Measured parent chemical in a lake used for drinking water
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	A description and map (Figure 1) of the sampling locations were provided. Lake is located in Italy.
	Metric 5:	Currency	Low	Samples were collected in 1992-1993.
	Metric 6:	Spatial and Temporal Variability	Low	The total sample size for all parameters was 500. While the initial reviewer correctly noted that the sample size for specific analyses (including those shown in Table 1) is not reported, authors did report something about the sample size albeit unclear. Unclear if there were duplicate samples
	Metric 7:	Exposure Scenario	Medium	1-m and 30-m sampling depths are likely relevant to drinking water and recreational uses as described in the introduction.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	For table 1 (volatile chlorohydrocarbons), the number of samples and type of estimate (e.g., point) are not specified. Only date and location are given.
	Metric 9:	Quality Assurance	Low	Quality assurance methods are not specified; standard methods were referenced so it can implied that QA/QC techniques were applied.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The results are only provided for two lake depths at one of nine sampling locations on one day in August. The analysis is unlikely to have captured spatiotemporal variability (e.g., spikes following rain events). There is also no characterization of variance or discussion of limitations and uncertainties.
Overall Quality Determination			Medium	

Study Citation:		Herbarth, O., Rehwagen, M., Ronco, A. E. (1997). The influence of localized emittants on the concentration of volatile organic compounds in the ambient air measured close to ground level. Environmental Toxicology and Water Quality 12(1):31-37.		
HERO ID:		660069		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling equipment, sampling protocol, and study site were reported.
	Metric 2:	Analytical Methodology	Medium	Extraction method, instrumentation, calibration were reported. LOD was reported as a range. No recovery samples reported.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Argentina
	Metric 5:	Currency	Low	Samples collected in Nov 1994
	Metric 6:	Spatial and Temporal Variability	Low	Samples collected at one indoor and three outdoor sites. The number of replicates per site is unclear.
	Metric 7:	Exposure Scenario	High	Exposure scenario (traffic and a petrochemical refinery) was detailed in paper.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Only mean values are reported.
	Metric 9:	Quality Assurance	Low	No internal standards/recoveries or site specific backgrounds were reported. QA/QC is not directly described, but can be implied through use of standard laboratory and field protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No standard deviation or other quantitative measure of variance was reported.
Overall Quality Determination			Low	

Study Citation:		Huybrechts, T., Dewulf, J., Van Langenhove, H. (2004). Spatial and temporal variability of priority volatile organic compounds in the Scheldt estuary. Water Research 38(14-15):3241-3250.		
HERO ID:		660097		
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Sampling Methodology	High	The authors reported study site characteristics, sampling equipment, procedure, design, and storage conditions.
		Metric 2: Analytical Methodology	Medium	The authors report the extraction method, analytical instruction, recovery results and LODs.
		Metric 3: Biomarker Selection	N/A	Water samples
Domain 2: Representativeness		Metric 4: Geographic Area	High	The authors report the study location.
		Metric 5: Currency	Low	Samples were collected between 1998-2000.
		Metric 6: Spatial and Temporal Variability	High	The authors collected 84 samples total over different sites and different sampling years. The authors collected multiple samples from the same estuary at the same time point (replicates).
		Metric 7: Exposure Scenario	Medium	The authors describe the microenvironment.
Domain 3: Accessibility/Clarity		Metric 8: Reporting of Results	Medium	The authors reported summary statistics including minimums, maximums, mean, standard deviation, median, 25th and 75th percentile, detection frequency and the number of samples. The authors did not report individual sample data.
		Metric 9: Quality Assurance	High	The authors reported following standard European QA methods. They reported recovery results, they analyzed reference materials,
Domain 4: Variability and Uncertainty		Metric 10: Variability and Uncertainty	Low	The authors discussed the variability in the concentrations across the sampling locations and time, but they did not discuss the uncertainty of the study, data gaps, or limitations.
Overall Quality Determination			Medium	

Study Citation:		Assmuth, T., Kalevi, K. (1992). Concentrations and toxicological significance of trace organic compounds in municipal solid waste landfill gas. Chemosphere 24(9):1207-1216.		
HERO ID:		660779		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling protocol described sampling equipment, regimen, site characteristics, and more.
	Metric 2:	Analytical Methodology	Low	No detection or reporting limits provided
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in gas samples from landfills.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Finland
	Metric 5:	Currency	Low	Data collected in 1989 and 1990
	Metric 6:	Spatial and Temporal Variability	Low	We can infer that there were at least 4 samples collected in replicates because the study analyzed 4 landfills. Table 2 also as a column header "n" for each landfill site that might indicate the number of samples per landfill.
	Metric 7:	Exposure Scenario	High	Exposure scenario is through landfill gas
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Raw data not reported. Missing most summary statistics. Only min and max are provided.
	Metric 9:	Quality Assurance	Low	QA/QC implied
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No gaps, limitations, or characterization of variance reported
Overall Quality Determination			Medium	

Study Citation:		Lorah, M. M., Olsen, L. D. (1999). Degradation of 1,1,2,2-tetrachloroethane in a freshwater tidal wetland: Field and laboratory evidence. Environ-mental Science & Technology 33(2):227-234.		
HERO ID:		661103		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling Methodology	Medium	The authors reported the sampling equipment and the study site characteristics. They did not give many details on the sampling methodology, but they did describe the sampling set-up and procedure for obtaining the sam-ples.
	Metric 2:	Analytical Methodology	High	The authors reported using EPA Method 524.2 to analyze the samples for VOCs
	Metric 3:	Biomarker Selection	N/A	Water sampling
Domain 2: Representativeness	Metric 4:	Geographic Area	High	The authors report the geographic area where the study took place.
	Metric 5:	Currency	Low	Samples were collected in the fall of 1995 and the spring/summer of 1996.
	Metric 6:	Spatial and Temporal Variability	Low	Sample size is inferred by the 25 piezometers. No indication of replicate sampling
	Metric 7:	Exposure Scenario	Medium	The authors describe the study site and it is a plausible exposure scenario.
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Critically Deficient	Results are only shown in figures. It is difficult to tell exact concentrations and the entire dataset is not provided neither are summary statistics. Additionally, Figure 2 which is supposed to show the sample sites is unreadable and therefore the results become meaningless.
	Metric 9:	Quality Assurance	Low	The authors used a standard analytical method but did not discuss QA/QC procedures.
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	The authors have a limited discussion on the uncertainty in the results but they do not report a standard devia-tion.
Overall Quality Determination			Uninformative	

Study Citation:		Wilson, S. C., Burnett, V., Waterhouse, K. S., Jones, K. C. (1994). Volatile organic compounds in digested United Kingdom sewage sludges. Environmental Science & Technology 28(2):259-266.		
HERO ID:		661596		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	digested sewage sludge collected from 12 treatment works (specific location not provided, but characteristic of each works described in table 3); 60mL sludge measured directly into screw-cap flasks; 3 samples of each sludge and a blank; kept at 4C in dark
	Metric 2:	Analytical Methodology	High	liquid-liquid extraction method; GC-ECD/FID; recovery Table 2; MDL 0.10 ug/L wet sludge (p. 262)
	Metric 3:	Biomarker Selection	N/A	Sewage sludge sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	northwest England
	Metric 5:	Currency	Low	date of sampling not provided; published in 1994
	Metric 6:	Spatial and Temporal Variability	Medium	12 sludge treatment works; 3 samples per site; description of sampling period and timing not provided
	Metric 7:	Exposure Scenario	High	digested sludges from rural, urban and industrial treatment works (Table 3 provides characteristics of each treatment works)
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Table 3 provides mean concentration (dry weight and wet volume) at each site; individual sample concentrations not provided
	Metric 9:	Quality Assurance	High	65.9 % recovery, SD, and % coeff variation provided Table 2; blanks measured; corrected for recovery
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	discusses variability between different catchment characteristics and treatment processes that affect concentrations detected in sludge (p. 262-264); discusses uncertainty in results
Overall Quality Determination			Medium	

Study Citation:		Schrab, G. E., Brown, K. W., Donnelly, K. C. (1993). Acute and genetic toxicity of municipal landfill leachate. Water, Air, and Soil Pollution 69(1-2):99-112.		
HERO ID:		661846		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Described some sampling methodology (e.g., equipment, site characteristics) but nothing about storage conditions
	Metric 2:	Analytical Methodology	Low	equipment described; EPA protocol referenced; no LOD
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in landfill leachate
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	U.S.
	Metric 5:	Currency	Low	published 1992
	Metric 6:	Spatial and Temporal Variability	Low	Five samples total - one each from four landfills and one groundwater monitoring well. No replicates
	Metric 7:	Exposure Scenario	High	Potential contamination of groundwater by landfill leachate is relevant if there are drinking water wells.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	average and range provided. no raw data
	Metric 9:	Quality Assurance	Low	QA not discussed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed
Overall Quality Determination			Medium	

Study Citation:		Huff, G. F., Braun, C. L., Lee, R. W. (2000). Assessment of potential for natural attenuation of chlorinated ethenes and ethanes in ground water at a petrochemical reclamation site, Harris County, Texas.		
HERO ID:		664358		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Groundwater collected from wells using peristaltic pump after pumping for min of 30 minutes at 0.5 L/min prior. Figure 3 depicted locations of wells. Table 2 listed the vertical screening intervals per well. Further details pertaining to measuring concentration in the groundwater is not provided.
	Metric 2:	Analytical Methodology	Low	Extraction performed by USGS GC/MS and method 8260. Detection limits for this chemical was not reported.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in groundwater.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Harris County, Texas.
	Metric 5:	Currency	Low	Samples were collected in 1999.
	Metric 6:	Spatial and Temporal Variability	Medium	Sixteen wells were measured between Feb 8-10 without replicates.
	Metric 7:	Exposure Scenario	Medium	Report describes groundwater conditions at a petrochemical reclamation site and and discusses evidence for the occurrence and rates of natural attenuation in groundwater. However, populations of interest and how the groundwater is used were not defined.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 3 provides concentration per well but not summary statistics.
	Metric 9:	Quality Assurance	Medium	Table 3 provided field blank, triple blank, and method blank; recoveries were not discussed/provided.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The spatial distribution of chemical between the wells (Fig 3) and along groundwater flowpath (fig 4) were characterized. However, paper was missing a characterization of data variance and discussion of limitations/uncertainties.
Overall Quality Determination			Medium	

Study Citation:		Fast, T., Kliest, J., Boleij, J. S. M., Slingerland, P. (1988). The influence of soil pollution on the indoor air quality. 1:441-449.		
HERO ID:		664403		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Multiple information missing- equipment details used for soil and air sampling, storage, procedure, calibration. More methodology information might be in the referenced study- (Fast et.al. ,1983).
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology not described- instrumentation only listed in table 1. LOD/LOQ not reported
	Metric 3:	Biomarker Selection	N/A	Chemical measured in soil
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The Netherlands
	Metric 5:	Currency	Low	May 1984 to November 1985
	Metric 6:	Spatial and Temporal Variability	Medium	Measurements were carried out in 77 houses on 11 locations with different types of soil pollution and in 20 houses on two reference locations. Some replicates- "In 12 houses the program of measurements was repeated 2 to 6 times to examine seasonal variation."
	Metric 7:	Exposure Scenario	High	Samples were taken from homes. Sites well described.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Individual data points are not reported. Missing multiple summary statistics.
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not directly discussed- unclear if this would interfere with study.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Some characterization of variability in seasons. No limitations mentioned.
Overall Quality Determination			Uninformative	

Study Citation:		Sakai, K., Kamijima, M., Shibata, E., Ohno, H., Nakajima, T. (2009). Annual transition and seasonal variation of indoor air pollution levels of 2-ethyl-1-hexanol in large-scale buildings in Nagoya, Japan. Journal of Environmental Monitoring 11(11):2068-2076.		
HERO ID:		697407		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling method including device and sampling location described. Handling and transport of samples post-collection was not described.
	Metric 2:	Analytical Methodology	Medium	Sample extraction and analysis described. Limit of detection defined as 10 times standard deviation of response of lowest standard but not reported.
	Metric 3:	Biomarker Selection	N/A	Air sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Nagoya, Japan
	Metric 5:	Currency	Low	Sampling conducted between 2004 and 2007
	Metric 6:	Spatial and Temporal Variability	Medium	67 rooms sampled in winter and summer. No indication of replicate sampling or analysis.
	Metric 7:	Exposure Scenario	High	Indoor air
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data
	Metric 9:	Quality Assurance	Low	Limited QA/QC reported. No discussion of recovery rates, replicate analysis, or use of blanks and controls
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Variability in results and limitation of study discussed.
Overall Quality Determination			Medium	

Study Citation:		Sabel, G. V., Clark, T. P. (1984). Volatile organic compounds as indicators of municipal solid waste leachate contamination. Waste Management & Research 2(2):119-130.		
HERO ID:		724484		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Leachate and groundwater from 20 MSW landfills and two dumps (Fig 1 shows location of sampling sites) that described in detail. Section 2 - Methods; samples collected in 40-ml glass vials without head space; 4 vials per sample; samples iced and analysed within 48 hr; P.122 describes collection of leachate and groundwater samples.
	Metric 2:	Analytical Methodology	Low	Analyses followed USEPA Method 601. Detection limits not provided.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Minnesota, USA (Fig 1)
	Metric 5:	Currency	Low	Study published in 1984.
	Metric 6:	Spatial and Temporal Variability	Medium	6 leachate samples; 45 groundwater wells at 13 landfills; 21 groundwater at 8 landfills and 2 dumps. Replicate samples.
	Metric 7:	Exposure Scenario	High	Leachate and groundwater contamination at MSW landfill sites in MN. Table 3 indicates if area is urban or rural.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 2 provides DF and range for leachate and groundwater. No individual data reported.
	Metric 9:	Quality Assurance	Medium	Field blank carried out at all times. Recoveries not discussed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study mentions that the data is limited. There is comparison of results to other leachate data.
Overall Quality Determination			Medium	

Study Citation:		Blount, B. C., Mcelprang, D. O., Chambers, D. M., Waterhouse, M. G., Squibb, K. S., Lakind, J. S. (2010). Methodology for collecting, storing, and analyzing human milk for volatile organic compounds. Journal of Environmental Monitoring 12(6):1265-1273.		
HERO ID:		737432		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
Metric 1:	Sampling Methodology	Medium	Breast milk sampling procedures and equipment described in detail as manual expression directly into pre-cleaned Vacutainer with immediate replacement of stopper following collection or manual expression into pre-cleaned wide-mouth glass jars with subsequent transfer to low headspace Vacutainer for storage and shipment. Samples stored at 4°C for less than two weeks prior to analysis for most samples. Insufficient information on number of samples expressed into Vacutainer versus those expressed into wide-mouth glass jars. Insufficient information on number of samples stored for longer than two weeks prior to analyses.	
Metric 2:	Analytical Methodology	Low	Method detection limit calculations described, however chemical-specific limits of detection not reported or referenced. Analytical and extraction methodology noted as modified from existing SPME-GC-MS methodology and referenced (Blount et al., 2006) and described in detail. Authors noted a full set of eight calibrators, including one blank, was analyzed with each set of samples to generate calibration curves for each analytical run. Authors report concentrations for the 10 of the 36 original chemicals with median concentrations higher than the lowest reportable level (LRL), but chemical-specific LRL’s and recoveries not reported.	
Metric 3:	Biomarker Selection	N/A	Sampling for parent chemical of interest.	
Domain 2: Representativeness				
Metric 4:	Geographic Area	High	Samples collected from participants in Baltimore, MD.	
Metric 5:	Currency	Low	Insufficient information on dates of sample collection, 2010 publication date.	
Metric 6:	Spatial and Temporal Variability	Low	Single samples from 12 participating women for reported total of twelve samples from a convenience, non-statistical sampling approach at single time.	
Metric 7:	Exposure Scenario	Medium	Data likely represent relevant, non-occupational exposure scenario—authors note participants completed questionnaire, however insufficient information on whether data on occupation was collected.	
Domain 3: Accessibility/Clarity				
Metric 8:	Reporting of Results	Low	Median reported as below the lowest reportable level (LRL). Insufficient information regarding chemical-specific frequency of detection, dates of sampling, raw data and lipid-adjustment for breast milk samples.	
Metric 9:	Quality Assurance	Medium	Chemical-specific recoveries not detailed, however extensive details on quality control measures for sampling, extraction and analyses—characterized control human milk sample described as left exposed to room air while breast milk sample expressed with final sample concentrations corrected for the background air VOC levels derived from the control open-air sample. Each analysis batch described as evaluated at two blind QC-concentration levels and evaluated by an independent, blinded QC officer. Lab blanks utilized with blanks described as prepared from VOC-free blank water.	
Domain 4: Variability and Uncertainty				
Metric 10:	Variability and Uncertainty	Medium	Study characterized sample variability in terms of concentration range, with detailed discussion regarding potential uncertainties derived from sampling, extraction and analysis procedures. Authors discussed differences in reported concentrations between this pilot study and previous reports, however additional potential limitations, such as sample size, not discussed (although this was noted as a pilot study).	
Overall Quality Determination			Low	

Study Citation:		Jang, Y. C., Townsend, T. G. (2001). Occurrence of organic pollutants in recovered soil fines from construction and demolition waste. Waste Management 21(8):703-715.		
HERO ID:		789748		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The authors mentioned using a standard sampling method, (US EPA SW-846 Chapter nine), the authors also report sampling equipment, procedures, storage conditions. Authors reported LODs, standard EPA methods were used for analysis and extraction. Biomarkers of interest were not addressed in this reference.
	Metric 2:	Analytical Methodology	High	
	Metric 3:	Biomarker Selection	N/A	
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Authors reference visiting and collecting samples from 14 construction and demolition sites in Florida. no sampling date is provided, but a publication date is available, 2000 so low anyways They collected duplicate samples, a total of >40 samples from different sample sites over a period of time to capture temporal trends. The authors described that samples were collected from construction and demolition sites, so they describe the setting.
	Metric 5:	Currency	Low	
	Metric 6:	Spatial and Temporal Variability	High	
	Metric 7:	Exposure Scenario	High	
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data is not reported, only the ranges of concentrations, number of samples, detection frequencies, and there is no reporting of measure of variation. Authors report collecting field blanks and analyzing lab blanks. The authors mentioned recoveries however it was related to the leaching experiments. There were no mentions of recoveries for extraction analysis.
	Metric 9:	Quality Assurance	Medium	
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No standard deviation is reported and there is no discussion on limitations or uncertainties.
Overall Quality Determination			Medium	

Study Citation:		Yamaguchi, T., Nakajima, D., Ezoe, Y., Fujimaki, H., Shimada, Y., Kozawa, K., Arashidani, K., Goto, S. (2006). Measurement of volatile organic compounds (VOCs) in new residential buildings and VOCs behavior over time. Journal of UOEH 28(1):13-27.		
HERO ID:		824416		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported, such as storage conditions
	Metric 2:	Analytical Methodology	Medium	Some analytical methods not reported, such as recovery samples
	Metric 3:	Biomarker Selection	N/A	Air sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Japan
	Metric 5:	Currency	Low	Data collected between 2003 and 2004
	Metric 6:	Spatial and Temporal Variability	Medium	24 total samples collected at two locations. No indication of replicate sampling or analysis.
	Metric 7:	Exposure Scenario	High	Potential exposure sources identified in indoor environments. Indoor and outdoor air measured as a comparison.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	no raw data
	Metric 9:	Quality Assurance	Low	Limited QA/QC reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No gaps or limitations reported. Limited information provided on variability and uncertainty.
Overall Quality Determination			Medium	

Study Citation:		Donnelly, C. A. (1995). The spatial analysis of covariates in a study of environmental epidemiology. Statistics in Medicine 14(21-22):2393-2409.		
HERO ID:		1024050		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Only briefly discussed
	Metric 2:	Analytical Methodology	Low	Only briefly discussed, LOD not reported
	Metric 3:	Biomarker Selection	N/A	Air samples, no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Sampling in 1986
	Metric 6:	Spatial and Temporal Variability	Medium	73 samples, no replicates
	Metric 7:	Exposure Scenario	Medium	Missing details about the population of interest and micro environment
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not discussed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Did not discuss study limitations
Overall Quality Determination			Low	

Study Citation:		Logue, J. M., Small, M. J., Stern, D., Maranche, J., Robinson, A. L. (2010). Spatial variation in ambient air toxics concentrations and health risks between industrial-influenced, urban, and rural sites. Journal of the Air and Waste Management Association 60(3):271-286.		
HERO ID:		1255270		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling procedure was described, and calibration was carried out. Sampling sites were described, GC-MS was used to analyze the samples, LOD was not reported. Paper measures concentration of parent compound in environmental media.
	Metric 2:	Analytical Methodology	Medium	
	Metric 3:	Biomarker Selection	N/A	
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Pittsburgh, PA 2006 to 2008 4 sites in Pittsburgh were sampled. And each site has 70 days of samples, and 103 days of samples were available for at least 3 sites.
	Metric 5:	Currency	Medium	
	Metric 6:	Spatial and Temporal Variability	High	
	Metric 7:	Exposure Scenario	Medium	Ambient air
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Average concentrations were reported with summary statistics; no individual data were reported. The study reported that it followed QA/QC procedures outlined in EPA methods TO-11A and TO-15.
	Metric 9:	Quality Assurance	High	
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study addressed spatial variability but lacked discussion on limitations.
Overall Quality Determination			High	

Study Citation:		AT&T, (1990). Letter from AT\&T to USEPA submitting enclosed initial submission concerning the preliminary soil contamination study with attachments.		
HERO ID:		1270143		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methodology not reported
	Metric 2:	Analytical Methodology	High	Methodology summary reported in page 7
	Metric 3:	Biomarker Selection	N/A	Parent chemical in soils
Domain 2: Representativeness	Metric 4:	Geographic Area	Critically Deficient	Geographic location not reported
	Metric 5:	Currency	Low	Samples collected in 1990
	Metric 6:	Spatial and Temporal Variability	Low	4 samples
	Metric 7:	Exposure Scenario	Critically Deficient	Exposure scenario not reported
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Raw data reported in page 24
	Metric 9:	Quality Assurance	High	The study used standardized EPA methods
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Critically Deficient	Variability and uncertainty can't be assessed
Overall Quality Determination		Uninformative		

Study Citation:		Takigawa, T., Wang, B. L., Saijo, Y., Morimoto, K., Nakayama, K., Tanaka, M., Shibata, E., Yoshimura, T., Chikara, H., Ogino, K., Kishi, R. (2010). Relationship between indoor chemical concentrations and subjective symptoms associated with sick building syndrome in newly built houses in Japan. International Archives of Occupational and Environmental Health 83(2):225-235.		
HERO ID:		1313544		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported, such as sample storage conditions and sampler calibration
	Metric 2:	Analytical Methodology	Medium	Some analytical methods not reported, such as recovery samples
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Japan
	Metric 5:	Currency	Low	Data were collected in 2003 and 2004
	Metric 6:	Spatial and Temporal Variability	Medium	2297 households. No replicate samples collected.
	Metric 7:	Exposure Scenario	High	Relationship between indoor chemical concentrations and sick building syndrome in newly built houses
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data reported
	Metric 9:	Quality Assurance	Low	No QA/QC reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability not well characterized (e.g. no standard deviation, variance reported)
Overall Quality Determination			Medium	

Study Citation:		Hazleton Labs, (1986). Pollutant analyses on effluent discharge - phenol - with cover letter dated 072387.		
HERO ID:		1316229		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methods not described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods not described
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental media.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	Wisconsin, USA
	Metric 5:	Currency	Low	Sampling in 1986
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size is not reported
	Metric 7:	Exposure Scenario	Low	Data lacks key pieces of information and this impacts the exposure scenario characterization
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Only individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not discussed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability was not characterized, uncertainties and limitations were not discussed
Overall Quality Determination		Uninformative		

Study Citation:		Ciba-Geigy, (1987). Briefing for the assistant administrator - Record for decision on the Lone Pine Landfill.		
HERO ID:		1316232		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methodology not described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology not described
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	New Jersey
	Metric 5:	Currency	Low	Published in 1987
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size is not reported
	Metric 7:	Exposure Scenario	Low	Data may represent a relevant exposure scenario but lacks key data details to support its validity
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Low	Only reported maximum concentrations detected, no summary statistics
	Metric 9:	Quality Assurance	Low	QA/QC details not discussed
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	Variability, uncertainties and limitations were not characterized
Overall Quality Determination		Uninformative		

Study Citation:		Geraghty & Miller Inc, (1990). Phase II - Site investigation: Borden site Carson, California (volume I) with attached appendices and cover letter dated 032790.		
HERO ID:		1316237		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Low	Sampling methodology only briefly described
	Metric 2:	Analytical Methodology	Critically Deficient	Not described
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	California
	Metric 5:	Currency	Low	Sampling began in 1987
	Metric 6:	Spatial and Temporal Variability	Low	10 soil samples, 15 water samples
	Metric 7:	Exposure Scenario	High	Provided an exposure assessment
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	High	Detailed QA/QC description
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability was not characterized, uncertainties were briefly discussed
Overall Quality Determination		Uninformative		

Study Citation:	Ecology and Environment, (1991). Letter from Vulcan Chemicals to USEPA submitting enclosed final report concerning RCRA facility assessment with tetrachloroethylene and trichloromethane with attachments.
HERO ID:	1316245

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling Methodology	High	Well described sampling methods
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methodology was not described
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness	Metric 4: Geographic Area	High	Samples collected in USA
	Metric 5: Currency	Low	Published in 1991
	Metric 6: Spatial and Temporal Variability	Low	n=15, no replicates
	Metric 7: Exposure Scenario	Medium	Limited description about the population of interest
Domain 3: Accessibility/Clarity	Metric 8: Reporting of Results	Medium	Only individual sample concentrations, no summary statistics
	Metric 9: Quality Assurance	Low	Only briefly described
Domain 4: Variability and Uncertainty	Metric 10: Variability and Uncertainty	Low	Did not characterize variability or discussed uncertainties and limitations

Overall Quality Determination**Uninformative**

Study Citation:		Rohm and Haas, (1981). Landfill monitoring wells and stream survey attach cover letter.		
HERO ID:		1332944		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methods not described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods not described
	Metric 3:	Biomarker Selection	N/A	Landfill samples no biomarker needed.
Domain 2: Representativeness	Metric 4:	Geographic Area	Critically Deficient	Geographic location not reported
	Metric 5:	Currency	Low	Published in 1982
	Metric 6:	Spatial and Temporal Variability	Low	7 sampling sites, no replicates
	Metric 7:	Exposure Scenario	Low	Lack of location details, population of interest and methods make this metric uncertain.
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Only individual sample concentration data, no summary statistics
	Metric 9:	Quality Assurance	Low	QA/QC was not discussed
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	Variability, uncertainties and limitations were not discussed
Overall Quality Determination		Uninformative		

Study Citation:		ERM, (1988). Hydrogeological investigation at the Union Carbide solvents and materials coating plant with cover letter dated 070688.		
HERO ID:		1332986		
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling Methodology	Low	Only briefly described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods not described
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Sampling began in 1985
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7:	Exposure Scenario	Low	The exposure scenario is unclear
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Low	Individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	Medium	Limited description of QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainties were not characterized

Overall Quality Determination	Uninformative
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Study Citation:		Enwright Associates, (1985). Groundwater {\&} wastewater monitoring report with cover letter dated 120385.		
HERO ID:		1335577		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sample containers, preparation, and collection procedures followed a 1977 EPA method where applicable.
	Metric 2:	Analytical Methodology	High	Analytical procedures followed various EPA approved methods for NPDES sampling and analysis
	Metric 3:	Biomarker Selection	N/A	The study tested parent chemicals in the environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Testing took place in the US.
	Metric 5:	Currency	Low	Samples were collected in 1984.
	Metric 6:	Spatial and Temporal Variability	Medium	Samples were collected in duplicates at 8 locations.
	Metric 7:	Exposure Scenario	Medium	Data may represent a relevant exposure scenario, but details about the population of interest are missing.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual sample concentrations are provided. Summary statistics are missing.
	Metric 9:	Quality Assurance	High	QA/QC techniques, which consisted of blanks, spiked samples, field replicates, duplicate analysis, and analysis of standards, were described.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variance and uncertainties were not discussed
Overall Quality Determination			Medium	

Study Citation:		NUS, (1987). Preliminary investigation at the Hranica waste disposal site - Sarver, Penn.		
HERO ID:		1335585		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	No description of sampling methods, including equipment, sampling procedures/regime, sample storage conditions or duration, and performance/calibration of samplers. The paper starts on page 2-20 and may be missing pages.
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods not described. The paper starts on page 2-20 and may be missing pages.
	Metric 3:	Biomarker Selection	N/A	All samples were from environmental media.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	Pennsylvania, USA
	Metric 5:	Currency	Low	Published in 1982
	Metric 6:	Spatial and Temporal Variability	Medium	Not stated, can be inferred from tables. 9 soil samples, 10 surface water samples, 14 groundwater samples. No replicates.
	Metric 7:	Exposure Scenario	Low	Missing details about the population of interest and the microenvironment.
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Individual sample concentrations reported. No summary statistics.
	Metric 9:	Quality Assurance	Critically Deficient	QA/QC techniques were not described and cannot be inferred without sampling and analytical procedures.
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	Variability, limitations, and uncertainty were not characterized.
Overall Quality Determination			Uninformative	

Study Citation: Chem-Dyne, (1987). CRA sampling and analytical tables on nine chemicals with attachments.
HERO ID: 1335590

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling Methodology	Critically Deficient	Sampling methodology not reported
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methodology is not described
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media
Domain 2: Representativeness	Metric 4: Geographic Area	High	Hamilton, Ohio
	Metric 5: Currency	Low	1984
	Metric 6: Spatial and Temporal Variability	Critically Deficient	Sample size not reported or hard to read
	Metric 7: Exposure Scenario	Critically Deficient	The exposure scenario is not reported
Domain 3: Accessibility/Clarity	Metric 8: Reporting of Results	Critically Deficient	There is no explanation regarding the data
	Metric 9: Quality Assurance	Medium	the study reports key QA parameters
Domain 4: Variability and Uncertainty	Metric 10: Variability and Uncertainty	Critically Deficient	Key limitations or sample variability not reported

Overall Quality Determination **Uninformative**

Study Citation: Hargis, (1986). Phase III: Investigation of groundwater quality and hydrogeologic conditions, Summa Corporation Facility, Culver City, California (final report) with attach and letter dated 013192.

HERO ID: 1356129

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Sampling methods briefly described
Metric 2:	Analytical Methodology	Medium	Cited EPA method 624, included LOD, did not describe the method
Metric 3:	Biomarker Selection	N/A	Did not test for biomarkers
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	California, USA
Metric 5:	Currency	Low	Samples from 1985
Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size was not reported
Metric 7:	Exposure Scenario	Medium	Data may represent a relevant exposure scenario but the report doesn't have details about the population or microenvironment of interest
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual sample concentrations, no summary statistics
Metric 9:	Quality Assurance	Medium	Limited description of QA/QC techniques
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty were not characterized

Overall Quality Determination

Uninformative

Study Citation:	Westinghouse Electric Corporation, (1991). Hydrogeological investigation of the Hoechst Celanese facility Spartanburg, South Carolina - Westinghouse project 4122-90-022A with attachments and cover letter dated 052291.
HERO ID:	1356133

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Well described sampling methods
	Metric 2: Analytical Methodology	Low	Limited description of analytical methods
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	USA
	Metric 5: Currency	Low	Report from 1991
	Metric 6: Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7: Exposure Scenario	Medium	Missing details about the population of interest
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual sample concentrations only
	Metric 9: Quality Assurance	Medium	Analyzed control samples, techniques briefly described
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability and uncertainties were not characterized

Overall Quality Determination

Uninformative

Study Citation:		ERT, (1990). Results of site investigation at the Cleveland Service Center Solon, Ohio with attachments, cover sheet and letter dated 020690.		
HERO ID:		1356151		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Only briefly described
	Metric 2:	Analytical Methodology	High	Analytical Reports included containing information on QA/QC, methods, and LoD/RL
	Metric 3:	Biomarker Selection	N/A	Did not test for biomarker
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Solon, OH
	Metric 5:	Currency	Low	1988
	Metric 6:	Spatial and Temporal Variability	Low	Small sample size: 4 soil borings and 1 GW sample with a duplicate
	Metric 7:	Exposure Scenario	Medium	Data may represent relevant exposure scenarios, missing details about the population of interest and microenvironment
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Independent sample concentrations only, no summary statistics
	Metric 9:	Quality Assurance	High	Well described QA/QC techniques
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Did not characterize variability or uncertainty
Overall Quality Determination			Medium	

Study Citation:		ERM, (1989). Endangerment assessment, on-site conditions on seven chemicals with cover letter dated 022489.		
HERO ID:		1356167		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sample storage conditions and sampler calibration
	Metric 2:	Analytical Methodology	Medium	Recovery samples not reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Study was conducted in 1988.
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples were collected but there were not replicates.
	Metric 7:	Exposure Scenario	High	The exposure source was characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data were reported.
	Metric 9:	Quality Assurance	Low	Limited QA were reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Few gaps and limitations were reported
Overall Quality Determination			Medium	

Study Citation:		Great Lakes Chemical Corp. (1987). Exposure assessment for hazardous waste landfill with cover letter dated 072187.		
HERO ID:		1356178		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling methodology not described, only briefly mentioned
	Metric 2:	Analytical Methodology	High	Analytical reports included in the appendix
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	El Dorado, AR
	Metric 5:	Currency	Low	1986
	Metric 6:	Spatial and Temporal Variability	Medium	7 waste samples analyzed along with air samples collected in the months of Jan-March (33 samples) and May 1985 (14 days). No replicates.
	Metric 7:	Exposure Scenario	High	Report characterizes facility and sources as well as nearby residential communities and explores various exposure pathways through different medias.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual data points available for waste samples but only monthly averages and summaries available for air samples. No other statistics were used
	Metric 9:	Quality Assurance	Low	QA/QC was not mentioned but lab reports for analyses and air data from the Arkansas Dept of Pollution Control Ecology imply SOP and methods.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Key limitations and data gaps not addressed.
Overall Quality Determination			Medium	

Study Citation:		Ghassemi, M., Quinlivan, S., Bachmaier, J. (1984). Characteristics of leachates from hazardous waste landfills. Journal of Environmental Science and Health, Part A: Environmental Science and Engineering 19(5):579-620.		
HERO ID:		1358515		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling method was not directly mentioned in the report, but can be inferred that the sampling was done in manners according to U.S EPA standards.
	Metric 2:	Analytical Methodology	Low	Analytical method was not directly mentioned in the report, but can be inferred that the analysis was done in manners according to U.S EPA standards.
	Metric 3:	Biomarker Selection	N/A	Tested for parent chemicals in landfill leachate
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The leachate site was not mentioned, but can be inferred that it's in the US because these landfills are subject to EPA regulations.
	Metric 5:	Currency	Low	No sampling date is provided, but a publication date is available - 1984.
	Metric 6:	Spatial and Temporal Variability	Medium	30 leachate data sets, 11 leachate sites, no replicates
	Metric 7:	Exposure Scenario	High	Exposure scenario was described and relevant (leachate, landfill). See Table 1 for more details.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Some individual data were reported, but not all. Summary statistics were not reported.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The report compared results among municipal leachates and limited discussion of variability. No discussion of limitations, uncertainties, and data gaps.
Overall Quality Determination			Low	

Study Citation:		U.S. EPA OTS, (1982). Hexachlorobutadiene with attachment. :7-10.		
HERO ID:		1441890		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Medium	limited description of sampling methods
	Metric 2:	Analytical Methodology	Critically Deficient	Not described
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Samples from 1977
	Metric 6:	Spatial and Temporal Variability	Low	16 samples
	Metric 7:	Exposure Scenario	Medium	Data likely represents a relevant exposure scenario
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Low	Limited individual sample concentrations reported as wt%
	Metric 9:	Quality Assurance	Low	Analyzed control samples, did not describe techniques
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	Did not characterize variability or uncertainties.
Overall Quality Determination		Uninformative		

Study Citation:		Juang, D. F., Yuan, C. S., Hsueh, S. C., Chiou, L. J. (2009). Distribution of volatile organic compounds around a polluted river. International Journal of Environmental Science and Technology 6(1):91-104.		
HERO ID:		1444237		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling procedure, equipment, and matrix characterization of the VOC chemicals were discussed.
	Metric 2:	Analytical Methodology	Medium	Analytical methodology is discussed in detail and is clear and appropriate, however, instrument calibration and recovery samples are not discussed.
	Metric 3:	Biomarker Selection	N/A	Study tested for the parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Taiwan
	Metric 5:	Currency	Medium	Study was conducted from August 2004 to July 2005.
	Metric 6:	Spatial and Temporal Variability	High	Sample size is 40. Ten locations along the river were sampled during four seasons. Duplicates were collected for each sample.
	Metric 7:	Exposure Scenario	Medium	Ambient air near water surface. The data likely represent the relevant exposure scenario. Routes of exposure and exposure source not characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data reported. Average concentrations with standard deviation were reported in Table 3.
	Metric 9:	Quality Assurance	Low	QA/QC control techniques and results were not thoroughly discussed. Field blanks and system blanks were taken for each sampling. Recoveries were not reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Discussion of variability and limitation was limited. Seasonal and temporal variability were reported.
Overall Quality Determination			Medium	

Study Citation:		Harding Lawson Associates, (1986). Site assessment report - amphenol products (Garden Grove, California) with cover letter dated 050986.		
HERO ID:		1481067		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Only briefly discussed
	Metric 2:	Analytical Methodology	Low	Not described but cited EPA methods, LOD reported on page 16
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	California
	Metric 5:	Currency	Low	Sampling in 1985
	Metric 6:	Spatial and Temporal Variability	Low	7 sample sites, no replicates
	Metric 7:	Exposure Scenario	Medium	Data may represent a relevant exposure scenario, missing details about the population of interest and exposure characteristics
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not described
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability, uncertainties and limitations were not characterized
Overall Quality Determination			Low	

Study Citation:		Geraghty & Miller Inc, (1980). Hydrogeologic investigation at Allied Chemical Corporation Syracuse works Solvay, New York.		
HERO ID:		1481333		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sampling methodology is discussed
	Metric 2:	Analytical Methodology	Low	Samples were analyzed using mass spectrometer, but there is not much information of the analytical methods and no report of LOD or LOQ.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in ground water
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Solvay, New York
	Metric 5:	Currency	Low	1980
	Metric 6:	Spatial and Temporal Variability	Low	No sample replicates, 15 wells. Only one time collection
	Metric 7:	Exposure Scenario	High	Groundwater contamination due to pond leaking
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Individual data points
	Metric 9:	Quality Assurance	Low	No QA/QC measures reported but implied through the use of appropriate methods.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	There is no sample variability and it is recommended to do more monitoring studies
Overall Quality Determination			Medium	

Study Citation:		ICI Americas Inc, (1990). Letter from ICI Americas Inc to USEPA submitting initial submission concerning phenol in groundwater with attachments.		
HERO ID:		1481739		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	No aspects of sampling methodology are described, but field and trip blanks are reported.
	Metric 2:	Analytical Methodology	Low	September samples show method of analysis as "EPA, GC." EPA method 624, LOD reported in page 10, for November samples. January samples list method of analysis as "EPA." Instrument calibration and recoveries are not discussed.
	Metric 3:	Biomarker Selection	N/A	They analyzed parent chemicals in water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Hopewell, Virginia
	Metric 5:	Currency	Low	1990
	Metric 6:	Spatial and Temporal Variability	Low	Samples were collected in September (but none were analyzed for this chemical), December (of the 8 samples reported, 5 appear to have been analyzed for this chemical, along with 2 blanks), and January (4 samples, all analyzed for this chemical, along with 2 blanks). No replicates identified.
	Metric 7:	Exposure Scenario	High	Primarily groundwater monitoring at ICI Americas, Inc., along with monitoring for VOCs in a potable water tank and water from a water fountain.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Only individual data reported for the 3 monitoring surveys, no summary statistics.
	Metric 9:	Quality Assurance	Low	The report doesn't include any QA/QC parameter for sample analysis, but does mention they followed an EPA method.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability is shown in the concentrations across three monitoring studies, but it is not discussed. There is not information regarding key limitations.
Overall Quality Determination			Low	

Study Citation:		Kraut, A., Chan, E., Liroy, P. J., Cohen, F. B., Goldstein, B. D., Landrigan, P. J. (1991). Epidemiologic investigation of a cancer cluster in professional football players. Environmental Research 56(2):131-143.		
HERO ID:		1486654		
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Sampling Methodology	Medium	Timing, location, and equipment described briefly
	Metric 2:	Analytical Methodology	Critically Deficient	LOD not provided. Equipment provided, but very little detail of analysis. There is high analysis error with little explanation. These lead to high uncertainty in the method used.
	Metric 3:	Biomarker Selection	N/A	environmental samples
Domain 2: Representativeness		Metric 4: Geographic Area	High	New Jersey, U.S
	Metric 5:	Currency	Low	1988
	Metric 6:	Spatial and Temporal Variability	Medium	Sampling for one month: Samples were collected every third day at each location for an 8- to 9-hr period during daylight hours. Unclear if there are replicates.
	Metric 7:	Exposure Scenario	High	Relevant exposure to players, workers, population in the area.
Domain 3: Accessibility/Clarity		Metric 8: Reporting of Results	Critically Deficient	Only averages provided. No summary statistics or individual data provided. This leads to high uncertainty in the reported results.
	Metric 9:	Quality Assurance	Critically Deficient	Only QC information provided: Mass spec verification done on 15% of samples. Lack of other QC information and verification done on only 15% of samples lead to interference of overall reliability of study.
Domain 4: Variability and Uncertainty		Metric 10: Variability and Uncertainty	Medium	Variability in locations tested. Limitations only discussed for for epid analysis section.
Overall Quality Determination			Uninformative	

Study Citation:		Bi, E., Liu, Y., He, J., Wang, Z., Liu, F. (2012). Screening of emerging volatile organic contaminants in shallow groundwater in East China. Ground Water Monitoring and Remediation 32(1):53-58.		
HERO ID:		1488836		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology and sites described.
	Metric 2:	Analytical Methodology	High	Analytical methods mentioned, described and briefly summarized.
	Metric 3:	Biomarker Selection	N/A	Ground water samples no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study was conducted in China
	Metric 5:	Currency	Medium	The study took place in 2008 and 2009
	Metric 6:	Spatial and Temporal Variability	Medium	n=130 samples (from Table 2). No replicate samples.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenarios related to polluted ground water in China.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Maximum concentrations reported, no raw data.
	Metric 9:	Quality Assurance	High	QA/QC was described, including MDLs and recoveries.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty sources were not discussed or attributed to anything.
Overall Quality Determination			High	

Study Citation:		Srivastava, A., Som, D. (2007). Hazardous air pollutants in industrial area of Mumbai - India. Chemosphere 69(3):458-468.		
HERO ID:		1489889		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Limited description of sampling methods
	Metric 2:	Analytical Methodology	Medium	Well described analytical methods, did not report LOD
	Metric 3:	Biomarker Selection	N/A	Analyzed air samples for parent chemical
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	India
	Metric 5:	Currency	Low	Sampling in 2004
	Metric 6:	Spatial and Temporal Variability	Low	16 sampling sites monitored over 3 seasons, sample size not reported directly
	Metric 7:	Exposure Scenario	Medium	Data may represent relevant exposure scenarios related to airborne TCA in Mumbai, India. Missing details about sample size but conducted exposure assessment.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	incomplete summary statistics
	Metric 9:	Quality Assurance	Medium	limited description of QA/QC, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Discussed uncertainties, did not characterize variability
Overall Quality Determination			Medium	

Study Citation:		Shell Oil, (1986). Fate of some specific compounds in the Norco chemical biotreater and their effect on the outcome of effluent bioassays.		
HERO ID:		1629033		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	There is limited description included. It says water samples were daily composites, but there is little other information about water sampling protocol. Missing information includes sampling equipment for water, sampling procedures, sample storage, and performance/calibration of sampler. Page 35 explains in some detail sampling and analysis procedures for the vapor samples collected with TENAX traps, including calibration information.
	Metric 2:	Analytical Methodology	Medium	There is limited description included. They used GC/MS. MDLs listed for water samples listed as 10 ppb, based on EPA published values, but for some samples detections down to 1 ppb were listed in parentheses next to "<MDL." Analytical methodologies for water samples were EPA-approved. It appears standards were used, but their use is not well-explained. Recoveries are only mentioned for SVOCs. Spiking is only mentioned for the June 1984 samples. Although MDLs are not listed for air samples, p. 35 explains in some detail sampling and analysis procedures for the vapor samples collected with TENAX traps, including calibration information. Medium applies to water, the primary medium analyzed; low applies to air samples due to missing MDLs and generally limited information.
	Metric 3:	Biomarker Selection	N/A	Samples were from environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Sampling began in 1984
	Metric 6:	Spatial and Temporal Variability	Medium	Sampling approach poorly captures variability of environmental contamination. There were 9 samples from April 1984 (pp. 27, 29, 31), including 3 of effluent on 3 consecutive dates and 3 from two other locations on the same 3 days. Also, results were reported from 4 water samples from May 1984 (p. 42) and 8 water samples from June 1984 (pp. 54 and 56). Only one duplicate was collected, in June 1984 (see p. 60).
	Metric 7:	Exposure Scenario	Medium	Data may represent a relevant exposure scenario, but come from "pilot plants," with different aeration methods and temperatures to actual WWTPs. Data are missing details about the population of interest, the climate, and contextual information such as what types of manufacturing facilities the wastewater treated is coming from.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	There was only one blank water sample, from June 1984. Spiking of a blank air sample for calibration is mentioned too. Recoveries are only discussed for samples analyzed for SVOCs but were from 11 to 38 percent. They did not correct for low recoveries, so assigned this a low score.
	Metric 9:	Quality Assurance	Low	There was only one blank water sample, from June 1984. Spiking of a blank air sample for calibration is mentioned too. Recoveries are only discussed for samples analyzed for SVOCs but were from 11 to 38 percent. They did not correct for low recoveries.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability was not characterized, and there was minimal discussion of uncertainties. No standard deviations were reported.
Overall Quality Determination			Low	

Study Citation:		Olansandan, Amagai, T., Matsushita, H. (1999). A passive sampler-GC/ECD method for analyzing 18 volatile organohalogen compounds in indoor and outdoor air and its application to a survey on indoor pollution in Shizuoka, Japan. Talanta 50(4):851-863.		
HERO ID:		1738909		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Study is primarily a methods paper. Details on sampling methodology for monitoring is limited. No description of sampling preparations and post-sampling handling of samples. Study site characteristics not detailed.
	Metric 2:	Analytical Methodology	High	
	Metric 3:	Biomarker Selection	N/A	
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected in Shizuoka, Japan.
	Metric 5:	Currency	Low	Samples collected in summer 1996.
	Metric 6:	Spatial and Temporal Variability	Medium	Temporal variability not accounted for (each site was sampled in one 24-hour period).
	Metric 7:	Exposure Scenario	Medium	Contains some characterization of setting and potential sources.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported.
	Metric 9:	Quality Assurance	High	Study applied quality assurance measures and no issues were identified.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Study characterizes variability and uncertainties.
Overall Quality Determination			Medium	

Study Citation:		Westinghouse Savannah River Company, (1997). Sanitary landfill groundwater monitoring report. Fourth quarter 1996 and 1996 summary. 14(GRA and I):506.		
HERO ID:		1740826		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sample storage conditions and sampler calibration
	Metric 2:	Analytical Methodology	High	Key analytical methods reported
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Samples collected in 1996
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7:	Exposure Scenario	High	Exposure source characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data reported
	Metric 9:	Quality Assurance	High	Key QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Few gaps and limitations reported
Overall Quality Determination			Medium	

Study Citation:		Westinghouse Savannah River Company, (1992). Sanitary Landfill 1991 annual groundwater monitoring report.		
HERO ID:		1740870		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling Methodology	Low	Sampling methodology is only briefly discussed, therefore, most sampling information is missing and likely to have a substantial impact on results. The type of monitoring wells are reported.
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology was not described, including analytical instrumentation.
	Metric 3:	Biomarker Selection	N/A	The study tested for the parent chemical in environmental media (groundwater).
Domain 2: Representativeness	Metric 4:	Geographic Area	High	The samples were collected in Savannah River Site, Aiken, SC.
	Metric 5:	Currency	Low	The samples were collected in 1991.
	Metric 6:	Spatial and Temporal Variability	Low	The collection of replicates was not reported. Fifty-seven wells were sampled, but sample size is not reported. It's inferred that at least one sample was collected from each well.
	Metric 7:	Exposure Scenario	Medium	Groundwater samples were collected from monitoring wells beneath a sanitary landfill. The use of exposure controls are not described.
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Low	Raw data is reported in tables for each monitoring well starting on page 168. Summary statistics are not reported.
	Metric 9:	Quality Assurance	Low	QA/QC techniques and results were not directly discussed and recoveries were not reported.
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	The characterization of variability is absent (no measure of variance reported). Key uncertainties, limitations, and data gaps are not discussed.
Overall Quality Determination		Uninformative		

Study Citation:		ATSDR, (1994). Petitioned public health assessment: E. I. du Pont de Nemours, Pompton Lakes, Passaic County, New Jersey.		
HERO ID:		1741389		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling procedure was not directly described but can be inferred that it was done according to the NJDEP standards.
	Metric 2:	Analytical Methodology	Low	Analysis was not mentioned in the report but can be inferred. LOD was not reported.
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Pompton Lakes, NJ
	Metric 5:	Currency	Low	No sampling date was provided, an onsite investigation date was available - 1989.
	Metric 6:	Spatial and Temporal Variability	Medium	3 surface water bodies were monitored from 1984-1988, 15 wells were monitored. 5000 soil samples were taken in the area. 93 fish samples were obtained.
	Metric 7:	Exposure Scenario	High	The exposure scenario seems to be highly relevant (covers surface water, groundwater, soil, dietary exposure).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Average concentrations were reported without summary statistics.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study had some discussion of the variability and uncertainties.
Overall Quality Determination			Medium	

Study Citation:		Harkov, R., Kebbekus, B., Bozzelli, J. W. (1987). Volatile organic compounds at urban sites in New Jersey. :69-90.		
HERO ID:		1742362		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Followed a sampling protocol and described the sample medium, flow rate, etc. Did not discuss sample storage
	Metric 2:	Analytical Methodology	Medium	Used GC with FID. Limits not provided.
	Metric 3:	Biomarker Selection	N/A	NA - air samples biomarker not needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	US
	Metric 5:	Currency	Low	1982
	Metric 6:	Spatial and Temporal Variability	Medium	>24 samples, multiple seasons.
	Metric 7:	Exposure Scenario	High	Described possible sources nearby.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Only mean value provided.
	Metric 9:	Quality Assurance	Medium	QA QC discussed, although no specific recoveries provided.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No standard deviation but did assess variability.
Overall Quality Determination			Medium	

Study Citation:	Yamasaki, T., Oki, N., Okuno, T. (1992). Cycle of halocarbons in the air-water phase. Water Science and Technology 25(11):33-39.
HERO ID:	1742404

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling Methodology	Medium	Some sampling methods not reported such as sampler calibration
	Metric 2: Analytical Methodology	Low	LOD nor LOQ reported
	Metric 3: Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness	Metric 4: Geographic Area	High	Japan
	Metric 5: Currency	Low	Study published in 1992
	Metric 6: Spatial and Temporal Variability	Critically Deficient	Number of samples not reported
	Metric 7: Exposure Scenario	Medium	Exposure scenario not well characterized
Domain 3: Accessibility/Clarity	Metric 8: Reporting of Results	Medium	raw data not provided
	Metric 9: Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty	Metric 10: Variability and Uncertainty	Low	No gaps nor limitations reported

Overall Quality Determination**Uninformative**

Study Citation:		Geraghty & Miller Inc, (1983). Hydrogeology of the Hill Site: The Bendix corporation: Sidney, New York with cover letter.		
HERO ID:		1745520		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	There is some (limited) sampling methodology reported for soil collection on pg 62, but half of that page is illegible. Sampling methods for groundwater were almost nonexistent, as the report primarily focused on boring installation.
	Metric 2:	Analytical Methodology	High	Volatile organic compounds analyzed by EPA method 601. LODs are reported in Appendix E at the bottom of the table on page 81.
	Metric 3:	Biomarker Selection	N/A	Parent chemicals were tested in soil and water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Sampling conducted at the Bendix Corporation plant in Sidney, New York.
	Metric 5:	Currency	Low	Samples collected in 1983.
	Metric 6:	Spatial and Temporal Variability	Low	Samples were collected from the wells five times as the drillings proceeded. There is no report of number of samples. Duplicate sampling occurred some but not all of the time.
	Metric 7:	Exposure Scenario	High	Soil and ground water were sampled to investigate the extent of contamination at this site.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Table 3 presents the results but due to the quality of the scan it is impossible to read. Appendix E contains the laboratory reports.
	Metric 9:	Quality Assurance	Low	The laboratory followed an EPA method so QA/QC can be inferred.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	There is no information on sample variability or statistics. The document reports the need to keep monitoring the next steps.
Overall Quality Determination			Low	

Study Citation:		Allied, (1984). Hydrogeologic investigation summary report with cover letter.		
HERO ID:		1745530		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methodology was not described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology was not described
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	Michigan, USA
	Metric 5:	Currency	Low	Report from 1984
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7:	Exposure Scenario	Medium	Missing details about methods, population and microenvironment of interest
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not described
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	Variability was not characterized, uncertainties and limitations were not discussed
Overall Quality Determination		Uninformative		

Study Citation:	DEE, (1984). State purgeable organic testing program (spot) quarterly report from April 1, 1987 to July 31, 1987 with cover letter dated 080387.
HERO ID:	1745594

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling Methodology	Critically Deficient	The sampling methodology is not discussed in the data source or companion source
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methodology is not described
	Metric 3: Biomarker Selection	N/A	Parent chemical in an environmental media
Domain 2: Representativeness	Metric 4: Geographic Area	High	Massachusetts, US
	Metric 5: Currency	Low	1987
	Metric 6: Spatial and Temporal Variability	Low	There is no information regarding the samples, the sample size could be around 600 samples
	Metric 7: Exposure Scenario	Critically Deficient	The exposure scenario is not reported or discussed
Domain 3: Accessibility/Clarity	Metric 8: Reporting of Results	Low	Since there is no information regarding the samples it is possible that the tables only report raw data
	Metric 9: Quality Assurance	Critically Deficient	There is no information regarding QA/QC procedures
Domain 4: Variability and Uncertainty	Metric 10: Variability and Uncertainty	Critically Deficient	There is no information regarding variability or uncertainty

Overall Quality Determination**Uninformative**

Study Citation: Ciba-Geigy, (1987). Annual report on results of water quality monitoring water year 1985-86 with cover letter dated 082887.
HERO ID: 1745597

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling Methodology	High	Monitoring methods reported in appendix A
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methods not reported
	Metric 3: Biomarker Selection	N/A	Parent chemical in water samples
Domain 2: Representativeness	Metric 4: Geographic Area	High	Montebello Forebay, California
	Metric 5: Currency	Low	Water quality data 1985-1986
	Metric 6: Spatial and Temporal Variability	High	Samples collected in 20 wells in Montebello Bay, 170 wells for basin wide ground water
	Metric 7: Exposure Scenario	High	Water quality data from Montebello Bay
Domain 3: Accessibility/Clarity	Metric 8: Reporting of Results	Medium	Table 4 reports raw data, no statistics calculated
	Metric 9: Quality Assurance	Low	No information on analytical methods, but sampling program well described
Domain 4: Variability and Uncertainty	Metric 10: Variability and Uncertainty	Medium	Variability reported in ranges in page 49

Overall Quality Determination **Uninformative**

Study Citation:		CA State Dept of Health Services, (1986). Organic chemical contamination of large public water systems in California April 1986 on seven chemicals with attachments.		
HERO ID:		1745610		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling methodology is not described, but the report is from the California State Department of Health Services.
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology was not described, including analytical instrumentation.
	Metric 3:	Biomarker Selection	N/A	The study tested for the parent chemical in environmental media (groundwater).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The samples were collected in several locations across California.
	Metric 5:	Currency	Low	The samples were collected in 1984-1985.
	Metric 6:	Spatial and Temporal Variability	Medium	The collection of replicates was not reported. 2947 groundwater wells were sampled. The report lists only positive test results and Table E-1 lists how many wells tested positively for the contaminant. Negative test results are on file at the SEB district offices.
	Metric 7:	Exposure Scenario	Medium	Groundwater samples were collected from light industrial/residential, heavy industrial, agricultural and contamination free settings in California. The use of exposure controls are not described.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data is reported in Table II-23 (pg 109). Summary statistics (concentration range and median concentration) are reported in the text on pg 19.
	Metric 9:	Quality Assurance	Low	QA/QC techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols. Certified laboratories analyzed the samples (pg 6).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The characterization of variability is absent (no measure of variance reported). Key uncertainties, limitations, and data gaps are not discussed.
Overall Quality Determination			Uninformative	

Study Citation:		SC DHEC, (1987). Investigation of groundwater at South Carolina Recycling and Disposal Company Bluff Road site, Richland County, South Carolina.		
HERO ID:		1745613		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Low	Sampling methodology only briefly described missing details about storage conditions, volume of sample.
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology not described
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	South Carolina, USA
	Metric 5:	Currency	Low	Sampling in 1980
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7:	Exposure Scenario	Medium	Missing details about the population and microenvironment of interest
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Low	Only presence/absence
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not discussed
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	Variability not characterized, limitations were briefly described
Overall Quality Determination		Uninformative		

Study Citation:		Geraghty & Miller Inc, (1988). Results of the second phase of a hydrogeologic investigation at the Allied-Signal Inc facility, Morristown, New Jersey with cover letter dated 012089.		
HERO ID:		1745619		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	The study did not report storage conditions, sampling equipment or procedures.
	Metric 2:	Analytical Methodology	Low	The study did not describe analytical methods or reported LODs however it cited EPA Method 601.
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media (water).
Domain 2: Representativeness	Metric 4:	Geographic Area	High	Geographic location is reported; New Jersey, USA.
	Metric 5:	Currency	Low	Timing of sample collection for monitoring data is not consistent with when current exposures (sampling occurred in 1987; >15 years old) may be expected and likely to have a substantial impact on results.
	Metric 6:	Spatial and Temporal Variability	Low	Sampling approach does not captures variability of environmental contamination in population/scenario/media of interest. The study used 20 samples and no replicates.
	Metric 7:	Exposure Scenario	Medium	The study did not provide details about the population of interest or exposure assessment.
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Individual sample concentrations (raw data) reported but there is no summary statistics.
	Metric 9:	Quality Assurance	Medium	Limited description of QA/QC techniques.
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	Did not characterize variability, or discussed uncertainties and limitations.
Overall Quality Determination		Uninformative		

Study Citation:		Dames & Moore, (1989). Ground water and soils data summary report with attachments, appendices, cover sheets and letter dated 080989.		
HERO ID:		1745621		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Medium	Limited description of sampling methodology
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods not described
	Metric 3:	Biomarker Selection	N/A	Did not sample for biomarkers
Domain 2: Representativeness	Metric 4:	Geographic Area	High	Illinois, USA
	Metric 5:	Currency	Low	Samples from 1987
	Metric 6:	Spatial and Temporal Variability	Low	5 samples, no replicates
	Metric 7:	Exposure Scenario	Medium	Data likely represents a relevant exposure scenario, missing details about the population of interest and microenvironment
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Only individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	Medium	Limited description of QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty were not characterized or described
Overall Quality Determination		Uninformative		

Study Citation:		Aeroject General Corp, (1979). Letter from Aeroject general corporation to USEPA regarding information on trichloroethylene with attachments.		
HERO ID:		1745640		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methodology was not described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology was not described
	Metric 3:	Biomarker Selection	N/A	Parent chemical
Domain 2: Representativeness	Metric 4:	Geographic Area	High	Sacramento, CA
	Metric 5:	Currency	Low	1979
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size was not reported
	Metric 7:	Exposure Scenario	Medium	Contamination near Aeroject Center
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Low	No summary of statistics, only individual data points
	Metric 9:	Quality Assurance	Critically Deficient	No report regarding QA/QC
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	Variability and Uncertainty not discussed
Overall Quality Determination		Uninformative		

Study Citation:	HSWMR, (1993). Toxicological evaluation of sampling data for Little Rocky Creek, Greenville, South Carolina with cover letter dated 050793.
HERO ID:	1745693

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling Methodology	Low	Only briefly described
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methods were not described
	Metric 3: Biomarker Selection	N/A	Did not test for biomarkers
Domain 2: Representativeness	Metric 4: Geographic Area	High	USA
	Metric 5: Currency	Low	Samples taken in 1990
	Metric 6: Spatial and Temporal Variability	Low	82 samples from 20 locations, <5 samples per site
	Metric 7: Exposure Scenario	Medium	Data likely represents relevant exposure scenarios, missing methodological details
Domain 3: Accessibility/Clarity	Metric 8: Reporting of Results	Medium	Only summary statistics
	Metric 9: Quality Assurance	Low	QA/QC techniques were not described
Domain 4: Variability and Uncertainty	Metric 10: Variability and Uncertainty	Medium	Limited characterization of variability, did not discuss uncertainties and limitations

Overall Quality Determination**Uninformative**

Study Citation:		ERM-Northeast, (1994). Hydrogeologic investigation (including ground water quality) north of Husky Brook Eatontown, New Jersey, with cover letter dated 011894.		
HERO ID:		1745841		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology followed NJDEPE’s (NJ Department of Environmental Protection) Field Sampling Procedures Manual published in 1992.
	Metric 2:	Analytical Methodology	High	Followed EPA 624+15. Detection limits reported on page 80.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in ground water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study was performed in Eatontown, New Jersey, USA.
	Metric 5:	Currency	Low	Sampling was performed in 1993.
	Metric 6:	Spatial and Temporal Variability	Medium	Samples were collected from six new and existing monitoring wells. While the number of samples collected from each well was not reported, we can infer that there were at least 12 samples. Surface water samples collected from 3 wells. No replicates were collected.
	Metric 7:	Exposure Scenario	Medium	On-site ground and surface water quality was assessed for the conditions AlliedSignal Aerospace Company. The population of interest is not described.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Only individual data points and no statistics were provided.
	Metric 9:	Quality Assurance	Medium	Some QA/QC parameters reported in the laboratory reports. Through the use of EPA methods, QA/QC was also implied.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	There is no characterization of variance or report of uncertainties, limitations, and gaps.
Overall Quality Determination			Medium	

Study Citation:		Shin, S. H., Jo, W. K. (2012). Volatile organic compound concentrations, emission rates, and source apportionment in newly-built apartments at pre-occupancy stage. Chemosphere 89(5):569-578.		
HERO ID:		1787932		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported, such as sample storage conditions
	Metric 2:	Analytical Methodology	High	GC/MS and GC/FID method described. Method detection limit reported.
	Metric 3:	Biomarker Selection	N/A	Indoor and outdoor air sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Metropolitan and Rural areas in Korea
	Metric 5:	Currency	Low	Timing of sample collection for monitoring data is not directly reported but is inferred by discussion of 2003 building standards that sampling occurred after 2003. Publication date is 2012
	Metric 6:	Spatial and Temporal Variability	High	107 buildings sampled
	Metric 7:	Exposure Scenario	High	Sources of potential exposure in buildings such as building material and proximity to roadways identified.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data reported. Statistical summaries presented.
	Metric 9:	Quality Assurance	High	QA/QC conducted including blanks, spiked samples, and duplicate sample analysis.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No gaps or limitations reported
Overall Quality Determination			High	

Study Citation:		Guo, P., Yokoyama, K., Piao, F., Sakai, K., Khalequzzaman, M., Kamijima, M., Nakajima, T., Kitamura, F. (2013). Sick building syndrome by indoor air pollution in Dalian, China. International Journal of Environmental Research and Public Health 10(4):1489-1504.		
HERO ID:		1938385		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported, such as sample storage conditions
	Metric 2:	Analytical Methodology	Medium	Some analytical methods not reported, such as recovery samples
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Dalian, China.
	Metric 5:	Currency	Medium	Data collected in 2007
	Metric 6:	Spatial and Temporal Variability	Medium	Replicate samples not collected
	Metric 7:	Exposure Scenario	High	the exposure scenario discussed in the monitored study represents the exposure scenario of interest for the chemical.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	no raw data provided
	Metric 9:	Quality Assurance	Low	no QA/QC reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No gaps nor limitations reported
Overall Quality Determination			Medium	

Study Citation:		Boillot, C., Bazin, C., Tissot-Guerraz, F., Droguet, J., Perraud, M., Cetre, J. C., Trepo, D., Perrodin, Y. (2008). Daily physicochemical, microbiological and ecotoxicological fluctuations of a hospital effluent according to technical and care activities. Science of the Total Environment 403(1-3):113-129.		
HERO ID:		1941262		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling described. Sampling was performed with several EPIC 1011 automatic samplers which were in-stalled in parallel
	Metric 2:	Analytical Methodology	Low	The analytical instrument was provided in Table 1 for each chemical, but references to the standards were not in the reference section. Little description of QA/QC.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	France
	Metric 5:	Currency	Low	Unclear because date is not in standard form. "The samples were taken from 06/04/12 at 1 p.m. to 06/04/13 at 1 pm." This seems to be Apr-12-2006 to Apr-13-2006
	Metric 6:	Spatial and Temporal Variability	Low	One 24 hour air sample and five samples of various time extents (5–9 a.m.; 9 a.m.–1 p.m.; 1–5 p.m.; 5–11 p.m. and 11 p.m.–5 a.m)
	Metric 7:	Exposure Scenario	Medium	This measured effluent from a hospital.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Only one result from the average sample.
	Metric 9:	Quality Assurance	Low	Used a standard method so QC implied, but no info on QA procedures or results.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The sample is a 24 average, so a little implied variability.
Overall Quality Determination			Low	

Study Citation: Oldaker G B, III, Taylor, W. D., Parrish, K. B. (1995). Investigations of ventilation rate, smoking activity and indoor air quality at four large office buildings. Environmental Technology 16(2):173-180.

HERO ID: 1946147

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Detailed description of Sampling methodology provided.
Metric 2:	Analytical Methodology	High	Detailed description of analytical methodology provided.
Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	It may be inferred that the location of the four buildings studies is in the US including the Midwest.
Metric 5:	Currency	Low	Data collected in 1991
Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
Metric 7:	Exposure Scenario	High	the exposure scenario discussed in the monitored study represents the exposure scenario of interest for the chemical.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	no raw data reported
Metric 9:	Quality Assurance	Low	Limited QA/QC information reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Little information provided on gaps and limitations and variability of results

Overall Quality Determination

Uninformative

Study Citation:		Fox, R. B. (2000). Air quality and comfort measurement aboard a commuter aircraft and solutions to improve perceived occupant comfort levels. American Society for Testing and Materials special technical publication 1393:161-186.		
HERO ID:		1947427		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling procedure, equipment, and EPA methods referenced were all described.
	Metric 2:	Analytical Methodology	High	Analytical procedure - GC/MS was described in details, reporting limit was included.
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Australia, airplane indoor air
	Metric 5:	Currency	Low	No sampling date is reported. However, the publication year of 2000 is used as a proxy for sampling year.
	Metric 6:	Spatial and Temporal Variability	Low	3 sample locations on an aircraft were sampled.
	Metric 7:	Exposure Scenario	Medium	The data likely represent the relevant exposure scenario (indoor air of a revenue flight)
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Average data were reported; no individual data were reported.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study has discussion about variability on the specific testing method
Overall Quality Determination			Medium	

Study Citation:		Helmig, D., Apel, E., Blake, D., Ganzeveld, L., Lefer, B. L., Meinardi, S., Swanson, A. L. (2009). Release and uptake of volatile inorganic and organic gases through the snowpack at Niwot Ridge, Colorado. Biogeochemistry 95(1):167-183.		
HERO ID:		1947616		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling method was described in details: samples were collected from snowpack. Method was illustrated in previous studies.
	Metric 2:	Analytical Methodology	Low	Analytical method was described: GC. No LOD or LOQ was provided.
	Metric 3:	Biomarker Selection	N/A	NA - snow samples no biomarker needed
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Niwot Ridge, Colorado
	Metric 5:	Currency	Medium	Sampling took place in March, 2005.
	Metric 6:	Spatial and Temporal Variability	High	2 towers/locations were sampled. In each tower, there were 22 and 34 samples collected.
	Metric 7:	Exposure Scenario	Medium	The study presented likely relevant exposure scenario. However, sources of chemicals, exposure matrix were not known from the study.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Data were reported as average amount. No individual data was reported.
	Metric 9:	Quality Assurance	Medium	QA/QC was not directly mentioned, but can be inferred based on the mentioning of use of recoveries.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	The study has discussion about uncertainty about loss of volatile gas samples. The study also compared the results to other studies.
Overall Quality Determination			Medium	

Study Citation:	T A Gleason Assoc, (1986). Hydrological and groundwater quality investigations (final report) with cover letter dated 071587.
HERO ID:	1973128

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling Methodology	High	The method is described
	Metric 2: Analytical Methodology	High	The study followed the USA EPA method 1624
	Metric 3: Biomarker Selection	N/A	Parent chemical in ground water
Domain 2: Representativeness	Metric 4: Geographic Area	High	Fostoria OH
	Metric 5: Currency	Low	1987
	Metric 6: Spatial and Temporal Variability	Critically Deficient	Number of samples not reported
	Metric 7: Exposure Scenario	High	Off site ground water contamination from Autolite
Domain 3: Accessibility/Clarity	Metric 8: Reporting of Results	Medium	Only individual data reported, no summary of statistics. The data can not be read do to the quality of the scan
	Metric 9: Quality Assurance	Critically Deficient	QA/QC not reported
Domain 4: Variability and Uncertainty	Metric 10: Variability and Uncertainty	Low	Variability and uncertainty is nor discussed

Overall Quality Determination**Uninformative**

Study Citation:		Bookman-Edmonston, (1985). Annual report on results of water quality monitoring water year 1983-84 on seven chemicals with attachments.		
HERO ID:		1973144		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methods were not described.
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods were not described.
	Metric 3:	Biomarker Selection	N/A	They did not test for biomarkers, but rather for parent chemicals in water.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	California, USA
	Metric 5:	Currency	Low	Sampling was conducted in 1983 and 1984.
	Metric 6:	Spatial and Temporal Variability	Low	I found it difficult to ascertain the total number of samples analyzed for this chemical, but it was more than 10, as there were more than 10 locations (wells) sampled, some "intensively." There were no replicates.
	Metric 7:	Exposure Scenario	Low	Data likely represents a relevant exposure scenario, but methodological details are missing to describe the reliability of the data. Exposure sources are not well-characterized. It's a bit unclear whether the samples analyzed for this chemical came from ground water or drinking water wells.
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	For 16 samples from October 1984, Table B-4 shows individual sample concentrations from Montebello Forebay, without summary statistics. Table IV-6 summarizes the range of detections in samples of local storm water, reclaimed water, imported water, unchlorinated well water, and chlorinated well water, respectively. It says there were 57 samples of reclaimed water, but the number of samples of water in other categories is not specified.
	Metric 9:	Quality Assurance	Low	Little to no discussed of QA/QC techniques was included.
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	Uncertainty and gaps were not characterized, and there was minimal discussion of variability (see p. 15, which is the 25th page of the PDF, and the tables with data on this chemical).

Overall Quality Determination

Uninformative

Study Citation:		T A Gleason Assoc, (1990). Letter from Allied Signal Inc to US EPA regarding well water test result data from a closed landfill site with attachment.		
HERO ID:		1973153		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Limited description of sampling methods
	Metric 2:	Analytical Methodology	Low	Analytical methods only briefly discussed
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	South Bend, Indiana
	Metric 5:	Currency	Low	Sampling in 1990
	Metric 6:	Spatial and Temporal Variability	Low	12 sampling sites, no replicates
	Metric 7:	Exposure Scenario	Medium	Missing details about the population of interest and exposure characteristics
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	Medium	Limited description of QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability, study limitations and uncertainties were not discussed
Overall Quality Determination			Low	

Study Citation:		Buhamra, S. S., Bouhamra, W. S., Elkilani, A. S. (1998). Assessment of air quality in ninety-nine residences of Kuwait. Environmental Technology 19(4):357-368.		
HERO ID:		1992664		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	no inconsistencies in the reporting of sampling information
	Metric 2:	Analytical Methodology	Low	No LOD or LOQ reported
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Kuwait
	Metric 5:	Currency	Low	Data collected December 1994 to June 1996
	Metric 6:	Spatial and Temporal Variability	Medium	no replicates collected
	Metric 7:	Exposure Scenario	High	the exposure scenario discussed in the monitored study does represent the exposure scenario of interest for the chemical.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Good reporting of results.
	Metric 9:	Quality Assurance	Low	Limited QA/QC information provided
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited gaps and limitations reported
Overall Quality Determination			Medium	

Study Citation:		Monsanto Chemical Company, (1995). Whole effluent and chemical specific evaluation (o-dichlorobenzene) of Monsanto's Antwerp plant aqueous discharge, with cover letter dated 07/10/95.		
HERO ID:		2048254		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Sampling method was not described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods not described
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	St. Louis Missouri
	Metric 5:	Currency	Low	1995
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size is not reported
	Metric 7:	Exposure Scenario	Low	Data may represent relevant exposure scenario but lacks sufficient details about methods, population of interest, exposure characteristics
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	Low	QA/QC details were not provided
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability, uncertainties and limitations were not characterized
Overall Quality Determination		Uninformative		

Study Citation:		Dames & Moore, (1988). Report of hydrogeologic and environmental assessment for sixteen chemicals at the former Allied Automotive Plant with cover letter dated 033188.		
HERO ID:		2048351		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Samples were collected according to publicly available SOPs that are scientifically sound and widely accepted. VOCs were collected according to EPA Analytical Methods 601 and 602. Base/neutral extractable organic compounds were collected according to EPA Analytical Method 625 for groundwater and Method 8270 for soil. Sampling methodology described in section 1.1, groundwater sampling methods in section 1.1.2, and soil in section 1.1.3.
	Metric 2:	Analytical Methodology	High	Samples were analyzed according to publicly available analytical methods. VOCs were analyzed according to EPA Analytical Methods 601 and 602. Base/neutral extractable organic compounds were analyzed according to EPA Analytical Method 625 for groundwater and Method 8270 for soil. The detection level used is specified in the standard methods, but the values are listed in the report.
	Metric 3:	Biomarker Selection	N/A	The study tested for the parent chemical in environmental media (groundwater and soil).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The samples were collected in Port Huron, Michigan.
	Metric 5:	Currency	Low	The samples were collected in 1987.
	Metric 6:	Spatial and Temporal Variability	Medium	The collection of replicates was not reported. Composite soil samples were collected from five sites at three different depths. One sample was collected from three different monitoring wells.
	Metric 7:	Exposure Scenario	Medium	Groundwater and soil samples were collected from monitoring wells and the land on the site of a former automotive plant with previous contamination. The use of exposure controls are not described.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data is reported in Appendix C for groundwater and Appendix D for soil samples. Summary statistics are not reported.
	Metric 9:	Quality Assurance	Low	The study applied QA/QC measures like preventing cross contamination while collecting samples; however, recoveries and baseline samples are not reported. It's implied that QA/QC techniques were used through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The characterization of variability is absent (no measure of variance reported). Key uncertainties, limitations, and data gaps are not discussed.
Overall Quality Determination			Medium	

Study Citation:		Yoshida, T., Matsunaga, I. (2006). A case study on identification of airborne organic compounds and time courses of their concentrations in the cabin of a new car for private use. Environment International 32(1):58-79.		
HERO ID:		2095300		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods described for all air pollutants of interest.
	Metric 2:	Analytical Methodology	Low	LOD not reported
	Metric 3:	Biomarker Selection	N/A	Air sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Cars in Osaka, Japan
	Metric 5:	Currency	Low	Data collected in 1999
	Metric 6:	Spatial and Temporal Variability	Medium	Sampling done 44 times during time period. No indication of replicate sampling for all samples or replicate analysis.
	Metric 7:	Exposure Scenario	High	Car interior
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Note raw data reported in a figure so will be difficult to extract
	Metric 9:	Quality Assurance	Low	QA/QC not explicitly described. Detection limits for instruments and recovery not measured.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No limitations nor gaps reported
Overall Quality Determination			Medium	

Study Citation:		Brenner, D. (2010). Results of a long-term study of vapor intrusion at four large buildings at the NASA Ames research center. Journal of the Air and Waste Management Association (1990-1992) 60(6):747-758.		
HERO ID:		2127874		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods and approaches described.
	Metric 2:	Analytical Methodology	Medium	Analytical methods provided, LOD missing.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed air samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	NASA, Research Park site, located in Moffett Field, CA, US
	Metric 5:	Currency	Low	Data collected in 2004
	Metric 6:	Spatial and Temporal Variability	High	Over 10 samples collected
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenarios related to indoor and outdoor air in and near NASA Ames Research Center buildings.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data provided, only summary statistics.
	Metric 9:	Quality Assurance	Medium	Missing recoveries and blanks. Mentioned doing them, but not reported or summarized.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No gaps nor limitations reported. Variability was characterized (SD).
Overall Quality Determination			Medium	

Study Citation:		Yamamoto, K., Fukushima, M., Kakutani, N., Tsuruho, K. (2001). Contamination of vinyl chloride in shallow urban rivers in Osaka, Japan. Water Research 35(2):561-566.		
HERO ID:		2310570		
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Sampling Methodology	High	Sampling procedure, equipment, storage, and sites were described.
		Metric 2: Analytical Methodology	Medium	The authors reported the method of extraction and analysis (GC-MS). The method detection limit for this chemical was reported in an earlier paper, along with method accuracy and precision.
		Metric 3: Biomarker Selection	N/A	Chemicals of interest were analyzed in parent media.
Domain 2: Representativeness		Metric 4: Geographic Area	High	Osaka, Japan
		Metric 5: Currency	Low	Samples were collected in 1995-1997.
		Metric 6: Spatial and Temporal Variability	Low	There were 106 samples. 1,1-DCA and cis-DCE were among the most frequently detected chemicals. Since trans-DCE and 1,1,2-TCA were detected in less than 66% of samples, details about the levels of these chemicals detected were not included, so I rated this metric as low. There was no mention of replicates, but that may have been addressed in prior papers.
		Metric 7: Exposure Scenario	High	The data likely represent the relevant exposure scenario (surface water). Possible sources of the primary chemicals discussed (but not all chemicals) were hypothesized.
Domain 3: Accessibility/Clarity		Metric 8: Reporting of Results	Low	Data were log-transformed and presented in a figure for some chemicals, but not for this one. (Also, the top of p. 564 reports the frequency of detection (pr), range, mean ("m"), SD, and median ("me") for cis-1,2-DCE and 1,1-DCA.) No individual data were presented for this chemical either.
		Metric 9: Quality Assurance	Medium	There is discussion of using standards for calibration, but no mention of determining recoveries. The paper says the accuracy and precision of the methods were discussed in detail elsewhere. While specific quality assurance/quality control techniques and results were not discussed further, they are implied through the study's use of standard field and laboratory protocols and the language included in this paper. Site 1 had no detection of the four VOCs that were discussed at greatest length in this paper, serving as something of a "control" location.
Domain 4: Variability and Uncertainty		Metric 10: Variability and Uncertainty	Medium	The study had some discussion of temporal and spatial variability. The only uncertainty mentioned was whether contaminated groundwater might be responsible for the detections in surface water. Gaps and limitations were not discussed.
Overall Quality Determination			Medium	

Study Citation:		Yu, C. H., Zhu, X., Fan, Z. H. (2014). Spatial/temporal variations and source apportionment of VOCs monitored at community scale in an urban area. PLoS ONE 9(4):e95734.		
HERO ID:		2382561		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The sampling methodology was adequately described and the EPA TO-15 sampling method was cited.
	Metric 2:	Analytical Methodology	Medium	ERG conducted the analysis and the quality assurance and control was overseen by EPA.
	Metric 3:	Biomarker Selection	N/A	This metric is not applicable as the study assessed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	This study was conducted near Patterson, NJ.
	Metric 5:	Currency	Medium	This study was conducted during the years 2005-2006.
	Metric 6:	Spatial and Temporal Variability	High	This study reported 25 duplicate samples out of 209 samples and described example spatial and temporal patterns in detail.
	Metric 7:	Exposure Scenario	Medium	The exposure scenario for air sampling was adequately described, but exposure/dose metrics were not quantified.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Statistical summary measures of average, SD, minimum, medium and maximum were reported, but raw data was not reported.
	Metric 9:	Quality Assurance	High	Quality assurance and control procedures included method precision, MDL, and field blanks and were overseen by the EPA.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Spatial and temporal variability were described, and uncertainty was represented by the standard deviation (SD)
Overall Quality Determination			High	

Study Citation:		Chin, J. Y., Godwin, C., Parker, E., Robins, T., Lewis, T., Harbin, P., Batterman, S. (2014). Levels and sources of volatile organic compounds in homes of children with asthma. Indoor Air 24(4):403-415.		
HERO ID:		2443355		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Storage conditions not described. Study referenced several peer-reviewed papers for its sampling protocol, which may contain more information.
	Metric 2:	Analytical Methodology	High	Analytical methodology fully described.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Detroit, Michigan.
	Metric 5:	Currency	Medium	2009-2010.
	Metric 6:	Spatial and Temporal Variability	High	Study used large sample size (about 1300), duplicate samples, and continuous monitoring methods.
	Metric 7:	Exposure Scenario	Medium	Includes some characterization of setting and potential sources.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics are detailed, though no raw data are reported.
	Metric 9:	Quality Assurance	Medium	Recoveries not reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Characterizes variability and identifies data gaps.
Overall Quality Determination			High	

Study Citation:		Ras-Mallorqui, M. R., Marce-Recasens, R. M., Borrull-Ballarin, F. (2007). Determination of volatile organic compounds in urban and industrial air from Tarragona by thermal desorption and gas chromatography-mass spectrometry. Talanta 72(3):941-950.		
HERO ID:		2443817		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	air samples by active collection on multisorbent tubes; air sampling pump; tubes transported in glass jars; analyzed as soon as possible or kept refrigerated during storage and analyzed day after sampling (Section 2.1)
	Metric 2:	Analytical Methodology	High	thermal desorption and GC-MS; compounds quantified by a target ion and identified by qualifier ions and retention time; Table 1 provides MDL and MQL; recoveries
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Tarragona, Spain
	Metric 5:	Currency	Medium	December 2005 and January 2006
	Metric 6:	Spatial and Temporal Variability	High	urban samples (4sites) taken every 2 hrs from 8AM-8PM; industrial samples (3 sites) taken in morning, mid-day, and afternoon;
	Metric 7:	Exposure Scenario	High	samples in urban and industrial areas
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 1 provides MDL and MQL; only chemicals detected were presented; this chemical was not one of the chemicals detected; chemical not listed in Table 2
	Metric 9:	Quality Assurance	High	recoveries higher than 98.9%; linearity I the responses and the repeatability was also good; analyzed blanks
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	discussed variability throughout the day and between urban and industrial areas
Overall Quality Determination			High	

Study Citation:		Kuo, M. C. T., Chen, C. M., Lin, C. H., Fang, H. C., Lee, C. H. (2000). Surveys of volatile organic compounds in soil and groundwater at industrial sites in Taiwan. Bulletin of Environmental Contamination and Toxicology 65(5 (Nov 2000)):654..		
HERO ID:		2529812		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	30 sites (fig 1 shows locations); 3-6 soil sampling points randomly selected within each site at 3 depths (0.5, 1.5, and 3 m); direct push sampling method; gw samples from existing monitoring wells at each site; each soil and gw sample taken twice at two different times; samples stored at 4C
	Metric 2:	Analytical Methodology	Low	analyzed according to EPA SW846 Method 5035 using purge and trap and Method 8260B using GC/MD reported- references could provide more information on methodology; LOD not provided.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Taiwan
	Metric 5:	Currency	Low	Table 1 indicates gw samples taken 1999
	Metric 6:	Spatial and Temporal Variability	High	30 industrial sites (8 chemical and petrochemical districts, 2 technology industrial parks, 11 general industrial districts, 2 metal processing areas, 2 oil refinery plants, 1 pesticide manufacturing, and 4 landfills); 3 to 6 sampling points within each site
	Metric 7:	Exposure Scenario	High	soil and groundwater samples from various industrial sites in Taiwan
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Fig 2 and 3 show DF; Table 1 show concentrations in gw wells; soil concentrations not reported
	Metric 9:	Quality Assurance	Low	QA/QC is not discussed but can be implied through the study's use of EPA analysis methods
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	discusses variability in gw by location; no apparent correlation of chemicals in gw and soil samples from a particular site; may be due to large areas studies and relatively small sample sizes within a site. No limitation discussion.
Overall Quality Determination			Medium	

Study Citation:		He, Z., Yang, G., Lu, X., Ding, Q., Zhang, H. (2013). Halocarbons in the marine atmosphere and surface seawater of the south Yellow Sea during spring. Atmospheric Environment 80:514-523.		
HERO ID:		2532227		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported
	Metric 2:	Analytical Methodology	Medium	Key analytical methods reported; analytical methods for halocarbons in seawater is briefly described and referenced to another article.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	South Yellow Sea, China
	Metric 5:	Currency	Medium	Samples collected in 2012
	Metric 6:	Spatial and Temporal Variability	Medium	Samples from 10 stations were collected
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data reported
	Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported
Overall Quality Determination			Medium	

Study Citation:		Bookman-Edmonston, (1986). Annual report on results of water quality monitoring water year 1984-85 on 4 chemicals with attachments.		
HERO ID:		2799637		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	High	The sampling methodology is reported. Table A-4 sampling locations
	Metric 2:	Analytical Methodology	Low	LOD reported in table 4, analytical methodology not discussed
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media
Domain 2: Representativeness	Metric 4:	Geographic Area	High	Los Angeles, CA. Montebello Forebay
	Metric 5:	Currency	Low	1986
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7:	Exposure Scenario	High	Montebello forebay wells contamination
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Low	There is no summary of statistics, only individual points
	Metric 9:	Quality Assurance	Critically Deficient	QA/QC was not discussed
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	No summary of statistics, no information regarding variability or uncertainty.
Overall Quality Determination		Uninformative		

Study Citation:		Uhler, A. D., Diachenko, G. W. (1987). Volatile halocarbon compounds in process water and processed foods. Bulletin of Environmental Contamination and Toxicology 39(4):601-607.		
HERO ID:		2801793		
Domain	Metric	Rating	Comments	
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported
	Metric 2:	Analytical Methodology	Low	LOD nor LOQ reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Study published in 1987
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7:	Exposure Scenario	Medium	Exposure scenario not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data reported
	Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported
Overall Quality Determination			Medium	

Study Citation:		Rogers, H. R., Crathorne, B., Watts, C. D. (1992). Sources and fate of organic contaminants in the Mersey estuary: Volatile organohalogen compounds. Marine Pollution Bulletin 24(2):82-91.		
HERO ID:		2802879		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sampler calibration
	Metric 2:	Analytical Methodology	Low	LOD nor LOQ reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	UK
	Metric 5:	Currency	Low	Samples collected between 1987 and 1990
	Metric 6:	Spatial and Temporal Variability	High	>10 samples; replicates
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data reported
	Metric 9:	Quality Assurance	Medium	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Some limitations reported
Overall Quality Determination			Medium	

Study Citation:		Dawes, V. J., Waldock, M. J. (1994). Measurement of volatile organic compounds at UK national monitoring plan stations. Marine Pollution Bulletin 28(5):291-298.		
HERO ID:		2803418		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported
	Metric 2:	Analytical Methodology	Low	Key analytical methods reported. MDL provided in text for only EDC but not TCA.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in UK estuaries.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	UK
	Metric 5:	Currency	Low	Samples collected in 1992
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7:	Exposure Scenario	High	Exposure source is anthropogenic discharges to rivers and estuaries.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data reported but missing most summary statistics
	Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Limited characterization of variance and few gaps and limitations reported
Overall Quality Determination			Medium	

Study Citation:		Uchiyama, S., Tomizawa, T., Tokoro, A., Aoki, M., Hishiki, M., Yamada, T., Tanaka, R., Sakamoto, H., Yoshida, T., Bekki, K., Inaba, Y., Nakagome, H., Kunugita, N. (2015). Gaseous chemical compounds in indoor and outdoor air of 602 houses throughout Japan in winter and summer. Environmental Research 137:364-372.		
HERO ID:		2834618		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology specified including sampling equipment, procedure, and sampling location.
	Metric 2:	Analytical Methodology	Low	No LOD nor LOQ reported; no recovery samples reported
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Japan
	Metric 5:	Currency	Medium	Data collected in 2012, 2013, and 2014
	Metric 6:	Spatial and Temporal Variability	Medium	602 randomly selected dwellings. No replicates.
	Metric 7:	Exposure Scenario	High	Monitoring (survey) four types of diffusive samplers
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data reported
	Metric 9:	Quality Assurance	Low	Limited QA/QC reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Limited QA/QC reported
Overall Quality Determination			Medium	

Study Citation:		Nikolaou, A. D., Golfinopoulos, G., Kostopoulou, M. N., Kolokythas, G. A., Lekkas, T. D. (2002). Determination of volatile organic compounds in surface waters and treated wastewater in Greece. Water Research 36(11):2883-2890.		
HERO ID:		2859218		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling was performed seasonally at 10 rivers, 2 sampling points in each river. Three sampling points were established in seawater areas. Samples were also collected from three municipal wastewater treatment plants and in wastewater from two industries.
	Metric 2:	Analytical Methodology	High	Samples were analyzed using a Hewlett Packard Purge and Trap Concentrator 7695 and a Hewlett Packard Gas Chromatograph 5890 Series II FMass Spectrometer HP 5971. QA/QC described, reported, including detection limits.
	Metric 3:	Biomarker Selection	N/A	NA - water samples no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Greece
	Metric 5:	Currency	Low	Data collected from October 1998 to September 1999
	Metric 6:	Spatial and Temporal Variability	High	Sampling was performed seasonally, from October 1998 to September 1999, at 10 rivers. Duplicate samples for VOCs measurement were collected (sample size is unclear).
	Metric 7:	Exposure Scenario	High	The data closely represent exposure scenarios from various water bodies in Greece.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	no raw data reported. Limited summary statistics were reported.
	Metric 9:	Quality Assurance	Medium	Some analytical QA reported in Table 2, missing information about blanks
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability among locations was not addressed, only providing range of concentrations. Uncertainty sources were not identified.
Overall Quality Determination			Medium	

Study Citation:		Wallace, L. A., Pellizzari, E. P., Hartwell, T. D., Whitmore, R., Zelon, H., Perritt, C., Sheldon, L. (1988). The California TEAM study: Breath concentrations and personal exposures to 26 volatile compounds in air and drinking water of 188 residents of Los Angeles, Antioch, and Pittsburg, CA. Atmospheric Environment 22(10):2141-2164.		
HERO ID:		2952692		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Concise but scientifically sound sampling methods
	Metric 2:	Analytical Methodology	Medium	Limited description of analytical methods, LOD mentioned but not reported
	Metric 3:	Biomarker Selection	N/A	Not applicable
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Samples from 1984
	Metric 6:	Spatial and Temporal Variability	Low	117 study participants, 55 had a follow up visit
	Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics
	Metric 9:	Quality Assurance	High	QA/QC techniques were described, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Characterized variability, did not discuss uncertainties and limitations
Overall Quality Determination			Medium	

Study Citation:		Liu, B., Chen, L., Huang, L., Wang, Y., Li, Y. (2015). Distribution of volatile organic compounds (VOCs) in surface water, soil, and groundwater within a chemical industry park in Eastern China. Water Science and Technology 71(2):259-267.		
HERO ID:		2956688		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Authors reported sampling collection procedures, storage conditions and storage duration. They cited following standard Chinese Geological Survey sampling procedures. They also described the study site characteristics.
	Metric 2:	Analytical Methodology	Medium	The authors described the extraction method, analytical instrumentation, recovery experiments, but they did not mention calibration. MDLs are listed in the supporting information
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Authors described the study site. China
	Metric 5:	Currency	Medium	Authors reported collecting samples in 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	Authors collected 4 soil samples, 7 surface water samples, 9 groundwater samples. Duplicate sample collected.
	Metric 7:	Exposure Scenario	Medium	Authors describe the study site.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Detection frequencies were reported, it appears maximum concentrations are reported in Table 2 but it is not fully clear. No measure of variation or central tendency is reported. Individual sample concentrations are not reported.
	Metric 9:	Quality Assurance	High	Duplicate samples were collected in the field, QA/QC controls outlined by EPA methods were followed. They used spiked samples to measure recoveries, lab blanks. Recovery results were above 70%.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The authors did not report a measure of variation and did not discuss limitations, uncertainties or data gaps.
Overall Quality Determination			Medium	

Study Citation:		Dohoo, C., Read Guernsey, J., Gibson, M. D., Vanleeuwen, J. (2015). Impact of biogas digesters on cookhouse volatile organic compound exposure for rural Kenyan farmwomen. Journal of Exposure Science & Environmental Epidemiology 25(2):167-174.		
HERO ID:		3024658		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling equipment, procedure, calibration and study site characteristics specified but sample storage duration not specified.
	Metric 2:	Analytical Methodology	Medium	LOD reported but recoveries not reported.
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Kenya
	Metric 5:	Currency	Medium	2010
	Metric 6:	Spatial and Temporal Variability	High	31 biogas farms, 31 referent farms with replicate.
	Metric 7:	Exposure Scenario	High	VOCs exposure while cooking
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	The result and statistics reported but raw data not provided.
	Metric 9:	Quality Assurance	Medium	Recovery not reported. Graphical evaluation and the Shapiro–Wilk test conducted and t-test used for variability.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	SD, limited information on limitations and gaps reported
Overall Quality Determination			Medium	

Study Citation:		Wallace, L., Zweidinger, R., Erickson, M., Cooper, S., Whitaker, D., Pellizzari, E. (1982). Monitoring individual exposure. Measurements of volatile organic compounds in breathing-zone air, drinking water, and exhaled breath. Environment International 8(1/6):269-282.		
HERO ID:		3227643		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sample storage and instrument calibration not detailed, but study site characteristics described as campus near-industrial site and non-industrial campus area with sampling conducted for 5-9 hour/day as participants had normal daily activities with spirometry conducted at end of day when returning personal air and drinking water samples; sampling equipment/procedures for personal exposure monitoring (MSA Model C-200 pump w/Tenax cartridge), drinking water and spirometry breath samples described.
	Metric 2:	Analytical Methodology	Medium	Instrument calibration not described, but analytical instrumentation (GC/MS) described and methodology referenced (unknown if standard, accepted methods); LOD's (Table 7) and recoveries (Table 3) detailed.
	Metric 3:	Biomarker Selection	Low	The authors measured isomer (1,1,1-trichloroethane), rather than parent chemical of interest (1,1,2-trichloroethane) in human breath.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Lamar University campus near industrial site and UNC campus areas.
	Metric 5:	Currency	Low	March 4-5, 1980 (Lamar Univ) and June 10-11, 1980 (UNC)
	Metric 6:	Spatial and Temporal Variability	Low	Acceptable moderate sample size with 11 Lamar Univ samples and 6 UNC samples for personal air (5-9 hours for one day) and spirometry breath (single sample, for each of 11 Lamar Univ and 6 UNC participants), similar number with drinking water as samples provided for each time participant drank water during sampling day. Non-statistical sampling approach and no duplicate samples. Sampling conducted for one day for each participant.
	Metric 7:	Exposure Scenario	Medium	Exposure source/scenario described as industrial and non-industrial, field and laboratory blanks and controls described, however unable to distinguish between indoor/outdoor (ambient) sampling for breathing-zone personal air monitoring, indoor/ outdoor sampling scenario not described (building characteristics, climate, etc.), although questionnaire noting residence on/off campus, etc. administered to subjects.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data from each participant noted within Tables 7-8, summary data Tables 13-14 with range, percent detected, SD, mean and sample size.
	Metric 9:	Quality Assurance	Medium	No baseline pre-exposure samples, but field and lab controls and percent recoveries detailed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Key uncertainties and data gaps not discussed but variability characterized in summary statistics and limited discussion. Discussion of contribution to variance within regression modeling, and discrepancies between personal air monitoring and spirometry breath samples taken after personal air monitoring. Measurement of non-specific chemical isomers. Authors discuss need for additional studies to validate concentrations reported in various media.
Overall Quality Determination			Medium	

Study Citation:		Kingsbury, J. A., Delzer, G. C., Hopple, J. A. (2008). Anthropogenic organic compounds in source water of nine community water systems that withdraw from streams, 2002-2005. Scientific Investigations Report 2008-5208 :68.		
HERO ID:		3364193		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sampling methods followed standard USGS sampling protocols.
	Metric 2:	Analytical Methodology	Medium	Analyzed using USGS approved analytical methods, but recoveries and LOD were not reported.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed water samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in United States.
	Metric 5:	Currency	Medium	Samples were collected 2002-2005.
	Metric 6:	Spatial and Temporal Variability	High	n=12-17 source-water samples collected at each site over 12-month period; variety of flow conditions; field blanks and replicates.
	Metric 7:	Exposure Scenario	High	The data likely represent relevant exposure scenarios related to stream water collected prior to water treatment and then finished water tested at nine community water systems.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Limited summary statistics were reported DF, n, max concentration reported in appendices.
	Metric 9:	Quality Assurance	High	QA/QC techniques were described in detail, including the use of field blanks and replicates.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability was not characterized. Section "Changes in Concentration" address uncertainties and need for additional information.
Overall Quality Determination			High	

Study Citation:		Gallego, E., Roca, F. J., Perales, J. F., Guardino, X., Gadea, E., Garrote, P. (2016). Impact of formaldehyde and VOCs from waste treatment plants upon the ambient air nearby an urban area (Spain). Science of the Total Environment 568:369-380.		
HERO ID:		3449325		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The air sampling methodology was well described.
	Metric 2:	Analytical Methodology	High	The analytical methods were well described and included LODs. Recoveries were not reported.
	Metric 3:	Biomarker Selection	N/A	This metric is not applicable to this study as the authors analyzed air samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study was conducted in Spain.
	Metric 5:	Currency	Medium	The study was conducted in 2014 and 2015.
	Metric 6:	Spatial and Temporal Variability	Medium	The authors took<10 samples for each sampling site.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenarios related to airborne pollutants near waste treatment plants in Spain.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	The authors only reported summary statistics with no individual sample concentrations or raw data.
	Metric 9:	Quality Assurance	High	Quality assurance and quality control (QA/QC) techniques were described, including the use of control samples.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability was characterized (SD, range). Uncertainties were briefly discussed.
Overall Quality Determination			High	

Study Citation:		Ma, H., Zhang, H., Wang, L., Wang, J., Chen, J. (2014). Comprehensive screening and priority ranking of volatile organic compounds in Daliao River, China. Environmental Monitoring and Assessment 186(5):2813-2821.		
HERO ID:		3488897		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sampling method, sample storage, site characteristics are well described.
	Metric 2:	Analytical Methodology	High	The analytical methods are well described. LODs are reported (in supplemental file).
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in river water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The site locations in China are well described.
	Metric 5:	Currency	Medium	Samples were collected in October 2011.
	Metric 6:	Spatial and Temporal Variability	High	Triplicate samples were collected from 20 sites in the river for target VOCs and duplicates for non-target VOCs.
	Metric 7:	Exposure Scenario	High	Sampling from the river is relevant for environmental exposures.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	The data are pooled and the mean and maximum are provided, as well as the frequency of detection. The raw data are not provided and there is no measure of variability.
	Metric 9:	Quality Assurance	High	QA/QC procedures were described and are provided in the supplemental file.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	There is limited discussion of variability and uncertainty.
Overall Quality Determination			High	

Study Citation:		Tucker, R. K. (1981). Groundwater quality in New Jersey: An investigation of toxic contaminants.		
HERO ID:		3637110		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Some sampling methodology including sampling sites decisions are reported at the introduction. There is not information on sampling technique, materials, and sample transport.
	Metric 2:	Analytical Methodology	High	The minimum reported level and the analytical methods are reported. Volatile organic compounds were extracted into pentane and analyzed with a gas chromatography with an electron capture detector.
	Metric 3:	Biomarker Selection	N/A	The study only tested the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in New Jersey, USA.
	Metric 5:	Currency	Low	In the initial text the authors mentioned that the study is from the last 3 years, therefore it is possible to infer that the sampling dates were between 1978 and 1980.
	Metric 6:	Spatial and Temporal Variability	High	A total of 1116 samples were collected.
	Metric 7:	Exposure Scenario	High	The study evaluates groundwater concentrations in New Jersey. Sampled wells included industrial, public supply, and domestic wells.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Data reported as % of samples above MRC, % above 10 ppb, maximum concentration, and also reported in figure 7.
	Metric 9:	Quality Assurance	Medium	The study reports some calculation of precision.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	There is some mention of sample variability and limitations in the introduction section.
Overall Quality Determination			Medium	

Study Citation:		Hopple, J. A., Delzer, G. C., Kingsbury, J. A. (2009). Anthropogenic organic compounds in source water of selected community water systems that use groundwater, 2002-05. SIR 2009-5200 :76.		
HERO ID:		3975066		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods for source groundwater and finished drinking water samples prior to distribution were described in detail.
	Metric 2:	Analytical Methodology	High	Analytical methods were described and detailed as using USGS approved analytical methods. Laboratory reporting limits were provided within tables.
	Metric 3:	Biomarker Selection	N/A	Study tested parent chemicals in selected community water systems.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Sampling was conducted across the U.S. (Fig 1).
	Metric 5:	Currency	Medium	Sampling was conducted October 2002 through July 2005.
	Metric 6:	Spatial and Temporal Variability	High	Sampling was conducted within 12 principal aquifers across the United States within about 15 wells in each SWQA study with 221 well samples. Replicate sampling was conducted.
	Metric 7:	Exposure Scenario	High	Exposure sources were described for contamination in source water (groundwater) and finished water (drinking water) across the U.S.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistic data was provided in Table 5, Appendix 1, and Appendix 3 and included detection frequency, number of samples, maximum concentration in source water (groundwater) and finished water (drinking water). Raw data was not provided.
	Metric 9:	Quality Assurance	Medium	Quality assurance was detailed within descriptions of use of field blanks, replicate samples, and recoveries. Recoveries were generally within acceptable limits for most compounds but actual numbers were not provided.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Authors did not provide measures of variance within statistical summary measures of results, but maximum groundwater concentrations were presented. There was little discussion of limitations, uncertainties, or data gaps.
Overall Quality Determination			High	

Study Citation:		OBG, (1987). Waste disposal sites assessment.		
HERO ID:		4213875		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methodology was not described.
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology is not described, including analytical instrumentation, extraction method, and detection limits.
	Metric 3:	Biomarker Selection	N/A	The study tested for the parent chemical in environmental media (soil and groundwater).
Domain 2: Representativeness	Metric 4:	Geographic Area	High	The samples were collected in Ohio.
	Metric 5:	Currency	Low	The sample collection date is not reported. The document is from 1987.
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	The sample size was not reported.
	Metric 7:	Exposure Scenario	Low	Data may represent relevant exposure scenarios related to polluted soil and groundwater at waste disposal sites in the US, but the report lacks methodological, exposure and contextual descriptions.
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	The raw data is reported. Summary statistics are not reported.
	Metric 9:	Quality Assurance	Low	QA/QC techniques and results were not directly discussed and cannot be implied.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The characterization of variability is absent (no measure of variance reported). Key uncertainties, limitations, and data gaps are not discussed.
Overall Quality Determination		Uninformative		

Study Citation:		UT Austin, (1987). Analysis and interpretation of batch equilibrium and column studies of the partitioning of chlorinated hydrocarbons to soil materials from the PPG Lake Charles site.		
HERO ID:		4213876		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	sampling procedure, equipment were described, lacking calibration and storage conditions
	Metric 2:	Analytical Methodology	Low	GC was used for analysis, LOD was not reported.
	Metric 3:	Biomarker Selection	N/A	NA - soil samples no need for biomarkers
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Lake Charles, LA
	Metric 5:	Currency	Low	No sampling date is provided, but a publication date is available - 1987.
	Metric 6:	Spatial and Temporal Variability	Low	Sample amount was not reported, but at least 2 boring sites were reported.
	Metric 7:	Exposure Scenario	Low	Exposure scenario lacks detailed description, but mainly focused on soil.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Some individual data were reported, but it was not clear whether full sampling results were reported.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The study has limited discussion of key uncertainties, limitations.
Overall Quality Determination			Low	

Study Citation:	Ken E Davis Assoc, (1984). Investigation of contamination at the North Dock Storage Area phase I - PPG Industries, Lake Charles, LA.
HERO ID:	4213877

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling Methodology	Critically Deficient	Sampling methods not described. Only states that soil and water samples were taken.
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methods not described
	Metric 3: Biomarker Selection	N/A	Environmental media
Domain 2: Representativeness	Metric 4: Geographic Area	High	Louisiana
	Metric 5: Currency	Low	Sampling in 1984
	Metric 6: Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7: Exposure Scenario	Medium	Lacking details about the population of interest, exposure characteristics
Domain 3: Accessibility/Clarity	Metric 8: Reporting of Results	Medium	Individual sample concentrations, no summary statistics
	Metric 9: Quality Assurance	Low	QA/QC techniques were not discussed
Domain 4: Variability and Uncertainty	Metric 10: Variability and Uncertainty	Low	Did not characterize variability, limitations and uncertainties

Overall Quality Determination**Uninformative**

Study Citation:	Ken E Davis Assoc, (1983). Field investigation in the northeast portion of the south terminal - Addendum I to phase VI.
HERO ID:	4213878

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling Methodology	Low	Only briefly discussed
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methods not described
	Metric 3: Biomarker Selection	N/A	Environmental media
Domain 2: Representativeness	Metric 4: Geographic Area	High	Pennsylvania, USA
	Metric 5: Currency	Low	Sampling in 1984 and 1985
	Metric 6: Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7: Exposure Scenario	Medium	May be of relevance but report lacks details on methods, sample size, population of interest and exposure characteristics
Domain 3: Accessibility/Clarity	Metric 8: Reporting of Results	Medium	individual sample concentrations only, no summary statistics
	Metric 9: Quality Assurance	Low	QA/QC was not discussed
Domain 4: Variability and Uncertainty	Metric 10: Variability and Uncertainty	Low	Variability and uncertainties were not characterized or discussed

Overall Quality Determination**Uninformative**

Study Citation:		ESC, (1985). Groundwater monitoring summary - Hranica Landfill, Sarver, Penn.		
HERO ID:		4213880		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methods are not described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods are not described
	Metric 3:	Biomarker Selection	N/A	The authors analyzed water samples.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	Pennsylvania, USA
	Metric 5:	Currency	Low	Sampling in 1984 and 1985
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7:	Exposure Scenario	Medium	May represent a relevant exposure scenario, but lacks sufficient methodological details and population of interest
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Only individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	Low	QA/QC was not discussed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Did not characterize variability, uncertainties or limitations
Overall Quality Determination		Uninformative		

Study Citation:		ERM-Northeast, (1992). ECRA sampling and analysis plan report - AlliedSignal Aerospace Company Bendix Electric Power Division with cover letter dated 111693.		
HERO ID:		4213973		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methodology was not described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology was not discussed
	Metric 3:	Biomarker Selection	N/A	Not applicable
Domain 2: Representativeness	Metric 4:	Geographic Area	High	NJ, USA
	Metric 5:	Currency	Low	Published in 1992
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size was not reported
	Metric 7:	Exposure Scenario	Medium	Did not describe the population of interest
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Only individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	High	Analyzed control samples, described QA/QC techniques
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Limited description of uncertainties, no characterization of variability
Overall Quality Determination		Uninformative		

Study Citation:		Geraghty & Miller Inc, (1982). Ground-water quality conditions in the vicinity of waste oil disposal facilities at the Sidney, New York, plant.		
HERO ID:		4214163		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methods not described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods not described
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	New York
	Metric 5:	Currency	Low	Sampling in 1982
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7:	Exposure Scenario	Low	Insufficient methodological details, no information about population of interest
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not described
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	Variability, uncertainties, and limitations were not discussed

Overall Quality Determination	Uninformative
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Study Citation:		Allied Signal, (1990). Letter from Allied-Signal Inc notifying USEPA of their intentions to conduct an environmental assessment pursuant to the Environment Cleanup Responsibility Act with attachments.		
HERO ID:		4214323		
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Sampling Methodology	High	Sampling and analytical plan are described across the document from 1983 (page 168) -1986 (page 455)
		Metric 2: Analytical Methodology	Medium	Sampling and analytical plan are described across the document from 1983 (page 168) -1986 (page 455). LOD or LOQ reported in most of the data tables
		Metric 3: Biomarker Selection	N/A	Parent chemical in ground water and soil samples
Domain 2: Representativeness		Metric 4: Geographic Area	High	Eatontown, New Jersey
		Metric 5: Currency	Low	1983-1986
		Metric 6: Spatial and Temporal Variability	Low	Sample size in total is not reported, but the report has sampling data from 1983-1986
		Metric 7: Exposure Scenario	High	Organic compounds contamination in ground water and solids from the Bendix- Electric Power Division facility
Domain 3: Accessibility/Clarity		Metric 8: Reporting of Results	Low	Only individual data points, no summary of statistics
		Metric 9: Quality Assurance	High	QA/QC reported for most of the sampling periods
Domain 4: Variability and Uncertainty		Metric 10: Variability and Uncertainty	Medium	Sampling from 1983-1986, no report on key limitations
Overall Quality Determination			Medium	

Study Citation: ICI Americas Inc, (1991). Letter from ICI Americas Inc to USEPA submitting follow-up information concerning phenol and other chemicals in groundwater at the facility in Hopewell, Virginia with attachments.

HERO ID: 4214419

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Critically Deficient	Sampling methods were not described
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methods were not described
	Metric 3: Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Virginia, USA
	Metric 5: Currency	Low	Sampling in 1990
	Metric 6: Spatial and Temporal Variability	Critically Deficient	Sample size is not reported
	Metric 7: Exposure Scenario	Low	Data lacks key pieces of information and this impacts the exposure scenario characterization
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No summary statistics
	Metric 9: Quality Assurance	Low	Analyzed control samples, did not describe QA/QC techniques
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Did not characterize variability, did not discuss uncertainties or study limitations

Overall Quality Determination

Uninformative

Study Citation: Battelle Ocean Sciences, (1987). Draft final report on the fate and effects of produced water discharges in nearshore marine waters (volume I {\& } II) with cover letter dated 091187.

HERO ID: 4214480

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling Methodology	Medium	Limited description of sampling methods
	Metric 2: Analytical Methodology	Critically Deficient	No description of analytical methods
	Metric 3: Biomarker Selection	N/A	Does not measure biomarkers
Domain 2: Representativeness	Metric 4: Geographic Area	High	United States
	Metric 5: Currency	Low	Published in 1987
	Metric 6: Spatial and Temporal Variability	N/A	Sample size not reported
	Metric 7: Exposure Scenario	Medium	Data may represent relevant exposure scenarios, missing details about the population of interest
Domain 3: Accessibility/Clarity	Metric 8: Reporting of Results	Medium	Individual sample concentrations, no summary statistics
	Metric 9: Quality Assurance	Low	Techniques only briefly described
Domain 4: Variability and Uncertainty	Metric 10: Variability and Uncertainty	Low	Variability and uncertainty were not characterized

Overall Quality Determination

Uninformative

Study Citation:		Ciba-Geigy, (1984). Memo from S. Workman to C. Staton on Scrdi Dreyfus street site dated September 24, 1984 on one chemical.		
HERO ID:		4215637		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling Methodology	Critically Deficient	There is no information on sampling methods included; this document cites a memo to the file (not attached) that describes sampling methodology.	
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methods were not described, but the sample was analyzed by South Carolina Department of Health and Environmental Control, Analytical Services Division, suggesting the analytical methods were scientifically sound and accepted, as of that time. The LODs were not specified.	
	Metric 3: Biomarker Selection	N/A	They did not test for biomarkers, but rather for parent chemicals in water.	
Domain 2: Representativeness	Metric 4: Geographic Area	High	South Carolina	
	Metric 5: Currency	Low	Sample was from May 1984.	
	Metric 6: Spatial and Temporal Variability	Critically Deficient	The paper notes that the well was sampled after it was installed, and the analytical data shows only a single sample from a single date.	
	Metric 7: Exposure Scenario	Low	The memo lacked details about the exposure source(s) and microenvironment. There was mention of the groundwater likely impacting a nearby creek, but no samples were collected from the creek. It was not specified whether the groundwater was being used for drinking water.	
Domain 3: Accessibility/Clarity	Metric 8: Reporting of Results	High	They provided individual sample concentrations. No summary statistics could be calculated given that there was only 1 sample. They reported 1,1,1-TCA, not 1,1,2-TCA.	
	Metric 9: Quality Assurance	Low	QA/QC techniques were not described.	
Domain 4: Variability and Uncertainty	Metric 10: Variability and Uncertainty	Low	Variability and uncertainty were not characterized, but it was suggested they resample the well in the future, for verification.	

Overall Quality Determination**Uninformative**

Study Citation: Geraghty & Miller Inc, (1990). Investigation of ground-water conditions in the vicinity of Western Electric Company Princeton, New Jersey with attachments, cover sheet and letter dated 020690.

HERO ID: 4215684

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Sampling methods only briefly described
Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology not described
Metric 3:	Biomarker Selection	N/A	Did not test for biomarkers
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	New Jersey
Metric 5:	Currency	Low	Report from 1980 to 1982
Metric 6:	Spatial and Temporal Variability	Low	9 samples
Metric 7:	Exposure Scenario	Medium	Data likely represents relevant exposure scenarios, missing details about the population of interest
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual sample concentrations only, no summary statistics
Metric 9:	Quality Assurance	Low	QA/QC techniques were not described
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty were not characterized

Overall Quality Determination

Uninformative

Study Citation: ENSR, (1987). Environmental soil investigation AT{\&}T Kansas City works {\&} quality assurance plan for identifying contaminants around under-ground storage tanks w-attachments, cover sheet {\&} letter.
HERO ID: 4215685

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling procedures, equipment, and calibration were reported.
Metric 2:	Analytical Methodology	High	GC/FID was used to analyze the samples. Reporting limit was reported.
Metric 3:	Biomarker Selection	N/A	Did not use biomarkers.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Kansas City
Metric 5:	Currency	Low	1987
Metric 6:	Spatial and Temporal Variability	High	36 soil samples were collected.
Metric 7:	Exposure Scenario	Medium	Exposure scenario was relevant (soil).
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Average data were reported, individual data were not reported.
Metric 9:	Quality Assurance	Medium	QA/QC was performed. And there was no major concerns.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	The study discussed variability among the different sampling sites.

Overall Quality Determination **Medium**

Study Citation:		Allied Signal, (1990). Results of the phase III hydrogeologic investigation report with attachments and cover letter dated 020890.		
HERO ID:		4215688		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Medium	Sampling methodology reported
	Metric 2:	Analytical Methodology	High	USEPA Method 601, detection limits in appendix C
	Metric 3:	Biomarker Selection	N/A	Parent chemical in groundwater
Domain 2: Representativeness	Metric 4:	Geographic Area	High	Morris Township, New Jersey
	Metric 5:	Currency	Low	1987
	Metric 6:	Spatial and Temporal Variability	Medium	19 wells, no sample replicates
	Metric 7:	Exposure Scenario	High	Groundwater quality conditions at the Allied-Signal facility
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	High	Raw data reported in appendix C. Summary of concentrations presented in table 3
	Metric 9:	Quality Assurance	Low	No QA/QC reported, but the laboratory followed an EPA method
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability or uncertainty not discussed
Overall Quality Determination		Medium		

Study Citation:		NJ DEP, (1987). Data generated from three water departments on untreated well water, plant delivered water and distribution system with cover letter dated 030387.		
HERO ID:		4290379		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methodology not described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology not described
	Metric 3:	Biomarker Selection	N/A	Parent chemical in groundwater
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	State of New Jersey
	Metric 5:	Currency	Low	1987
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size is not reported
	Metric 7:	Exposure Scenario	Medium	Raw water quality from three different areas the State of New Jersey
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Critically Deficient	Data reported but it is not possible to read it
	Metric 9:	Quality Assurance	Critically Deficient	QA/QC not reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Critically Deficient	Estimates are highly uncertain since there is not enough information from the study
Overall Quality Determination			Uninformative	

Study Citation:		Geosciences Research Assoc, (1987). Identification of ground water characteristics at the Knauf Fiberglass Company plant - Shelbyville, Indiana (final report).		
HERO ID:		4412645		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Low	Sampling methods only briefly described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods not described
	Metric 3:	Biomarker Selection	N/A	Did not test for biomarkers
Domain 2: Representativeness	Metric 4:	Geographic Area	High	Indiana, USA
	Metric 5:	Currency	Low	Sampling began in 1983
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7:	Exposure Scenario	Medium	Data may represent a relevant exposure scenario, missing details about the population and microenvironment of interest
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Individual sample concentrations only, no summary statistics
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not described
Domain 4: Variability and Uncertainty	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty were not characterized
Overall Quality Determination		Uninformative		

Study Citation:		Buszka, P. M., Barber, L. B., Schroeder, M. P., Becker, L. D. (1994). Organic compounds downstream from a treated-wastewater discharge near Dallas, Texas, March 1987.		
HERO ID:		4506342		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	water samples collected at 4 sites (Fig 1 and Table 1); collected in glass bottles by submerging the bottles and allowing them to fill completely; refrigerated
	Metric 2:	Analytical Methodology	Low	purge-and-trap, closed-loop stripping, and pH-adjusted solvent extraction methods used for water samples; GC/MS; All compound identities were confirmed by matching sample mass spectra and retention indices with those of authentic standards; detection limit not provided
	Metric 3:	Biomarker Selection	N/A	environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Rowlett Creek near Dallas, Texas
	Metric 5:	Currency	Low	March 9 and 10,1987
	Metric 6:	Spatial and Temporal Variability	Low	1 site upstream; 3 sites downstream; no replicates
	Metric 7:	Exposure Scenario	High	streambed sediments from upstream and downstream of discharge from a WWTP
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 4 provides the concentrations from water samples by purge-and-trap extraction per sites; no further statistics provided
	Metric 9:	Quality Assurance	Low	no discussion on recoveries for pure-and-trap extraction with GC/MS; Site 1 was the upstream control site representing background conditions
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	provided concentrations determined from other studies (Table 4 and text); further discussion absent
Overall Quality Determination			Medium	

Study Citation:		Xing, L., Wang, L., Zhang, R. (2018). Characteristics and health risk assessment of volatile organic compounds emitted from interior materials in vehicles: a case study from Nanjing, China. Environmental Science and Pollution Research 25(15):14789-14798.		
HERO ID:		4697151		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling described in detail. Additional information reported in reference (USEPA 1999) and an associated reference (Xu et al. 2016).
	Metric 2:	Analytical Methodology	Medium	Detection limits reported as a range and not for each chemical.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Nanjing, China
	Metric 5:	Currency	High	April 2015
	Metric 6:	Spatial and Temporal Variability	Medium	Ten sets of samples. Unclear if there are replicates.
	Metric 7:	Exposure Scenario	Medium	Relevant scenario of car interiors. Missing information of car details- such as model, condition.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics provided. Raw data not provided
	Metric 9:	Quality Assurance	Low	QA/QC not directly discussed but can be interpreted.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No discussion of limitations or variability.
Overall Quality Determination			Medium	

Study Citation:		Grosjean, E., Rasmussen, R. A., Grosjean, D. (1999). Toxic air contaminants in Porto Alegre, Brazil. Environmental Science & Technology 33(12):1970-1978.		
HERO ID:		4697228		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The sampling procedure, equipment, and matrix characterization were discussed.
	Metric 2:	Analytical Methodology	Medium	The extraction and analytical method (GC/MS) were described. The limit of detection (LOD) was not reported, but the method detection limit (MDL) was reported as 0.1 ppbv.
	Metric 3:	Biomarker Selection	N/A	This metric is not applicable for this study which conducted sampling within environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study was conducted in Porto Alegre, Brazil.
	Metric 5:	Currency	Low	The study was conducted during the years 1996-1997.
	Metric 6:	Spatial and Temporal Variability	Medium	Most compounds have more than 23 sample points.
	Metric 7:	Exposure Scenario	Medium	The exposure scenario was adequately described for ambient air samples.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Range and average of the concentrations were reported with standard deviation and background concentration.
	Metric 9:	Quality Assurance	Low	Quality assurance measures were not described in detail.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	The study discussed in details the variability from one urban area to the next area.
Overall Quality Determination			Medium	

Study Citation:		Wallace, L., Nelson, W., Ziegenfus, R., Pellizzari, E., Michael, L., Whitmore, R., Zelon, H., Hartwell, T., Perritt, R., Westerdahl, D. (1991). The Los Angeles TEAM Study: personal exposures, indoor-outdoor air concentrations, and breath concentrations of 25 volatile organic compounds. Journal of Exposure Analysis and Environmental Epidemiology 1(2):157-192.		
HERO ID:		4727403		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Well described sampling methods. Missing sampler storage and handling.
	Metric 2:	Analytical Methodology	Medium	Limited description of analytical methods
	Metric 3:	Biomarker Selection	N/A	Study is primarily focused on air measurements although they do collect breath samples to see if it can be an appropriate biomarker.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Sampling in 1987
	Metric 6:	Spatial and Temporal Variability	High	51 sampling sites (43 re-visited at follow-up in different season)
	Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics
	Metric 9:	Quality Assurance	High	Described QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited characterization of variability and uncertainties
Overall Quality Determination			Medium	

Study Citation: Assmuth, T. W. (1996). Comparative risk analysis of waste site toxicants by indices based on concentration distributions, fluxes, environmental fate and critical effects. Journal of Hazardous Materials 48(1-3):121-135.

HERO ID: 5066259

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Some sampling methods were not reported such as sample storage conditions and sampler calibration
Metric 2:	Analytical Methodology	Critically Deficient	Recovery samples were not reported; analytical methodology not described in this paper. The study simply states that "Standardized and established analytical methods were used."
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Finland
Metric 5:	Currency	Low	Study was published in 1995
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples were collected but there were no replicates collected.
Metric 7:	Exposure Scenario	High	The exposure source was well characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data were not reported
Metric 9:	Quality Assurance	Low	Limited QA was reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Few gaps and limitations were reported

Overall Quality Determination

Uninformative

Study Citation:		Williams, D. T., Coburn, J. A., Bancsi, J. J. (1984). Study of total organic halogen as a means to detect groundwater contamination. Environment International 10(1):39-44.		
HERO ID:		5096383		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The sampling collection procedure, equipment, storage conditions were provided. Calibration is not mentioned.
	Metric 2:	Analytical Methodology	Low	Analytical method was described - GC/MS. LOD was not reported.
	Metric 3:	Biomarker Selection	N/A	Parent chemical is in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	10 landfill sites; not specified where it is. It was assumed to be in Canada.
	Metric 5:	Currency	Low	May and June 1982
	Metric 6:	Spatial and Temporal Variability	Medium	10 sites were sampled, 2-3 samples were collected from each site.
	Metric 7:	Exposure Scenario	Low	Groundwater is the media of exposure, but an assessment was not conducted
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Average concentrations were presented for each site; no individual raw data were reported.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study’s use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study has limited discussion of variability; it compared the TOX analyses to GC-MS analyses.
Overall Quality Determination			Low	

Study Citation:		Kliest, J., Fast, T., Boley, J. S. M., van de Wiel, H., Bloemen, H. (1989). The relationship between soil contaminated with volatile organic compounds and indoor air pollution. Environment International 15(1-6):419-426.		
HERO ID:		5239410		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sample storage not described
	Metric 2:	Analytical Methodology	Low	Detection limits are not reported
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in soil.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The Netherlands
	Metric 5:	Currency	Low	May 1984 to November 1985
	Metric 6:	Spatial and Temporal Variability	Medium	Samples were collected from 77 houses, but there were no replicate samples
	Metric 7:	Exposure Scenario	High	Samples were collected from homes
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual data points are not provided
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not directly discussed, but can be implied
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Limited characterization, if any, of variance and discussion of limitations, uncertainties, or data gaps
Overall Quality Determination			Medium	

Study Citation:		Kuo, H. W., Lo, I. I., Chan, C. C., Lai, J. S., Wang, J. D. (1996). Volatile organic compounds in water near petrochemical factories in Taiwan. Chemosphere 33(5):913-920.		
HERO ID:		5245153		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling equipment, sampling procedure, sample storage duration, and study site characteristics are all reported.
	Metric 2:	Analytical Methodology	Medium	Study used EPA methods 524.2 and 624, but LODs reported as a range.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Taiwan
	Metric 5:	Currency	Low	Paper was published in 1996.
	Metric 6:	Spatial and Temporal Variability	Low	Three to five samples were collected for each condition (wastewater, drinking water, surface water).
	Metric 7:	Exposure Scenario	Medium	Source of exposure, the petrochemical industry, described broadly.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Raw data was reported, but no summary statistics were reported.
	Metric 9:	Quality Assurance	Medium	Internal standards and surrogates were used but efficiencies were not reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No measure of variance was reported.
Overall Quality Determination			Medium	

Study Citation:		Harkov, R., Gianti, S. J., Bozzelli, J. W., Laregina, J. E. (1985). Monitoring volatile organic compounds at hazardous and sanitary landfills in New Jersey. Journal of Environmental Science and Health, Part A: Environmental Science and Engineering 20(5):491-502.		
HERO ID:		5245498		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	air sampled at abandoned hazardous waste sits and sanitary landfills (see Table 1 for details) using 5 low flow (10-15ml/min) samplers for 24 hr/day for three consecutive days; p. 493 Sampling explained further Varian 3700 gas chromatograph equipped with a fused silica SP2100 column; quadrupole mass spectrometer equipped with a fused silica SP2100 GC column and a liquid nitrogen cold trap; detection limits provided in footnote C of Table 4
	Metric 2:	Analytical Methodology	High	
	Metric 3:	Biomarker Selection	N/A	
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	New Jersey (Table 1 for townships/city of sites) 1984 7 sites sampled for 3 days each; 5 sampling locations per site for each day of sampling examine ambient air contamination at a cross-section of abandoned hazardous waste sites
	Metric 5:	Currency	Low	
	Metric 6:	Spatial and Temporal Variability	Medium	
	Metric 7:	Exposure Scenario	High	
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Table 4 provides the mean per site QA discussed p.495; included spikes, duplicates, and blanks
	Metric 9:	Quality Assurance	Medium	
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	compared results to those from an urban/industrial site in Newark (Table 5) and daily variations per site (Table 6-9)
Overall Quality Determination			Medium	

Study Citation:		Purtymun, W. D., Ferenbaugh, R. W., Maes, M. (1988). Quality of surface and ground water at and adjacent to the Los Alamos National Laboratory: Reference organic compounds.		
HERO ID:		5255865		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling methodology not described, but followed the USEPA guidelines USEPA 1983 and USEPA 1985.
	Metric 2:	Analytical Methodology	High	Analytical methods described in Appendix B. DL reported
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media (water).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Geographic location is reported; Alamos National Laboratory, USA.
	Metric 5:	Currency	Low	Timing of sample collection for monitoring data is not consistent with current or recent exposures may be expected (> 15years). The water samples were collected in late September and early October of 1986.
	Metric 6:	Spatial and Temporal Variability	High	Sampling approach accurately captures variability. The study used a large sample size (43 surface and ground water stations and a total of 5,676 individual analytical results), and sampling occurred over a sufficient period of time (fall of one year). Replicate samples are used.
	Metric 7:	Exposure Scenario	High	Surface and ground water samples adjacent to the Los Alamos National Laboratory.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data (i.e., individual data points) are not reported , and therefore summary statistics cannot be reproduced.
	Metric 9:	Quality Assurance	Low	QA/QC describes in page 9 in QA/QC section. Recoveries are on the low side (<70%) and it is unclear if they correct for recovery.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability or uncertainty not reported.
Overall Quality Determination			Medium	

Study Citation:		Zimmerman, M. J., Massey, A. J., Campo, K. W. (2005). Pushpoint sampling for defining spatial and temporal variations in contaminant concentrations in sediment pore water near the ground-water / surface-water interface. :1-75.		
HERO ID:		5258475		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	The study detailed a validation study of a new sampler, a push point sampler. The method was not compared to standard methods within this study. The sampling procedures and storage conditions were reported by the authors. Storage duration times were not reported.
	Metric 2:	Analytical Methodology	Low	The authors refer to analytical methods listed in an appendix that was not part of the pdf. The article refers to the samples being analyzed by an USEPA laboratory so one could assume that standard analytical methods were used but it is unclear from the main text. Reporting level was reported by authors.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The authors report the study location.
	Metric 5:	Currency	Low	Data was collected in 2002 and 2003.
	Metric 6:	Spatial and Temporal Variability	High	The authors collected replicate samples, at two different sampling sites and over multiple time points. The reported total sample size for location A was 148 and for location B 159.
	Metric 7:	Exposure Scenario	Medium	The study site was a river where ground-water discharge of pollutants was known.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	The authors provide the individual samples concentrations, range of concentration, detection frequency, number of samples within the dataset. They did not report a standard deviation or measure of central tendency.
	Metric 9:	Quality Assurance	Medium	The authors reported detailed results of trip blanks, replicates, and equipment blanks. Recovery tests were not reported. Chemical of interest was not detected in trip or laboratory blanks.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The authors do not report a standard deviation. The authors discussed variability in the data, but did not discuss gaps or limitations.
Overall Quality Determination			Medium	

Study Citation:	Pellizzari, E. D., Hartwell, T. D., Perritt, R. L., Sparacino, C. M., Sheldon, L. S., Zelon, H. S., Whitmore, R. W., Breen, J. J., Wallace, L. (1986). Comparison of indoor and outdoor residential levels of volatile organic chemicals in five usa geographical areas. Environment International 12(6):619-624.			
HERO ID:	5276359			
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling Methodology	Medium	Not all details of the sampling methodology are reported in the methods (e.g., storage conditions/duration).	
	Metric 2: Analytical Methodology	Medium	The analytical methods were discussed, but LOD and recoveries were not reported.	
	Metric 3: Biomarker Selection	N/A	The authors analyzed air samples.	
Domain 2: Representativeness	Metric 4: Geographic Area	High	The samples were from U.S. locations.	
	Metric 5: Currency	Low	Data were collected between 1981-1984.	
	Metric 6: Spatial and Temporal Variability	Medium	Replicates were not collected, n=281 in total (estimated from Table 1).	
	Metric 7: Exposure Scenario	High	The data closely represent relevant indoor and outdoor air exposure scenarios in the U.S.	
Domain 3: Accessibility/Clarity	Metric 8: Reporting of Results	Medium	Raw data was not reported. Only summary statistics were reported.	
	Metric 9: Quality Assurance	High	QA/QC techniques were described, including the use of blank and control samples.	
Domain 4: Variability and Uncertainty	Metric 10: Variability and Uncertainty	Medium	Limited characterization of variability was reported (maximum values). Little information on gaps and limitations was provided.	
Overall Quality Determination		Medium		

Study Citation:		Huang, Y., Su, T., Wang, L., Wang, N., Xue, Y., Dai, W., Lee, S. C., Cao, J., Ho, S. S. H. (2019). Evaluation and characterization of volatile air toxics indoors in a heavy polluted city of northwestern China in wintertime. Science of the Total Environment 662:470-480.		
HERO ID:		5431563		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Field blanks were used. Storage temp provided. Equipment calibration and flow rates provided. Detailed sampling procedures in other publications (Spaulding et al., 1999; Ho et al., 2011).
	Metric 2:	Analytical Methodology	Medium	Details on method shown in Dai et al., 2012, but relatively robust description provided. Limits only provided as a range.
	Metric 3:	Biomarker Selection	N/A	Paper reports chemical concentrations in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	High	2016-2017
	Metric 6:	Spatial and Temporal Variability	High	44 samples from 11 homes.
	Metric 7:	Exposure Scenario	High	Questionnaire provided details to characterize the building and activity patterns of occupants. No known pollution sources near buildings.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Mean and sd in main report. Individual samples appear o have been provided in SI. Conducted source apportionment for indoor sources.
	Metric 9:	Quality Assurance	Medium	Calibration curve was established. Precision was <25%. Recoveries not discussed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability assessed via factor analysis. No discussion of uncertainties.
Overall Quality Determination			High	

Study Citation:		Lorah, M. M., Olsen, L. D., Smith, B. L. (1997). Natural attenuation of chlorinated hydrocarbons in a freshwater wetland. 4(3)(3):207-212.		
HERO ID:		5433584		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	groundwater in a small section of wetland sampled from 87 piezometers using stainless-steel bailers or pumps; kept on ice; sampling procedure not discussed
	Metric 2:	Analytical Methodology	Low	USGS analyzed the samples; detection limits not provided
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Aberdeen Proving Grounds, US Army Base, Maryland
	Metric 5:	Currency	Low	June to October 1995
	Metric 6:	Spatial and Temporal Variability	High	87 piezometers sampled June to October
	Metric 7:	Exposure Scenario	High	contamination in shallow groundwater that discharges to freshwater wetlands on an Army base
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	no data provided in table form or text; only pictured in Fig 1 and 2
	Metric 9:	Quality Assurance	Low	QA/QC not discussed but implied since study conducted by USGS
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed
Overall Quality Determination			Medium	

Study Citation:		Giger, W., Molnar-Kubica, E., Wakeham, S. (1978). Volatile chlorinated hydrocarbons in ground and lake waters. :101-123.		
HERO ID:		5434129		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sampling methodology was described in detail.
	Metric 2:	Analytical Methodology	Medium	The analytical methods were reported, including LOD but not recoveries.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study was conducted in Zurich, Switzerland
	Metric 5:	Currency	Low	The data was collected in 1977.
	Metric 6:	Spatial and Temporal Variability	Medium	n=31 samples. No replicates were taken.
	Metric 7:	Exposure Scenario	Medium	Exposure through groundwater and lake water use, but a detailed assessment was not conducted.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	raw data reported
	Metric 9:	Quality Assurance	Low	Limited QA/QC reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No limitations reported
Overall Quality Determination			Medium	

Study Citation:		Roy F. Weston Inc, (1986). Installation restoration program phase ii-confirmation/quantification, stage 1. Final report for Burlington Air national guard base, Burlington, Vermont.		
HERO ID:		5436115		
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Sampling Methodology	Medium	Sampling equipment, procedure were described in details for the samples in groundwater and surface water.
		Metric 2: Analytical Methodology	High	GC/MS was used to analyze the chemicals, detection limits was reported - 10 ug/L.
		Metric 3: Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness		Metric 4: Geographic Area	High	Burlington Air National Guard Base, Vermont
		Metric 5: Currency	Low	In 1984, soil and surface water samples from the site were collected.
		Metric 6: Spatial and Temporal Variability	Medium	5 monitoring wells and 3 existing wells, 6 surface water stations were sampled.
		Metric 7: Exposure Scenario	Medium	Exposure scenario was about an Airforce base.
Domain 3: Accessibility/Clarity		Metric 8: Reporting of Results	High	Individual data were reported for each chemical at each sampling location, though no summary statistics were provided.
		Metric 9: Quality Assurance	High	QA/QC measures were performed and all pertinent quality assurance information is provided in the data source or companion source.
Domain 4: Variability and Uncertainty		Metric 10: Variability and Uncertainty	Medium	The study is a site investigation, not having much discussion on study limitations or variability because the study followed standard procedure.
Overall Quality Determination			Medium	

Study Citation:		Buzska, P. M. (1987). Relation of water chemistry of the Edwards aquifer to hydrogeology and land use, San Antonio Region, Texas.		
HERO ID:		5436763		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling was not performed because the study used a standard database, but no major concerns were raised.
	Metric 2:	Analytical Methodology	Medium	Analytical procedure was not performed in this study because it used a database.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Edwards aquifer, TX
	Metric 5:	Currency	Low	Sampling occurred during 1984 and 1985.
	Metric 6:	Spatial and Temporal Variability	High	The WATSTORE database contained more than 1500 water chemistry analyses from 280 wells and 3 spring waters.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenario (surface water/groundwater in an aquifer).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Average data with summary statistics were presented, though individual data were not reported.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study had detailed discussion of data variability and compared among each subareas.
Overall Quality Determination			Medium	

Study Citation:		Fusillo, T. V., Voronin, L. M. (1981). Water-quality data for the Potomac-Raritan-Magothy aquifer system, Trenton to Pennsville, New jersey, 1980.		
HERO ID:		5437962		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some methods not reported such as sampler calibration
	Metric 2:	Analytical Methodology	Medium	Recovery samples not reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	New Jersey and Pennsylvania
	Metric 5:	Currency	Low	Samples collected June through December 1980
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no site replicates; but the sampling does cover a large spatial extent over the course of June-December
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized; primary through groundwater use
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data reported in Table 4
	Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported
Overall Quality Determination			Medium	

Study Citation:		Glass, R. L. (1996). Hydrologic and water-quality data for U.S. Coast Guard Support Center Kodiak, Alaska, 1987-89. :1-73.		
HERO ID:		5438106		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported. Samples were collected according to publicly available SOPs that are scientifically sound and widely accepted (i.e., USEPA methods).
	Metric 2:	Analytical Methodology	High	Key analytical methods reported. Samples were analyzed according to publicly available analytical methods that are scientifically sound and widely accepted. MCLG/MCLs provided.
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media (water).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Kodiak, Alaska
	Metric 5:	Currency	Low	1987-1989
	Metric 6:	Spatial and Temporal Variability	High	Sampling approach accurately captures variability of environmental contamination in media of interest. Used large sample size (Large sample size (i.e., > 10 samples for a single scenario). Used replicates.
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Supplementary or raw data (i.e., individual data points) are not reported , and therefore summary statistics cannot be reproduced.
	Metric 9:	Quality Assurance	High	Acceptable QA
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Few gaps and limitations reported
Overall Quality Determination			Medium	

Study Citation:		Guimaraes, W. B. (1995). Water quality in the Withers Swash Basin, with emphasis on enteric bacteria, Myrtle Beach, South Carolina, 1991-93.		
HERO ID:		:1-102. 5438210		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The water sampling methods were discussed but didn’t include procedure details. The authors cited previously published articles.
	Metric 2:	Analytical Methodology	Medium	The analytical methods were reported, including instrumentation, LOD but did not include recoveries.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed water samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study was conducted in South Carolina, USA.
	Metric 5:	Currency	Low	The samples were taken in 1991 and 1992.
	Metric 6:	Spatial and Temporal Variability	High	n≥ 10 samples for a single scenario. The sample size was not explicitly reported but the results throughout the report suggest a large sample collection from 51 sites in total.
	Metric 7:	Exposure Scenario	Medium	The data likely represent relevant exposure scenarios related to water contamination in Withers Swash and its two tributaries in Myrtle Beach, S.C, USA.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics were reported (median, min, max).
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not discussed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The authors provided a limited characterization of variability (range). Uncertainties and limitations were not discussed.
Overall Quality Determination			Medium	

Study Citation:		Heck, B. A., Myers, N. C., Hargadine, D. A. (1992). Hydrogeology and ground-water quality conditions at the Reno County Landfill, South-Central Kansas, 1990-91.		
HERO ID:		5438509		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sampler calibration
	Metric 2:	Analytical Methodology	Low	LOD nor LOQ reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Reno County, Kansas
	Metric 5:	Currency	Low	Data collected in 1991
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized. Further investigation needed to determine usefulness of information.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data reported. Most summary statistics provided.
	Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported
Overall Quality Determination			Medium	

Study Citation:		Hunt, J., Birch, G., Warne, M. S. J. (2007). Deriving trigger values for, and assessing hazard posed by, volatile chlorinated hydrocarbons in a sydney estuary. Australasian Journal of Ecotoxicology 13(1):33-42.		
HERO ID:		5438705		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling procedure and program designs were described in details. Site matrix was provided, including graphs and maps.
	Metric 2:	Analytical Methodology	High	Analytical procedure was reported to follow EPA methodology (USEPA 5030B)
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Penrhyn Estuary, Sydney, Australia
	Metric 5:	Currency	Medium	2004-2005
	Metric 6:	Spatial and Temporal Variability	High	5 rounds of samples were collected every 3 months from 7 sites along the estuary and 2 storm water sites in the span of 1 year.
	Metric 7:	Exposure Scenario	High	Exposure scenario was closely related to the chemicals of interest - surface water and storm water drainage.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Mean concentrations for each site were reported along with summary statistics.
	Metric 9:	Quality Assurance	High	Quality control was undertaken; recovery rates were acceptable (80% to 120%). No major concerns were noticed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	The study had a robust discussion about the limitation and uncertainty of the hazard assessment conducted in this study.
Overall Quality Determination			High	

Study Citation:		Mack, T. J. (1997). Design of monitoring wells, hydrogeology, and ground-water quality beneath Country Pond, Kingston, New Hampshire.		
HERO ID:		5440304		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	Limited sampling methods were discussed.
	Metric 2:	Analytical Methodology	Critically Deficient	The analytical methods were not described.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed water samples.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	The study was conducted in New Hampshire, USA.
	Metric 5:	Currency	Low	The samples were collected in 1993.
	Metric 6:	Spatial and Temporal Variability	Low	n=17 samples were collected (two samples per location). Estimated from Table 4.
	Metric 7:	Exposure Scenario	Low	The data may represent relevant water exposure scenarios in New Hampshire, but the lack of methodological details limits the study's results.
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	Only individual sample concentrations were reported, without summary statistics.
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability was not characterized. Limitations were not reported.
Overall Quality Determination		Uninformative		

Study Citation:		Miermans, C. J. H., Van Der Velde, L. E., Frintrop, P. C. M. (2000). Analysis of volatile organic compounds, using the purge and trap injector coupled to a gas chromatograph ion-trap mass spectrometer review of the results in Dutch surface water of the Rhine, Meuse, Northern Delta area and Westerscheldt, over the period 1992-1997. Chemosphere 40(1):39-48.		
HERO ID:		5440660		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Automatic online sampling system takes composite samples on a daily basis, supplemented by manual sampling if values are high. The authors noted grab samples of volatile compounds needs to be improved.
	Metric 2:	Analytical Methodology	High	Both onsite and lab samples were analyzed with (novel) purge and trap injection (PTI) coupled to a chromatograph/ion trap mass spectrometer. Detection limits are reported.
	Metric 3:	Biomarker Selection	N/A	Environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	River sampling locations in the Netherlands are named.
	Metric 5:	Currency	Low	1992-1997
	Metric 6:	Spatial and Temporal Variability	Medium	13-14 samples per year at 11 sites. No replicates
	Metric 7:	Exposure Scenario	Medium	Timing of sampling (e.g., season) is missing. Figure 4 implies the samples may have been taken monthly.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Only maximum values are reported. No raw data
	Metric 9:	Quality Assurance	Medium	Method validation study; discussed standards, reliability, and recovery to some extent.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Quantitative and qualitative descriptions of variability are lacking for most chemicals (some have greater spatiotemporal detail in the discussion).
Overall Quality Determination			Medium	

Study Citation:		Naber, S., Verducci, J. (1988). Statistical analysis of ground water contamination of the Alert Apron and northern landfill areas of Wurtsmith AFB, Michigan.		
HERO ID:		5440990		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sources, sampling procedure were described in details, though calibration and storage were not mentioned.
	Metric 2:	Analytical Methodology	Low	Analysis was mentioned but not described in details.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Wurtsmith Air Force Base, Michigan
	Metric 5:	Currency	Low	Sampling occurred from 1980 to 1987.
	Metric 6:	Spatial and Temporal Variability	Medium	3 agencies(USGS, USAF, MDNR) collected samples for the 2 sites of interest near the AFB over the sampling period.
	Metric 7:	Exposure Scenario	Medium	The exposure scenario was relevant - groundwater samples near the AFB.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual data were provided for each site.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study’s use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Key uncertainties and errors have been identified.
Overall Quality Determination			Medium	

Study Citation:		Van Luin, A. B., Van Starkenburg, W. (1985). Hazardous Substances in Waste Water. Water Science and Technology 17(6-7):843–853.		
HERO ID:		5443237		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling methodology is only briefly discussed
	Metric 2:	Analytical Methodology	Low	Analytical methodology only briefly discussed
	Metric 3:	Biomarker Selection	N/A	Chemical measured in wastewater
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The Netherlands
	Metric 5:	Currency	Low	1980-1983
	Metric 6:	Spatial and Temporal Variability	Medium	No replicate samples
	Metric 7:	Exposure Scenario	Medium	Samples collected from a wastewater treatment plant
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual data points are not reported
	Metric 9:	Quality Assurance	Low	QA/QC techniques are not directly discussed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Limited characterization of variability
Overall Quality Determination			Low	

Study Citation:		USGS, (1989). Inorganic and organic ground-water chemistry in the Canal Creek area of Aberdeen Proving Ground, Maryland.		
HERO ID:		5443295		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Description of sampling area was well described.
	Metric 2:	Analytical Methodology	High	GC/FID was used perform the analysis of chemicals. Detection limits were reported (page 59).
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemicals.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Canal Creek, Maryland
	Metric 5:	Currency	Low	1986 - 1987
	Metric 6:	Spatial and Temporal Variability	High	Water samples were collected from 87 wells; at least 2 well volumes of water were collected from each well.
	Metric 7:	Exposure Scenario	High	Exposure scenarios were highly related - groundwater from the aquifer (sources were discussed).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Individual data were provided for each well in Table 10.
	Metric 9:	Quality Assurance	High	Quality control and assurance measures were performed and no major concerns were seen.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study characterizes variability in the media studied.
Overall Quality Determination			High	

Study Citation:		Watts, K. R., Ortiz, R. F. (1990). Geohydrology and ground-water quality at the pueblo depot activity landfill near Pueblo, Colorado.		
HERO ID:		5443405		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sample storage missing
	Metric 2:	Analytical Methodology	Medium	Some analytical methods not reported, such as recovery samples
	Metric 3:	Biomarker Selection	N/A	NA - Water samples no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Colorado, USA
	Metric 5:	Currency	Low	Data collected in 1988
	Metric 6:	Spatial and Temporal Variability	Medium	Multiple wells sampled about 3-5 times each, unclear if there are replicates
	Metric 7:	Exposure Scenario	High	Proximity to landfill water. Can be used in general population, and environmental exposure scenarios.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Table 10 start after page 95 while some ranges can be found within text too.
	Metric 9:	Quality Assurance	Low	QA/QC implied
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Few limitations reported
Overall Quality Determination			Medium	

Study Citation:		Bigsby, P. R., Myers, N. C. (1989). Hydrogeology and ground-water-quality conditions at the Geary County landfill, northeast Kansas, 1988.		
HERO ID:		5449639		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	USGS conducted study; 7 monitoring wells sampled (MW- to MW-2); samples retrieved with a Teflon-bottom check-valve bailer and immediately put on ice; samples filtered; also samples of Smoky Hill River collected by dipping bottles into the stream and allowing to fill
	Metric 2:	Analytical Methodology	Low	Performed by Kansas Department of Health and Environment laboratory, no discussion of analytical methodology. Although missing analytical description and other QA and uncertainties in this report they have references in which this information can be found. Most of the used methodology are accepted methods performed by accredited labs.
	Metric 3:	Biomarker Selection	N/A	NA - water samples no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Geary County, northeast Kansas
	Metric 5:	Currency	Low	Sept 20-22, 1988
	Metric 6:	Spatial and Temporal Variability	Medium	7 wells sampled Sept 20-22; also 3 samples from the river; no replicate samples indicated
	Metric 7:	Exposure Scenario	High	groundwater quality conditions at a county landfill
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Table 8 provides concentration per site
	Metric 9:	Quality Assurance	Low	QA/QC not reported but implied as it is a USGS investigation
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	no discussion of variability or uncertainty
Overall Quality Determination			Medium	

Study Citation:		Demas, C. R., Demcheck, D. K. (1989). Uptake of manmade organic compounds by <i>Rangia cuneata</i> in the lower Calcasieu River, Louisiana. :309-319.		
HERO ID:		5451873		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Rangia, sediment, and water collection are specified in the materials and methods section.
	Metric 2:	Analytical Methodology	High	Detection limits are reported in table E-16. Samples were analyzed using an standardized U.S. EPA method (625).
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Lake Charles in the lower Calcasieu river, Louisiana.
	Metric 5:	Currency	Low	Data collected in July, August and September of 1987.
	Metric 6:	Spatial and Temporal Variability	Medium	No replicates collected. Samples divided in two sets and collected in 4 sites in 3 different seasons.
	Metric 7:	Exposure Scenario	High	The study used <i>Rangia Cuneata</i> as a sentinel to evaluate the concentrations of VOCs in an affected and a recovery area of the Calcasieu river.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Data reported in table E-17 - E-19 seem to be individual point values. No summary of statistics reported.
	Metric 9:	Quality Assurance	High	QA/QC assumed since the study followed an U.S. EPA methodology.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No limitations reported. Variability reported in terms of seasonal variation.
Overall Quality Determination			High	

Study Citation:		Westinghouse Savannah River Company, (1993). Mixed Waste Management Facility (MWMF) groundwater monitoring report (U): Fourth quarter 1992 and 1992 summary.		
HERO ID:		5452031		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling Methodology	Low	Sampling methodology is only briefly discussed. Described sampling locations and study site characteristics. Did not report sample storage conditions/duration or sampling equipment and procedure.
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology is not described, including analytical instrumentation.
	Metric 3:	Biomarker Selection	N/A	Study tested for the parent chemical in environmental media.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	Savannah River Site, Aiken, SC
	Metric 5:	Currency	Low	Samples collected throughout second quarter 1992.
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples were collected but there no replicate samples collected. Several wells sampled, but only one sample per well.
	Metric 7:	Exposure Scenario	Medium	The report provides extensive background information about the sites and wells. The data likely represent the relevant exposure scenario. Routes of exposure and populations of interest not described.
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	High	Raw data were reported.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not discussed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The characterization of variability is absent and key uncertainties, limitations, and data gaps are not discussed.
Overall Quality Determination		Uninformative		

Study Citation:		Van Zoest, R., Van Eck, G. T. M. (1991). Occurrence and behaviour of several groups of organic micropollutants in the Scheldt estuary. Science of the Total Environment 103(1):57-71.		
HERO ID:		5471921		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some methods not reported such as sample storage conditions and sampler calibration
	Metric 2:	Analytical Methodology	High	Key analytical methods reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Europe
	Metric 5:	Currency	Low	Study published in 1991
	Metric 6:	Spatial and Temporal Variability	Medium	5-10 samples
	Metric 7:	Exposure Scenario	Low	Exposure source not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported
	Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Few gaps and limitations reported
Overall Quality Determination			Medium	

Study Citation:		Dreisch, F. A., Gower, M., Munson, T. O. (1980). Survey of the Huntington and Philadelphia River water supplies for purgeable organic contaminants.		
HERO ID:		5471952		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling procedure and storage conditions were described.
	Metric 2:	Analytical Methodology	High	Analytical method was described (hall detector/flame ionization detector), LOD was reported in Table 2.
	Metric 3:	Biomarker Selection	N/A	environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Ohio River, Huntington, WV, and Schuylkill River, Philadelphia, PA
	Metric 5:	Currency	Low	1978-1979
	Metric 6:	Spatial and Temporal Variability	High	Quadruplicate samples were taken every 12 hours at the 2 locations. Sampling was from December 4, 1978 to January 29, 1979 for Ohio River and from November 27, 1978 to February 24, 1979.
	Metric 7:	Exposure Scenario	Medium	The data likely represent the relevant exposure scenario - surface water.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Data were reported for each sampling point with no summary reports.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	The study provided the limitation of the study including short sampling time period, no individual sample run, and inherent time lag between sampling collection and analysis.
Overall Quality Determination			Medium	

Study Citation:		Campbell, T. R. (1997). Soil, water, and streambed quality at a demolished asphalt plant, Fort Bragg, North Carolina, 1992-94.		
HERO ID:		5489294		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	samples were collected and handled according to procedures outlined in the work plan for Ft. Bragg SWMU's and approved by local government and EPA (p.17)
	Metric 2:	Analytical Methodology	High	samples were analyzed in accordance with the USEPA methods or ASTM standards; Table 4 provides LODs
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Ft. Bragg, Fayetteville, NC
	Metric 5:	Currency	Low	December 1992-April 1994
	Metric 6:	Spatial and Temporal Variability	Medium	7 wells for groundwater sampling; 22 soil samples at various depths; several sub-samples of streambed sediment at various locations; soil samples collected at 7 locations across the site;
	Metric 7:	Exposure Scenario	Medium	soil, ground water, surface water, and sediments in the area of a demolished asphalt plant at Ft. Bragg; aim to determine if site should added to list of solid-waste management units under the RCRA permit; p. 12-16 contains information on the area of contamination
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 7 provides concentrations in soil samples; no results specific to this chemical; only data is for LOD
	Metric 9:	Quality Assurance	Low	QA/QC not directly discussed but implied through standard methods and lab protocols
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	characterization of variability and uncertainties are absent
Overall Quality Determination			Medium	

Study Citation:		Rowe, B. L., Toccalino, P. L., Moran, M. J., Zogorski, J. S., Price, C. V. (2007). Occurrence and potential human-health relevance of volatile organic compounds in drinking water from domestic wells in the United States. Environmental Health Perspectives 115(11):1539-1546.		
HERO ID:		5553456		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	methods cited elsewhere for a USGS book on protocols and procedures
	Metric 2:	Analytical Methodology	High	MRLs reported in supporting info; method cites a USGS reference
	Metric 3:	Biomarker Selection	N/A	no biomonitoring data
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Figure 2 shows the wells in the US
	Metric 5:	Currency	Low	1985-2002
	Metric 6:	Spatial and Temporal Variability	Medium	single sample collected at each well (no replicates)
	Metric 7:	Exposure Scenario	High	Domestic well throughout the USA.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	info likely in the supporting information
	Metric 9:	Quality Assurance	Medium	quality-control samples used in this study have been reported elsewhere (USGS references); unclear what was done exactly
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	study characterizes variability around the US based on samples collected in many states but no standard deviation/measure of variation mentioned (unclear if in SI)
Overall Quality Determination			Medium	

Study Citation:		Garcia, C., Tiedra, P. G., Ruano, A., Gomez, J. A., Garcia-Villanova, R. J. (1992). Volatile halo-organic compounds in treated waters of the province of Salamanca (Spain). European Water Pollution Control 2(4):46-49.		
HERO ID:		5608960		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling procedure, equipment, and storage condition were described. Calibration was not described.
	Metric 2:	Analytical Methodology	High	Analytical process (GC with ECD) and equipment were described. Detection limit for each compound was reported in Table 2.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Salamanca, Spain
	Metric 5:	Currency	Low	May to July 1991
	Metric 6:	Spatial and Temporal Variability	High	The study reported that a total of 117 duplicate analyses were made, corresponding to 30 raw, 30 finished and 57 distribution system water samples.
	Metric 7:	Exposure Scenario	Medium	Exposure scenario was relevant - surface and drinking water.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	It is stated that "none of the 16 halo-organic compounds were detected in any of the raw water samples" and treated water only some compounds were identified- therefore no concentrations were not reported for DCP.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The study discussed variability of the data, but discussion did not involve the chemicals of interest. No discussion of limitations.
Overall Quality Determination			Medium	

Study Citation:		Landmeyer, J. E., Campbell, B. G. (2014). Assessment of ethylene dibromide, dibromochloropropane, other volatile organic compounds, radium isotopes, radon, and inorganic compounds in groundwater and spring water from the Crouch Branch and McQueen Branch aquifers near McBee, South Carolina, 2010-2012.		
HERO ID:		5639273		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	USGS method
	Metric 2:	Analytical Methodology	High	USGS method
	Metric 3:	Biomarker Selection	N/A	NA- water samples no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	SC, USA
	Metric 5:	Currency	Medium	2010-2011
	Metric 6:	Spatial and Temporal Variability	Medium	single samples over multiple years
	Metric 7:	Exposure Scenario	High	Ground water and spring water, for environmental and general population scenarios.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	only average
	Metric 9:	Quality Assurance	High	Analytical QA/QC was reported and is reliable.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Sources or variability and uncertainly are not discussed.
Overall Quality Determination			High	

Study Citation:		Li, Y., Cakmak, S., Zhu, J. (2019). Profiles and monthly variations of selected volatile organic compounds in indoor air in Canadian homes: Results of Canadian national indoor air survey 2012-2013. Environment International 126:134-144.		
HERO ID:		5736601		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling storage not described. More information may be in the following: Indoor air VOC samples were collected as part of the Canadian Health Measures Survey (Statistics Canada, 2016) using the same methodology as previously described for the 2009–2011 survey (Zhu et al., 2013; Patry-Parisien et al., 2013).
	Metric 2:	Analytical Methodology	High	Analytical methods described in detail. LOD provided in S1.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Canada
	Metric 5:	Currency	Medium	Data collected from 2009 to 2013
	Metric 6:	Spatial and Temporal Variability	High	3524 homes including duplicates.
	Metric 7:	Exposure Scenario	High	Measuring VOC in residential homes.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported in the study. Summary statistics provided in detail.
	Metric 9:	Quality Assurance	High	QA reported in detail, including field quality control samples which included 133 field blanks and recoveries (in S1).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited information on limitations and gaps reported. Standard errors, coefficients of variation and 95%confidence intervals were calculated. Monthly variation also calculated.
Overall Quality Determination			High	

Study Citation:		Dodson, R. E., Udesky, J. O., Colton, M. D., Mccauley, M., Camann, D. E., Yau, A. Y., Adamkiewicz, G., Rudel, R. A. (2017). Chemical exposures in recently renovated low-income housing: Influence of building materials and occupant activities. Environment International 109:114-127.		
HERO ID:		5755270		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods are standard SOPs and are detailed in the paper and the SI.
	Metric 2:	Analytical Methodology	High	MRLs are tabulated. The paper and SI adequately discuss methodology.
	Metric 3:	Biomarker Selection	N/A	Testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Boston, MA.
	Metric 5:	Currency	Medium	Samples were collected from 2013-2014.
	Metric 6:	Spatial and Temporal Variability	High	10 pre-occupancy and >= 25 post-occupancy samples were collected. Duplicates were collected.
	Metric 7:	Exposure Scenario	Medium	Information on potential chemical use not discussed beyond describing the measured concentrations.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics were reported, but no raw data were reported (unless provided in the SI).
	Metric 9:	Quality Assurance	High	The QAQC discussion was adequate.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	There was sufficient discussion on variability and uncertainty.
Overall Quality Determination			High	

Study Citation:		LTI Limno-Tech, (1993). Preliminary evaluation of Dow Corning Carrollton, Kentucky environmental effects to surface waters with cover letter dated 04/20/94.		
HERO ID:		5885319		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Limited description of sampling methods
	Metric 2:	Analytical Methodology	Medium	Limited description of analytical methods
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Ohio, USA
	Metric 5:	Currency	Low	Sampling in 1992
	Metric 6:	Spatial and Temporal Variability	Low	Sample size is reported in Appendix B - Laboratory Data Report (page 74 of the 134 pages of the .PDF file). There are 4 water and 4 soil samples.
	Metric 7:	Exposure Scenario	Medium	Missing information about the population of interest, limited description of microenvironment
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	High	Described QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Did not characterize variability, or discussed uncertainties and limitations
Overall Quality Determination			Medium	

Study Citation:		Miksch, R. R., Anthon, D. W., Barnes, M., Fanning, L. Z., Glanville, J., Schmidt, H., Tashima, M. (1979). Energy efficient buildings program: Organic contaminants. American Industrial Hygiene Association Journal 41(11):851-853.		
HERO ID:		6033301		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The sampling methodology was described but did not include sample storage conditions.
	Metric 2:	Analytical Methodology	Medium	The analytical methods were described but did not include LOD or recoveries.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed air samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	United States
	Metric 5:	Currency	Low	The samples were collected in 1979
	Metric 6:	Spatial and Temporal Variability	Low	n=24, with replicates (3-9).
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenarios related to indoor and outdoor airborne formaldehyde
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics were reported (Table 1) but 1,1,1 trichloroethane concentrations were described as "small".
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not described.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability was not characterized (samples seem to be below the LOD). Uncertainties were briefly discussed.
Overall Quality Determination			Medium	

Study Citation: Cooke, K. M., Hassoun, S., Pilling, M. J., Saunders, S. M. (2001). Identification and quantification of volatile organic compounds found in a eucalyptus forest during FIELDVOC'94 in Portugal. Chemosphere - Global Change Science 3(3):249-257.

HERO ID: 6229881

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Acceptable sampling methods reported.
	Metric 2: Analytical Methodology	Low	LOD nor LOQ was reported.
	Metric 3: Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Portugal
	Metric 5: Currency	Low	Study was published in 2001.
	Metric 6: Spatial and Temporal Variability	Critically Deficient	Number of samples were not reported.
	Metric 7: Exposure Scenario	Medium	Exposure source was not well characterized.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Raw data were not reported
	Metric 9: Quality Assurance	Low	Limited QA was reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Few gaps and limitations were reported

Overall Quality Determination

Uninformative

Study Citation:		Bechtel Environmental, (1988). Final site investigation report for the Rohm and Haas Redwood City Facility.		
HERO ID:		6307465		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology is discussed and is generally appropriate (i.e., scientifically sound) for the chemical and media of interest. Details regarding soil sampling page 18-23, 28; groundwater sampling page 37-38, 41-47; monitoring well sampling page 48-58; concrete and asphalt sampling page 60-64.
	Metric 2:	Analytical Methodology	High	Samples were analyzed according to EPA Methods. Table 2-2 reports EPA methods followed for each contaminant.
	Metric 3:	Biomarker Selection	N/A	Study tested for the parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in California, USA.
	Metric 5:	Currency	Low	Samples were collected in 1986-1987.
	Metric 6:	Spatial and Temporal Variability	High	Duplicate samples were collected for all media types; 95 soil samples, 53 groundwater samples, 26 monitoring well samples, and 55 concrete and asphalt samples.
	Metric 7:	Exposure Scenario	Medium	The data likely represent relevant/realistic exposure scenario, but the use of expose controls was not described.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data reported in Tables 4-1, 5-1, 5-2, 8-1, A-1, B-1, C-1, C-2. No summary statistics reported.
	Metric 9:	Quality Assurance	Medium	The use of QA/QC techniques were described such as the use of standards, blanks, laboratory duplicates, field duplicates, and spikes. However, recovery values and baseline samples were not reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The study has limited characterization of variability and no measure of variance is provided. Key uncertainties, limitations, and data gaps are not discussed.
Overall Quality Determination			Medium	

Study Citation:		Hargis & Montgomery Inc, (1984). Phase I Investigation of Groundwater Quality and Hydrogeological Conditions Summa Corporation Facility Culver City, California.		
HERO ID:		6311565		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling methods were only briefly described.
	Metric 2:	Analytical Methodology	Low	The authors cited analytical methods from EPA with brief descriptions.
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study was conducted in the USA.
	Metric 5:	Currency	Low	Samples were collected in 1983.
	Metric 6:	Spatial and Temporal Variability	High	14 monitoring wells, with replicates.
	Metric 7:	Exposure Scenario	Medium	The data may represent a relevant exposure scenario, but it's missing details about the population of interest.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only individual sample concentrations were reported.
	Metric 9:	Quality Assurance	High	The authors described QA/QC techniques and analyzed control samples.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The authors did not characterize variability or uncertainties.
Overall Quality Determination			Medium	

Study Citation:		McKesson Environmental Services, (1984). Priority pollutant analysis.		
HERO ID:		6574972		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling Methodology	Critically Deficient	The groundwater sampling methodology was not described.
	Metric 2:	Analytical Methodology	Critically Deficient	The analytical methodology was not described.
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in groundwater.
Domain 2: Representativeness	Metric 4:	Geographic Area	High	The study was conducted in California, USA.
	Metric 5:	Currency	Low	The analysis is from 1984.
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	The sample size is not reported.
	Metric 7:	Exposure Scenario	Low	The data may represent a relevant exposure scenario, but the document lacks sufficient details about sampling and analytical methods, population of interest and microenvironment characteristics.
Domain 3: Accessibility/Clarity	Metric 8:	Reporting of Results	Medium	The authors only reported individual sample concentrations, without summary statistics.
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not described, control samples were not analyzed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability was not characterized. Uncertainties and limitations were not described.
Overall Quality Determination		Uninformative		

Study Citation:		Vu, D. C., Ho, T., Vo, P. H., Bayati, M., Davis, A. N., Gulseven, Z., Carlo, G., Palermo, F., McElroy, J. A., Nagel, S. C., Lin, C. H. (2019). Assessment of indoor volatile organic compounds in Head Start child care facilities. Atmospheric Environment 215:116900.		
HERO ID:		6952657		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods described, including study site characteristics, procedures, equipment, and storage.
	Metric 2:	Analytical Methodology	High	The analytical methodology is sufficiently described. LOD and LOQ reported in Table S2.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in indoor air.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Kansas City, Missouri.
	Metric 5:	Currency	High	Samples collected from mid-October in 2014 to late January in 2015.
	Metric 6:	Spatial and Temporal Variability	Medium	50 indoor air samples collected from 10 classrooms in four facilities and across multiple microenvironments. No replicate samples were collected.
	Metric 7:	Exposure Scenario	High	Samples collected indoor air from child care facilities, including playrooms and learning rooms.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	All samples were ND. Raw data are not reported.
	Metric 9:	Quality Assurance	Medium	Key QA reported, including the use of field blanks, laboratory blanks, and reference standards. Analytical method also included acceptable correlation coefficients (R² = 0.982–0.999). However, recoveries not reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Characterizes spatial differences across buildings and rooms, and seasonal differences between fall and winter. SD also reported. Several uncertainties are noted including temporal replication, lack of ventilation data, absence of outdoor comparison samples, and facility-level generalizability.
Overall Quality Determination			High	

Study Citation:		Han, F., Chen, J., Jiang, Z., Chen, L., Ji, W. (2013). Volatile and semi-volatile organic compounds in the lower Yangtze River and surface waters of three Chinese provinces. Polish Journal of Environmental Studies 22(3):683-690.		
HERO ID:		6968122		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling procedure lacked a few details including sampling procedure and equipment.
	Metric 2:	Analytical Methodology	High	Analytical method of the pollutants were described (GC-MS) and LOD was reported for each chemical.
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media (water).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Yangtze River, China
	Metric 5:	Currency	Medium	Sampling date was from April to May 2008.
	Metric 6:	Spatial and Temporal Variability	Medium	Sampling approach accurately captures variability of environmental contamination in population/scenario/media of interest. The study used a large sample size (21 samples) and replicate samples. However, sampling did not occurred over a sufficient period of time (only during Apr-May) to characterize seasonal trends.
	Metric 7:	Exposure Scenario	High	Exposure scenario was highly relevant (surface water).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Statistics were described. Individual data were not reported.
	Metric 9:	Quality Assurance	High	The study conducted quality control measures.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study reported standard deviation to measure variability, but lacked discussion about its limitation.
Overall Quality Determination			High	

Study Citation:		U.S. EPA, (1977). Evaluation and wastewater characterization: Northeast Philadelphia water pollution control plant, Philadelphia, Pennsylvania (September 16-23, 1976).		
HERO ID:		6985025		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Samples were collected according to publicly available SOPs that are scientifically sound and widely accepted (i.e., procedures approved by EPA for monitoring of industrial effluents). See Page 11, Appendix E - Analytical Procedures and Quality Control, and Appendix F - Organics Analytical Methodology.
	Metric 2:	Analytical Methodology	Medium	Analytical methodology is discussed in detail (Appendices E, F, and G) and is clear and appropriate (i.e., scientifically sound) for the chemical and media of interest; however, one or more pieces of analytical information is not described (LOQ, LOD, detection limits, and/or reporting limits not provided). The missing information is unlikely to have a substantial impact on results.
	Metric 3:	Biomarker Selection	N/A	The study is testing in an environmental media (water).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Geographic location is reported; Northeast Philadelphia
	Metric 5:	Currency	Low	Timing of sample collection for monitoring data is not consistent with when current exposures (September 1976; >15 years old) may be expected and likely to have a substantial impact on results.
	Metric 6:	Spatial and Temporal Variability	High	Sampling approach accurately captures variability of environmental contamination in population/scenario/media of interest. The study used a large sample size; >10 samples were collected as part of a compliance program and replicates were collected.
	Metric 7:	Exposure Scenario	High	The exposure scenario is relevant (Influent and effluent of wastewater treatment plant). Microenvironment data (location, time, climate) provided.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Supplementary or raw data (i.e., individual data points) are not reported, and therefore summary statistics cannot be reproduced.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The report had limited discussion on the characterization of variability and uncertainty.
Overall Quality Determination			Medium	

Study Citation:		CTEH, (2021). Shell Puget Sound Refinery 9-29-2020 flaring event: Supplemental report.		
HERO ID:		11273432		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling was completed using 1.4 L MiniCans(TM). Sample sites are also reported.
	Metric 2:	Analytical Methodology	High	Samples were analyzed via the USEPA Method TO-15 by a third-party analytical laboratory. Reported detection limit range is referenced in each sample results.
	Metric 3:	Biomarker Selection	N/A	The parent chemical was tested in ambient air.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Anacortes, Washington, USA.
	Metric 5:	Currency	High	Samples were collected in October 2020.
	Metric 6:	Spatial and Temporal Variability	Medium	Six samples were collected for a 24h period
	Metric 7:	Exposure Scenario	High	This study measures air concentrations after a flare event at a refinery.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Individual data is reported in attachment B.
	Metric 9:	Quality Assurance	High	Attachment B reports a range of laboratory quality controls.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability is not reported but the chemical data is all reported as ND, the study also reports qualifier of the results for uncertainty.
Overall Quality Determination			High	

Study Citation:		U.S. EPA, (2006). Air toxics field investigation report: EPA Method TO-15/Cerex UV Sentry comparison.		
HERO ID:		11273457		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology described including equipment, procedures, conditions, and calibration following EPA methods.
	Metric 2:	Analytical Methodology	Medium	Samples analyzed by publicly available methods as described in Section 3.4, including TO-15 method. MDL is mentioned but actual number not reported.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in ambient air.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected in Louisville, Kentucky.
	Metric 5:	Currency	Medium	Samples collected in 2006.
	Metric 6:	Spatial and Temporal Variability	Medium	3-day study: Samples collected over a week from 3 monitoring locations over 3-hr sampling intervals. 5 sample results total in Appendix B. SEDS lab: Lab reporting sheets of App D are hard to read.
	Metric 7:	Exposure Scenario	High	Samples measuring urban ambient air from the following monitoring locations: firearms training facility, rubber company, and university with a potential to affect the general population.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Raw data provided in appendix, however quality of the PDF makes the headers unreadable. Limited concentration data provided in the text and tables.
	Metric 9:	Quality Assurance	Medium	Discussed QA/QC procedures in Section 3.5 and 5.0. Recoveries are reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	The paper discusses problems/concerns and uncertainties observed during the study and from the results. Variation accounted for different days and locations sampled.
Overall Quality Determination			Medium	

Study Citation:		Bugher, N. A., Xiong, B., Gentles, R. I., Glist, L. D., Siegel, H. G., Johnson, N. P., Clark, C. J., Deziel, N. C., Saiers, J. E., Plata, D. L. (2024). Domestic groundwater wells in Appalachia show evidence of low-dose, complex mixtures of legacy pollutants. Environmental Science: Processes & Impacts 26(12):2250-2263.		
HERO ID:		12795200		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
Metric 1:		Sampling Methodology	High	Wellheads were purged until pH, temperature, dissolved oxygen, and specific conductance readings stabilized and were collected in method-specific containers, as described in other sources including 1) Siegel et al 2022, 2) EPA Method 8015C: Nonhalogenated Organics by Gas Chromatography, 3) EPA Method 3510C: Separatory Funnel Liquid-Liquid Extraction, 1996, and 4) USGS, National Field Manual for the Collection of Water-Quality Data, 2018. While specifics were not provided, widely accepted USGS and EPA protocols were used. Samples were analyzed within two months following collection.
Metric 2:		Analytical Methodology	High	Water sample analysis followed EPA Method 8015C, EPA Method 3510C, and the USGS Field Manual. Quantification of VOC utilized purge and trap extraction (Teledyne Tekmar) paired with GC-FID. Authentic standards were used to confirm compound identities and calibrate the instrument following EPA-method specific requirements. Laboratory and field blanks were used for quality control. The method LOD was provided.
Metric 3:		Biomarker Selection	N/A	Analysis of TSCA chemical in environmental media.
Domain 2: Representativeness				
Metric 4:		Geographic Area	High	Samples collected in Appalachian region of Pennsylvania, Ohio, and West Virginia.
Metric 5:		Currency	High	Samples were collected between 2018 and 2020.
Metric 6:		Spatial and Temporal Variability	High	Samples were collected from 94 sites in Pennsylvania (primarily Bradford, PA), 162 sites in Ohio (primarily Belmont and Monroe Counties), and 56 sites in West Virginia (northeastern region); all areas which contain unconventional oil and gas (UOG) activities. It does not appear that multiple samples were collected from the same well, but multiple wells in the same region were sampled.
Metric 7:		Exposure Scenario	Medium	Domestic groundwater samples were collected in regions of extensive hydraulic fracturing activity, as well as other extractive and industrial technologies, in close proximity to communities reliant on private drinking water sources. The geology, environmental regulation, and legacy pollution of the three states in the study varied. No wells in areas outside of the hydraulic fracturing region were collected.
Domain 3: Accessibility/Clarity				
Metric 8:		Reporting of Results	Medium	Min, Max, Median, Mean, Standard Deviation, and % detection was provided for each state. Raw data points were not provided.
Metric 9:		Quality Assurance	Medium	Field and laboratory blanks were analyzed. VOC detection frequencies were less than 10%. However, field, laboratory, and/or storage recovery results were not reported.
Domain 4: Variability and Uncertainty				
Metric 10:		Variability and Uncertainty	High	Results were characterized with respect to locations of conventional and unconventional wells and superfund sites, and the number of compounds detected. Results were compared to those of national assessments. Measure of variance was provided.
Overall Quality Determination			High	

Study Citation:		Kim, S., Kim, J. A., An, J. Y., Kim, H. J., Kim, S. D., Park, J. C. (2007). TVOC and formaldehyde emission behaviors from flooring materials bonded with environmental-friendly MF/PVAc hybrid resins. Indoor Air 17(5):404-415.		
HERO ID:		1512515		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	High	The paper provided adequate discussion of sampling methodology of engineered flooring bonded with MF/PVAc hybrid resin to determine and compare the effect of PVAc content. There were five different composition blends with MF resin/PVAc content ratios of 0%, 30%, 50%, 70% and 100%, by weight of MF resin. There were three species of fancy veneers, beech, oak, and walnut, were bonded by cold and hot press.
	Metric 2:	Analytical Methodology	High	More than adequate discussion/variety of analytical methods used in the study. Discussion included 20-L chamber, field and laboratory emission cell (FLEC), VOC analyzer and standard formaldehyde emission test (desiccator method).
	Metric 3:	Biomarker Selection	N/A	A biomarker was not used in this study.
Domain 2: Representative				
	Metric 4:	Testing Scenario	Medium	A 20-L chamber was used in this study because it has been standardized in Korea. Testing was not conducted under a broad range of conditions but adequate based on multiple techniques utilized to measure emissions.
	Metric 5:	Sample Size and Variability	Low	There were five different composition blends with MF resin/PVAc content ratios of 0%, 30%, 50%, 70% and 100%, by weight of MF resin, across three fancy veneer types: beech, oak and walnut. No mention of replicate tests.
	Metric 6:	Temporality	Medium	The paper was published in 2007.
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	Medium	Satisfactory discussion of results but mainly for TVOC. Table 8 lists the chemical specifically with the 20 L chamber method, as detected by GC/MS analysis. There were multiple results due to sampling types and techniques, analysis of emissions and emissions rate, graph of emission with SD bars, raw data may be assessed by graph. TVOC was defined as a peak area and under 10 was defined as the limit of detection.
	Metric 8:	Quality Assurance	Medium	Multiple techniques have been covered with varying degree of quality assurance or control. The 20-L chamber has the most quality control measures in place to maintain constant conditions.
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Medium	Adequate discussion about high level of variability of emissions across analytical techniques. The formaldehyde emission results by the 20-L small-chamber and FLEC methods showed a similar tendency.
Overall Quality Determination			Medium	

Study Citation:		Popescu, M., Ghosh, T. K. (1999). Dehumidification and simultaneous removal of selected pollutants from indoor air by a desiccant wheel using a 1M type desiccant. Journal of Solar Energy Engineering 121(1):1-13.		
HERO ID:		5465286		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	High	The authors used new 1M-type dessicant material in a test chamber. The material was not modified from its original condition prior to the first experiment of each run. The material used to spike the indoor air derived from a well-known chemical supply company.
	Metric 2:	Analytical Methodology	Low	The authors used a toxic gas monitor to measure the levels of pollutants in the chamber air. They do not provide descriptions of the equipment or sampling process. The authors did not provide a LOD for the study.
	Metric 3:	Biomarker Selection	N/A	The study did not involve biomarkers.
Domain 2: Representative				
	Metric 4:	Testing Scenario	High	The authors intentionally varied parameters (e.g., air flow rates, temperature, and humidity) by modifying only one parameter at a time.
	Metric 5:	Sample Size and Variability	Medium	Each removal efficiency was the result of 50 wet-dry cycles. The figures show the removal over time with the same dessicant in the chamber. It seems that each unique experiment was run only once.
	Metric 6:	Temporality	Low	The paper is dated 1999, which is more than 15 years prior to the start of the program (2019).
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	Low	The authors reported the calculated removal efficiencies for 1,1,1-Trichloroethane of one run, but did not describe the conditions of the run. They also showed select results over time in graphs. The authors do not provide raw results or the ranges applicable to the averages that they calculated.
	Metric 8:	Quality Assurance	Medium	The authors do not describe any significant quality issues with the samples or the study processes or results. They suggest reasons why vinyl chloride was present in the samples involving 1,1,1-Trichloroethane.
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Medium	The authors suggest reasons why the dessicant did not completely dry between runs. They also suggest that a binder may have blocked some of the pores, thus reducing the ability of the device to remove water and pollutants. The authors did not compare their results with those of other researchers.
Overall Quality Determination			Medium	

Study Citation:		Kim, S., Park, J. C. (2010). Environment-friendly Hwangtoh composite materials using water soluble resin for indoor air quality and human health. Journal of Composite Materials 44(8):905-913.		
HERO ID:		5967010		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	Medium	Adequate description of the samples’ components and materials blending ratio.
	Metric 2:	Analytical Methodology	Low	Some description of the approved analytical methodology utilizing TDS-GC/MS. Gives description for total VOCs but TVOC was defined by conversion of all areas of the peaks between C6 and C16 to concentrations using the toluene response factor. Not chemical-specific, no replicate trials explained, and sample specimens were removed from the 20 L small chamber after 7 days for adequate testing.
	Metric 3:	Biomarker Selection	N/A	A biomarker was not used in this study.
Domain 2: Representative				
	Metric 4:	Testing Scenario	Low	There is a very local geographic region impact of the study.
	Metric 5:	Sample Size and Variability	Low	Four sampling scenarios were used. The total number of replicates for each scenario was not reported.
	Metric 6:	Temporality	Medium	This paper was published in 2010.
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	Low	Table 3 may be the raw data as no replicates described or average calculations reported. Any peak area under ten was defined as the limit of detection, but LODs not reported. Emission factor equation described but the individual inputs were not given for the samples.
	Metric 8:	Quality Assurance	Critically Deficient	There were no replicates described, no blanks reported, and no internal standards for the GC/MS. The gas was sampled according to the regulation from the Ministry of the Environment, Korea but no specific citation given.
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Critically Deficient	No description of variation or comparison across other related studies, or uncertainty was given.
Overall Quality Determination			Uninformative	

Study Citation:		U.S. EPA, U.,S.G.S. and National Water Quality Monitoring Council (2022). 1,1,2-Trichloroethane (1,1,2-TCA) (CAS RN: 79-00-5): WQP Output (NWIS, STEWARDS {\&} STORET), Site data {\&} sample results (physical/chemical metadata).		
HERO ID:		10709393		
Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling methodology information is provided in columns AF to AJ, including the sampling method code and the equipment used. No information was provided on transportation or storage conditions for any sample. Note that for a large portion of the samples the sampling methodology was reported as "UNKNOWN".
	Metric 2:	Analytical Methodology	High	Description of the methods reported in column BQ and detection limit in column BY. A detection limit was not provided for all samples. While there is heterogeneity in the information provided, the confidence rating of high is based on the samples with the most complete data.
Domain 2: Representative				
	Metric 3:	Geographic Area	High	Column X reports the location identifier code. All samples are from the U.S. The station.xlsx file included as part of the HERO reference provides detailed information on the sites sampled. The information of each code can be found at https://waterdata.usgs.gov/nwis/si
	Metric 4:	Temporal	High	Data was collected from 1988 to 2022. The date is reported in column G.
	Metric 5:	Exposure Scenario	Medium	Media are reported in column E and F; location and time are also reported. The station.xlsx file included as part of the HERO reference provides, for some samples, more detailed information on the sites sampled, such as sample depth. There is no information provided on sources of chemicals.
Domain 3: Accessibility/Clarity				
	Metric 6:	Availability of Database and Supporting Documents	High	The database is widely accepted, and a user guide is available which describes all of the data fields.
	Metric 7:	Reporting Results	Medium	The database does not report summary of statistics, only point values. While the data are well organized, since the data originates from numerous different entities (states) and monitoring programs, some data may be difficult to interpret due to the lack of populated data fields or discrepancies between columns.
Domain 4: Variability and Uncertainty				
	Metric 8:	Variability and Uncertainty	Medium	Uncertainty is characterized by the inclusion of data qualifier column AR; however, it was not expected for all rows to have a data qualifier code. Column AS reports the results status identifier that indicates the acceptability of the result with respect to QA/QC criteria.
Overall Quality Determination			High	

Study Citation:		U.S. EPA, (2022). Ambient Monitoring Technology Information Center (AMTIC) - Ambient Monitoring Archive for HAPs.		
HERO ID:		11195094		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling Methodology	High	Widely accepted sampling methodologies, the sampling frequency, duration, and description of sampling collection are reported in columns SAMPLING_FREQUENCY_CODE, DURATION_DESC, and SAMPLE_COLLECTION_DESC.
	Metric 2:	Analytical Methodology	High	Analytical methodology described at the SAMPLE_ANALYSIS_DESC column. A description of all the methods is reported in the compendium: https://www.epa.gov/amtic/compendium-methods-determination-toxic-organic-compounds-ambient-air .
Domain 2: Representative	Metric 3:	Geographic Area	High	Data was collected in the United States. Columns MONITOR_LATITUDE and MONITOR_LONGITUDE report the exact monitoring location.
	Metric 4:	Temporal	High	The database reports data from 1990-2020.
	Metric 5:	Exposure Scenario	High	The exposure scenario is the measurement of key hazardous air pollutants across cities, regions and specific areas of interest.
Domain 3: Accessibility/Clarity	Metric 6:	Availability of Database and Supporting Documents	High	The database is widely accepted, and guidance materials are available which describes all of the data fields.
	Metric 7:	Reporting Results	High	The database is organized, and key information is readily accessible. Raw data is provided in the output file, and a summary of statistics is presented here: https://www.epa.gov/system/files/documents/2022-10/AMA2020_annual.xlsx
Domain 4: Variability and Uncertainty	Metric 8:	Variability and Uncertainty	High	Variability reported in the annual statistics as variance of daily averages and percentiles. Uncertainty reported as data qualifiers.
Overall Quality Determination			High	

Study Citation:		Chung, Y., Shin, D., Park, S., Lim, Y., Choi, Y., Cho, S., Yang, J., Hwang, M., Park, Y., Lee, H. (1997). Risk assessment and management of drinking water pollutants in Korea. Water Science and Technology 36(12):309-323.		
HERO ID:		625736		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Critically Deficient	This study determined risks from pollutants in drinking water in Korea. While the methodology is standard, information is lacking on the monitoring data used to calculate risks, which makes this metric uninformative. For example, the article did not report sample collection techniques or number of samples.
Domain 2: Representative	Metric 2:	Exposure Scenario	Medium	Drinking water is a media of interest, however, the data is older and limited data on the characterization of the water source.
Domain 3: Accessibility/Clarity	Metric 3:	Documentation of References	Low	Did not provide
Domain 4: Variability and Uncertainty	Metric 4:	Variability and Uncertainty	Low	Limited characterization of variability (range). Uncertainties and study limitations were not discussed.
Overall Quality Determination			Uninformative	

Study Citation:		PRC Environmental Management, (1995). Final baseline risk assessment for the Jayhawk Plant in Jayhawk, Kansas, with cover letter dated 02/22/95.		
HERO ID:		666891		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	The assessment uses techniques that are from reliable sources and are generally accepted by the scientific community; however, a discussion of sampling methodology for data previously collected is limited.
Domain 2: Representative	Metric 2:	Exposure Scenario	Medium	Characterization of geographic area with maps provided of site exposure sources, details and modeling of potential exposure, media of interest described, summary statistics and number of samples lacking within most tables, although raw data printouts provided. Data printout tables difficult to read at times.
Domain 3: Accessibility/Clarity	Metric 3:	Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty	Metric 4:	Variability and Uncertainty	Low	Statistical summary measures of variability for concentration data lacking, robust discussion of limitations lacking, however model and exposure data uncertainties discussed.
Overall Quality Determination			Medium	

Study Citation:		Monsanto, (1988). Monsanto Pensacola plant ground water assessment feasibility study on nineteen chemicals with attachments and cover letter dated 02/03/1989.		
HERO ID:		1316231		
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Sampling and analytic methodologies reported as following state of Florida regulations.
Domain 2: Representative	Metric 2:	Exposure Scenario	Medium	Characterization of geographic area with maps provided of site exposure sources, media of interest described, sample sizes not noted, temporal variability limited.
Domain 3: Accessibility/Clarity	Metric 3:	Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty	Metric 4:	Variability and Uncertainty	Low	Statistical summary measures of variability for concentration data lacking for most concentration data reported (some data reports concentration range). Robust discussion of uncertainties and limitations lacking.
Overall Quality Determination			Medium	

Study Citation:		Geraghty & Miller Inc, (1994). Risk assessment for the BFGoodrich chemical division facility, Henry, Illinois with cover letter dated 05/06/94.		
HERO ID:		1333011		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	Other than years and media of sample collection, sampling and analytic methodology not described. However, there is a detailed discussion of sampling assumptions provided.
Domain 2: Representative	Metric 2:	Exposure Scenario	Medium	The exposure activity assessed likely represents the population/scenario/media of interest. Characterization of geographic area with maps provided of site exposure sources, however characterization of population at risk lacking.
Domain 3: Accessibility/Clarity	Metric 3:	Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty	Metric 4:	Variability and Uncertainty	Medium	Statistical summary measures of variability for concentration data for some, but not all reported concentrations in tables. Discussion of uncertainties detailed.
Overall Quality Determination			Medium	

Study Citation:		Radian Corp. (1991). Air toxic hot spots - AB 2588 health risk assessment (volume I {\&} II) (final reports) with attachments and cover letter dated 032991. 910000774:#86-910000774.		
HERO ID:		1356137		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Modeling methodologies of ambient air concentrations from emissions data were presented with equations and model inputs, with assumptions and uncertainties reported and described.
Domain 2: Representative	Metric 2:	Exposure Scenario	Medium	Characterization of the population at risk through census tract, city data was presented, and temporality in risk data was calculated for 70-year lifetime. The range of dates for data used in emissions calculations was unclear.
Domain 3: Accessibility/Clarity	Metric 3:	Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty	Metric 4:	Variability and Uncertainty	Low	The complete assessment provides a discussion of key uncertainties within the risk assessment, however it does not provide a measure of variance for modeled ambient air data results.
Overall Quality Determination			Medium	

Study Citation:	Chemical Manufacturers Association, (1988). Petitioners and exhibits to petitioners memorandums in support of their motion for a remand with attachments and cover letter dated 012389 (Part b).
HERO ID:	1481091

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment methodology is described
Domain 2: Representative	Metric 2: Exposure Scenario	High	The data represent the exposure scenario of interest
Domain 3: Accessibility/Clarity	Metric 3: Documentation of References	Critically Deficient	the reported data is not legible
Domain 4: Variability and Uncertainty	Metric 4: Variability and Uncertainty	Low	No summary of statistics or report of key limitations

Overall Quality Determination	Uninformative
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Study Citation:		Radian Corp, (1995). Initial submission: Baseline risk assessment for the Jayhawk site Galena, Kansas with attachments and cover letter dated 030195.		
HERO ID:		1482017		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The methodology is well described across the document, equations reported inside tables	
Domain 2: Representative	Metric 2: Exposure Scenario	High	Exposure to contaminants from the Jayhawk chemical site	
Domain 3: Accessibility/Clarity	Metric 3: Documentation of References	High	Reported data well documented	
Domain 4: Variability and Uncertainty	Metric 4: Variability and Uncertainty	Medium	Section 2.4.5 reports uncertainty. No statistics of variability reported	
Overall Quality Determination		High		

Study Citation:		Rohm and Haas, (1988). Biological risk assessment for the Redwood City facility {\&} final site investigation report for the Rohm and Haas Redwood City facility with attachments {\&} cover letter dated 092588 (Part a).		
HERO ID:		1745617		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The methodology for the risk assessment is well described. Soil and groundwater monitoring methods in sections 2.1 and 2.2. Air quality methodology in section 6
Domain 2: Representative	Metric 2:	Exposure Scenario	High	Fish and wildlife exposure to selected contaminants in the groundwater beneath the Rohm and Hass facility in Redwood City
Domain 3: Accessibility/Clarity	Metric 3:	Documentation of References	High	Data inputs, references all reported in the study
Domain 4: Variability and Uncertainty	Metric 4:	Variability and Uncertainty	Medium	Variability across matrices not reported in terms of summary of statistics . Limitations reported in the text
Overall Quality Determination			High	

Study Citation:		Envirologic Data, (1992). Assessment of risks from potential exposure to airbourne facility emissions under California AB 2588 for the Rohr Inc Facility Riverside, Calif (vol. 1) (final report) w-letter.		
HERO ID:		4214360		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	A description of contaminant concentration modeling procedures, and the necessity for delineating uncertainties within models was reported, however an actual discussion of assumptions and limitations was lacking.
Domain 2: Representative	Metric 2:	Exposure Scenario	Medium	Characterization of the geographic area with maps was provided for the site exposure sources, and details of the modeling of potential exposure was described. Modeling for the relevant residential populations was presented, however temporality was not directly discussed in detail.
Domain 3: Accessibility/Clarity	Metric 3:	Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty	Metric 4:	Variability and Uncertainty	Low	Statistical summary measures of variability for concentration data were lacking, and a robust discussion of limitations was also lacking.
Overall Quality Determination			Low	

Study Citation:		U.S. EPA, (2015). Technical support document, EPA's 2011 National-scale Air Toxics Assessment, 2011 NATA TSD.		
HERO ID:		5113338		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The methods applied in conducting NATA are consistent with the general risk assessment framework used throughout EPA.
Domain 2: Representative	Metric 2:	Exposure Scenario	Medium	The presented data is for the U.S., representing point, nonpoint, and mobile sources, although the inventory year is 2011.
Domain 3: Accessibility/Clarity	Metric 3:	Documentation of References	High	References were well documented.
Domain 4: Variability and Uncertainty	Metric 4:	Variability and Uncertainty	High	Uncertainty and variability were specifically discussed at length throughout the report. There is a robust discussion of how the NATA assessment should and should not be used.
Overall Quality Determination			High	

Study Citation:		California Office of Environmental Health Hazard Assessment (OEHHA) (2006). Public health goals for chemicals in drinking water: 1,1,2-trichloroethane.		
HERO ID:		5155643		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Medium: The assessment uses technical approaches generally accepted by the scientific community; description of literature search or systematic review procedures lacking.
Domain 2: Representative	Metric 2:	Exposure Scenario	Medium	Medium: Exposure activity assessed likely represents the scenarios of interest with literature search for concentration data from multiple media.
Domain 3: Accessibility/Clarity	Metric 3:	Documentation of References	Medium	Medium: References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty	Metric 4:	Variability and Uncertainty	Low	Low: Study characterization of variability within the estimated daily dose concentration data presented as ranges for some results; discussion of key assumptions, uncertainties in exposure estimations lacking.
Overall Quality Determination			Medium	

Study Citation:		OECD, (2000). SIDS initial assessment profile: 1,1,2-Trichloroethane, CAS No.: 79-00-5.		
HERO ID:		5185306		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The methodology is clear and appropriate. Assumptions and models are documented and described.
Domain 2: Representative	Metric 2:	Exposure Scenario	Medium	The data likely represent a scenario of interest; however, some details to inform the exposure scenario are not provided such as the microclimate.
Domain 3: Accessibility/Clarity	Metric 3:	Documentation of References	Low	Some references for reported data seem to be missing, such as Table 1.
Domain 4: Variability and Uncertainty	Metric 4:	Variability and Uncertainty	Low	The characterization of variability is absent. Key uncertainties and limitations are not discussed.
Overall Quality Determination			Medium	

Study Citation:		Anderson, D., Dicianna, D., Yance, J., Tarnay, A. (1989). Preliminary data summary for the solvent recycling industry.		
HERO ID:		5478191		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Sampling are referenced in other sources for each plant in section 5.3.1. Analytical methods and instrument are reported, including detection limit range. Simple standard dilution model used to calculate effluent concentrations in Section 6, although effluent concentrations don't appear to be reported.
Domain 2: Representative	Metric 2:	Exposure Scenario	Medium	The study measured chemicals in wastewater. However, the study and sampling dates are old (1986 and 1987).
Domain 3: Accessibility/Clarity	Metric 3:	Documentation of References	Low	Document is well referenced, but many references don't appear to be published.
Domain 4: Variability and Uncertainty	Metric 4:	Variability and Uncertainty	Medium	Data specifically examined for three facilities. Some discussions of analytical uncertainties provided.
Overall Quality Determination			Medium	

Study Citation:		Schauer, J. J., Fraser, M. P., Cass, G. R., Simoneit, B. R. T. (2002). Source reconciliation of atmospheric gas-phase and particle-phase pollutants during a severe photochemical smog episode. Environmental Science & Technology 36(17):3806-3814.		
HERO ID:		37058		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Mathematical Equations	Medium	Equation is given and can be followed easily. Source not reported.
	Metric 2:	Model Evaluation	High	CMB7 program is from EPA. Comparison of measured and calculated values (Figure 1).
Domain 2: Representative	Metric 3:	Exposure Scenario	Low	Paper published in 2002 (methodology) and data was from 1993. This study only looks at regions in CA. May not be relevant to other regions.
	Metric 4:	Model and Model Documentation Availability	Low	Don't provide input values to verify equation used and results obtained. The EPA CMB7 model is openly available.
Domain 3: Accessibility/Clarity	Metric 5:	Model Inputs and Defaults	Medium	All inputs are described but actual values are not provided. Defaults may be available in supporting literature but not in this paper.
	Metric 6:	Variability and Uncertainty	Low	Variability is limited in this study (ambient air, CA only, only used one set of monitoring concentrations). Very limited discussion on variation and uncertainties.
Overall Quality Determination		Low		

Study Citation:	Monsanto Chemical Company, (1995). Whole effluent and chemical specific evaluation (o-dichlorobenzene) of Monsanto's Antwerp plant aqueous discharge, with cover letter dated 07/10/95.
HERO ID:	2048254

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Mathematical Equations	Critically Deficient	Equations are not provided for the extrapolation between measured concentration and concentration in the receiving stream. Paper only mentions a computerized Lotus spreadsheet was used.
	Metric 2: Model Evaluation	Critically Deficient	It is unknown if the model has undergone evaluation.
Domain 2: Representative	Metric 3: Exposure Scenario	Low	Paper appears to originate in 1995.
	Metric 4: Model and Model Documentation Availability	Low	No model documentation is available.
Domain 3: Accessibility/Clarity	Metric 5: Model Inputs and Defaults	Medium	There is some description on what the inputs were in the estimated concentration of the receiving stream.
	Metric 6: Variability and Uncertainty	Low	There is little discussion on variability and uncertainty.
Domain 4: Variability and Uncertainty			

Overall Quality Determination

Uninformative

Study Citation:		Gallego, E., Roca, F. J., Perales, J. F., Guardino, X., Gadea, E., Garrote, P. (2016). Impact of formaldehyde and VOCs from waste treatment plants upon the ambient air nearby an urban area (Spain). Science of the Total Environment 568:369-380.		
HERO ID:		3449325		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Mathematical Equations	Critically Deficient	The model equation is not given and only two out of three possible inputs are directly given. The output values cannot be reproduced.
	Metric 2:	Model Evaluation	Medium	Although it is unknown if the model has undergone evaluation, the equation combines emissions flow with measured concentrations per the notes of the table.QC: The paper states that the accuracy of TAPM was checked for two US tracer experiments, for several annual US dispersion datasets and dispersion throughout Australia, though other studies are cited little context or detail is given regarding this evaluation/validation.
Domain 2: Representative	Metric 3:	Exposure Scenario	Medium	This reference was published in 2016, but the treatment plants used in the inputs have been running for over 16 years. The treatment plants are also in Spain.QC: Sampling conducted between 2014 and 2015 in Barcelona, Spain, thus the medium metric score.
	Metric 4:	Model and Model Documentation Availability	High	The model equation is not given in the paper or cited.QC: The version used is not given, though documentation on The Air Pollution Model v3 is publicly available on CSIROs website. Little documentation or detail provided within the paper itself, though additional may be available in the cited sources.
Domain 3: Accessibility/Clarity	Metric 5:	Model Inputs and Defaults	Low	Two inputs are provided and measured in the paper. The emission flow is not fully described and chimney exhaust is only briefly mentioned.QC: Model inputs and defaults used in TAPM are not presented in detail, thus the concerns regarding reproducibility.
	Metric 6:	Variability and Uncertainty	Medium	There is limited discussion of variability and uncertainty related to emission factors, but both the average measured concentration and the standard deviation were used in the calculation

Overall Quality Determination**Uninformative**

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