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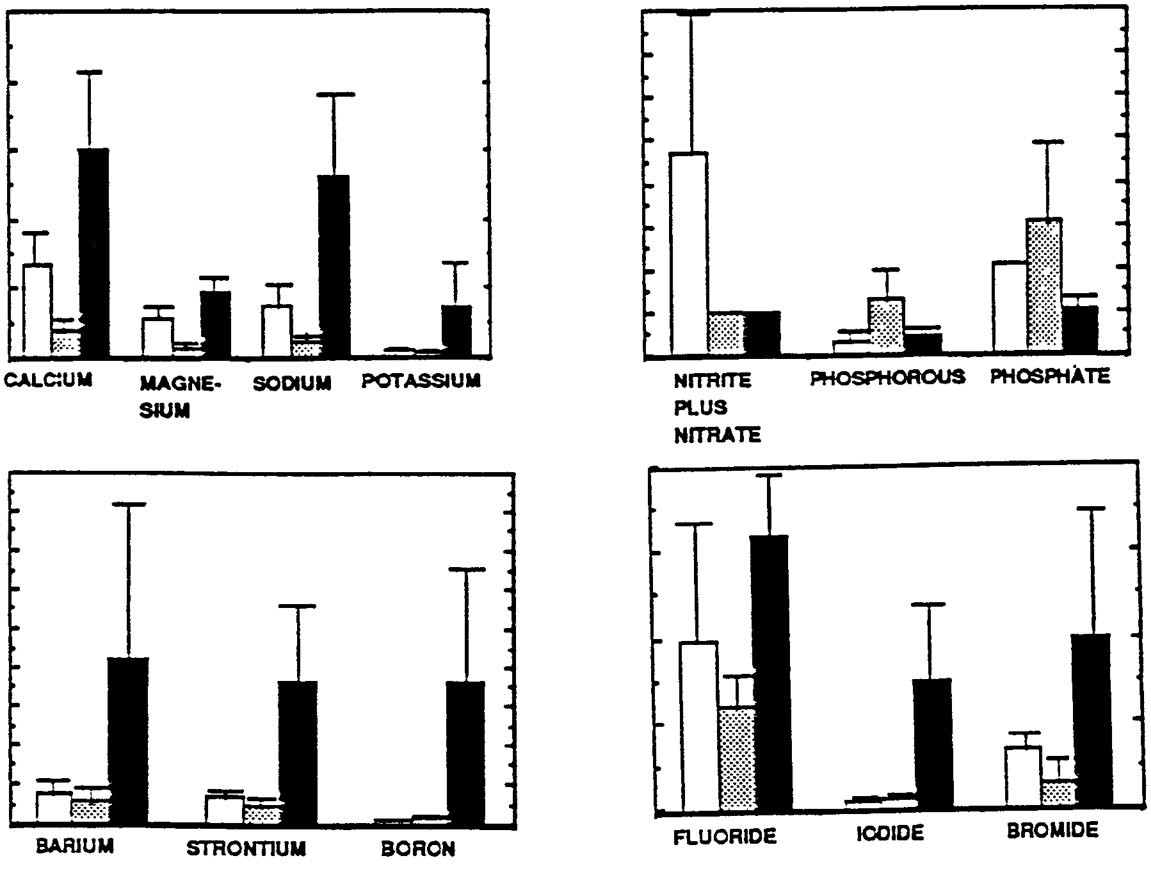
Water-Resources Investigations Report 91-4173

# HYDROGEOLOGY, GROUND-WATER QUALITY, AND POTENTIAL FOR WATER-SUPPLY CONTAMINATION NEAR THE SHELBY COUNTY LANDFILL IN MEMPHIS, TENNESSEE

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samples showing maximum barium and strontium concentrations, even in the absence of the confining unit.

Boron concentrations in all samples from Memphis aquifer wells range from less than 10 to 80 $\mu g/L$ (table 6), which is approximately an order of magnitude lower than concentrations found in the overlying alluvial aquifer. Cadmium concentrations are all 1.0 $\mu g/L$ or lower in samples from the Memphis aquifer (table 6), indicating that cadmium contamination in the overlying alluvial aquifer has not reached the Memphis aquifer.

## Synthetic Organic Compounds

Concentrations of synthetic organic compounds were detected in samples from wells screened in the alluvial aquifer or upper part of the confining unit (table 7) and in samples from wells screened in the Memphis aquifer (table 8). Twenty-two synthetic organic compounds were measured in samples from 14 wells screened in the alluvial aquifer or upper part of the confining unit (table 9), and 18 synthetic organic compounds were measured or detected in samples from 8 wells screened in the Memphis aquifer (table 10). Sixteen of the same compounds detected in the alluvial aquifer or upper part of the confining unit were detected in the Memphis aquifer. All of these compounds are volatile organic compounds except for bis(2-ethylhexyl)phthalate, which is a base-neutral extractable compound detected in two samples from wells in the Memphis aquifer. Samples from some wells indicate that a compound was measured in the first or second sample, but not in both samples (tables 9 and 10). The measurement limit for the gas-chromatography/mass spectrometry method used for analysis of the volatile organic compounds was 0.20 or 0.2 $\mu g/L$; that for the base-neutral and acid extractable organic compounds varied among compounds from less than 5 to 30 $\mu g/L$.

Interpretation of the data for synthetic organic compounds was conducted in a different manner than interpretation of the data for the major and trace inorganic constituents and nutrients. Synthetic organic compounds are not distributed widely in either the alluvial aquifer or upper part of the confining unit, or the Memphis aquifer. Consequently, it is not possible to clearly characterize upgradient, downgradient, or leachate plume wells using synthetic organic compounds, because samples from the majority of wells show concentrations below the detection level. Instead, the degree of contamination by synthetic organic compounds near the Shelby County landfill is interpreted by using sums of synthetic organic compounds at specific wells. The distribution of these synthetic organic compounds is considered in the context of trends observed in major and trace inorganic constituents and nutrients data.

Data for volatile organic compounds are tabulated (tables 9 and 10), and their distributions are plotted (fig. 13 and 14). For these illustrations, the volatile organic compound data have been grouped into three sets based on similar chemical structure: (1) substituted ring compounds, consisting of benzene molecules with chlorine, methyl or ethyl groups; (2) halogenated alkanes, consisting of simple chain hydrocarbon molecules substituted with chlorine or fluorine; and (3) halogenated alkenes, consisting of more complex, double-bonded hydrocarbon chains substituted with chlorine or ether groups.

Relatively high concentrations of volatile organic compounds were detected in samples from the alluvial aquifer or upper part of the confining unit collected from wells 20, 26, 27, 31, 37, 38, 39, and 40 on the north margin or north of the landfill (fig. 13). These wells are downgradient in the direction of ground-water flow from the landfill northward toward the center of the depression in the water table (fig. 5).

Substituted ring compounds [specifically benzene, chlorobenzene, and dichlorobenzenes (1,2-dichlorobenzene plus 1,4-dichlorobenzene)] were detected in high concentrations in samples from downgradient wells 26, 27, 31, 38, 39, and 40 screened in the alluvial aquifer or upper part of the confining unit (fig. 13). One analysis from well 38 showed a benzene concentration (5.8 $\mu g/L$, table 9) that exceeds the Federal and State MCL of 5.0 $\mu g/L$ (Tennessee Department of Health and Environment, 1988; U.S. Environmental Protection Agency, 1986). Analyses of samples from wells 26 and 27 showed the highest sums of substituted ring compound concentrations, both exceeding 8.0 $\mu g/L$ (fig. 13). Substituted ring compounds are used commonly as industrial solvents (Smith and others, 1988).

Halogenated alkanes were detected in highest concentrations in samples from alluvial aquifer or upper part of the confining unit wells 20, 27, 31, 38, 39, and 40 (fig. 13). Fluorine-substituted alkane (trichlorofluoromethane and dichlorodifluoromethane) concentrations were particularly high in samples from wells 20 and 27 (table 9). These two compounds are used as refrigerants, or propellants in aerosol sprays (Smith and others, 1988). Considering other halogenated alkane compounds, maximum concentrations of 1,2-dichloropropane (14 $\mu g/L$ and 6.4 $\mu g/L$, table 9) were detected in samples from well 31. Analyses of samples from wells 31 and 39 also showed maximum concentrations of dichloroethanes (1,1-dichloroethane plus 1,2-dichloroethane, table 9, fig. 13). However, no concentration of any halogenated alkane exceeded Federal or State MCLs (table 9). Dichloromethane is used commonly as an industrial solvent (Smith and others, 1988).

Table 7.--*Concentrations of synthetic organic compounds in samples from wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill*

[Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | DICHLORO-BROMO-METHANE, TOTAL (UG/L) | CARBON TETRACHLORIDE, TOTAL (UG/L) | 1,2-DICHLORO ETHANE, TOTAL (UG/L) | BROMOFORM, TOTAL (UG/L) | CHLORO-DIBROMO-METHANE, TOTAL (UG/L) | CHLOROFORM, TOTAL (UG/L) | TOLUENE, TOTAL (UG/L) | BENZENE, TOTAL (UG/L) | ACENAPHTH-YLENE, TOTAL (UG/L) | ACENAPHTH-ENE, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | Sh:Q-096 | 10-14-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 4A | Sh:Q-098 | 10-16-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 07 | Sh:Q-101 | 10-26-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 07-10-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.60 | < 0.20 | -- | -- |
| 8A | Sh:Q-102 | 10-15-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 19 | Sh:Q-112 | 10-17-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 20 | Sh:Q-113 | 10-20-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.20 | -- | -- |
| | | 07-06-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.40 | -- | -- |
| 26 | Sh:Q-119 | 10-20-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.20 | 4.0 | < 5.0 | < 5.0 |
| | | 07-13-90 | < 0.20 | < 0.20 | < 0.40 | < 0.20 | < 0.20 | < 0.20 | 0.80 | 4.6 | < 5.0 | < 5.0 |
| 27 | Sh:Q-120 | 10-11-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.20 | 1.5 | < 5.0 | < 5.0 |
| | | 07-02-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.20 | 1.5 | < 5.0 | < 5.0 |
| 30 | Sh:Q-128 | 10-27-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.20 | < 0.20 | < 5.0 | < 5.0 |
| | | 06-26-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.20 | 0.30 | < 0.20 | < 5.0 | < 5.0 |
| 31 | Sh:Q-129 | 10-30-89 | < 0.20 | < 0.20 | 0.90 | < 0.20 | < 0.20 | 0.20 | 0.30 | 0.70 | < 5.0 | < 5.0 |
| | | 06-25-90 | < 0.20 | < 0.20 | 0.70 | < 0.20 | < 0.20 | < 0.20 | 0.80 | 0.40 | < 5.0 | < 5.0 |
| 32 | Sh:Q-132 | 10-12-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 33 | Sh:Q-133 | 10-13-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 06-27-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 34 | Sh:Q-134 | 10-13-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 06-28-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 35 | Sh:Q-135 | 10-15-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 36 | Sh:Q-136 | 10-19-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 37 | Sh:Q-137 | 10-30-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 |
| | | 07-13-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.30 | < 5.0 | < 5.0 |
| 38 | Sh:Q-138 | 10-19-89 | < 0.20 | < 0.20 | 0.90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 5.8 | < 5.0 | < 5.0 |
| | | 07-03-90 | < 0.20 | < 0.20 | 0.80 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 2.4 | < 5.0 | < 5.0 |
| 39 | Sh:Q-139 | 10-11-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 1.1 | -- | -- |
| | | 07-11-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.40 | 1.8 | -- | -- |
| 40 | Sh:Q-140 | 10-19-89 | < 0.20 | < 0.20 | 0.80 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 1.9 | < 5.0 | < 5.0 |
| | | 07-11-90 | < 0.20 | < 0.20 | 0.70 | < 0.20 | < 0.20 | < 0.20 | 1.6 | 2.3 | < 5.0 | < 5.0 |
| 41 | Sh:Q-141 | 10-10-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 42 | Sh:Q-142 | 10-14-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.20 | 0.60 | -- | -- |
| | | 06-29-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.70 | -- | -- |
| 43 | Sh:Q-143 | 10-12-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 1.5 | -- | -- |
| | | 07-05-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.90 | -- | -- |

Table 7.--*Concentrations of synthetic organic compounds in samples from wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill*--Continued

[Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | ANTHRACENE, TOTAL (UG/L) | BENZO-B-FLUORANTHENE TOTAL (UG/L) | BENZO-K-FLUORANTHENE TOTAL (UG/L) | BENZO-A-PYRENE, TOTAL (UG/L) | BIS-2-CHLORO-ETHYL ETHER, TOTAL (UG/L) | BIS-(2-CHLORO-ETHOXY) METHANE, TOTAL (UG/L) | BIS-(2-CHLORO-ISOPROPYL) ETHER, TOTAL (UG/L) | N-BUTYL BENZYL PHTHALATE, TOTAL (UG/L) | CHLORO-BENZENE, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | Sh:Q-096 | 10-14-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| 4A | Sh:Q-098 | 10-16-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| 07 | Sh:Q-101 | 10-26-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| | | 07-10-90 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| 8A | Sh:Q-102 | 10-15-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| 19 | Sh:Q-112 | 10-17-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| 20 | Sh:Q-113 | 10-20-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| | | 07-06-90 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| 26 | Sh:Q-119 | 10-20-89 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | 1.2 |
| | | 07-13-90 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | 1.5 |
| 27 | Sh:Q-120 | 10-11-89 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | 5.5 |
| | | 07-02-90 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | 4.7 |
| 30 | Sh:Q-128 | 10-27-89 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 0.20 |
| | | 06-26-90 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 0.20 |
| 31 | Sh:Q-129 | 10-30-89 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | 0.50 |
| | | 06-25-90 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | 0.40 |
| 32 | Sh:Q-132 | 10-12-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| 33 | Sh:Q-133 | 10-13-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| | | 06-27-90 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| 34 | Sh:Q-134 | 10-13-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| | | 06-28-90 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| 35 | Sh:Q-135 | 10-15-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| 36 | Sh:Q-136 | 10-19-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| 37 | Sh:Q-137 | 10-30-89 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 0.20 |
| | | 07-13-90 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 0.20 |
| 38 | Sh:Q-138 | 10-19-89 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | 0.30 |
| | | 07-03-90 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 0.20 |
| 39 | Sh:Q-139 | 10-11-89 | -- | -- | -- | -- | -- | -- | -- | -- | 0.80 |
| | | 07-11-90 | -- | -- | -- | -- | -- | -- | -- | -- | 1.1 |
| 40 | Sh:Q-140 | 10-19-89 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | 1.6 |
| | | 07-11-90 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | 1.0 |
| 41 | Sh:Q-141 | 10-10-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 |
| 42 | Sh:Q-142 | 10-14-89 | -- | -- | -- | -- | -- | -- | -- | -- | 0.90 |
| | | 06-29-90 | -- | -- | -- | -- | -- | -- | -- | -- | 1.5 |
| 43 | Sh:Q-143 | 10-12-89 | -- | -- | -- | -- | -- | -- | -- | -- | 0.30 |
| | | 07-05-90 | -- | -- | -- | -- | -- | -- | -- | -- | 0.20 |

Table 7.--*Concentrations of synthetic organic compounds in samples from wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill*--Continued

[Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | CHLORO-ETHANE, TOTAL | CHRYSENE, TOTAL (UG/L) | DIETHYL PHTHALATE, TOTAL (UG/L) | DIMETHYL PHTHALATE, TOTAL (UG/L) | ETHYL BENZENE, TOTAL (UG/L) | FLUORANTHENE TOTAL (UG/L) | FLUORENE, TOTAL (UG/L) | HEXACHLORO-CYCLOPENTA-DIENE, TOTAL (UG/L) | HEXACHLORO-ETHANE, TOTAL (UG/L) | INDENO(1,2,3-CD) PYRENE, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | Sh:Q-096 | 10-14-89 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| 4A | Sh:Q-098 | 10-16-89 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| 07 | Sh:Q-101 | 10-26-89 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| | | 07-10-90 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| 8A | Sh:Q-102 | 10-15-89 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| 19 | Sh:Q-112 | 10-17-89 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| 20 | Sh:Q-113 | 10-20-89 | < 0.30 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| | | 07-06-90 | 0.60 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | < 10.0 |
| 26 | Sh:Q-119 | 10-20-89 | < 0.20 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 |
| | | 07-13-90 | < 0.20 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 |
| 27 | Sh:Q-120 | 10-11-89 | < 0.20 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 |
| | | 07-02-90 | < 0.20 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 |
| 30 | Sh:Q-128 | 10-27-89 | < 0.20 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 |
| | | 06-26-90 | < 0.20 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 |
| 31 | Sh:Q-129 | 10-30-89 | 0.60 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 |
| | | 06-25-90 | 0.20 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | -- |
| 32 | Sh:Q-132 | 10-12-89 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| 33 | Sh:Q-133 | 10-13-89 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| | | 06-27-90 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| 34 | Sh:Q-134 | 10-13-89 | < 0.20 | -- | -- | -- | 0.20 | -- | -- | -- | -- | -- |
| | | 06-28-90 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| 35 | Sh:Q-135 | 10-15-89 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| 36 | Sh:Q-136 | 10-19-89 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | < 10.0 |
| 37 | Sh:Q-137 | 10-30-89 | 0.30 | < 10.0 | < 5.0 | < 5.0 | 0.40 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 |
| | | 07-13-90 | < 0.20 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 |
| 38 | Sh:Q-138 | 10-19-89 | 0.50 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 |
| | | 07-03-90 | < 0.20 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | -- |
| 39 | Sh:Q-139 | 10-11-89 | 1.6 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| | | 07-11-90 | 2.8 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | < 10.0 |
| 40 | Sh:Q-140 | 10-19-89 | 0.80 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 |
| | | 07-11-90 | < 0.20 | < 10.0 | < 5.0 | < 5.0 | 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | -- |
| 41 | Sh:Q-141 | 10-10-89 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| 42 | Sh:Q-142 | 10-14-89 | < 0.20 | -- | -- | -- | 1.0 | -- | -- | -- | -- | -- |
| | | 06-29-90 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| 43 | Sh:Q-143 | 10-12-89 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- |
| | | 07-05-90 | < 0.20 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | |

Table 7.--*Concentrations of synthetic organic compounds in samples from wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill*--Continued

[Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PROJECT AND MAP | USGS LOCAL FOR TENNESSEE | DATE | ISOPHORONE, TOTAL (UG/L) | METHYL BROMIDE, TOTAL (UG/L) | METHYL CHLORIDE, TOTAL (UG/L) | METHYLENE CHLORIDE, TOTAL (UG/L) | N-NITRO-SODI-N-PROPYLAMINE, TOTAL (UG/L) | N-NITRO-SODI-PHENYLAMINE, TOTAL (UG/L) | N-NITRO-SODI-METHYLAMINE, TOTAL (UG/L) | NITROBENZENE, TOTAL (UG/L) | PARA-CHLORO-META-CRESOL, TOTAL (UG/L) | PHENANTHRENE, TOTAL (UG/L) |
| 02 | Sh:Q-096 | 10-14-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 4A | Sh:Q-098 | 10-16-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 07 | Sh:Q-101 | 10-26-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| | | 07-10-90 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 8A | Sh:Q-102 | 10-15-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 19 | Sh:Q-112 | 10-17-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 20 | Sh:Q-113 | 10-20-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| | | 07-06-90 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 26 | Sh:Q-119 | 10-20-89 | < 5.0 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| | | 07-13-90 | < 5.0 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| 27 | Sh:Q-120 | 10-11-89 | < 5.0 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| | | 07-02-90 | < 5.0 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| 30 | Sh:Q-128 | 10-27-89 | < 5.0 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| | | 06-26-90 | < 5.0 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| 31 | Sh:Q-129 | 10-30-89 | < 5.0 | < 0.20 | < 0.20 | 0.60 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| | | 06-25-90 | < 5.0 | < 0.20 | < 0.20 | 0.60 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| 32 | Sh:Q-132 | 10-12-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 33 | Sh:Q-133 | 10-13-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| | | 06-27-90 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 34 | Sh:Q-134 | 10-13-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| | | 06-28-90 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 35 | Sh:Q-135 | 10-15-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 36 | Sh:Q-136 | 10-19-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 37 | Sh:Q-137 | 10-30-89 | < 5.0 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| | | 07-13-90 | < 5.0 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| 38 | Sh:Q-138 | 10-19-89 | < 5.0 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| | | 07-03-90 | < 5.0 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| 39 | Sh:Q-139 | 10-11-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| | | 07-11-90 | -- | < 0.20 | < 0.20 | 0.30 | -- | -- | -- | -- | -- | -- |
| 40 | Sh:Q-140 | 10-19-89 | < 5.0 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| | | 07-11-90 | < 5.0 | < 0.20 | < 0.20 | 0.30 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 |
| 41 | Sh:Q-141 | 10-10-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 42 | Sh:Q-142 | 10-14-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| | | 06-29-90 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| 43 | Sh:Q-143 | 10-12-89 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |
| | | 07-05-90 | -- | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- |

Table 7.--*Concentrations of synthetic organic compounds in samples from wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill*--Continued

[Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS PROJECT AND MAP | WELL NUMBERS USGS LOCAL FOR TENNESSEE | DATE | PYRENE, TOTAL (UG/L) | TETRACHLORO-ETHYLENE, TOTAL (UG/L) | TRICHLORO-FLUORO-METHANE TOTAL (UG/L) | 1,1-DICHLORO-ETHANE, TOTAL (UG/L) | 1,1-DICHLORO-ETHYLENE, TOTAL (UG/L) | 1,1,1-TRI-CHLORO-ETHANE, TOTAL (UG/L) | 1,1,2-TRI-CHLORO-ETHANE, TOTAL (UG/L) | 1,1,2,2-TETRACHLORO-ETHANE, TOTAL (UG/L) | BENZO-G,H,I-PERYLENE1,12-BENZOPERYLENE, TOTAL (UG/L) | BENZ-A-ANTH-RACENE 1,2-BENZANTHRACENE, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | Sh:Q-096 | 10-14-89 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 4A | Sh:Q-098 | 10-16-89 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 07 | Sh:Q-101 | 10-26-89 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 07-10-90 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 8A | Sh:Q-102 | 10-15-89 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 19 | Sh:Q-112 | 10-17-89 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 20 | Sh:Q-113 | 10-20-89 | -- | 1.0 | 2.7 | < 0.20 | 1.0 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 07-06-90 | -- | 0.90 | 0.80 | 0.90 | 0.20 | 0.60 | < 0.20 | < 0.20 | -- | -- |
| 26 | Sh:Q-119 | 10-20-89 | < 5.0 | < 0.20 | < 0.20 | 0.80 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 5.0 |
| | | 07-13-90 | < 5.0 | < 0.20 | < 0.20 | 0.90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 10.0 |
| 27 | Sh:Q-120 | 10-11-89 | < 5.0 | < 0.20 | < 0.20 | 0.40 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 5.0 |
| | | 07-02-90 | < 5.0 | < 0.20 | < 0.20 | 0.30 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 10.0 |
| 30 | Sh:Q-128 | 10-27-89 | < 5.0 | 0.20 | 0.60 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 5.0 |
| | | 06-26-90 | < 5.0 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 10.0 |
| 31 | Sh:Q-129 | 10-30-89 | < 5.0 | 1.1 | < 0.20 | 5.9 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 5.0 |
| | | 06-25-90 | < 5.0 | 0.30 | < 0.20 | 2.6 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 10.0 |
| 32 | Sh:Q-132 | 10-12-89 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 33 | Sh:Q-133 | 10-13-89 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 06-27-90 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 34 | Sh:Q-134 | 10-13-89 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 06-28-90 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 35 | Sh:Q-135 | 10-15-89 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 36 | Sh:Q-136 | 10-19-89 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 37 | Sh:Q-137 | 10-30-89 | < 5.0 | < 0.20 | < 0.20 | 1.4 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 5.0 |
| | | 07-13-90 | < 5.0 | < 0.20 | < 0.20 | 0.90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 10.0 |
| 38 | Sh:Q-138 | 10-19-89 | < 5.0 | < 0.20 | < 0.20 | 4.0 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 5.0 |
| | | 07-03-90 | < 5.0 | < 0.20 | < 0.20 | 4.5 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 10.0 |
| 39 | Sh:Q-139 | 10-11-89 | -- | 1.0 | < 0.20 | 5.9 | 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 07-11-90 | -- | 1.2 | < 0.20 | 11.0 | 0.30 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 40 | Sh:Q-140 | 10-19-89 | < 5.0 | < 0.20 | < 0.20 | 3.7 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 5.0 |
| | | 07-11-90 | < 5.0 | < 0.20 | < 0.20 | 4.3 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 10.0 |
| 41 | Sh:Q-141 | 10-10-89 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 42 | Sh:Q-142 | 10-14-89 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 06-29-90 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| 43 | Sh:Q-143 | 10-12-89 | -- | 0.30 | < 0.20 | 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 07-05-90 | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |

Table 7.--*Concentrations of synthetic organic compounds in samples from wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill*--Continued

[Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | 1,2,-DICHLORO-BENZENE, TOTAL (UG/L) | 1,2-DICHLORO-PROPANE, TOTAL (UG/L) | 1,2-TRANS-DICHLORO ETHENE, TOTAL (UG/L) | 1,2,4-TRI-CHLORO-BENZENE, TOTAL (UG/L) | 1,2,5,6-DIBENZ-ANTHRACENE, TOTAL (UG/L) | 1,3-DICHLORO-PROPENE, TOTAL (UG/L) | 1,3-DICHLORO-BENZENE, TOTAL (UG/L) | 1,4-DICHLORO-BENZENE, TOTAL (UG/L) | 2-CHLORO-ETHYLVINYL ETHER, TOTAL (UG/L) | 2-CHLORO-NAPHTHALENE, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | Sh:Q-096 | 10-14-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| 4A | Sh:Q-098 | 10-16-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| 07 | Sh:Q-101 | 10-26-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | 0.30 | < 0.20 | -- |
| | | 07-10-90 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| 8A | Sh:Q-102 | 10-15-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| 19 | Sh:Q-112 | 10-17-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| 20 | Sh:Q-113 | 10-20-89 | < 0.20 | < 0.20 | 0.70 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| | | 07-06-90 | < 0.20 | < 0.20 | 1.3 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| 26 | Sh:Q-119 | 10-20-89 | < 0.20 | 0.30 | < 0.20 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | 0.90 | < 0.20 | < 5.0 |
| | | 07-13-90 | < 0.20 | 0.40 | < 0.20 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | 1.5 | < 0.20 | < 5.0 |
| 27 | Sh:Q-120 | 10-11-89 | 0.20 | < 0.20 | 0.50 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | 1.7 | < 0.20 | < 5.0 |
| | | 07-02-90 | < 0.20 | < 0.20 | 0.50 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | 1.8 | < 0.20 | < 5.0 |
| 30 | Sh:Q-128 | 10-27-89 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | < 2.0 | 2.3 | < 5.0 |
| | | 06-26-90 | < 0.20 | 0.20 | 0.30 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | 0.40 | < 0.20 | < 5.0 |
| 31 | Sh:Q-129 | 10-30-89 | < 0.20 | 14 | 30 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | 1.3 | < 0.20 | < 5.0 |
| | | 06-25-90 | < 0.20 | 6.4 | 13 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | 0.90 | < 0.20 | < 5.0 |
| 32 | Sh:Q-132 | 10-12-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| 33 | Sh:Q-133 | 10-13-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| | | 06-27-90 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| 34 | Sh:Q-134 | 10-13-89 | < 0.20 | < 0.20 | 1.3 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| | | 06-28-90 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| 35 | Sh:Q-135 | 10-15-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| 36 | Sh:Q-136 | 10-19-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| 37 | Sh:Q-137 | 10-30-89 | < 0.20 | 0.30 | 1.5 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | < 0.20 | < 0.20 | < 5.0 |
| | | 07-13-90 | < 0.20 | < 0.20 | 0.30 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | < 0.20 | < 0.20 | < 5.0 |
| 38 | Sh:Q-138 | 10-19-89 | < 0.20 | < 0.20 | 0.30 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | 0.80 | < 0.20 | < 5.0 |
| | | 07-03-90 | < 0.20 | 1.0 | 3.2 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | 0.90 | < 0.20 | < 5.0 |
| 39 | Sh:Q-139 | 10-11-89 | 1.2 | < 0.20 | 8.0 | -- | -- | < 0.20 | < 0.20 | 0.20 | < 0.20 | -- |
| | | 07-11-90 | < 0.20 | 0.70 | 18 | -- | -- | < 0.20 | < 0.20 | 0.40 | < 0.20 | -- |
| 40 | Sh:Q-140 | 10-19-89 | < 0.20 | 0.30 | 6.9 | < 5.0 | < 10.0 | < 0.20 | < 5.0 | 0.80 | < 0.20 | < 5.0 |
| | | 07-11-90 | < 0.20 | 0.50 | 6.3 | < 5.0 | < 10.0 | < 0.20 | < 0.20 | 0.80 | < 0.20 | < 5.0 |
| 41 | Sh:Q-141 | 10-10-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| 42 | Sh:Q-142 | 10-14-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | 0.60 | < 0.20 | -- |
| | | 06-29-90 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | 0.90 | < 0.20 | -- |
| 43 | Sh:Q-143 | 10-12-89 | < 0.20 | < 0.20 | 2.4 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |
| | | 07-05-90 | < 0.20 | < 0.20 | 1.3 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- |

Table 7.--*Concentrations of synthetic organic compounds in samples from wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill*--Continued

[Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | 2-CHLORO-PHENOL, TOTAL (UG/L) | 2-NITRO-PHENOL, TOTAL (UG/L) | DI-N-OCTYL-PHTHALATE, TOTAL (UG/L) | 2,4-DICHLORO-PHENOL, TOTAL (UG/L) | 2,4-DIMETHYL-PHENOL, TOTAL (UG/L) | 2,4-DINITRO-TOLUENE, TOTAL (UG/L) | 2,4-DINITRO-PHENOL, TOTAL (UG/L) | 2,4,6-TRI-CHLOROPHENOL, TOTAL (UG/L) | 2,6-DINITRO-TOLUENE, TOTAL (UG/L) | 4-BROMO-PHENYL, PHENYLETHER, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | Sh:Q-096 | 10-14-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4A | Sh:Q-098 | 10-16-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 07 | Sh:Q-101 | 10-26-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 07-10-90 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8A | Sh:Q-102 | 10-15-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 19 | Sh:Q-112 | 10-17-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 20 | Sh:Q-113 | 10-20-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 07-06-90 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 26 | Sh:Q-119 | 10-20-89 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| | | 07-13-90 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| 27 | Sh:Q-120 | 10-11-89 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| | | 07-02-90 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| 30 | Sh:Q-128 | 10-27-89 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| | | 06-26-90 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| 31 | Sh:Q-129 | 10-30-89 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| | | 06-25-90 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| 32 | Sh:Q-132 | 10-12-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 33 | Sh:Q-133 | 10-13-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 06-27-90 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 34 | Sh:Q-134 | 10-13-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 06-28-90 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 35 | Sh:Q-135 | 10-15-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 36 | Sh:Q-136 | 10-19-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 37 | Sh:Q-137 | 10-30-89 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| | | 07-13-90 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| 38 | Sh:Q-138 | 10-19-89 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| | | 07-03-90 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| 39 | Sh:Q-139 | 10-11-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 07-11-90 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 40 | Sh:Q-140 | 10-19-89 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| | | 07-11-90 | < 5.0 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 |
| 41 | Sh:Q-141 | 10-10-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 42 | Sh:Q-142 | 10-14-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 06-29-90 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 43 | Sh:Q-143 | 10-12-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 07-05-90 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

Table 7.--*Concentrations of synthetic organic compounds in samples from wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill*--Continued

[Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | 4-CHLORO-PHENYL, PHENYLETHER, TOTAL (UG/L) | 4-NITRO-PHENOL, TOTAL (UG/L) | 4,6-DINITRO-ORTHO-CRESOL, TOTAL (UG/L) | DICHLORO-DIFLUORO-METHANE, TOTAL (UG/L) | PHENOL (C6 H5 OH) TOTAL (UG/L) | NAPHTHALENE, TOTAL (UG/L) | TRANS-1,3-DICHLORO-PROPENE, TOTAL (UG/L) | CIS-1,3-DICHLORO-PROPENE, TOTAL (UG/L) | PENTACHLORO-PHENOL, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | Sh:Q-096 | 10-14-89 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| 4A | Sh:Q-098 | 10-16-89 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| 07 | Sh:Q-101 | 10-26-89 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| | | 07-10-90 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| 8A | Sh:Q-102 | 10-15-89 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| 19 | Sh:Q-112 | 10-17-89 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| 20 | Sh:Q-113 | 10-20-89 | -- | -- | -- | 11 | -- | -- | < 0.20 | < 0.20 | -- |
| | | 07-06-90 | -- | -- | -- | 8.3 | -- | -- | < 0.20 | < 0.20 | -- |
| 26 | Sh:Q-119 | 10-20-89 | < 5.0 | < 30.0 | < 30.0 | < 0.60 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| | | 07-13-90 | < 5.0 | < 30.0 | < 30.0 | < 0.60 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| 27 | Sh:Q-120 | 10-11-89 | < 5.0 | < 30.0 | < 30.0 | 8.1 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| | | 07-02-90 | < 5.0 | < 30.0 | < 30.0 | 4.6 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| 30 | Sh:Q-128 | 10-27-89 | < 5.0 | < 30.0 | < 30.0 | < 0.20 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| | | 06-26-90 | < 5.0 | < 30.0 | < 30.0 | < 0.20 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| 31 | Sh:Q-129 | 10-30-89 | < 5.0 | < 30.0 | < 30.0 | 1.6 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| | | 06-25-90 | < 5.0 | < 30.0 | < 30.0 | < 0.20 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| 32 | Sh:Q-132 | 10-12-89 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| 33 | Sh:Q-133 | 10-13-89 | -- | -- | -- | 3.4 | -- | -- | < 0.20 | < 0.20 | -- |
| | | 06-27-90 | -- | -- | -- | 1.2 | -- | -- | < 0.20 | < 0.20 | -- |
| 34 | Sh:Q-134 | 10-13-89 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| | | 06-28-90 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| 35 | Sh:Q-135 | 10-15-89 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| 36 | Sh:Q-136 | 10-19-89 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| 37 | Sh:Q-137 | 10-30-89 | < 5.0 | < 30.0 | < 30.0 | < 0.20 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| | | 07-13-90 | < 5.0 | < 30.0 | < 30.0 | < 0.20 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| 38 | Sh:Q-138 | 10-19-89 | < 5.0 | < 30.0 | < 30.0 | 0.90 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| | | 07-03-90 | < 5.0 | < 30.0 | < 30.0 | 1.7 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| 39 | Sh:Q-139 | 10-11-89 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| | | 07-11-90 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| 40 | Sh:Q-140 | 10-19-89 | < 5.0 | < 30.0 | < 30.0 | < 0.20 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| | | 07-11-90 | < 5.0 | < 30.0 | < 30.0 | < 0.20 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 |
| 41 | Sh:Q-141 | 10-10-89 | -- | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- |
| 42 | Sh:Q-142 | 10-14-89 | -- | -- | -- | 1.2 | -- | -- | < 0.20 | < 0.20 | -- |
| | | 06-29-90 | -- | -- | -- | 1.3 | -- | -- | < 0.20 | < 0.20 | -- |
| 43 | Sh:Q-143 | 10-12-89 | -- | -- | -- | 2.3 | -- | -- | < 0.20 | < 0.20 | -- |
| | | 07-05-90 | -- | -- | -- | 1.7 | -- | -- | < 0.20 | < 0.20 | -- |

Table 7.--*Concentrations of synthetic organic compounds in samples from wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill*--Continued

[Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | BIS (2-ETHYL-HEXYL) PHTHALATE, TOTAL (UG/L) | DI-N-BUTYL-PHTHALATE, TOTAL (UG/L) | VINYL CHLORIDE TOTAL (UG/L) | TRICHLORO-ETHYLENE, TOTAL (UG/L) | HEXACHLORO-BENZENE, TOTAL (UG/L) | HEXACHLORO-BUTADIENE, TOTAL (UG/L) | STYRENE, TOTAL (UG/L) | 1,2-DIBROMO-ETHANE WATER WHOLE TOTAL (UG/L) | XYLENE, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 02 | Sh:Q-096 | 10-14-89 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| 4A | Sh:Q-098 | 10-16-89 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| 07 | Sh:Q-101 | 10-26-89 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| | | 07-10-90 | -- | -- | < 0.20 | 0.5 | -- | -- | < 0.20 | < 0.20 | 0.40 |
| 8A | Sh:Q-102 | 10-15-89 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| 19 | Sh:Q-112 | 10-17-89 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| 20 | Sh:Q-113 | 10-20-89 | -- | -- | 4.0 | 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| | | 07-06-90 | -- | -- | 4.8 | 0.4 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| 26 | Sh:Q-119 | 10-20-89 | < 5.0 | < 5.0 | 0.90 | < 0.2 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | 0.50 |
| | | 07-13-90 | < 5.0 | < 5.0 | 1.4 | 0.2 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | 1.0 |
| 27 | Sh:Q-120 | 10-11-89 | < 5.0 | < 5.0 | < 0.20 | < 0.2 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 0.20 |
| | | 07-02-90 | < 5.0 | < 5.0 | 0.40 | 0.2 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | 0.20 |
| 30 | Sh:Q-128 | 10-27-89 | < 5.0 | < 5.0 | < 0.20 | < 0.2 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | 0.20 |
| | | 06-26-90 | < 5.0 | < 5.0 | < 0.20 | < 0.2 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | 0.30 |
| 31 | Sh:Q-129 | 10-30-89 | < 5.0 | < 5.0 | 2.1 | 1.3 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | 0.30 |
| | | 06-25-90 | < 5.0 | < 5.0 | 0.70 | 0.7 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | 0.20 |
| 32 | Sh:Q-132 | 10-12-89 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| 33 | Sh:Q-133 | 10-13-89 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| | | 06-27-90 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| 34 | Sh:Q-134 | 10-13-89 | -- | -- | 0.90 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| | | 06-28-90 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| 35 | Sh:Q-135 | 10-15-89 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| 36 | Sh:Q-136 | 10-19-89 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| 37 | Sh:Q-137 | 10-30-89 | < 5.0 | < 5.0 | 0.30 | < 0.2 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | 0.90 |
| | | 07-13-90 | < 5.0 | < 5.0 | < 0.20 | < 0.2 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 0.20 |
| 38 | Sh:Q-138 | 10-19-89 | < 5.0 | < 5.0 | 2.4 | < 0.2 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 0.20 |
| | | 07-03-90 | < 5.0 | < 5.0 | 7.3 | 0.6 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | 0.20 |
| 39 | Sh:Q-139 | 10-11-89 | -- | -- | 2.6 | 1.0 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| | | 07-11-90 | -- | -- | 3.0 | 1.5 | -- | -- | < 0.20 | < 0.20 | 0.30 |
| 40 | Sh:Q-140 | 10-19-89 | < 5.0 | < 5.0 | 1.8 | 0.9 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 0.20 |
| | | 07-11-90 | < 5.0 | < 5.0 | < 0.20 | 0.8 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | 0.90 |
| 41 | Sh:Q-141 | 10-10-89 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| 42 | Sh:Q-142 | 10-14-89 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | 1.9 |
| | | 06-29-90 | -- | -- | < 0.20 | < 0.2 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| 43 | Sh:Q-143 | 10-12-89 | -- | -- | 1.9 | 0.5 | -- | -- | < 0.20 | < 0.20 | < 0.20 |
| | | 07-05-90 | -- | -- | 1.3 | 0.4 | -- | -- | < 0.20 | < 0.20 | < 0.20 |

Table 8.--*Concentrations of synthetic organic compounds in samples from wells screened in the Memphis aquifer near the Shelby County Landfill*

[UG/L, micrograms per liter; Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | DICHLORO-BROMO-METHANE, TOTAL (UG/L) | CARBON TETRACHLORIDE, TOTAL (UG/L) | 1,2-DICHLORO-ETHANE, TOTAL (UG/L) | BROMOFORM, TOTAL (UG/L) | CHLORO-DIBROMO-METHANE, TOTAL (UG/L) | CHLOROFORM, TOTAL (UG/L) | TOLUENE, TOTAL (UG/L) | BENZENE, TOTAL (UG/L) | ACENAPHTH-YLENE, TOTAL (UG/L) | ACENAPHTH-ENE, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NONE | Sh:Q-088 | 10-29-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.20 | 0.20 | -- | -- |
| | | 07-10-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 2.4 | 1.8 | -- | -- |
| MS-2 | Sh:Q-092 | 10-14-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.70 | < 0.20 | -- | -- |
| | | 07-09-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.30 | < 0.20 | -- | -- |
| MS-4 | Sh:Q-126 | 10-16-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| MS-5 | Sh:Q-144 | 10-15-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.90 | < 0.20 | -- | -- |
| | | 06-29-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.60 | < 0.20 | -- | -- |
| MS-7 | Sh:Q-146 | 10-18-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 07-06-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| MS-9 | Sh:Q-148 | 10-13-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 2.9 | < 0.20 | < 5.0 | < 5.0 |
| | | 06-28-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 |
| MS-10 | Sh:Q-149 | 10-13-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 7.3 | < 0.20 | < 5.0 | < 5.0 |
| | | 06-27-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.30 | < 0.20 | < 5.0 | < 5.0 |
| MS-11 | Sh:Q-150 | 10-11-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 |
| | | 07-02-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.20 | 0.20 | < 5.0 | < 5.0 |
| MS-12 | Sh:Q-151 | 10-27-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.30 | 0.80 | -- | -- |
| | | 06-26-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | 0.30 | 1.3 | -- | -- |

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | ANTHRACENE, TOTAL (UG/L) | BENZO-B-FLUORANTHENE, TOTAL (UG/L) | BENZO-K-FLUORANTHENE, TOTAL (UG/L) | BENZO-A-PYRENE, TOTAL (UG/L) | BIS-2-CHLORO ETHYL ETHER, TOTAL (UG/L) | BIS-(2-CHLORO-ETHOXY) METHANE, TOTAL (UG/L) | BIS-(2-CHLORO-ISOPROPYL) ETHER, TOTAL (UG/L) | N-BUTYL BENZYL PHTHALATE, TOTAL (UG/L) | CHLORO-BENZENE, TOTAL (UG/L) | CHLORO-ETHANE, TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NONE | Sh:Q-088 | 10-29-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 | < 0.20 |
| | | 07-10-90 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 | < 0.20 |
| MS-2 | Sh:Q-092 | 10-14-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 | < 0.20 |
| | | 07-09-90 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 | < 0.20 |
| MS-4 | Sh:Q-126 | 10-16-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 | < 0.20 |
| MS-5 | Sh:Q-144 | 10-15-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 | < 0.20 |
| | | 06-29-90 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 | < 0.20 |
| MS-7 | Sh:Q-146 | 10-18-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 | < 0.20 |
| | | 07-06-90 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 | < 0.20 |
| MS-9 | Sh:Q-148 | 10-13-89 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 0.20 | < 0.20 |
| | | 06-28-90 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 0.20 | < 0.20 |
| MS-10 | Sh:Q-149 | 10-13-89 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 0.20 | < 0.20 |
| | | 06-27-90 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 0.20 | < 0.20 |
| MS-11 | Sh:Q-150 | 10-11-89 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 0.20 | < 0.20 |
| | | 07-02-90 | < 5.0 | < 10.0 | < 10.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 0.20 | < 0.20 |
| MS-12 | Sh:Q-151 | 10-27-89 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 | 0.80 |
| | | 06-26-90 | -- | -- | -- | -- | -- | -- | -- | -- | < 0.20 | 1.3 |

Table 8.--*Concentrations of synthetic organic compounds in samples from wells screened in the Memphis aquifer near the Shelby County Landfill*--Continued

[UG/L, micrograms per liter; Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | CHRYSENE, TOTAL (UG/L) | DIETHYL PHTHALATE, TOTAL (UG/L) | DIMETHYL PHTHALATE, TOTAL (UG/L) | ETHYL BENZENE, TOTAL (UG/L) | FLUOR-ANTHENE, TOTAL (UG/L) | FLUORENE, TOTAL (UG/L) | HEXACHLORO-CYCLOPENTA-DIENE, TOTAL (UG/L) | HEXACHLORO-ETHANE, TOTAL (UG/L) | INDENO (1,2,3-CD) PYRENE, TOTAL (UG/L) | ISOPHORONE, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NONE | Sh:Q-088 | 10-29-89 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- | -- |
| | | 07-10-90 | -- | -- | -- | 0.40 | -- | -- | -- | -- | -- | -- |
| MS-2 | Sh:Q-092 | 10-14-89 | -- | -- | -- | 0.20 | -- | -- | -- | -- | -- | -- |
| | | 07-09-90 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- | -- |
| MS-4 | Sh:Q-126 | 10-16-89 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- | -- |
| MS-5 | Sh:Q-144 | 10-15-89 | -- | -- | -- | 0.20 | -- | -- | -- | -- | -- | -- |
| | | 06-29-90 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- | -- |
| MS-7 | Sh:Q-146 | 10-18-89 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- | -- |
| | | 07-06-90 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- | -- |
| MS-9 | Sh:Q-148 | 10-13-89 | < 10.0 | < 5.0 | < 5.0 | 0.80 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 | < 5.0 |
| | | 06-28-90 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 | < 5.0 |
| MS-10 | Sh:Q-149 | 10-13-89 | < 10.0 | < 5.0 | < 5.0 | 1.7 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 | < 5.0 |
| | | 06-27-90 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 | < 5.0 |
| MS-11 | Sh:Q-150 | 10-11-89 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 | < 5.0 |
| | | 07-02-90 | < 10.0 | < 5.0 | < 5.0 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 10.0 | < 5.0 |
| MS-12 | Sh:Q-151 | 10-27-89 | -- | -- | -- | 0.20 | -- | -- | -- | -- | -- | -- |
| | | 06-26-90 | -- | -- | -- | < 0.20 | -- | -- | -- | -- | -- | -- |

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | METHYL BROMIDE, TOTAL (UG/L) | METHYL CHLORIDE, TOTAL (UG/L) | METHYLENE CHLORIDE, TOTAL (UG/L) | N-NITRO-SODI-N-PROPYLAMINE, TOTAL (UG/L) | N-NITRO-SODI-PHENYLAMINE, TOTAL (UG/L) | N-NITRO-SODI-METHYLAMINE, TOTAL (UG/L) | NITRO-BENZENE, TOTAL (UG/L) | PARA-CHLORO-META-CRESOL, TOTAL (UG/L) | PHEN-ANTHRENE, TOTAL (UG/L) | PYRENE, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NONE | Sh:Q-088 | 10-29-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- | -- |
| | | 07-10-90 | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- | -- |
| MS-2 | Sh:Q-092 | 10-14-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- | -- |
| | | 07-09-90 | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- | -- |
| MS-4 | Sh:Q-126 | 10-16-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- | -- |
| MS-5 | Sh:Q-144 | 10-15-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- | -- |
| | | 06-29-90 | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- | -- |
| MS-7 | Sh:Q-146 | 10-18-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- | -- |
| | | 07-06-90 | < 0.20 | < 0.20 | < 0.30 | -- | -- | -- | -- | -- | -- | -- |
| MS-9 | Sh:Q-148 | 10-13-89 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 | < 5.0 |
| | | 06-28-90 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 | < 5.0 |
| MS-10 | Sh:Q-149 | 10-13-89 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 | < 5.0 |
| | | 06-27-90 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 | < 5.0 |
| MS-11 | Sh:Q-150 | 10-11-89 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 | < 5.0 |
| | | 07-02-90 | < 0.20 | < 0.20 | < 0.40 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 30.0 | < 5.0 | < 5.0 |
| MS-12 | Sh:Q-151 | 10-27-89 | < 0.20 | < 0.20 | < 0.20 | -- | -- | -- | -- | -- | -- | -- |
| | | 06-26-90 | < 0.20 | < 0.20 | 0.30 | -- | -- | -- | -- | -- | -- | -- |

Table 8.--*Concentrations of synthetic organic compounds in samples from wells screened in the Memphis aquifer near the Shelby County Landfill*--Continued

[UG/L, micrograms per liter; Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | TETRACHLORO-ETHYLENE, TOTAL (UG/L) | TRICHLORO-FLUORO-METHANE TOTAL (UG/L) | 1,1-DICHLORO-ETHANE, TOTAL (UG/L) | 1,1-DICHLORO-ETHYLENE, TOTAL (UG/L) | 1,1,1-TRI-CHLORO-ETHANE, TOTAL (UG/L) | 1,1,2-TRI-CHLORO-ETHANE, TOTAL (UG/L) | 1,1,2,2-TETRACHLORO-ETHANE, TOTAL (UG/L) | BENZO-G,H,I-PERYLENE1,12-BENZOPERYLENE, TOTAL (UG/L) | BENZO-A-ANTHRACENE 1,2-BENZ ANTHRACENE, TOTAL (UG/L) | 1,2,-DI-CHLORO-BENZENE, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NONE | Sh:Q-088 | 10-29-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 |
| | | 07-10-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 |
| MS-2 | Sh:Q-092 | 10-14-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 |
| | | 07-09-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 |
| MS-4 | Sh:Q-126 | 10-16-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 |
| MS-5 | Sh:Q-144 | 10-15-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 |
| | | 06-29-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 |
| MS-7 | Sh:Q-146 | 10-18-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 |
| | | 07-06-90 | < 0.20 | < 0.20 | 0.80 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- | < 0.20 |
| MS-9 | Sh:Q-148 | 10-13-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 5.0 | < 0.20 |
| | | 06-28-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 10.0 | < 0.20 |
| MS-10 | Sh:Q-149 | 10-13-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 5.0 | < 0.20 |
| | | 06-27-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 10.0 | < 0.20 |
| MS-11 | Sh:Q-150 | 10-11-89 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 5.0 | < 0.20 |
| | | 07-02-90 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 10.0 | < 10.0 | < 0.20 |
| MS-12 | Sh:Q-151 | 10-27-89 | 1.5 | 12 | 1.5 | < 0.20 | 0.90 | < 0.20 | < 0.20 | -- | -- | < 0.20 |
| | | 06-26-90 | 1.1 | 4.0 | 2.3 | 0.20 | 0.40 | < 0.20 | < 0.20 | -- | -- | < 0.20 |

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | 1,2-DI-CHLORO-PROPANE, TOTAL (UG/L) | 1,2-TRANS-DICHLORO ETHENE, TOTAL (UG/L) | 1,2,4-TRANS-DICHLORO BENZENE, TOTAL (UG/L) | 1,2,5,6-DIBENZ-ANTHRACENE, TOTAL (UG/L) | 1,3-DICHLORO-PROPENE, TOTAL (UG/L) | 1,3-DICHLORO-BENZENE, TOTAL (UG/L) | 1,4-DICHLORO-BENZENE, TOTAL (UG/L) | 2-CHLORO-ETHYLVINYL ETHER, TOTAL (UG/L) | 2-CHLORO-NAPHTHALENE, TOTAL (UG/L) | 2-CHLORO-PHENOL, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NONE | Sh:Q-088 | 10-29-89 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 07-10-90 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| MS-2 | Sh:Q-092 | 10-14-89 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 07-09-90 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| MS-4 | Sh:Q-126 | 10-16-89 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| MS-5 | Sh:Q-144 | 10-15-89 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 06-29-90 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| MS-7 | Sh:Q-146 | 10-18-89 | < 0.20 | < 0.20 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 07-06-90 | < 0.20 | 1.4 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| MS-9 | Sh:Q-148 | 10-13-89 | < 0.20 | < 0.20 | < 5.0 | < 10.0 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 |
| | | 06-28-90 | < 0.20 | < 0.20 | < 5.0 | < 10.0 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 |
| MS-10 | Sh:Q-149 | 10-13-89 | < 0.20 | < 0.20 | < 5.0 | < 10.0 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 |
| | | 06-27-90 | < 0.20 | < 0.20 | < 5.0 | < 10.0 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 |
| MS-11 | Sh:Q-150 | 10-11-89 | < 0.20 | < 0.20 | < 5.0 | < 10.0 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 |
| | | 07-02-90 | < 0.20 | 0.50 | < 5.0 | < 10.0 | < 0.20 | < 0.20 | < 0.20 | < 0.20 | < 5.0 | < 5.0 |
| MS-12 | Sh:Q-151 | 10-27-89 | < 0.20 | 0.90 | -- | -- | < 0.20 | < 0.20 | < 0.20 | < 0.20 | -- | -- |
| | | 06-26-90 | 0.40 | 2.7 | -- | -- | < 0.20 | < 0.20 | 0.30 | < 0.20 | -- | -- |

Table 8.--*Concentrations of synthetic organic compounds in samples from wells screened in the Memphis aquifer near the Shelby County Landfill*--Continued

[UG/L, micrograms per liter; Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | 2-NITRO-PHENOL, TOTAL (UG/L) | DI-N-OCTYL-PHTHALATE, TOTAL (UG/L) | 2,4-DICHLORO-PHENOL, TOTAL (UG/L) | 2,4-DIMETHYL-PHENOL, TOTAL (UG/L) | 2,4-DINITRO-TOLUENE, TOTAL (UG/L) | 2,4-DINITRO-PHENOL, TOTAL (UG/L) | 2,4,6-TRI-CHLOROPHENOL TOTAL (UG/L) | 2,6-DINITRO-TOLUENE, TOTAL (UG/L) | 4-BROMO-PHENYL, PHENYLETHER, TOTAL (UG/L) | 4-CHLORO-PHENYL, PHENYLETHER, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NONE | Sh:Q-088 | 10-29-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 07-10-90 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MS-2 | Sh:Q-092 | 10-14-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 07-09-90 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MS-4 | Sh:Q-126 | 10-16-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MS-5 | Sh:Q-144 | 10-15-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 06-29-90 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MS-7 | Sh:Q-146 | 10-18-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 07-06-90 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MS-9 | Sh:Q-148 | 10-13-89 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 | < 5.0 |
| | | 06-28-90 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 | < 5.0 |
| MS-10 | Sh:Q-149 | 10-13-89 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 | < 5.0 |
| | | 06-27-90 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 | < 5.0 |
| MS-11 | Sh:Q-150 | 10-11-89 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 | < 5.0 |
| | | 07-02-90 | < 5.0 | < 10.0 | < 5.0 | < 5.0 | < 5.0 | < 20.0 | < 20.0 | < 5.0 | < 5.0 | < 5.0 |
| MS-12 | Sh:Q-151 | 10-27-89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 06-26-90 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | 4-NITRO-PHENOL, TOTAL (UG/L) | 4,6-DINITRO-ORTHO-CRESOL TOTAL (UG/L) | DICHLORO-DIFLUORO-METHANE, TOTAL (UG/L) | PHENOL (C6 H5 OH) TOTAL (UG/L) | NAPHTHALENE, TOTAL (UG/L) | TRANS-1,3-DICHLORO-PROPENE, TOTAL (UG/L) | CIS-1,3-DICHLORO-PROPENE, TOTAL (UG/L) | PENTACHLORO-PHENOL, TOTAL (UG/L) | BIS (2-ETHYL-HEXYL) PHTHALATE, TOTAL (UG/L) | DI-N-BUTYL-PHTHALATE, TOTAL (UG/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NONE | Sh:Q-088 | 10-29-89 | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- | -- | -- |
| | | 07-10-90 | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- | -- | -- |
| MS-2 | Sh:Q-092 | 10-14-89 | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- | -- | -- |
| | | 07-09-90 | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- | -- | -- |
| MS-4 | Sh:Q-126 | 10-16-89 | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- | -- | -- |
| MS-5 | Sh:Q-144 | 10-15-89 | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- | -- | -- |
| | | 06-29-90 | -- | -- | < 0.20 | -- | -- | < 0.20 | < 0.20 | -- | -- | -- |
| MS-7 | Sh:Q-146 | 10-18-89 | -- | -- | 1.8 | -- | -- | < 0.20 | < 0.20 | -- | -- | -- |
| | | 07-06-90 | -- | -- | 3.3 | -- | -- | < 0.20 | < 0.20 | -- | -- | -- |
| MS-9 | Sh:Q-148 | 10-13-89 | < 30.0 | < 30.0 | < 0.20 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 | 120 | < 5.0 |
| | | 06-28-90 | < 30.0 | < 30.0 | < 0.20 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 | < 5.0 | < 5.0 |
| MS-10 | Sh:Q-149 | 10-13-89 | < 30.0 | < 30.0 | < 0.20 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 | 59.0 | < 5.0 |
| | | 06-27-90 | < 30.0 | < 30.0 | < 0.20 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 | < 5.0 | < 5.0 |
| MS-11 | Sh:Q-150 | 10-11-89 | < 30.0 | < 30.0 | 0.90 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 | < 5.0 | < 5.0 |
| | | 07-02-90 | < 30.0 | < 30.0 | 0.90 | < 5.0 | < 5.0 | < 0.20 | < 0.20 | < 30.0 | < 5.0 | < 5.0 |
| MS-12 | Sh:Q-151 | 10-27-89 | -- | -- | 7.6 | -- | -- | < 0.20 | < 0.20 | -- | -- | -- |
| | | 06-26-90 | -- | -- | 4.2 | -- | -- | < 0.20 | < 0.20 | -- | -- | -- |

Table 8.--*Concentrations of synthetic organic compounds in samples from wells screened in the Memphis aquifer near the Shelby County Landfill*--Continued

[UG/L, micrograms per liter; Values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a constituent; --, indicate no data]

| WELL NUMBERS: PROJECT AND MAP | WELL NUMBERS: USGS LOCAL FOR TENNESSEE | DATE | VINYL CHLORIDE TOTAL (UG/L) | TRICHLORO-ETHYLENE, TOTAL (UG/L) | HEXACHLORO-BENZENE, TOTAL (UG/L) | HEXACHLORO-BUTADIENE, TOTAL (UG/L) | XYLENE, TOTAL WATER WHOLE, TOTAL REC (UG/L) |
|---|---|---|---|---|---|---|---|
| NONE | Sh:Q-088 | 10-29-89 | < 0.20 | < 0.2 | -- | -- | 0.2 |
| | | 07-10-90 | < 0.20 | < 0.2 | -- | -- | 2.4 |
| MS-2 | Sh:Q-092 | 10-14-89 | < 0.20 | < 0.2 | -- | -- | 1.4 |
| | | 07-09-90 | < 0.20 | < 0.2 | -- | -- | < 0.2 |
| MS-4 | Sh:Q-126 | 10-16-89 | < 0.20 | < 0.2 | -- | -- | < 0.2 |
| MS-5 | Sh:Q-144 | 10-15-89 | < 0.20 | < 0.2 | -- | -- | 1.4 |
| | | 06-29-90 | < 0.20 | < 0.2 | -- | -- | < 0.2 |
| MS-7 | Sh:Q-146 | 10-18-89 | < 0.20 | < 0.2 | -- | -- | < 0.2 |
| | | 07-06-90 | 0.70 | < 0.2 | -- | -- | < 0.2 |
| MS-9 | Sh:Q-148 | 10-13-89 | < 0.20 | < 0.2 | < 5.0 | < 5.0 | 6.7 |
| | | 06-28-90 | < 0.20 | < 0.2 | < 5.0 | < 5.0 | < 0.2 |
| MS-10 | Sh:Q-149 | 10-13-89 | < 0.20 | < 0.2 | < 5.0 | < 5.0 | 13 |
| | | 06-27-90 | < 0.20 | < 0.2 | < 5.0 | < 5.0 | < 0.2 |
| MS-11 | Sh:Q-150 | 10-11-89 | < 0.20 | < 0.2 | < 5.0 | < 5.0 | < 0.2 |
| | | 07-02-90 | < 0.20 | < 0.2 | < 5.0 | < 5.0 | < 0.2 |
| MS-12 | Sh:Q-151 | 10-27-89 | 2.4 | 0.4 | -- | -- | < 0.2 |
| | | 06-26-90 | 3.2 | 0.4 | -- | -- | < 0.2 |

Table 9.—*Synthetic organic compounds detected in samples from 14 wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill*

[Concentrations are total in micrograms per liter ($\mu$g/L); (TDHE) Tennessee Department of Health and Environment, 1988, and (USEPA) U.S. Environmental Protection Agency, 1986, (MCL) maximum contaminant levels for drinking water; values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a compound; -- indicates no established maximum contaminant level for the compound]

| Synthetic organic compound | Analytical method lower detection limit | Wells in which detected | | Concentration detected First sample | Concentration detected Second sample | TDEC and USEPA MCL |
|---|---|---|---|---|---|---|
| | | Volatile organic compounds | | | | |
| Benzene | 0.20 | 20 | (Sh:Q-113) | 0.20 | 0.40 | MCL 5 |
| | | 26 | (Sh:Q-119) | 4.0 | 4.6 | |
| | | 27 | (Sh:Q-120) | 1.5 | 1.5 | |
| | | 31 | (Sh:Q-129) | .70 | .40 | |
| | | 37 | (Sh:Q-137) | <.20 | .30 | |
| | | 38 | (Sh:Q-138) | 5.8 | 2.4 | |
| | | 39 | (Sh:Q-139) | 1.1 | 1.8 | |
| | | 40 | (Sh:Q-140) | 1.9 | 2.3 | |
| | | 42 | (Sh:Q-142) | .60 | .70 | |
| | | 43 | (Sh:Q-143) | 1.5 | .90 | |
| Chlorobenzene | .20 | 26 | (Sh:Q-119) | 1.2 | 1.5 | -- |
| | | 27 | (Sh:Q-120) | 5.5 | 4.7 | |
| | | 31 | (Sh:Q-129) | .50 | .40 | |
| | | 38 | (Sh:Q-138) | .30 | <.20 | |
| | | 39 | (Sh:Q-139) | .80 | 1.1 | |
| | | 40 | (Sh:Q-140) | 1.6 | 1.0 | |
| | | 42 | (Sh:Q-142) | .90 | 1.5 | |
| | | 43 | (Sh:Q-143) | .30 | .20 | |
| Chloroethane | .20 | 20 | (Sh:Q-113) | <.30 | .60 | -- |
| | | 31 | (Sh:Q-129) | .60 | .20 | |
| | | 37 | (Sh:Q-137) | .30 | <.20 | |
| | | 38 | (Sh:Q-138) | .50 | <.20 | |
| | | 39 | (Sh:Q-139) | 1.6 | 2.8 | |
| | | 40 | (Sh:Q-140) | .8 | <.20 | |
| 2-Chloroethylvinylether | .20 | 30 | (Sh:Q-128) | 2.3 | <.20 | -- |
| Chloroform | .20 | 30 | (Sh:Q-128) | <.20 | .20 | -- |
| | | 31 | (Sh:Q-129) | .20 | <.20 | |
| Dichlorodifluoromethane | .20 | 20 | (Sh:Q-113) | 11 | 8.3 | -- |
| | | 27 | (Sh:Q-120) | 8.1 | 4.6 | |
| | | 31 | (Sh:Q-129) | 1.6 | <.20 | |
| | | 33 | (Sh:Q-133) | 3.4 | 1.2 | |
| | | 38 | (Sh:Q-138) | .90 | 1.7 | |
| | | 42 | (Sh:Q-142) | 1.2 | 1.3 | |
| | | 43 | (Sh:Q-143) | 2.3 | 1.7 | |
| 1,2-Dichlorobenzene | .20 | 27 | (Sh:Q-120) | .20 | <.20 | -- |
| | | 39 | (Sh:Q-139) | 1.2 | <.20 | |
| 1,4-Dichlorobenzene | .20 | 7 | (Sh:Q-101) | .30 | <.20 | MCL 75 |
| | | 26 | (Sh:Q-119) | .90 | 1.5 | |
| | | 27 | (Sh:Q-120) | 1.7 | 1.8 | |
| | | 30 | (Sh:Q-128) | <.20 | .40 | |
| | | 31 | (Sh:Q-129) | 1.3 | .90 | |
| | | 38 | (Sh:Q-138) | .80 | .90 | |
| | | 39 | (Sh:Q-139) | .20 | .40 | |
| | | 40 | (Sh:Q-140) | .80 | .80 | |
| | | 42 | (Sh:Q-142) | .60 | .90 | |

Table 9.—*Synthetic organic compounds detected in samples from 14 wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill*-Continued

[Concentrations are total in micrograms per liter (μg/L); (TDHE) Tennessee Department of Health and Environment, 1988, and (USEPA) U.S. Environmental Protection Agency, 1986, (MCL) maximum contaminant levels for drinking water; values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a compound; -- indicates no established maximum contaminant level for the compound]

| Synthetic organic compound | Analytical method lower detection limit | Wells in which detected | | Concentration detected: First sample | Concentration detected: Second sample | TDHE and USEPA MCL |
|---|---|---|---|---|---|---|
| 1,1 -Dichloroethane | 0.20 | 20 | (Sh:Q-113) | <0.20 | 0.90 | -- |
| | | 26 | (Sh:Q-119) | .80 | .90 | |
| | | 27 | (Sh:Q-120) | .40 | .30 | |
| | | 31 | (Sh:Q-129) | 5.9 | 2.6 | |
| | | 37 | (Sh:Q-137) | 1.4 | .90 | |
| | | 38 | (Sh:Q-138) | 4.0 | 4.5 | |
| | | 39 | (Sh:Q-139) | 5.9 | 11.0 | |
| | | 40 | (Sh:Q-140) | 3.7 | 4.3 | |
| | | 43 | (Sh:Q-143) | .20 | <.20 | |
| 1,2-Dichloroethane | .20 | 31 | (Sh:Q-129) | .90 | .70 | MCL 5 |
| | | 38 | (Sh:Q-138) | .90 | .80 | |
| | | 40 | (Sh:Q-140) | .80 | .70 | |
| 1,1-Dichloroethylene | .20 | 20 | (Sh:Q-113) | 1.0 | .20 | MCL 7 |
| | | 39 | (Sh:Q-139) | .20 | .30 | |
| 1,2-Dichloropropane | .20 | 26 | (Sh:Q-119) | .30 | .40 | -- |
| | | 30 | (Sh:Q-128) | <.20 | .20 | |
| | | 31 | (Sh:Q-129) | 14 | 6.4 | |
| | | 37 | (Sh:Q-137) | .30 | <.20 | |
| | | 38 | (Sh:Q-138) | <.20 | 1.0 | |
| | | 39 | (Sh:Q-139) | <.20 | .70 | |
| | | 40 | (Sh:Q-140) | .30 | .50 | |
| Ethylbenzene | .20 | 34 | (Sh:Q-134) | .20 | <.20 | -- |
| | | 37 | (Sh:Q-137) | .40 | <.20 | |
| | | 42 | (Sh:Q-142) | 1.0 | <.20 | |
| Methylene chloride | .20 | 31 | (Sh:Q-129) | .60 | .60 | -- |
| | | 39 | (Sh:Q-139) | <.20 | .30 | |
| | | 40 | (Sh:Q-140) | <.20 | .30 | |
| Tetrachloroethylene | .20 | 20 | (Sh:Q-113) | 1.0 | .90 | -- |
| | | 30 | (Sh:Q-128) | .20 | <.20 | |
| | | 31 | (Sh:Q-129) | 1.1 | .30 | |
| | | 39 | (Sh:Q-139) | 1.0 | 1.2 | |
| | | 43 | (Sh:Q-143) | .30 | <.20 | |
| Toluene | .20 | 7 | (Sh:Q-101) | <.20 | .60 | -- |
| | | 26 | (Sh:Q-119) | .20 | .80 | |
| | | 27 | (Sh:Q-120) | .20 | .20 | |
| | | 30 | (Sh:Q-128) | .20 | .30 | |
| | | 31 | (Sh:Q-129) | .30 | .80 | |
| | | 39 | (Sh:Q-139) | <.20 | .40 | |
| | | 40 | (Sh:Q-140) | <.20 | 1.6 | |
| | | 42 | (Sh:Q-142) | .20 | <.20 | |

Table 9.—*Synthetic organic compounds detected in samples from 14 wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill*-Continued

[Concentrations are total in micrograms per liter (μg/L); (TDHE) Tennessee Department of Health and Environment, 1988, and (USEPA) U.S. Environmental Protection Agency, 1986, (MCL) maximum contaminant levels for drinking water; values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a compound; -- indicates no established maximum contaminant level for the compound]

| Synthetic organic compound | Analytical method lower detection limit | Wells in which detected | | Concentration detected: First sample | Concentration detected: Second sample | TDHE and USEPA MCL |
|---|---|---|---|---|---|---|
| 1,2-trans-Dichloroethene | 0.20 | 20 | (Sh:Q-113) | 0.70 | 1.3 | -- |
| | | 27 | (Sh:Q-120) | .50 | .50 | |
| | | 30 | (Sh:Q-128) | <.20 | .30 | |
| | | 31 | (Sh:Q-129) | 30 | 13 | |
| | | 34 | (Sh:Q-134) | 1.3 | <.20 | |
| | | 37 | (Sh:Q-137) | 1.5 | .30 | |
| | | 38 | (Sh:Q-138) | .30 | 3.2 | |
| | | 39 | (Sh:Q-139) | 8.0 | 18 | |
| | | 40 | (Sh:Q-140) | 6.9 | 6.3 | |
| | | 43 | (Sh:Q-143) | 2.4 | 1.3 | |
| 1,1,1-Trichloroethane | .20 | 20 | (Sh:Q-113) | <.20 | .60 | MCL 200 |
| Trichloroethylene | .20 | 7 | (Sh:Q-101) | <.20 | .50 | MCL 5 |
| | | 20 | (Sh:Q-113) | .20 | .40 | |
| | | 26 | (Sh:Q-119) | <.20 | .20 | |
| | | 27 | (Sh:Q-120 | <.20 | .20 | |
| | | 31 | (Sh:Q-129) | 1.3 | .70 | |
| | | 38 | (Sh:Q-138) | <.20 | .60 | |
| | | 39 | (Sh:Q-139) | 1.0 | 1.5 | |
| | | 40 | (Sh:Q-140) | .90 | .80 | |
| | | 43 | (Sh:Q-143) | .50 | .40 | |
| Trichlorofluoromethane | .20 | 20 | (Sh:Q-113) | 2.7 | .80 | -- |
| | | 30 | (Sh:Q-128) | .60 | <.20 | |
| Vinyl chloride | .20 | 20 | (Sh:Q-113) | 4.0 | 4.8 | MCL 2 |
| | | 26 | (Sh:Q-119) | .9 | 1.4 | |
| | | 27 | (Sh:Q-120) | <.20 | .40 | |
| | | 31 | (Sh:Q-129) | 2.1 | .70 | |
| | | 34 | (Sh:Q-134) | .90 | <.20 | |
| | | 37 | (Sh:Q-137) | .30 | <.20 | |
| | | 38 | (Sh:Q-138) | 2.4 | 7.3 | |
| | | 39 | (Sh:Q-139) | 2.6 | 3.0 | |
| | | 40 | (Sh:Q-140) | 1.8 | <.20 | |
| | | 43 | (Sh:Q-143) | 1.9 | 1.3 | |
| Xylene | .20 | 7 | (Sh:Q-101) | <.20 | .40 | -- |
| | | 26 | (Sh:Q-119) | .50 | 1.0 | |
| | | 27 | (Sh:Q-120) | <.20 | .20 | |
| | | 30 | (Sh:Q-128) | .20 | .30 | |
| | | 31 | (Sh:Q-129) | .30 | .20 | |
| | | 37 | (Sh:Q-137) | .90 | <.20 | |
| | | 38 | (Sh:Q-138) | <.20 | .20 | |
| | | 39 | (Sh:Q-139) | <.20 | .30 | |
| | | 40 | (Sh:Q-140) | <.20 | .90 | |
| | | 42 | (Sh:Q-142) | 1.9 | <.20 | |
| | | Extractable organic compounds | | | | |
| None detected above the detection limits of the individual compounds; see table 7 | | | | | | |

Table 10.—*Synthetic organic compounds detected in samples from eight wells screened in the Memphis aquifer near the Shelby County landfill*

[Concentrations are total in micrograms per liter (μg/L); (TDHE) Tennessee Department of Health and Environment, 1988, and (USEPA) U.S. Environmental Protection Agency, 1986, (MCL) maximum contaminant levels for drinking water; values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a compound; -- indicates no established maximum contaminant level for the compound]

| Synthetic organic compound | Analytical method lower detection limit | Wells in which detected | | Concentration detected: First sample | Concentration detected: Second sample | TDHE and USEPA MCL |
|---|---|---|---|---|---|---|
| | | Volatile organic compounds | | | | |
| Benzene | 0.20 | -- | (Sh:Q-88) | 0.20 | 1.8 | MCL 5 |
| | | MS-11 | (Sh:Q-150) | <.20 | .20 | |
| | | MS-12 | (Sh:Q-151) | .80 | 1.3 | |
| Chloroethane | .20 | MS-12 | (Sh:Q-151) | .80 | 1.3 | -- |
| Dichlorodifluoromethane | .20 | MS- 7 | (Sh:Q-146) | 1.8 | 3.3 | -- |
| | | MS-11 | (Sh:Q-150) | .90 | .90 | |
| | | MS-12 | (Sh:Q-151) | 7.6 | 4.2 | |
| 1,4-Dichlorobenzene | .20 | MS-12 | (Sh:Q-151) | <.20 | .30 | MCL 75 |
| 1,1-Dichloroethane | .20 | MS- 7 | (Sh:Q-146) | <.20 | .80 | -- |
| | | MS-12 | (Sh:Q-151) | 1.5 | 2.3 | |
| 1,2-Dichloropropane | .20 | MS-12 | (Sh:Q-151) | <.20 | .40 | -- |
| Ethylbenzene | .20 | -- | (Sh:Q-88) | <.20 | .40 | -- |
| | | MS- 2 | (Sh:Q-92) | .20 | <.20 | |
| | | MS- 5 | (Sh:Q-144) | .20 | <.20 | |
| | | MS- 9 | (Sh:Q-148) | .80 | <.20 | |
| | | MS-10 | (Sh:Q-149) | 1.7 | <.20 | |
| | | MS-12 | (Sh:Q-151) | .20 | <.20 | |
| Methylene chloride | .20 | MS-11 | (Sh:Q-150) | .20 | <.40 | -- |
| | | MS-12 | (Sh:Q-151) | <.20 | .30 | |
| Styrene | .20 | -- | (Sh:Q-88) | <.20 | .50 | -- |
| Tetrachloroethylene | .20 | MS-12 | (Sh:Q-151) | 1.5 | 1.1 | -- |
| Toluene | .20 | -- | (Sh:Q-88) | .20 | 2.4 | -- |
| | | MS- 2 | (Sh:Q-92) | .70 | .30 | |
| | | MS- 5 | (Sh:Q-144) | .90 | .60 | |
| | | MS- 9 | (Sh:Q-148) | 2.9 | <.20 | |
| | | MS-10 | (Sh:Q-149) | 7.3 | .30 | |
| | | MS-11 | (Sh:Q-150) | <.20 | .20 | |
| | | MS-12 | (Sh:Q-151) | .30 | .30 | |
| 1,2-trans-Dichloroethene | .20 | MS-7 | (Sh:Q-146) | <.20 | 1.4 | -- |
| | | MS-11 | (Sh:Q-150) | <.20 | .50 | |
| | | MS-12 | (Sh:Q-151) | .90 | 2.7 | |
| 1,1,1-Trichloroethane | .20 | MS-12 | (Sh:Q-151) | .90 | .40 | MCL 200 |
| Trichloroethylene | .20 | MS-12 | (Sh:Q-151) | .40 | .40 | MCL 5 |

Table 10.—*Synthetic organic compounds detected in samples from eight wells screened in the Memphis aquifer near the Shelby County landfill*-Continued

[Concentrations are total in micrograms per liter (μg/L); (TDHE) Tennessee Department of Health and Environment, 1988, and (USEPA) U.S. Environmental Protection Agency, 1986, (MCL) maximum contaminant levels for drinking water; values given as < (less than) indicate that the concentration was below the level of detection for the analytical method used and do not indicate the presence or absence of a compound; -- indicates no established maximum contaminant level for the compound]

| Synthetic organic compound | Analytical method lower detection limit | Wells in which detected | | Concentration detected: First sample | Concentration detected: Second sample | TDHE and USEPA MCL |
|---|---|---|---|---|---|---|
| Trichlorofluoromethane | 0.20 | MS-12 | (Sh:Q-151) | 12 | 4.0 | -- |
| Vinyl chloride | .20 | MS-7 | (Sh:Q-146) | <.20 | .70 | MCL 2 |
| | | MS-12 | (Sh:Q-151) | 2.4 | 3.2 | |
| Xylene | .20 | -- | (Sh:Q-88) | .20 | 2.4 | -- |
| | | MS- 2 | (Sh:Q-92) | 1.4 | <.20 | |
| | | MS- 5 | (Sh:Q-144) | 1.4 | <.20 | |
| | | MS- 9 | (Sh:Q-148) | 6.7 | <.20 | |
| | | MS-10 | (Sh:Q-149) | 13.0 | <.20 | |
| | | Extractable organic compounds | | | | |
| Bis (2-ethylhexyl) phthalate | 5.0 | MS- 9 | (Sh:Q-148) | 120 | <5.0 | -- |
| | | MS-10 | (Sh:Q-149) | 59.0 | <5.0 | |

Halogenated alkenes were detected in highest concentrations in alluvial aquifer or upper part of the confining unit wells 31, 39, and 40 (fig. 13). Concentrations of 1,2-trans-dichloroethene were particularly high in samples from these wells (table 9). Vinyl chloride was detected in high concentrations in wells 20, 31, 38, 39, and 43 (table 9). Concentrations in samples from these alluvial aquifer wells exceed the Federal and State MCL of 2 μg/L (Tennessee Department of Health and Environment, 1988; U.S. Environmental Protection Agency, 1986). All wells sampled during this investigation were constructed with polyvinyl chloride (PVC) casings and screens (*Appendix A*). Therefore, well construction materials may be a source of the high vinyl chloride concentrations.

The lowest sums of volatile organic compounds were detected in samples from alluvial aquifer wells 30, 33, and 34 (fig. 13). Several compounds were detected in samples from these wells, although in most instances each compound was detected in only one of the two samples collected. The only compound detected in low concentrations in replicate samples was dichlorodifluoromethane in well 33 (3.4 and 1.2 μg/L, table 9).

A "moderate" degree of contamination (that is, sums of concentrations approximately 3 μg/l) by volatile organic compounds was detected in samples from wells 31, 42 and 43 screened in the alluvial aquifer or upper part of the confining unit (fig. 13). Benzene, chlorobenzene, dichlorobenzenes, ethylbenzene, xylene, dichlorodifluoromethane, and vinyl chloride compounds were detected in moderate concentrations in samples from wells 31, 42 and 43, and these compounds were detected in both samples (table 9).

Well 7 was selected for the collection of background samples from the alluvial aquifer. This well, which is 38 feet deep, is located about 7,000 feet east of the landfill (fig. 9). It is on the east side of the depression in the water table and in the upgradient direction of ground-water flow westward toward the center of the depression (fig. 5). The analysis of water from the first sampling of well 7 showed 1,4-dichlorobenzene in a concentration (0.30 μg/L) just above the detection limit (0.2 μg/L). The analysis of water from the second sampling indicated that 1,4-dichlorobenzene was below the detection limit, but that small concentrations of toluene (0.60 μg/L) and xylene (0.40 μg/L) were measured. The measurement of these synthetic organic compounds in the background samples from well 7 suggests that sources other than the leachate plume may contribute to synthetic organic compound concentrations in the alluvial aquifer or upper part of the confining unit.

Synthetic organic compounds were detected in samples from all wells screened in the Memphis aquifer

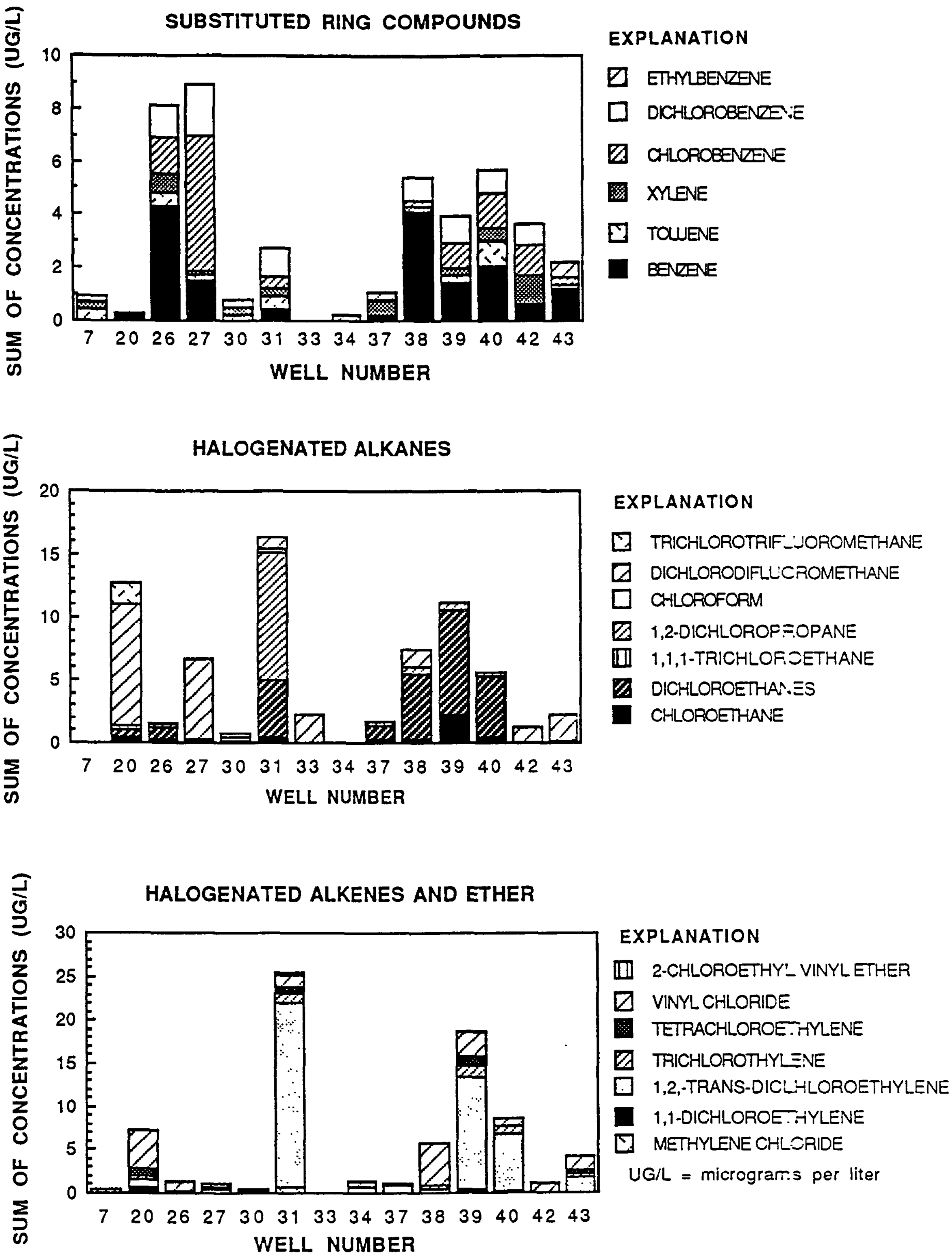


**Figure 13.**—Sums of mean values of concentrations of three classes of volatile organic compounds in samples from wells screened in the alluvial aquifer or upper part of the confining unit near the Shelby County landfill.

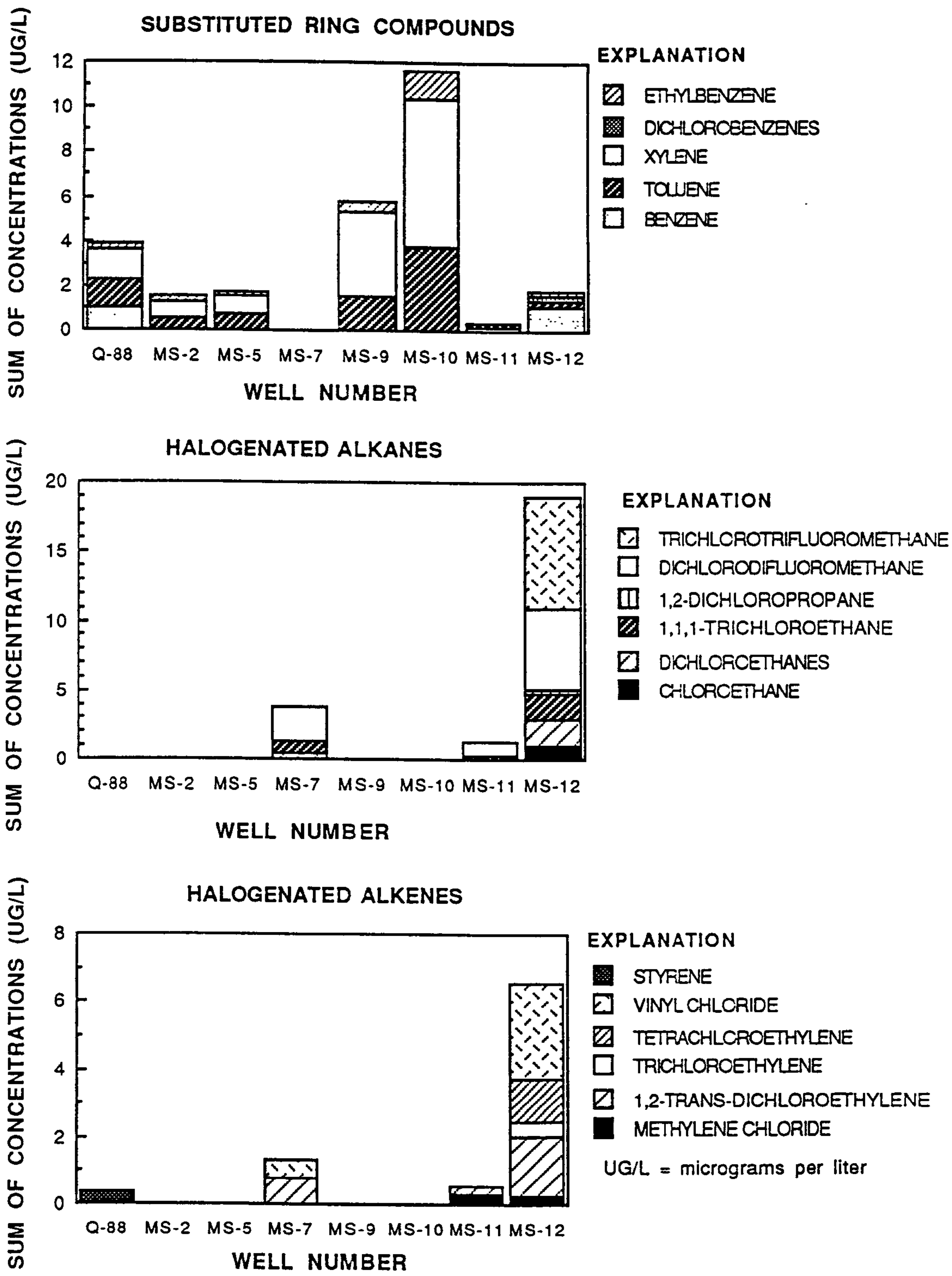


**Figure 14.**—Sums of mean values of concentrations of three classes of volatile organic compounds in samples from wells screened in the Memphis aquifer near the Shelby County landfill.

except MS-4. However, the classes of compounds detected in these samples differ among wells (fig. 14). High concentrations of substituted ring compounds were detected primarily in samples from wells MS-9, MS-10, and Sh:Q-88 (a background well). Halogenated alkane and alkene concentrations were highest in samples from wells MS-7, MS-11, and MS-12.

Substituted ring compounds (particularly benzene, toluene, and xylene) were detected in highest concentrations in samples from Memphis aquifer wells MS-9, MS-10, and Sh:Q-88 (a background well) (fig. 14). However, high concentrations of substituted ring compounds were not detected consistently in these wells. Concentrations of toluene and xylene were measured in the first samples from wells MS-9 and MS-10 and ranged from 2.9 to 13 $\mu$g/L. The second samples from these same wells had low (0.30 $\mu$g/L) or non-detectable (< 0.20 $\mu$g/L) toluene and xylene concentrations (table 10). Benzene, toluene, and xylene contamination may have been introduced to the first round of samples from wells MS-2, MS-5, MS-9, MS-10, and MS-11 by the isopropanol rinse used during the well-sampling procedures (*Appendix A*).

Both halogenated alkanes and halogenated alkenes occur with the highest concentrations in samples from Memphis aquifer wells MS-7, MS-11, and MS-12 (fig. 14). The halogenated alkanes showing the highest concentrations in wells MS-7, MS-11, and MS-12 were dichlorodifluoromethane and trichlorofluoromethane, with concentrations ranging from 0.9 to 12.0 $\mu$g/L (table 10). Halogenated alkene compounds showing the highest concentrations in wells MS-7, MS-11, and MS-12 are 1,2-trans-dichloroethene, tetrachloroethylene, and vinyl chloride with concentrations of these compounds ranging from 0.5 to 3.2 $\mu$g/L (table 10).

Well Sh:Q-88 (no field number assigned), an irrigation well at Agricenter International, was selected for the collection of background samples from the Memphis aquifer. This well, which is 295 feet deep, is about 10,500 feet east of the landfill (fig. 10). Well Sh:Q-88 is upgradient in the general direction of ground-water flow westward toward the landfill (fig. 8). The analysis of water from the first sample indicated that benzene, toluene, and xylene were detected at the detection limits (0.20 $\mu$g/L). The second samples indicated that benzene, toluene, and xylene were detected with concentrations of ranging from 1.8 to 2.4 $\mu$g/L. In addition, the analysis for the second sample measured ethylbenzene and styrene with concentrations that ranged from 0.4 to 0.5 $\mu$g/L. The pump on this well is powered by a diesel generator, and fumes from this generator may have contaminated the samples.

Substituted ring compounds were detected in nearly every well near the Shelby County landfill. In samples from wells screened in the alluvial aquifer and upper part of the "confining unit," the highest sums of concentrations of substituted ring compounds range from approximately 3 to 9 mg/L in wells 26, 27, 31, 38, 39, 40, and 42 (fig. 13). Benzene, chlorobenzene, and dichlorobenzenes are the principal substituted ring compounds detected in these wells.

In the Memphis aquifer, the highest sums of substituted ring compounds range from approximately 4 to 12 $\mu$g/L in samples from wells Sh:Q-88 (a background well), MS-9, and MS-10 (fig. 14). Benzene, toluene, and xylene are the principal substituted ring compounds detected in these wells.

An interpretation of the distribution of substituted ring compounds near the Shelby County landfill cannot be based solely on the appearance and transport of these compounds in the leachate plume. Although the highest concentrations of substituted ring compounds were detected in samples from downgradient plume wells 26, 27, 31, 38, 39 and 40 screened in the alluvial aquifer or upper part of the confining unit, these compounds also were detected in "moderate" concentrations in samples from upgradient wells 42 and 43. Substituted ring compounds also were detected in samples from all wells screened in the Memphis aquifer, except MS-7. However, the highest concentrations of substituted ring compounds were detected in samples from downgradient wells MS-2, MS-9, and MS-10, but not in samples from Memphis aquifer wells that show highest concentrations of the major and trace inorganic constituents used to geochemically define the leachate plume (for example, wells MS-7, MS-11, and MS-12). Lithologic logs from Memphis aquifer wells MS-2 (Bradley, 1988), MS-9, and MS-10 (*Appendix C*) show a sand and silt confining unit that ranges in thickness from 50 to 75 feet (*Appendix C*). Substituted ring compounds that were detected in samples from these wells probably did not originate from the alluvial aquifer directly overlying wells MS-2, MS-9, and MS-10.

Although the concentrations of substituted ring compounds in both the alluvial aquifer or upper part of the confining unit and the Memphis aquifer should be noted, the source and transport of these compounds may not be associated exclusively with leachate from the Shelby County landfill.

Halogenated alkane and halogenated alkene compounds show similar distributions in wells screened in both the alluvial aquifer or upper part of the confining unit and the Memphis aquifer. In samples screened in the alluvial aquifer, the highest sums of halogenated alkanes range from approximately 6 to 16 $\mu$g/L in wells 20, 27, 31, 38, 39, and 40 (fig. 13). Dichlorodifluoromethane, 1,2-dichloropropane, and dichloroethanes were the principal halogenated alkanes detected in these wells. The highest sums of halogenated alkenes range from approximately 6 to 25 $\mu g/L$ in wells 20, 31, 38, 39, and 40. Vinyl chloride and 1,2-trans-dichloroethene were the principal halogenated alkenes detected in these wells.

Halogenated alkanes and halogenated alkenes in the Memphis aquifer were detected almost exclusively in samples from wells MS-7, MS-11, and MS-12 (fig. 14). Sums of halogenated alkane concentrations range from approximately 1 to 19 $\mu g/L$, with trichlorofluoromethane, dichlorodifluoromethane, 1,1,1-trichloroethane, and dichloroethanes as principal constituents. Sums of halogenated alkene concentrations range from approximately 0.4 to 6.5 $\mu g/L$, with vinyl chloride, tetrachloroethylene and 1,2-trans-dichloroethene as principal constituents. The distribution of halogenated alkane and halogenated alkene compounds seems to show the same trend with ground-water flow as interpreted previously from major and trace inorganic constituent data. Maximum concentrations of halogenated alkanes and alkenes were detected in samples from leachate plume wells 20, 27, 31, 38, 39, and 40 screened in the alluvial aquifer or upper part of the confining unit. Maximum concentrations of halogenated alkanes and alkenes were detected in Memphis aquifer leachate plume wells MS-7, MS-11, and MS-12, which are adjacent to the alluvial aquifer wells. The confining unit separating the two aquifers at these wells is thin or absent (fig. 6).

Similar halogenated alkane and halogenated alkene compounds were detected in samples from alluvial aquifer wells 27, 31, 38, 39, and 40 when compared to samples from Memphis aquifer wells MS-7, MS-11, and MS-12. The halogenated alkanes trichlorofluoromethane and dichloroethanes (particularly 1,1-dichloroethane) were detected in both alluvial and Memphis aquifer wells, as were the halogenated alkenes vinyl chloride and 1,2-trans-dichloroethene. Trichloroethylene, which is easily biodegraded under anaerobic conditions (Barker and others, 1986) also appears in similar concentrations in wells 31, 38, 39, and 40 screened in the alluvial aquifer or upper part of the confining unit, and well MS-12 screened in the Memphis aquifer.

The base-neutral extractable compound bis(2-ethylhexyl)phthalate was detected at high concentrations (120 and 59 $\mu g/L$; table 8) in the first samples from Memphis aquifer wells MS-9 and MS-10. Because bis(2-ethylhexyl)phthalate was not detected in any samples from alluvial aquifer wells, or in the second samples from Memphis aquifer wells MS-9 and MS-10, this compound may have been introduced as a field or laboratory contaminant. Bis(2-ethylhexyl)phthalate is used extensively as a plasticizer (Smith and others, 1988).

## POTENTIAL FOR WATER-SUPPLY CONTAMINATION

The source of water supply most susceptible to contamination from the Shelby County landfill is the Sheahan well field of the Memphis Light, Gas and Water Division (MLGW). Ground water from the vicinity of the landfill generally flows westward toward this well field (fig. 1), based on a map of the altitude of the potentiometric surface of the Memphis aquifer for the late summer and fall of 1988 (Parks, 1990). The Sheahan well field is about 5 miles downgradient from the Shelby County landfill.

To estimate the rate of ground-water flow from the vicinity of the Shelby County landfill to the Sheahan well field, an equation derived from a combination of Darcy's law and the velocity equation of hydraulics (Heath, 1983), can be used:

$$v = \frac{Kdh}{ndl}$$

where

- $v$ is the Darcian velocity, which is the average velocity of the entire cross-sectional area, in feet per day;
- $K$ is the hydraulic conductivity, in feet per day;
- $dh/dl$ is the hydraulic gradient, in foot per foot; and
- $n$ is the porosity, in percent by volume

Average hydraulic conductivities are estimated to range from 40 feet per day for predominantly fine sand to 114 feet per day for predominantly coarse sand in the Memphis aquifer (Nyman, 1965, p. B20). The average hydraulic gradient is estimated to be 70 feet in 5 miles (0.0027 foot per foot) from the map of the altitude of the potentiometric surface in the Memphis aquifer in the late summer and fall 1988 (Parks, 1990). The average porosity for the sands is taken to be 20 percent (Bell and Nyman, 1968, p. 13). Using these values in the preceding equation, the average velocities of ground water moving through the Memphis aquifer from the Shelby County landfill to Sheahan well field are calculated to range from about 0.5 to 1.5 feet per day (182 to 548 feet per year).

These average velocities indicate that water now (1991) entering the Memphis aquifer at the Shelby County landfill would take about 50 to 150 years to reach the Sheahan well field. Given the time and distance of transport, any contaminants in the ground water would not likely persist long enough to reach this well field because of the effects of various physical, chemical, and biological processes, including dilution and adsorption.

## SUMMARY AND CONCLUSIONS

This investigation (1989-91) was conducted to collect and interpret hydrogeologic and ground-water-quality data more specific to the Shelby County landfill in east Memphis, Tennessee, than that collected during a previous investigation (1986-87) by the U.S. Geological Survey. The previous investigation focused on an area north of the landfill, which was under consideration for landfill use. Eighteen additional wells were installed in the alluvial aquifer or upper part of the confining unit and Memphis aquifer near the landfill. Hydrogeologic data collected from the auger borings and hydraulic-rotary test holes showed that the confining unit separating the alluvial aquifer from the Memphis aquifer was thin or absent just north of the landfill and that elsewhere it consists predominantly of fine sand and silt with lenses of clay.

A water-table map prepared from water-level measurements in 33 wells confirms the existence of a depression in the water table north and northeast of the landfill and indicates that the ground water passing beneath the landfill flows generally northeast from the Wolf River toward the depression in the water table. A map of the potentiometric surface in the Memphis aquifer prepared from water-level measurements in nine wells showed that water levels were anomalously high just north of the landfill, indicating downward leakage from the alluvial aquifer to the Memphis aquifer. A comparison of these two maps shows that head differences between the alluvial and Memphis aquifers favor downward leakage.

Water-quality data were collected from 31 wells during a first round of sampling in October 1989, and 22 of these wells were re-sampled in June and July 1990. An analysis of water-quality data for major and trace inorganic constituents and nutrients confirms that leachate from the landfill has migrated northeastward in the alluvial aquifer toward the depression in the water table. Selected major and trace inorganic constituents showed elevated concentrations in samples from leachate plume wells screened in the alluvial aquifer or upper part of the confining unit. Those constituents (specifically total organic carbon, chloride, dissolved solids, iron, ammonia nitrogen, calcium, sodium, iodide, barium, strontium, boron, and cadmium) were detected in concentrations 2 to 20 times higher in samples from downgradient wells than in samples from background or upgradient wells. Elevated concentrations of dissolved solids, calcium, sodium and possibly ammonia nitrogen, chloride, barium, and strontium were detected in samples from adjacent Memphis aquifer plume wells. Apparently, these constituents have migrated from the alluvial aquifer into the Memphis aquifer by downward leakage where the confining unit is thin or absent.

Volatile organic compounds were detected in samples from 14 wells in the alluvial aquifer and 8 wells in the Memphis aquifer. Of the 22 volatile organic compounds detected in samples from the alluvial aquifer, 18 of these same compounds were detected in the Memphis aquifer. Three classes of volatile organic compounds were detected in samples from wells screened in both the alluvial aquifer or upper part of the confining unit and the Memphis aquifer: (1) substituted ring compounds, (2) halogenated alkanes, and (3) halogenated alkenes. Substituted ring compounds (specifically benzene, chloro- and di-chlorobenzenes, toluene, and xylene) were detected in samples from nearly every well near the Shelby County landfill, but commonly at low concentrations (less than 4.0 $\mu g/L$). Because of their widespread occurrence (even in samples from background wells), substituted ring compounds cannot be used as geochemical tracers for the leachate plume.

The highest concentrations of halogenated alkane and halogenated alkene compounds were detected in leachate plume wells screened in the alluvial aquifer or upper part of the confining unit. Selected halogenated alkanes (dichlorodifluoromethane, 1,2-dichloropropane, and dichloroethanes) and halogenated alkenes (vinyl chloride and 1,2-trans-dichloroethene) seem to best characterize samples from the leachate plume in wells screened in the alluvial aquifer or upper part of the confining unit.

Many of these same halogenated alkane and halogenated alkene compounds were detected in samples from wells screened in the Memphis aquifer, adjacent to downgradient leachate plume wells screened in the alluvial aquifer. Of halogenated alkane compounds, dichlorodifluoromethane and dichloroethanes were detected in samples from both the Memphis aquifer and the overlying alluvial aquifer. Of halogenated alkene compounds, vinyl chloride and 1,2-trans-dichloroethene were detected in samples from both the Memphis aquifer and the overlying alluvial aquifer. However, the source of high vinyl chloride concentrations may be from well construction materials.

The base-neutral extractable compound bis(2-ethylhexyl)phthalate was detected at high concentrations, but only in two samples, both from wells screened in the Memphis aquifer. It is possible that bis(2-ethylhexyl)phthalate was introduced in these samples as a laboratory contaminant.

The ground-water supply most susceptible to contamination from the Shelby County landfill is the Sheahan well field of the Memphis Light, Gas and Water Division. This well field is about 5 miles downgradient from the landfill in the direction of ground-water flow. Based on an estimated ground-water velocity, about 50 to 150 years would be required for ground water to travel from the Shelby County landfill to the Sheahan well field. Given the time and distance of transport, it is unlikely that any contaminants in the ground water would persist long enough to reach this well field because of the effects of various physical, chemical, and biological processes, including dilution and adsorption.

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# APPENDIX A

Field Work and procedures

## APPENDIX A: FIELD WORK AND PROCEDURES

The field work for this investigation consisted principally of: (1) the installation of 18 wells in the alluvial aquifer, upper part of the confining unit, or Memphis aquifer near the Shelby County landfill, (2) the measurement of water-levels in 41 wells, (3) an initial sampling of 31 wells for water-quality analysis, and (4) the re-sampling of 22 of these wells to verify the analytical results from the first sampling. The procedures followed in performing these tasks are summarized below.

### Well Installation

General procedures followed during the installation of the wells in the alluvial aquifer or upper part of the confining unit were as follows:

(1) the auger stems and bit were decontaminated before augering each well using a steam cleaner and water from Memphis Light, Gas and Water Division that is piped from Agricenter International to the landfill for drinking and clean-up uses;

(2) 8-inch-diameter auger holes were drilled to depths (based on the estimated top of the water table from auger returns) that would assure the wells contained adequate water for well development and sampling;

(3) 2-inch-diameter polyvinyl chloride (PVC) casings with 5-foot lengths of horizontally slotted (0.020-inch slot) screen were installed through the augers;

(4) the augers were extracted from the bore holes leaving the casings and screens in place;

(5) measurements were made to determine the depths to which formation sand had collapsed around the casings and screens (generally at or above the top of the water table);

(6) about 1 foot of bentonite pellets were put at the top of the collapsed sand in each well and a bucket of water was added to swell the bentonite;

(7) the annular spaces around the casings above the bentonite seals were filled with a cement and bentonite grout nearly to land surface;

(8) cement pads or plugs were poured to seal the annular space around the wells at land surface, and 6-inch-diameter steel well protectors were installed and secured with locks;

(9) the wells were developed with a submersible pump designed for use in 2-inch-diameter wells (pumping capacity about 1 gallon per minute);

(10) well development was conducted until the water was clear or any sediment was considerably reduced and until measurements of specific conductance were constant.

North and northeast of the landfill water levels in the alluvial aquifer generally are deeper than normal because of the depression in the water table, and the alluvium locally is dry. In order to assure that the wells installed along the north and east perimeters and in adjacent areas of the landfill were deep enough to provide adequate water for well development and sampling, some of these wells probably were screened in the confining unit below the alluvium.

Wells 37, 38, 39, 40, and 41 were installed to depths that probably placed the screens adjacent to fine sand in the upper part of the confining unit. During augering of these wells, the returns from the lower part of the holes primarily consisted of wet, coarse to very coarse sand with scattered gravel. Any fine sand would be obscured in the wet slurry of the auger returns. Gamma-ray logs were made through the auger stems before the installation of these wells to confirm that the screens would be adjacent to sand and not clay. The gamma-ray logs indicated continuous sand in the lower part of the auger holes, including the interval to be screened.

The hole for well 35 was augered to 48 feet, but the lower stem was found to be full of fine sand. Therefore, the augers were pulled back to 43 feet before the well was installed to avoid setting the screen in fine sand. Later, geophysical logs made in the test hole for well MS-5, which was installed in the Memphis aquifer near well 35, indicated that the screen of well 35 probably was set in fine sand in the confining unit.

Geophysical logs for the test hole for well MS-7 near well 37 indicated that the screen of well 37 actually may be set adjacent to clay in the confining unit. During well development, some fine sand and silt entered the screens of wells 37 and 39. During well development and sampling, the water level in 37 and 40 pumped down in a relatively short time and was slow to recover.

The general procedures for installation of the wells in the Memphis aquifer were as follows:

(1) before drilling each well, the drill stems and bits were decontaminated using a steam cleaner and water piped to the landfill for drinking and clean-up uses;

(2) test holes were drilled to a depth of 150 feet using water from a Memphis Light, Gas and Water Division fire hydrant at Agricenter International and powdered bentonite to produce a drilling mud;

(3) electric and gamma-ray logs were made in the bore holes and the depths at which to set screens were determined;

(4) the lower parts of the bore holes up to the bottom of the screens were filled with gravel pack added to the residual drilling mud (a bentonite seal was added above this gravel pack in some wells);

(5) 4-inch-diameter polyvinyl chloride casings with 20-foot lengths of horizontally slotted (0.010-inch slot) screens were installed in the bore holes;

(6) the wells were backflushed with water from the same source as used for drilling to remove most of the drilling mud from the annulus around the screens;

(7) the annular space around the screens was gravel packed to at least 10 feet above the tops of the screens;

(8) about 1 foot of bentonite pellets were put at the tops of the gravel packs and, if present, adjacent to a clay beds near the top of the sands screened;

(9) the annular space around the casings above the bentonite plugs was pressure grouted to land surface with a commercial bentonite sealer using a tremie pipe;

(10) after time for the bentonite sealer to swell and setup, the upper foot of the annular space around the casings was excavated and cement plugs were poured to seal the wells at land surface;

(11) at the time the cement plugs were poured, 6-inch-diameter steel well protectors were installed over the wells, and the wells were capped and secured with locks;

(12) the wells were developed using compressed air for a minimum of 1 hour each or until the wells produced clear, sediment-free water.

During well development, formation sand was pumped from wells MS-6, MS-7, and MS-8. Fragments of lignite and gravel pack also were pumped from well MS-6, leading to the conclusion that the casing was split or separated in this well. The casing for well MS-6 was pulled from the bore hole intact and undamaged, but the disc seal in the end cap at the bottom of the screen was found to have come out during well installation. The casing of well MS-8 also was pulled. The holes left by wells MS-6 and MS-8 were filled with a commercial bentonite sealer and cement plugs were put at land surface. These wells were replaced by wells MS-11 and MS-12 at nearby sites.

During the drilling of MS-7, loss-of-circulation problems near land surface became so severe that the site was almost abandoned. However, circulation was re-established by the addition of a bentonite sealer and drilling-mud additive, and the test hole was drilled to a depth of 165 feet. Rather than replace this well or abandon this site, a cement plug was put at the bottom of the screen. Cement was pressure grouted into the bore hole just below the screen and into the screen. Bentonite pellets were put in the screen above the cement plug, and some gravel pack was put above the bentonite. After the bentonite swelled, the effective screen interval in well MS-7 was reduced from 88.5-108.5 to 88.5-99.5 feet below land surface (Appendix C). After the plug was installed, this well was developed for an additional hour.

### Water-Level Measurements

Water-level measurements were made with a steel tape with a weight on the end so that entering the water surface could be heard. A few feet of the tape were coated with a thin layer of carpenter's chalk so that the water-level mark could be readily distinguished. Water levels were measured twice in each well to assure an accuracy of 0.01 foot. A length of tape from above the water-level mark to the end of the tape was let dry thoroughly after each measurement, wiped clean with disposable napkins, and then re-chalked.

The water-level measurements were made in advance of sampling for water quality to provide data from which the volumes of water to be evacuated from the wells to be sampled could be calculated and the depths of the pump settings could be determined. In addition, the measurements were made before the wells were sampled so that any water that might be contaminated from the tape or chalk would be evacuated prior to sampling.

### Well Sampling for Water Quality

General procedures followed during the first sampling of the 2-inch-diameter wells screened in the alluvial aquifer or the upper part of the confining unit were as follows:

(1) a submersible pump designed for use in 2-inch-diameter wells was decontaminated internally at the landfill headquarters before each well was sampled by pumping copious amounts of tap water through the pump and Teflon discharge line followed by de-ionized water;

(2) the churns and other equipment that would come in contact with the water samples also were decontaminated at the landfill headquarters using a Liquinox soap and tap-water solution, followed by rinsing with tap water and then de-ionized water before each well was sampled;

(3) the pump and about 15 to 20 feet of Teflon discharge line were decontaminated externally at the well sites by spraying with soapy water, then tap water, and finally de-ionized water, and then the pump was lowered into each well to a depth below the water level but not into the screen;

(4) the well was pumped for several minutes at a rate of about 1 gallon per minute to discharge any residual de-ionized water in the pump and discharge line before the measurements of field water-quality properties (pH, specific conductance, and temperature) were begun;

(5) pumping continued at about 1 gallon per minute for a minimum time to evacuate at least five volumes of water from each well and until measurements of field water-quality properties stabilized;

(6) after the well was evacuated, the churn was rinsed with water pumped from the well and then filled to provide water for the filtered samples and raw samples to be analyzed for nutrients, while the other raw samples were collected directly from the pump discharge line;

(7) at the landfill headquarters the filtered and nutrient samples were prepared, the samples were tagged and labeled, and those that required chilling were placed on ice;

(8) the samples were collected by USGS personnel and shipped at the end of each day through the U.S. Postal Service, as Priority Mail, to the USGS National Water Quality Laboratory at Arvada, Colorado;

(9) three quality assurance/quality control samples of the de-ionized water pumped through the smaller submersible pump were collected at selected intervals during the first sampling and two of these samples were taken during the second sampling.

Changes in the general procedures made during the second sampling of the wells screened in the alluvial aquifer or upper part of the confining unit were as follows:

(1) high purity organic-free water was used to wash and clean equipment instead of the de-ionized water;

(2) glass containers were used to store the organic-free water instead of the plastic bottles used to store the de-ionized water;

(3) the small submersible pump was decontaminated by pumping a Liquinox soap and tap water solution through the pump followed by copious amounts of tap water and then organic-free water.

Well 37 required pumping many times with much time in between to allow for water-level recovery before the required four volumes could be evacuated. The water from this well was cloudy with suspended sediment, some of which passed through the filter (0.45 micron pores). The water from well 30 contained live ants, other insect remains, and a black substance, all of which was retained on the filter. These foreign substances could not be completely evacuated after prolonged pumping of this well, and some were included in the raw samples. Wells 3 and 20, which were installed in 1986 for the earlier investigation (Bradley, 1988) and were scheduled to be sampled for this investigation, were found to be so badly damaged that the integrity of any samples collected from them would be in doubt. Therefore, the casings of these wells were cut off below land surface, capped, and sealed with a cement plug about 1-foot thick.

General procedures followed during the first sampling of the 4-inch-diameter wells screened in the Memphis aquifer were the same as for the 2-inch-diameter wells in the alluvial aquifer, except as follows:

(1) a submersible pump designed for use in 4-inch-diameter wells was lowered to a depth below the water level but not into the screen;

(2) the wells were pumped at a rate of about 10 gallons per minute until a minimum of five volumes of water were evacuated and measurements of pH, specific conductance, and temperature had stabilized;

(3) after evacuation of the wells, a stainless steel bailer was used to collect samples after it had been decontaminated by the same procedure as the pumps, except that isopropanol was used as a final rinse in sampling wells MS-2, MS-5, MS-9, MS-10, and MS-11.

Changes in procedures for sampling the wells screened in the Memphis aquifer during the second sampling in addition to those changes in procedures for sampling the wells screened in the alluvial aquifer were as follows:

(1) analytical-grade methanol was used as the final rinse to decontaminate the bailer and the equipment was allowed to dry thoroughly before samples were collected;

(2) a Teflon bailer with a mono-filament leader attached to cotton strand rope was used to sample the wells after they were evacuated using the submersible pump.

During the measurement of water levels before the first sampling, well MS-7 was found to contain some residual drilling mud additive adhering to the inside of the casing at about 50 feet below land surface. Therefore, after prolonged evacuation of this well with the larger submersible pump, this well was sampled with the smaller submersible pump lowered to a depth of about 70 feet. All of the samples collected from well MS-7 were taken from the discharge line of the smaller pump.

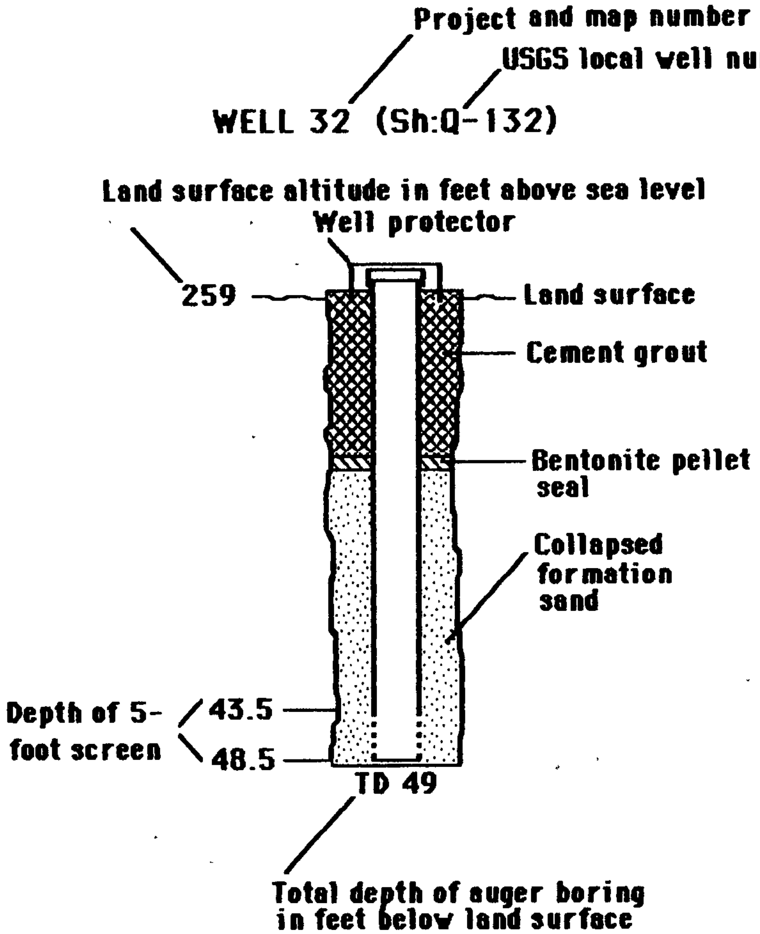
# APPENDIX B

Lithologic information from auger borings and well-construction diagrams
for wells installed in the alluvial aquifer

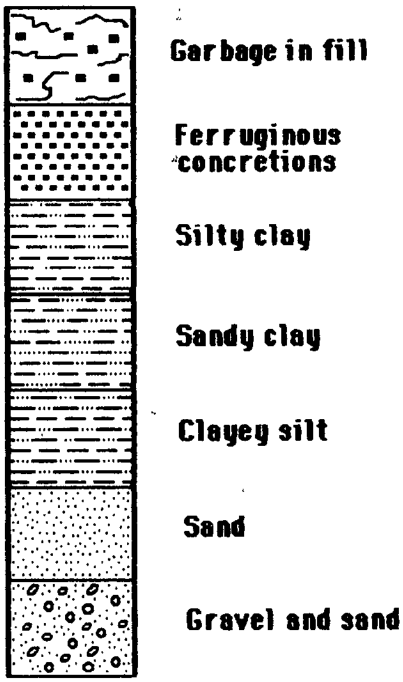
# APPENDIX B:

## Lithologic information from auger borings and well-construction diagrams for wells installed in the alluvial aquifer

## EXPLANATION



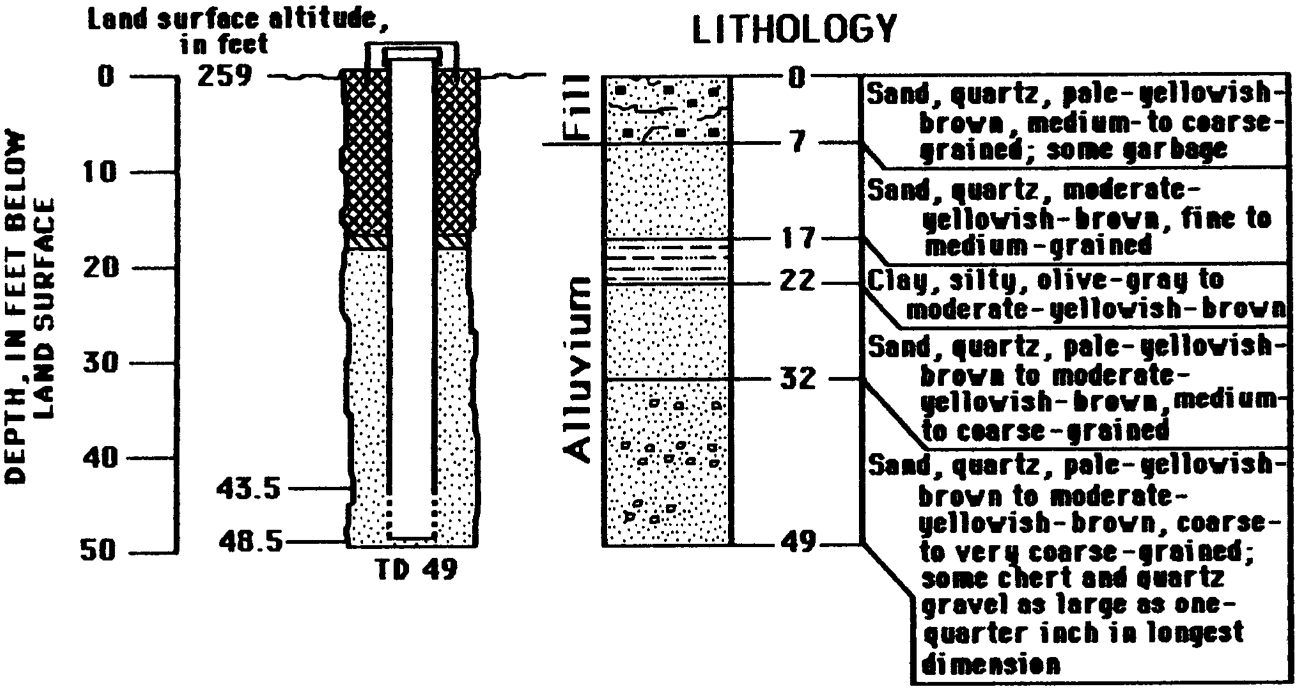

LITHOLOGIC SYMBOLS



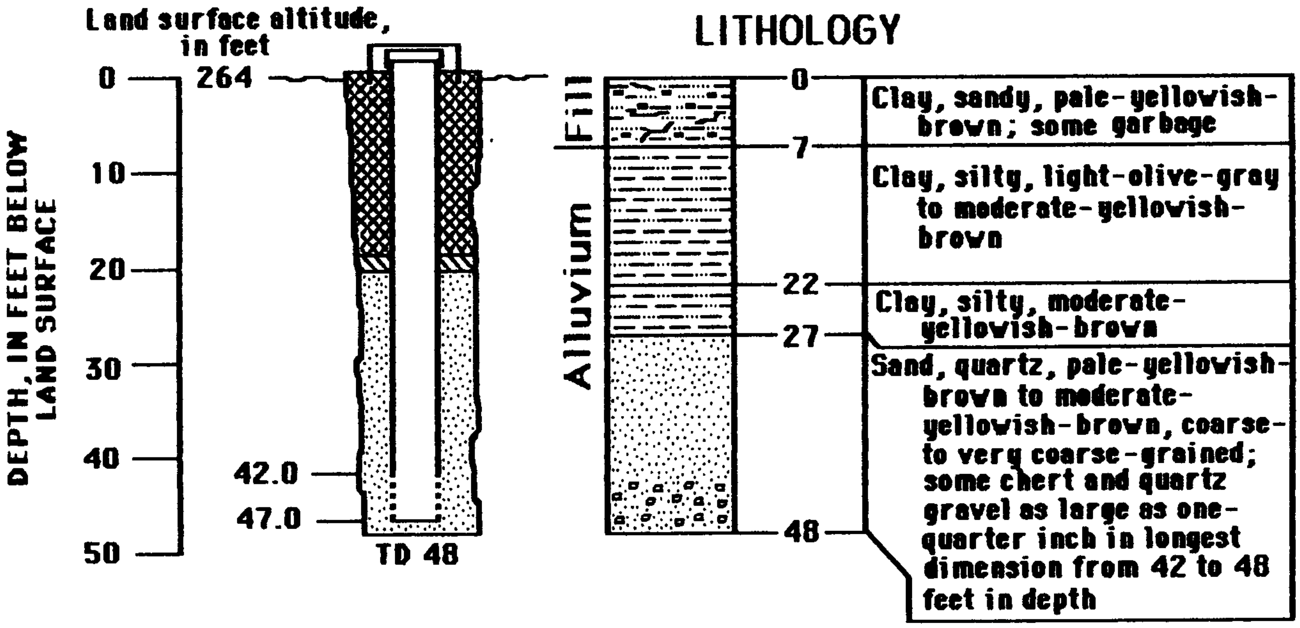

Lithology is from field notes by D.D. Zettwoch, USGS; samples representative of lithology; and gamma-ray logs made through the auger stem in borings for wells 37, 38, 39, and 40. Colors are from the "Rock Color Chart" of the Geological Society of America. Sand sizes are from a visual comparison card based on the Wentworth grade scale of particle size.

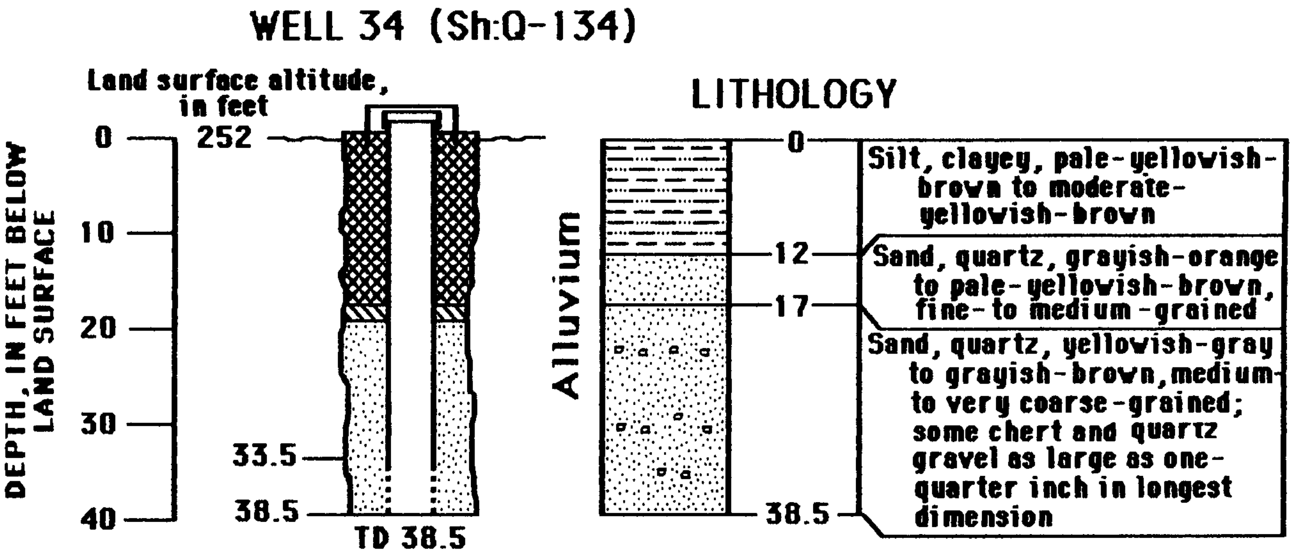
Observation wells in the alluvial aquifer are constructed with 2-inch-diameter, polyvinyl chloride (PVC) casings and screens. Most wells were developed by evacuating at least five volumes of water with a low-capacity (about 1 gallon per minute) submersible pump.

## WELL 32 (Sh:Q-132)

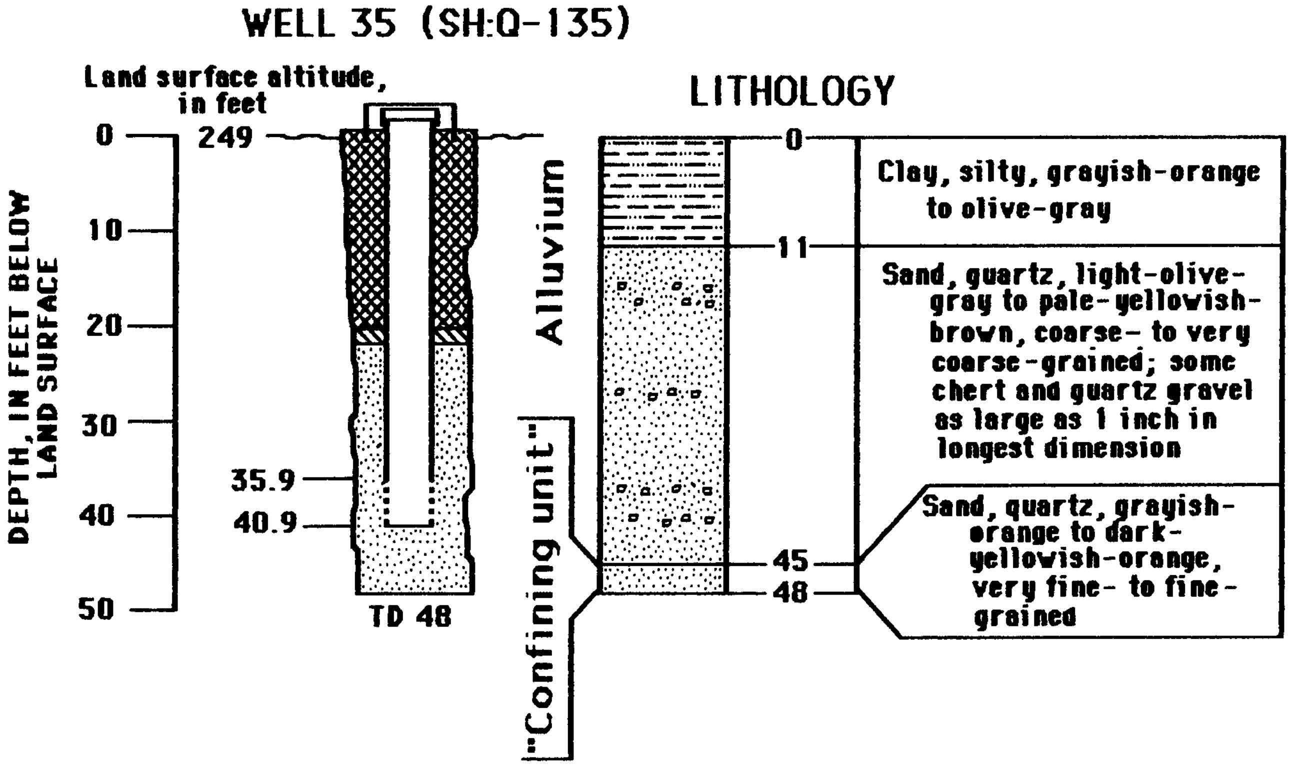



## WELL 33 (Sh:Q-133)



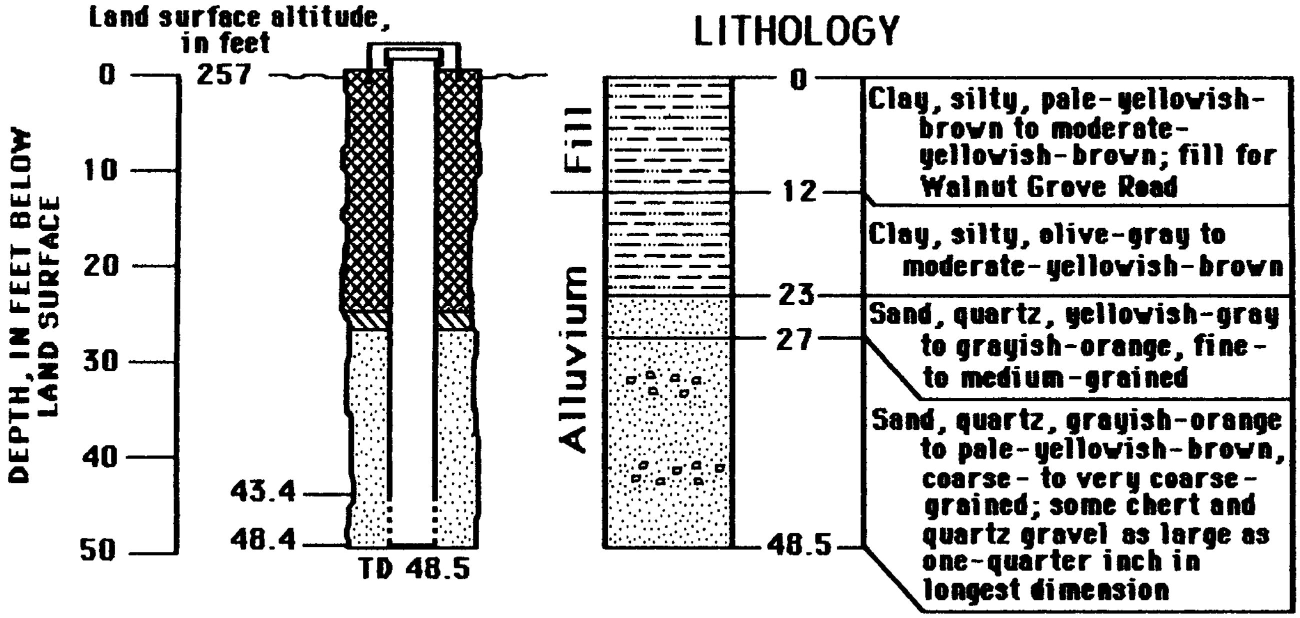


WELL 34 (Sh:Q-134)
Land surface altitude, in feet
252
DEPTH, IN FEET BELOW LAND SURFACE
0
10
20
30
40
33.5
38.5
TD 38.5
LITHOLOGY
Alluvium
0
12
17
38.5
Silt, clayey, pale-yellowish-brown to moderate-yellowish-brown
Sand, quartz, grayish-orange to pale-yellowish-brown, fine- to medium-grained
Sand, quartz, yellowish-gray to grayish-brown, medium- to very coarse-grained; some chert and quartz gravel as large as one-quarter inch in longest dimension

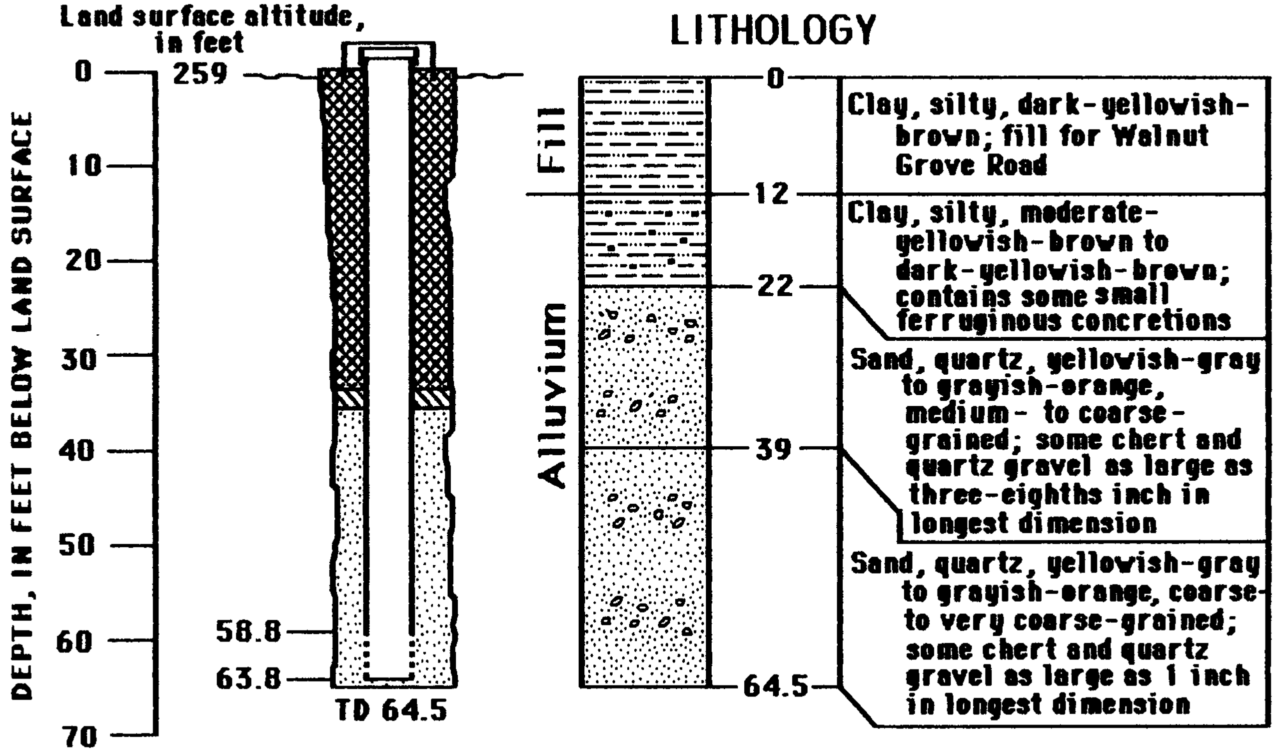



WELL 35 (SH:Q-135)
Land surface altitude, in feet
249
DEPTH, IN FEET BELOW LAND SURFACE
0
10
20
30
40
50
35.9
40.9
TD 48
LITHOLOGY
Alluvium
"Confining unit"
0
11
45
48
Clay, silty, grayish-orange to olive-gray
Sand, quartz, light-olive-gray to pale-yellowish-brown, coarse- to very coarse-grained; some chert and quartz gravel as large as 1 inch in longest dimension
Sand, quartz, grayish-orange to dark-yellowish-orange, very fine- to fine-grained

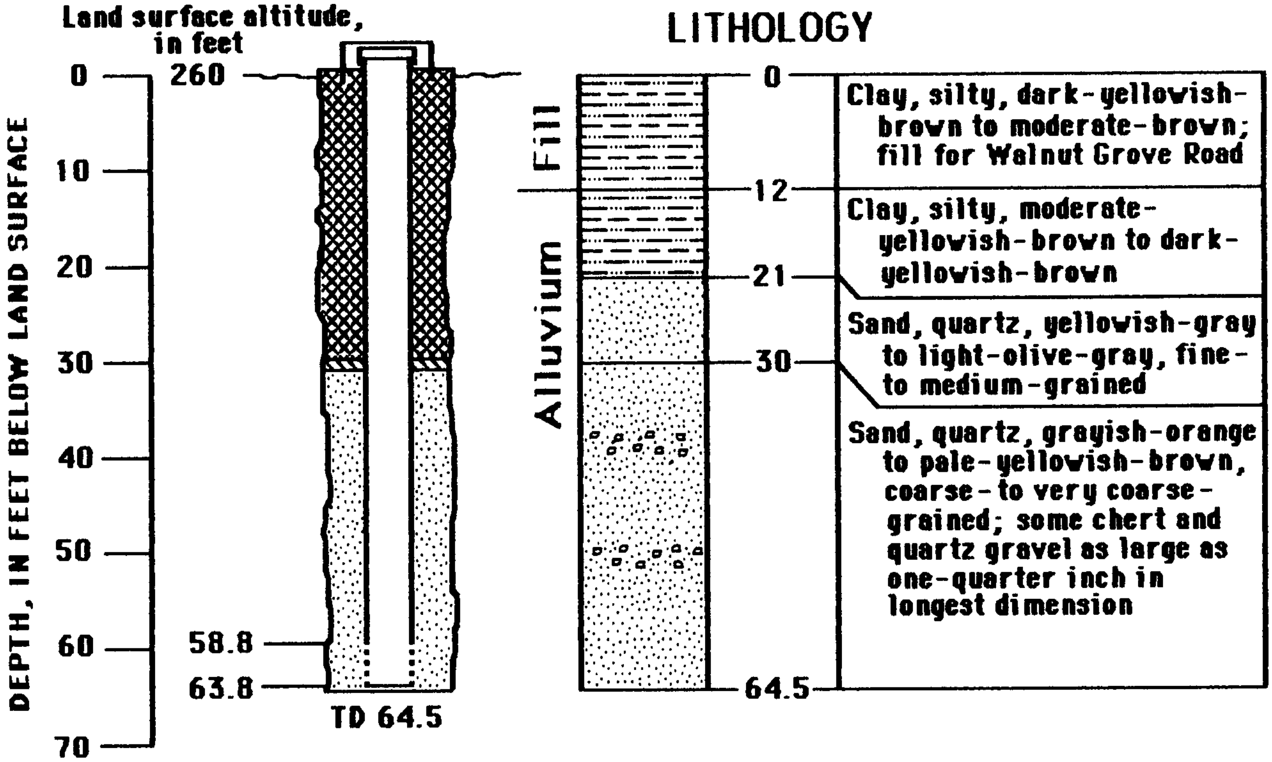
## WELL 36 (Sh:Q-136)



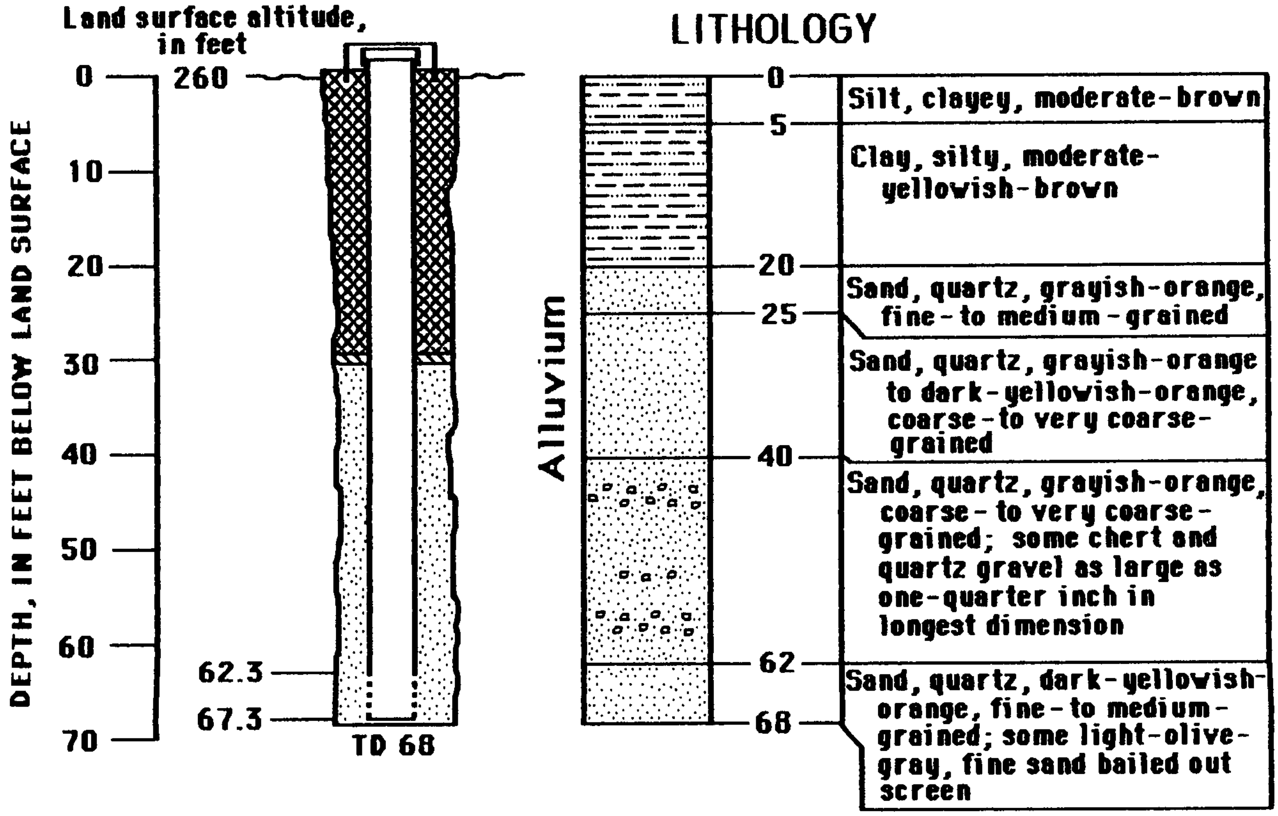

## WELL 37 (Sh:Q-137)



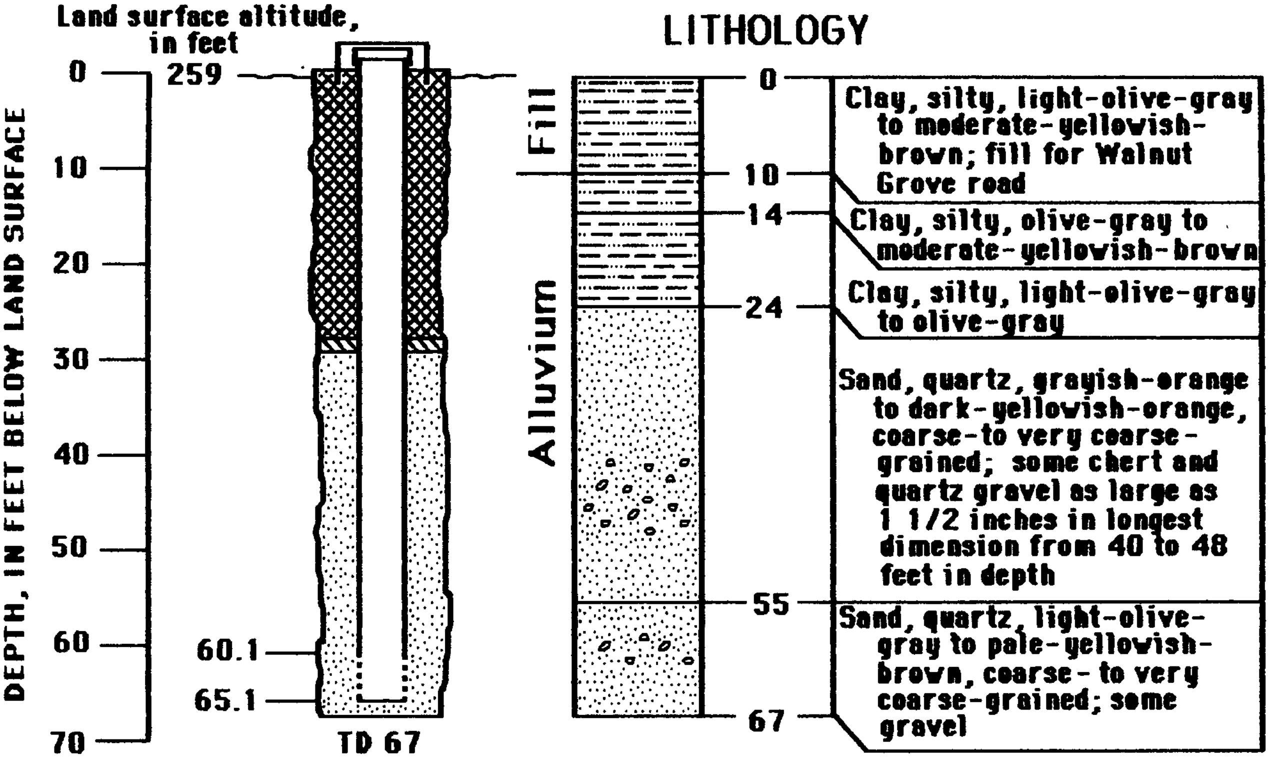
## WELL 38 (Sh:Q-138)



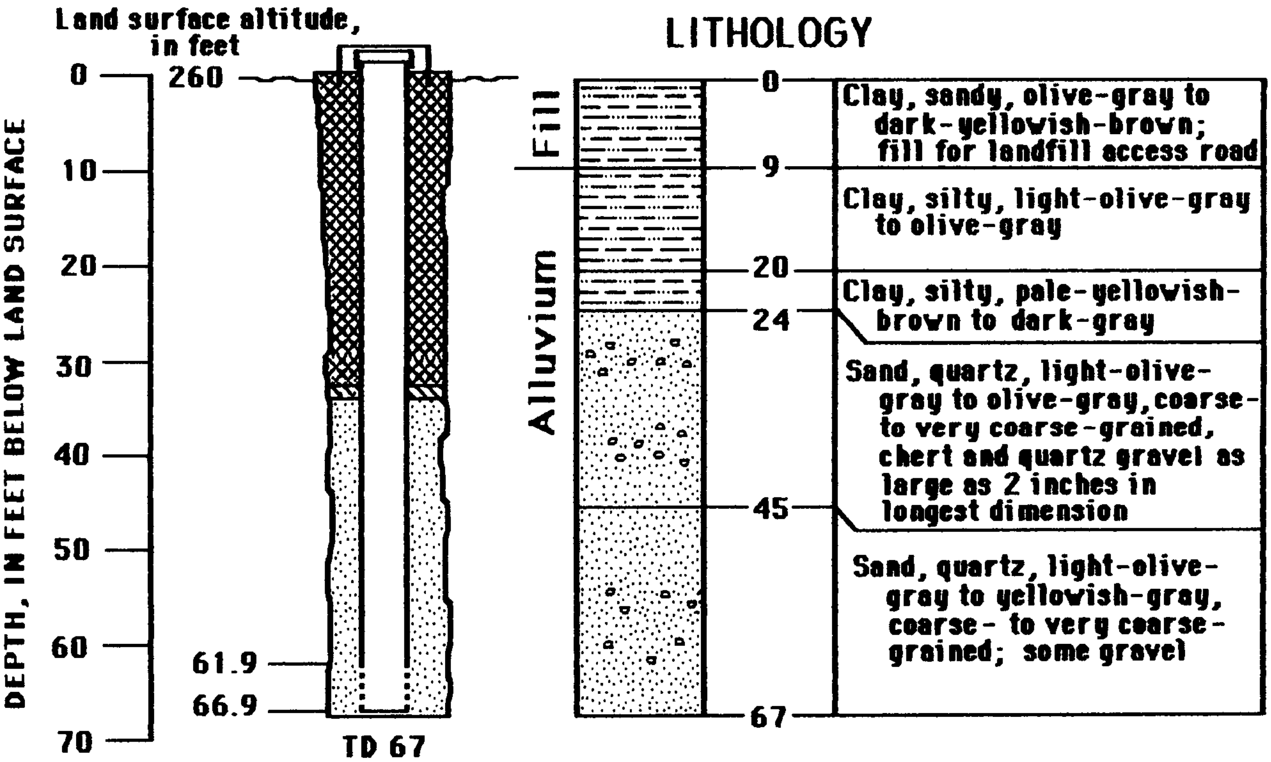

## WELL 39 (Sh:Q-139)



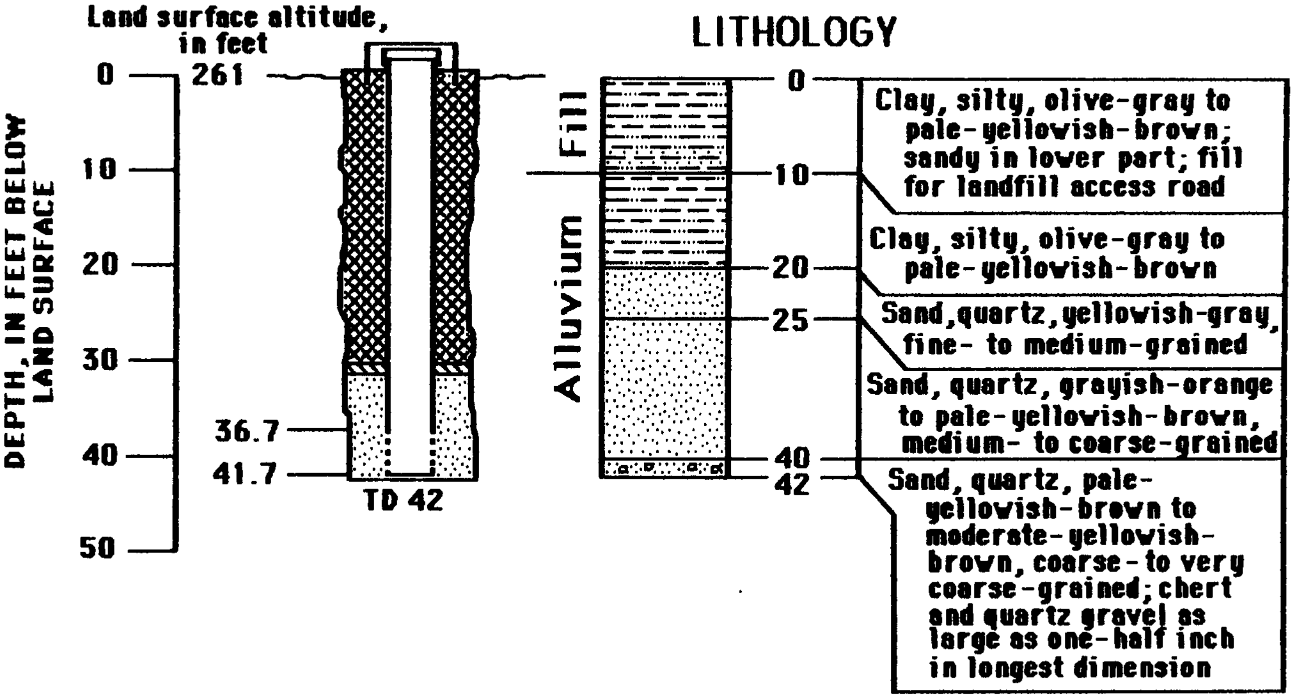
## WELL 40 (Sh:Q-140)



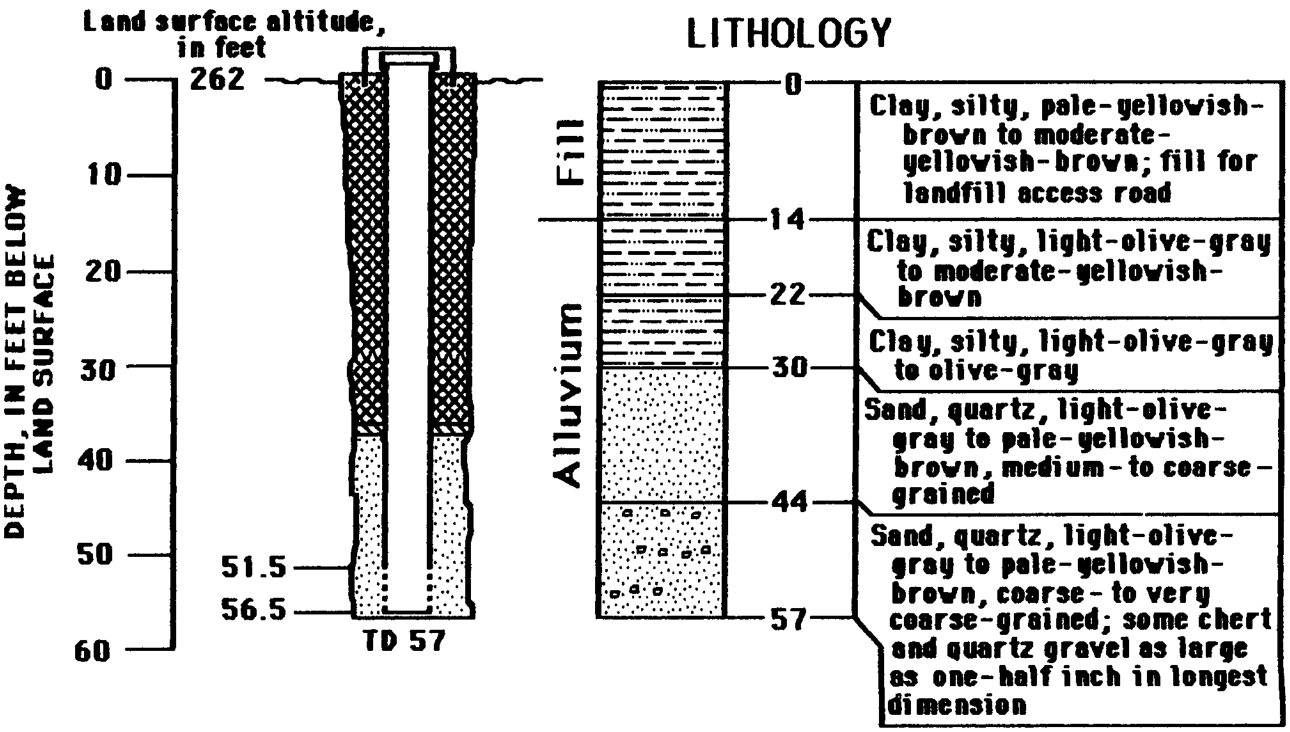

## WELL 41 (Sh:Q-141)



## WELL 42 (Sh:Q-142)




## WELL 43 (Sh:Q-143)



# APPENDIX C

Lithologic information from hydraulic-rotary test holes and well-construction diagrams for wells installed in the Memphis aquifer

## APPENDIX C:

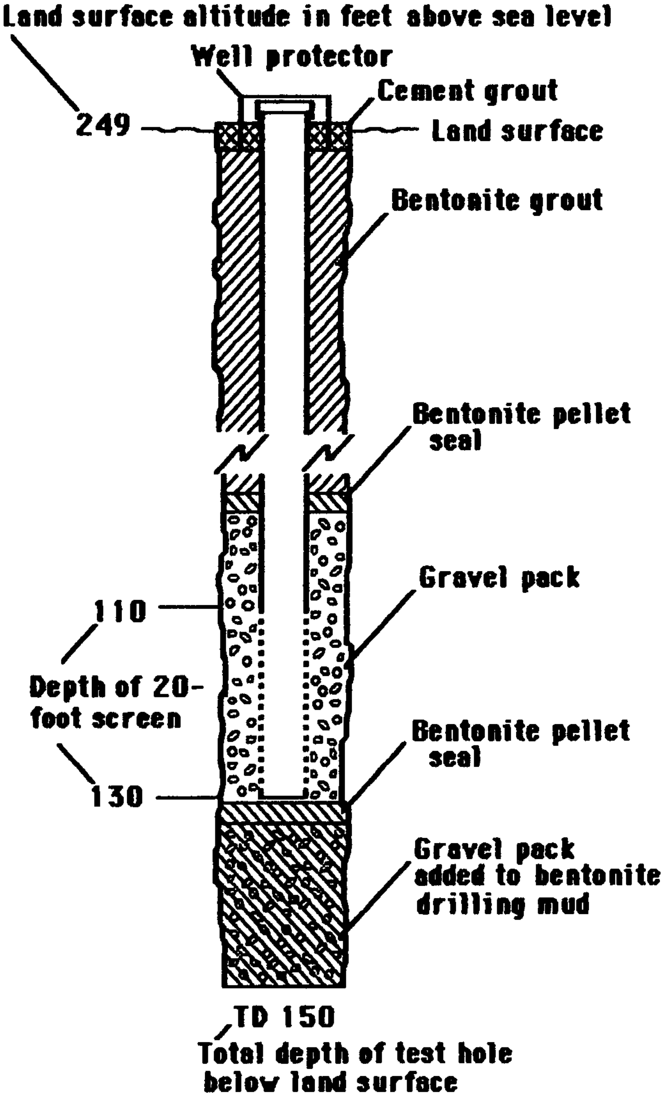
### Lithologic information from hydraulic-rotary test holes and well-construction diagrams for wells installed in the Memphis aquifer

## EXPLANATION

Project and map number for this report

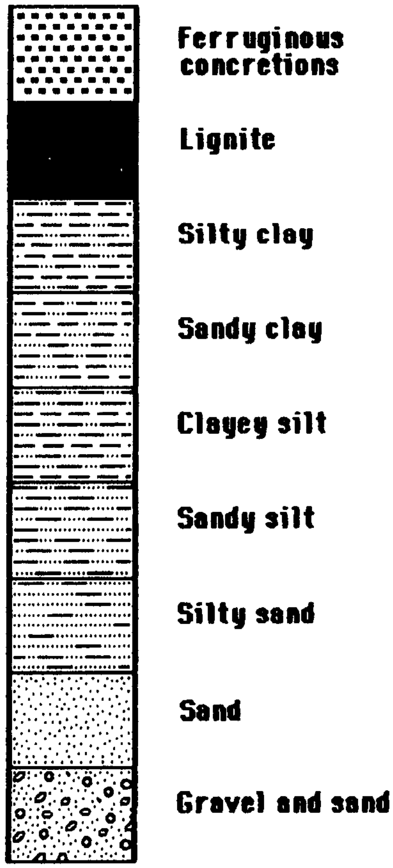
USGS local well number for Tennessee

WELL MS-5 (Sh:Q-144)



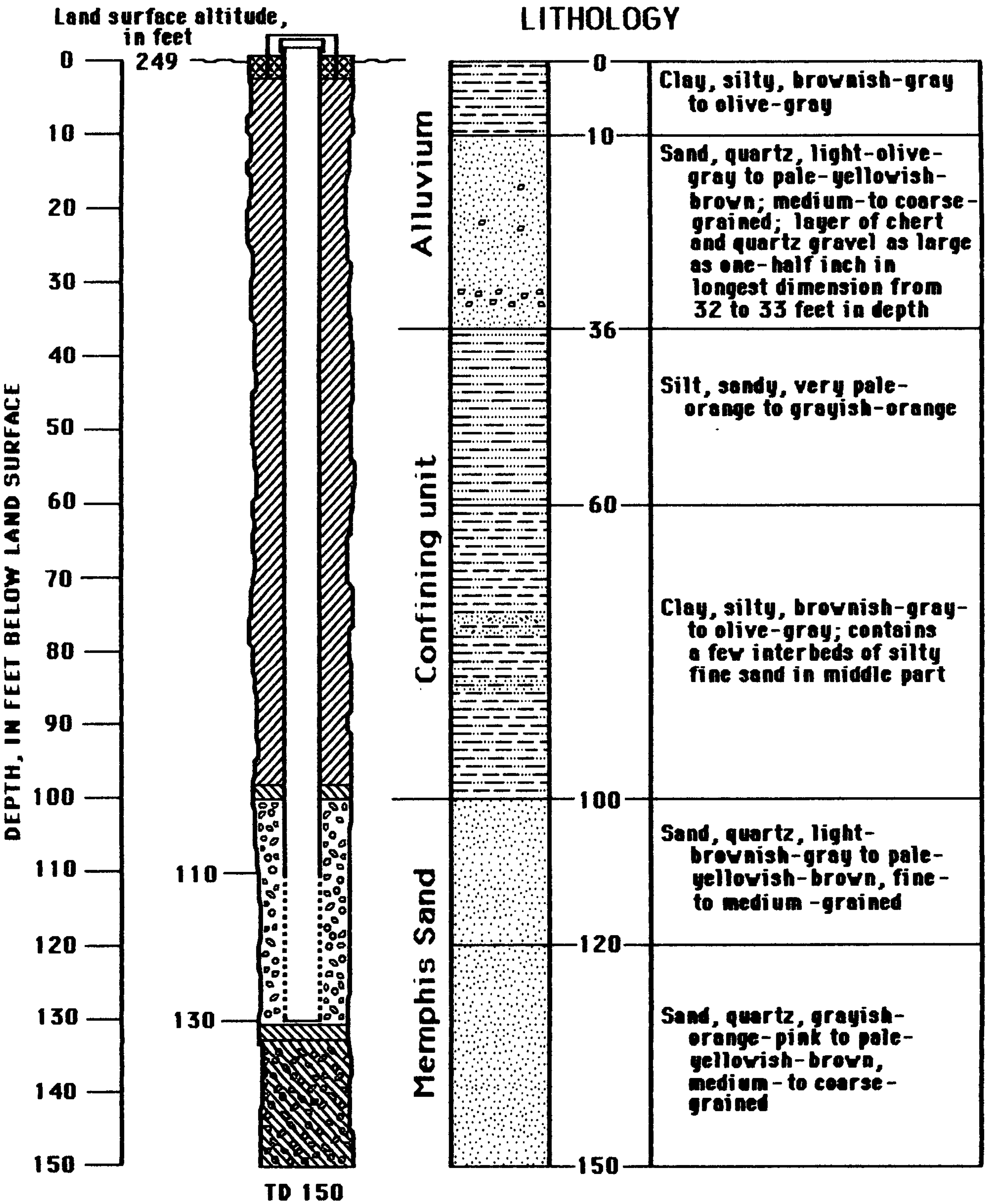

Observation wells in the Memphis aquifer are constructed with 4-inch-diameter, polyvinyl chloride (PVC) casings and screens. Wells were developed at least 1 hour by pumping with air compressor.

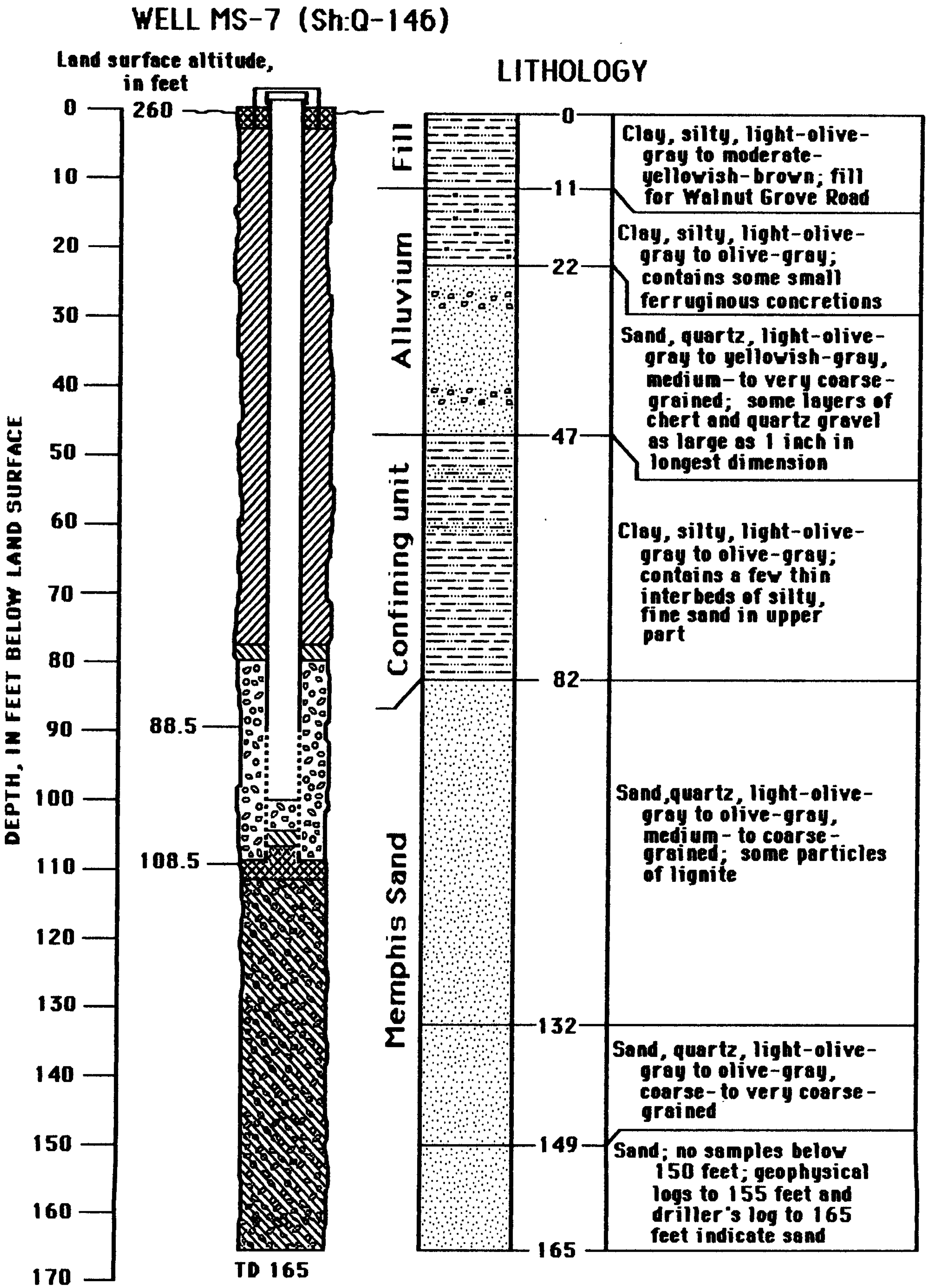
### LITHOLOGIC SYMBOLS




Lithology is from driller's logs, geophysical logs, and 10-foot-interval samples. Colors are from the "Rock Color Chart" of the Geological Society of America. Sand sizes are from a visual comparison card based on the Wentworth grade scale of particle size.

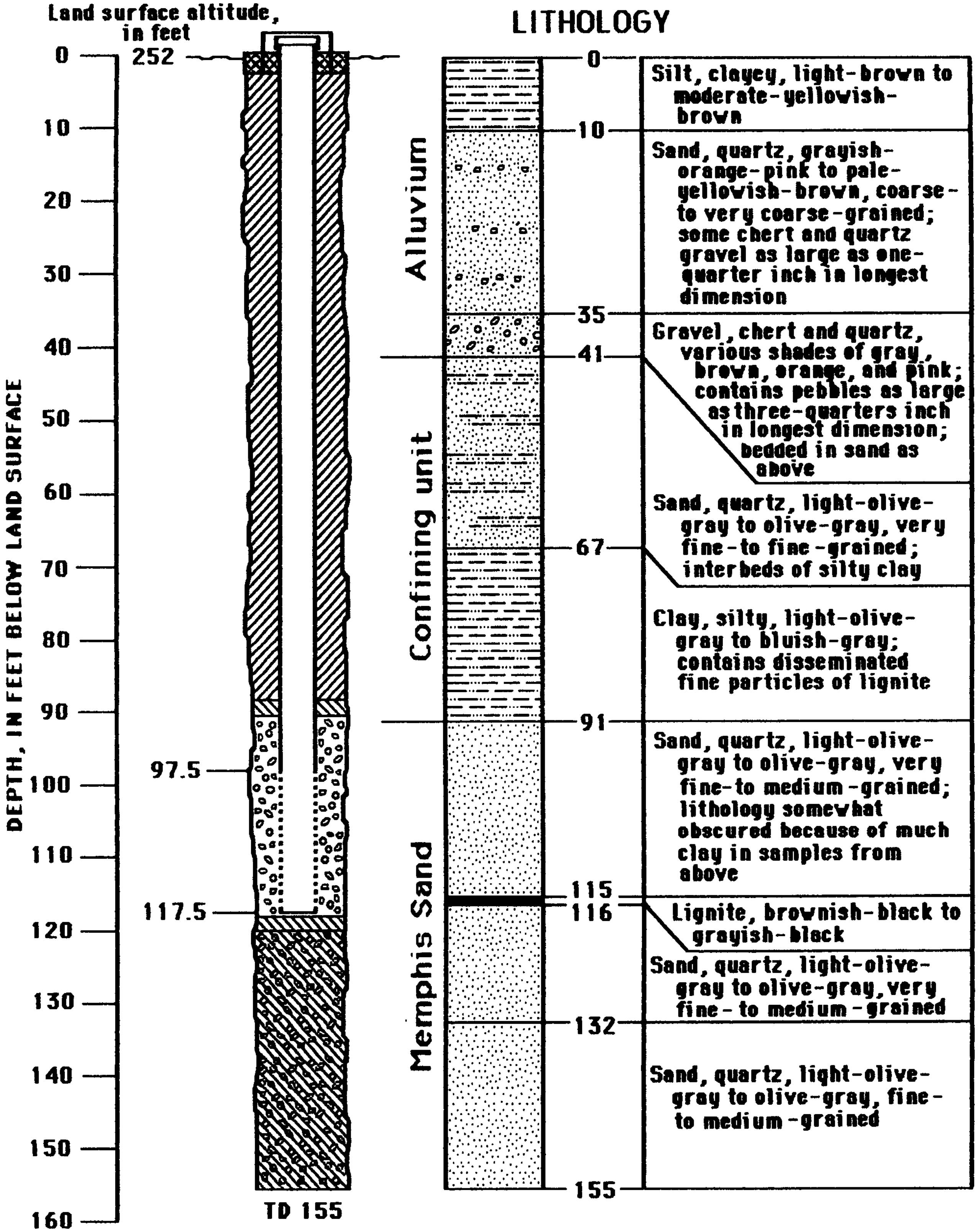
# WELL MS-5 (Sh:Q-144)

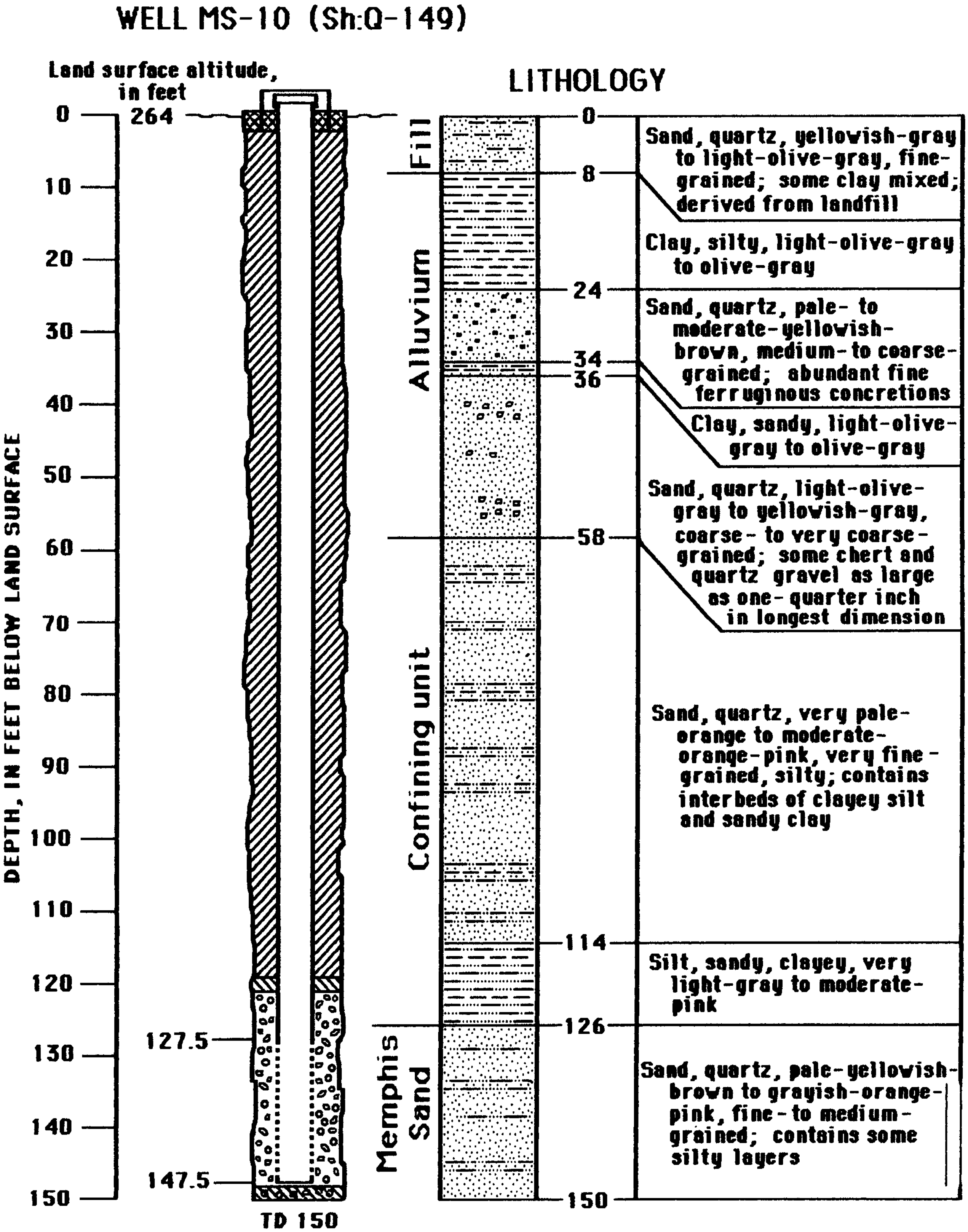


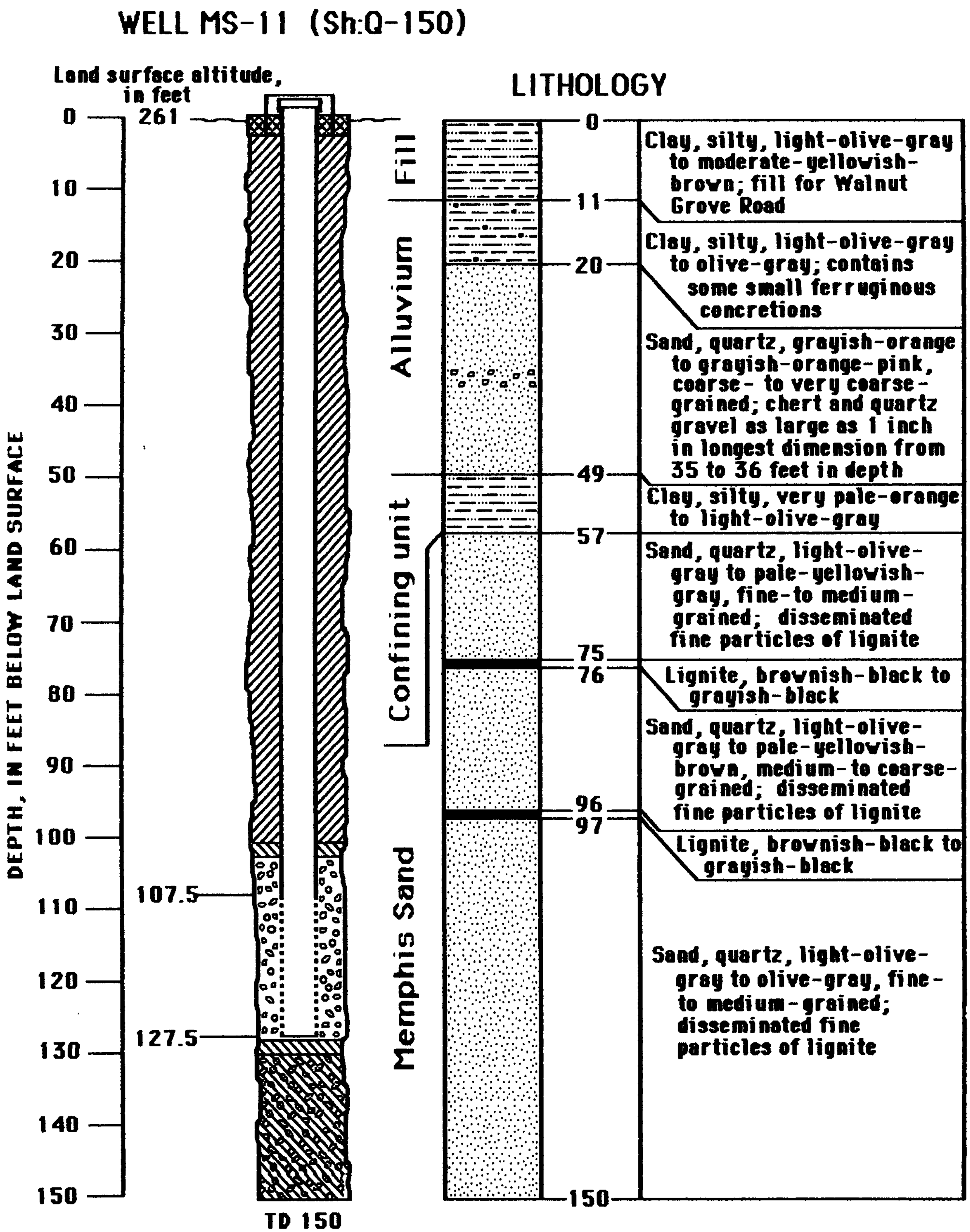


WELL MS-7 (Sh:Q-146)
Land surface altitude, in feet
260
88.5
108.5
DEPTH, IN FEET BELOW LAND SURFACE
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
TD 165
LITHOLOGY
Fill
Alluvium
Confining unit
Memphis Sand
0
11
22
47
82
132
149
165
Clay, silty, light-olive-gray to moderate-yellowish-brown; fill for Walnut Grove Road
Clay, silty, light-olive-gray to olive-gray; contains some small ferruginous concretions
Sand, quartz, light-olive-gray to yellowish-gray, medium- to very coarse-grained; some layers of chert and quartz gravel as large as 1 inch in longest dimension
Clay, silty, light-olive-gray to olive-gray; contains a few thin interbeds of silty, fine sand in upper part
Sand, quartz, light-olive-gray to olive-gray, medium- to coarse-grained; some particles of lignite
Sand, quartz, light-olive-gray to olive-gray, coarse- to very coarse-grained
Sand; no samples below 150 feet; geophysical logs to 155 feet and driller's log to 165 feet indicate sand

## WELL MS-9 (Sh:Q-148)




WELL MS-10 (Sh:Q-149)
Land surface altitude, in feet
264
DEPTH, IN FEET BELOW LAND SURFACE
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
127.5
147.5
TD 150
LITHOLOGY
Fill
Alluvium
Confining unit
Memphis Sand
0
8
24
34
36
58
114
126
150
Sand, quartz, yellowish-gray to light-olive-gray, fine-grained; some clay mixed; derived from landfill
Clay, silty, light-olive-gray to olive-gray
Sand, quartz, pale- to moderate-yellowish-brown, medium- to coarse-grained; abundant fine ferruginous concretions
Clay, sandy, light-olive-gray to olive-gray
Sand, quartz, light-olive-gray to yellowish-gray, coarse- to very coarse-grained; some chert and quartz gravel as large as one-quarter inch in longest dimension
Sand, quartz, very pale-orange to moderate-orange-pink, very fine-grained, silty; contains interbeds of clayey silt and sandy clay
Silt, sandy, clayey, very light-gray to moderate-pink
Sand, quartz, pale-yellowish-brown to grayish-orange-pink, fine- to medium-grained; contains some silty layers



WELL MS-11 (Sh:Q-150)
Land surface altitude, in feet
261
DEPTH, IN FEET BELOW LAND SURFACE
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
107.5
127.5
TD 150
Fill
Alluvium
Confining unit
Memphis Sand
LITHOLOGY
0
11
20
49
57
75
76
96
97
150
Clay, silty, light-olive-gray to moderate-yellowish-brown; fill for Walnut Grove Road
Clay, silty, light-olive-gray to olive-gray; contains some small ferruginous concretions
Sand, quartz, grayish-orange to grayish-orange-pink, coarse- to very coarse-grained; chert and quartz gravel as large as 1 inch in longest dimension from 35 to 36 feet in depth
Clay, silty, very pale-orange to light-olive-gray
Sand, quartz, light-olive-gray to pale-yellowish-gray, fine-to medium-grained; disseminated fine particles of lignite
Lignite, brownish-black to grayish-black
Sand, quartz, light-olive-gray to pale-yellowish-brown, medium-to coarse-grained; disseminated fine particles of lignite
Lignite, brownish-black to grayish-black
Sand, quartz, light-olive-gray to olive-gray, fine-to medium-grained; disseminated fine particles of lignite

## WELL MS-12 (Sh:Q-151)