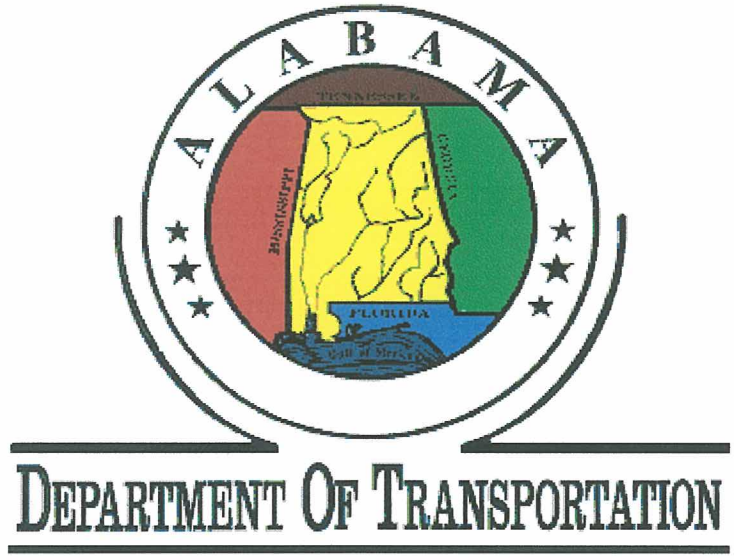
CONCEPTUAL GEOLOGY AND HYDROGEOLOGY BASED ON INVESTIGATIONS THROUGH MARCH 2001 COLISEUM BOULEVARD PLUME SITE MONTGOMERY, ALABAMA



May 9, 2001

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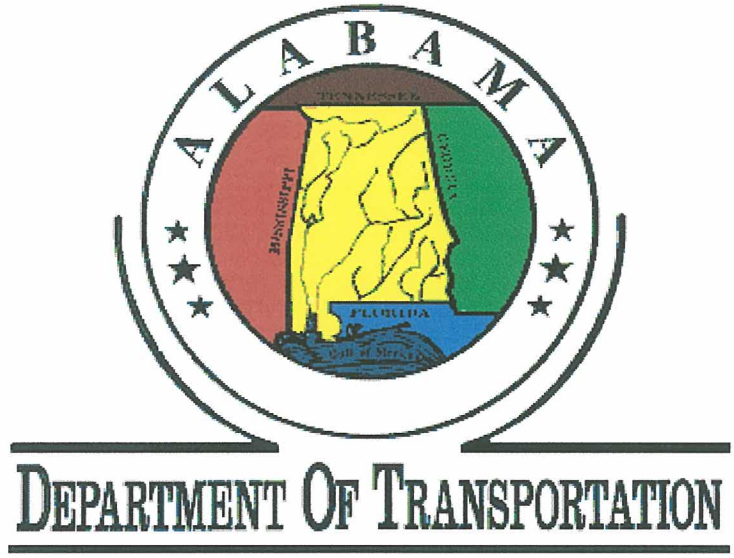

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Note: Appendix B is provided in a separate notebook.

Ground water flows both east and west from a ground-water divide at the CB site. In some areas of the CB site, recharge from substantial rainfall events can reverse the directions of ground-water flow at this divide. Based on the water levels, to date, the directions of ground-water flow are dynamic because of the recharge. The resultant changes in the directions of ground-water flow provide for transient contaminant pathways. Therefore, current ground-water conditions may not represent past conditions.

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1. INTRODUCTION

TTL, under contract with the ALDOT (Alabama Department of Transportation), has investigated the geology and extent of TCE in soils/sediments and shallow ground water within the area known as the Coliseum Boulevard Plume site. This work was conducted in phased tasks over the past 18 months and has included:

- continuous soil/sediment coring to determine geology;
- construction of monitoring wells and piezometers;
- analyses of soil/sediment, ground-water, surface-water, and vapor samples.

The purpose of this report is to provide a summary of environmental investigations completed, by **TTL**, for the ALDOT and a basis for decisions about future work at the site.

2. SITE DESCRIPTION

The CB site is within the City of Montgomery, Alabama (Figure 1). Coliseum Boulevard bisects the site from north to south. The site is defined generally to the south by the CSX Railroad, west by Lower Wetumpka Road, north by North Boulevard, and east by Emory Folmar Boulevard. The ALDOT Central Complex is a 70.9-acre tract that is within the south-central part of the CB site.

There are three residential neighborhoods at the CB site: Chisholm in the southwestern part, Eastern Meadows in the Central part, and Vista View in the northeastern part. The Montgomery Zoo and Chisholm Elementary School are in the northwestern part of the site. Eastern Meadows Church

EXECUTIVE SUMMARY

This report summarizes results from environmental investigations conducted at the CB (Coliseum Boulevard Plume) Site by **TTL** through contracts with the ALDOT (Alabama Department of Transportation). The report provides an initial site-conceptual model of the geology, shallow stratigraphy, ground-water/surface-water interactions, influences on the directions of ground-water flow, and analytical results of the site investigations conducted, to date.

The soils/sediments within the upper 80 feet at the CB site can be classified into three lithofacies: (1) sandy clay; (2) fine- to coarse-grained sand that contains lenses of gravel and, (3) graded fine- to medium-grained sands with variable fractions of fines. The graded fine- to medium-grained sands are both above and beneath the fine- to coarse-grained sand (for example, lithofacies 2). The boundaries between the fine- to coarse-grained sand and the overlying and underlying fine- to medium-grained sands are gradational. These two lithofacies form a single continuous shallow aquifer. Importantly, the fine- to coarse-grained sand with gravel lenses is laterally continuous and conveys the majority of the ground-water flow within this shallow aquifer.

There are three principal ditches (main Kilby, west Kilby, and the Children's Zoo ditch) that convey surface-water runoff at the CB site. Surface water infiltrates in the earthen parts of the ditches and recharges ground water. Periodically (based on seasonal variations of rainfall), ground water is in contact with parts of the bottoms of the both the main Kilby ditch and the west Kilby ditch. TCE (trichloroethylene) has been detected in water samples collected from the main Kilby ditch and part of the west Kilby ditch that is east of Coliseum Boulevard. Based on the TCE in the surface water in parts of the ditches, barrier fences were erected around parts of the west Kilby ditch and the main Kilby ditch. These fences eliminate casual and unintentional entry into the west Kilby ditch where it is east of Coliseum Boulevard and into the main Kilby ditch from its confluence with the west Kilby ditch to its intersection with North Boulevard.

of Christ, Chisholm Community Center and recreational facilities, Vista Terrace Apartments, and the Vista View Commercial development are in the north-central part of the site. A Pizza Hut and Sonic Restaurant recently have been constructed in the Vista View Commercial development. The Vista View Residential development and commercial lots are in the northeastern part of the site. An Amoco station is immediately east of Coliseum Boulevard near the intersection of North Boulevard.

3. HISTORY OF ENVIRONMENTAL INVESTIGATIONS

The following discussions present the sequence of events and rationale for the environmental investigations conducted for the ALDOT by **TTL**. Plate 1 shows the locations of probeholes, piezometers, vapor implants, and monitoring wells installed during site investigations. Plate 2 shows the results of the analyses of ground-water samples, for TCE/VOCs (volatile organic compounds), collected during the investigations.

- TCE was first reported in ground water at a commercial lot in the Vista View Commercial Development. This lot, which is owned by Alfa Mutual Fire Insurance Company, is east of Coliseum Boulevard. Goodwyn, Mills & Cawood Environmental Consultants (GMC) collected soil/sediment and ground-water samples from 30 probeholes and 5 permanent monitoring wells (MW-1A through MW-5A), which were constructed on Alfa's property. In their Phase II Environmental Site Assessment Report (GMC, 1999), the consultants reported TCE in ground water east and west of Coliseum Boulevard.

- The ALDOT Central Complex was, according to the Phase II Environmental Site Assessment Report (GMC, 1999), hydraulically upgradient of the Vista View Commercial Development. At the request of Alfa and the ADEM, the ALDOT initiated a voluntary investigation of the ALDOT Central Complex in October 1999. Consequently, **TTL** constructed 9 monitoring wells (MW-1 through MW-9) at the ALDOT Central Complex. The concentrations of TCE in ground-water samples collected, in October and November 1999, from these 9 monitoring

wells were generally lower than the concentrations in ground-water samples collected on the Alfa property.

- The ADEM (Alabama Department of Environmental Management) requested investigations for TCE in the soils/sediments and ground water west of Fairground Road. ALDOT and Alfa jointly agreed to perform these investigations. From February 16 to March 7, 2000, **TTL** used a Geoprobe and an on-site mobile laboratory to collect and analyze soil/sediment and ground-water samples from 16 probeholes (PH-1 through PH-16) and to construct four piezometers (PZ-1 through PZ-4). An area of elevated concentrations of TCE was discovered west of Fairground Road (**TTL**, 2000a). This area was near the intersections of Fairground Road with Broadway Street, Chisholm Street, and Gardendale Drive.

- The ADEM requested that the ALDOT continue investigations to determine the extent of TCE in the ground water west of Fairground Road. The ALDOT subsequently entered into a Voluntary Assessment Agreement to continue the investigations requested by ADEM. Based on this Agreement, additional soil/sediment and ground-water samples were collected. From May 1 to May 25, 2000, soil/sediment and ground-water samples were collected from probeholes PH-17 through PH-28 and piezometers PZ-5 through PZ-11 were constructed in the Chisholm area and near the Montgomery Zoo. Results of the analyses of the samples indicated that the southern, western, and northwestern extents of TCE in the ground water generally were determined (**TTL**, 2000b).

- A piezometer was constructed, by GMC, adjacent to the west Kilby ditch in March 2000. In May 2000, **TTL** constructed three additional piezometers along this ditch. **TTL** piezometers are identified as PD-1, -2, and -3 and the GMC piezometer is identified as PD-4 (see Plate 1). The piezometers were constructed to evaluate whether ground water intersected the base of the ditch.

- The ADEM requested five additional probeholes to "define the extent (TCE concentration less than 5 micrograms per liter) of the plume." From August 14 to 29, 2000, five probeholes (PH-29 through PH-33) were constructed in response to the ADEM request. In addition, a piezometer (PZ-12 through PZ-16) was constructed at the site of each of the five probeholes. There were elevated concentrations of TCE in ground-water samples from probehole PH33, which was about 100 feet south of North Boulevard (northeast part of the site). It was thought previously that the northeast edge of the plume of TCE was near Alfa monitoring well MW-5A. However, ground-water samples collected from monitoring well MW-5A contained smaller concentrations of TCE than ground-water samples from probehole PH33. Probehole

PH33 was about 150 feet northeast and downgradient of monitoring well MW-5A. Review of the data from the previous investigations and probeholes PH29 through PH33 indicated that the western and northwestern boundaries of the plume of TCE for the CB site had been defined. However, the northeast part of the plume of TCE had not been determined.

- In March 2000, the ADEM collected surface-water samples from the west and main Kilby ditches and the Children's Zoo ditch. The samples from the west Kilby ditch were collected between Coliseum Boulevard and the intersection of the west ditch with the main Kilby ditch. The samples from the main Kilby ditch were collected about 300 feet north (downstream) of the confluence of the west Kilby ditch with the main Kilby ditch. The samples from the west Kilby ditch and the main Kilby ditch contained dissolved TCE, whereas the samples collected from the Children's Zoo ditch did not contain detectable TCE. **TTL** began collecting monthly surface-water samples from the west and main Kilby ditches in July 2000. Results from the samples collected and analyzed by **TTL** are contained in previously submitted reports (TTL; 2000b, 2000c, 2001a).

- Because of TCE in water samples, barrier fences were erected around parts of the west Kilby ditch and the main Kilby ditch in January and February 2001. The fence was erected around the west Kilby ditch from its intersection with Coliseum Boulevard to its confluence with the main Kilby ditch. The fence was erected around the main Kilby ditch from its confluence with the west Kilby ditch to its intersection with North Boulevard. The barrier fences were erected as temporary interim responses to eliminate casual and unintentional entry into the ditches.

- From March 2000 to November 2000, **TTL** conducted a "soil-vapor" investigation in areas west of Fairground Road. Review of the results of the soil-vapor investigation indicates that the surficial sandy clay at the intersections of Fairground Road with Broadway Street, Chisholm Street, and Gardendale Drive retards migration of vapors to the surface (TTL, 2001c).

- In January and February 2001, **TTL** utilized a MIP (membrane interface probe) to conduct real-time measurements of "soil" conductivity and to screen for VOCs to assist in selecting soil/sediment samples for analyses. Samples of soil/sediment and ground water were collected from 25 probeholes (PH34 through PH-58). The results of the analyses of these samples are summarized in an April 2001 report (TTL, 2001b).

- Nine piezometers were constructed in February and March 2001 near the west Kilby ditch and the north part of the main Kilby ditch to evaluate the relationship of ground water to the ditch.

4. SURFACE WATER

The land surface of the CB site generally slopes from south to northeast. The land surface is about 220 feet AMSL at the ALDOT Complex and about 185 feet AMSL near North Boulevard (the northeast corner of the CB site). Natural drainageways historically conveyed stormwater to a pond in the general location of the present ponds at the Montgomery Zoo and to a former pond north of Vista View. The current ditches at the CB site coincide roughly with these historical drainageways. These current ditches (shown on Plates 1 and 2) are as follows:

- The "Children's Zoo" ditch, which is the western-most ditch within the CB site, collects water from areas west of Fairground Road and conveys it via a culvert to the north side of North Boulevard.

- There are two principal ditches (main Kilby ditch and west Kilby ditch) that convey surface-water runoff from the remainder of the CB site. The west Kilby ditch conveys surface runoff northward from the south-central part of the ALDOT Complex through Eastern Meadows. From Eastern Meadows, the west Kilby ditch conveys surface runoff north-northeast to the main Kilby Ditch. The main Kilby ditch traverses generally north-south from the ADEM, through Vista View Development, to North Boulevard. The main Kilby ditch generally parallels and is about 500 feet east of Coliseum Boulevard. As shown on Plates 1 and 2, parts of the west Kilby ditch are open (earthen and concrete-lined) and closed (piped). On-site, the main Kilby ditch is open and is intermittently earthen and lined with concrete. (The part of the west Kilby ditch that is east of Coliseum Boulevard and the part of the main Kilby ditch that is north of Gardendale Drive were referenced in the February 9, 2001 work plan as the East Coliseum ditch area.)

- The average annual precipitation in Montgomery is about 53 inches (CH2MHill, 1997). Surface runoff from the main and west Kilby ditches eventually empties into Three Mile Branch. Water from Three Mile Branch enters the Alabama River.

5. GEOLOGY

Knowles, and others (1963) described the geology and ground-water resources in Montgomery County. Their hydrogeologic descriptions were updated in the wellhead-protection plan for the north well field of the City of Montgomery (CH2MHill, 1997). The hydrogeology at the Gunter Air Force Station Annex has been reported by Radian (1999). These reports and geologic logs (see Appendix A) for probeholes, piezometers, and monitoring wells were reviewed to develop the conceptual geology and hydrogeology of the CB site. The locations of the probeholes, piezometers, and monitoring wells are shown on Plate 1.

The ALDOT Complex, Vista View residential area, the Northeast Montgomery Industrial Park, and the Gunter Annex (formerly Gunter Air Force Base) are within the Alluvial-Deltaic Plain District of the East Gulf Coastal Plain physiographic section (Sapp and Emplaincourt, 1975). Surface drainage in the area of the CB site is northward and westward to the Alabama River.

Northeastern Montgomery is underlain by Quaternary and Cretaceous sedimentary deposits (see Figure 2). The Cretaceous sediments strike generally eastward and dip southward at 30 to 40 feet per mile. Beneath these sedimentary deposits are pre-Cretaceous igneous and metamorphic rocks.

Except for the hilly areas of southern Chisholm, Capitol Heights, and Dalraida where the Eutaw Formation crops out, Quaternary alluvial and terrace deposits overlie the Cretaceous sediments throughout the northeastern sector of Montgomery. The alluvial deposits crop out along the flood plains of the Alabama and Tallapoosa Rivers. Terrace deposits (alluvial deposits of an old flood plain) crop out from Chisholm through the ALDOT Complex, Vista View area, to the Gunter

Annex area. The alluvial deposits typically are 40 to 85 feet thick and the terrace deposits typically are 40 to 55 feet thick. The alluvial and terrace deposits comprise lenses of gravel and pale-yellow-orange, medium- to coarse-grained, poorly sorted sands that commonly are interbedded with dark-reddish-brown sandy clay (Knowles, and others, 1963). The CB site is on a river terrace that is about 200 to 220 feet AMSL.

Beneath the alluvial and terrace deposits is the Cretaceous Eutaw Formation, which crops out from the southern part of Chisholm through Capitol Heights and Dalraida. The Eutaw Formation comprises marine glauconitic sand that is interbedded with clay and sandy clay. Review of sample logs indicates that the Eutaw Formation is about 200 feet thick in eastern Montgomery. However, only the basal 50 to 60 feet of the Eutaw Formation underlies the Chisholm-Vista View-Gunter area. The occurrence of only basal Eutaw Formation at the CB site agrees with the findings of CH2MHill (1997) in the wellhead-protection report for the City of Montgomery. Radian (1999) reported that the Eutaw Formation pinches out on the Gunter Annex, which is southeast of the CB site.

Beneath the Eutaw Formation is the Gordo Formation. The Gordo comprises a basal zone of non-marine sand and gravel that is overlain by alternating beds of sand and varicolored mottled clay from the western part of Alabama through Montgomery County. Scott (written communication, 2001) reviewed drillers' logs, geologists' sample logs, and geophysical logs for wells and test wells and determined that the varicolored mottled clay, which is at the top of the Gordo Formation, is 10 to 50 feet thick in the Montgomery area. Scott estimated that the top of the Gordo Formation is 85 to 100 feet BLS or 170 to 155 feet AMSL in the Chisholm-ALDOT-Vista View-Gunter area. Radian (1999) reported depths to the top of the Gordo Formation at five drill sites at the Gunter Annex (Air Force Base). Review of information in the Radian report indicates that the top of the Gordo Formation may be 150 to 125 feet AMSL in the Chisholm-ALDOT area. The Gordo Formation is about 300 to 340 feet thick in northeastern Montgomery.

Beneath the Gordo Formation is the Coker Formation. The Coker Formation comprises a basal non-marine zone of deltaic sand, gravel, and clay. The basal zone is overlain by marine sand, clay, and thin beds of calcareous sandstone. Review of drillers' logs, geologists' sample logs, and geophysical logs indicates that the Coker Formation is 350 to 400 feet thick in northeastern Montgomery. Beneath the Coker Formation are pre-Cretaceous Rocks.

As described above, the Eutaw Formation typically contains glauconite. There have been glauconitic sands in the samples from numerous probeholes completed by **TTL**. These glauconitic sands were below coarse sandy layers that contained significant gravel fractions. Fine-grained clayey sands in samples from some of the probeholes contained large quantities of glauconite. The glauconitic sands may be the contact between the terrace deposits and the lower Eutaw Formation. This contact may not be distinct because the Eutaw Formation could have been reworked by the alluvial processes.

TTL has completed probeholes to a maximum depth of about 80 feet BLS (about 140 feet AMSL). Most of the soils/sediments retrieved from probeholes at the CB site were poorly sorted sands with various quantities of gravel, silt, and clay. The gravel deposits comprised well-rounded, quartz, pebble- to cobble-sized gravel. These gravels typically were embedded in a medium- to coarse-grained sand matrix with only thin layers of well-sorted gravel. These gravelly sands contained 10 percent to 50 percent gravel, by weight.

5.1 Hydrogeology

The Coker, Gordo, and Eutaw Formations are the major aquifers in the Montgomery area. These aquifers comprise sand and gravelly sand beds in the Coker, Gordo, and Eutaw Formations. These aquifers are confined downdip from their recharge areas. Downdip, the upper confining layer for the Eutaw aquifer is the Mooreville Chalk. This upper confining chalk is absent at the CB site. The upper confining layer for the Gordo aquifer is the varicolored mottled clay that marks the top of

the Gordo Formation. The upper confining layer for the Coker aquifer is a marine clay at the top of the Coker Formation. These confining layers occur consistently from western Alabama through Montgomery County.

Gravels and gravelly sands in the alluvial deposits are a potential source of large water supplies in the Montgomery area. However, the alluvial deposits generally are not used for water supplies because of their susceptibility to contamination from the land surface.

Water in the Coker, Gordo, and Eutaw aquifers generally moves downdip from the recharge areas. The Coker and Gordo Formations are sources of water supply for the Montgomery Water Works "North Well" and "West Well" Fields. The Eutaw Formation is tapped by some wells in the North and West Well Fields. CH2MHill (1997) reported that the shallow aquifer near the City of Montgomery includes the Eutaw Formation and the overlying terrace deposits. Based on the CH2MHill report, ground water that is west of the CB site flows westward towards the well field and the Alabama River.

5.2 Site-Specific Hydrogeology

5.2.1 Stratigraphy and Lithofacies

This section provides a conceptual hydrogeologic framework for the CB site. This framework was developed by reviewing published and unpublished information on the geology and hydrogeology of the Montgomery area and by reviewing the geologic logs for monitoring wells, piezometers, and direct-push probeholes completed by **TTL** during investigations at the site. These geologic logs, which are provided in Appendix A, include information about grain-size distributions, mineralogies, and the results of laboratory sieve analyses (based on the Unified Soil Classification System). The sieve analyses were reviewed to verify the geologic classifications of the grain sizes in soil/sediment samples. Mineralogical features such as the occurrences of glauconitic sands, silts, and clays characteristic of the Eutaw Formation are noted on the geologic logs in Appendix A. However, there was no attempt to distinguish between alluvial and Eutaw Formation sediments. Rather, the focus was on the potential for various lithofacies to affect the flow of ground water.

Site-specific lithofacies were identified and depicted on cross-sections by interpreting the geologic logs, sieve analyses, and soil-conductivity logs. Examination of these cross-sections resulted in the identification of lithofacies that are hydraulically connected and control the movements of the shallow ground water and dissolved chlorinated solvents.

The soils/sediments that have been sampled and described during the investigations at the CB site were "lumped" into the following three (3) lithofacies:

- Sandy Clay: 50 percent to 100 percent fine-grained silts or clays with the remaining fraction consisting of fine sand.

- Fine- to Coarse-Grained Sand with Gravel: Classified as a lithofacies primarily because of the large fraction of fine- to coarse-grained sand that it contains. There are laterally continuous lenses of well-rounded quartz

gravels, which are indicative of the alluvial-terrace deposits, within this lithofacies.

- Graded Sand: Fine- to medium-grained sand that contains less than 50 percent silt or clay.

The sandy clay lithofacies is at or near the surface throughout most of the site. The sandy clay that was used as the marker to terminate probeholes at the site also is within this lithofacies. This lithofacies is 3 to 20 feet thick where it is at or near the surface. This lithofacies is absent in the northeast part of the CB site and at probehole PH26, which is in the Chisholm area. The color, thickness, and lateral extent of the deeper sandy clays differ from the shallow sandy clays of this lithofacies. Typically, the deeper sandy clays are thin (½ to 4 feet thick) and may be laterally discontinuous.

The fine- to coarse-grained sand with gravel is the main lithofacies at the site. The gravels within this lithofacies have been the historical target of gravel-mining operations in the area. Because of the gravels within this lithofacies, it should be sufficiently permeable to convey large volumes of ground water.

The graded sand lithofacies both overlies and underlies the fine- to coarse-grained sand with gravel lithofacies. The graded sand lithofacies is probably less permeable than the fine- to coarse-grained sand with gravel lithofacies. (Aquifer [pumping] tests would be necessary to quantify the vertical and horizontal permeabilities of the lithofacies.)

The above classification of the soils/sediments into three lithofacies was used to develop four (4) cross-sections (Figures 4 through 7) to depict the conceptual geology and hydrogeology at the CB site. The locations of these four cross-sections are shown on Figure 3. Also shown on the four figures are the results of analyzing discrete ground-water samples and the March 2001 ground-water elevations.

Figure 4 shows the lithofacies along a cross-section (A-A') from the southwest corner to the northeast corner of the CB site. The sandy clay is at or within about 5 feet of the land surface across most of the cross-section. The clay is absent at probehole PH-45 (near the Vista View neighborhood at the northeast part of the site), which is within a former retention pond that has been filled and also near a historical gravel quarry. The absence of the clay probably resulted from excavation for the pond or excavation of gravel. The shallow sandy clay is 3 to 20 feet thick along this cross-section.

The fine- to coarse-sand lithofacies, which is continuous along the cross-section of Figure 4, is 10 to 20 feet thick. Above, below, and occasionally interbedded with this lithofacies is the graded-sand lithofacies. The lower layers of the graded sand are as much as 50 feet thick in the southwest part of the site, but less than 10 feet thick in the northeast part of the site. As noted above, the lower sandy clay was used as the marker to terminate probeholes. The top of this lower clay layer is about 140 feet AMSL in the southwest to about 180 feet AMSL in the northeast portion of the site.

Figure 5 is a generally south-to-north cross-section (B-B') from near the intersection of the CSX Railroad with Fairground Road to immediately north of the Montgomery Zoo property. The coarse sand is at least 15 feet thick to the south and at least 30 feet thick to the north on this cross-section. The depth of the deep sandy clay increases distinctly from probehole PH-5 to PH-17. The absence of sediment descriptions for the graded-sand lithofacies in the south part of the cross-section resulted from poor to no recovery of samples because of "heaving" sands or the impenetrable (for example, refusal) character of the sands.

Figure 6 is a generally south to north cross-section (C-C') that begins about 500 feet north of the intersection of Coliseum Boulevard with the CSX Railroad and terminates generally at the Chisholm Community Center. The surficial sandy clay is continuous along this cross-section. The "fine- to coarse-grained sand with gravel" is up to 40 feet thick beneath the east part of the ALDOT Facility (south part of the cross-section) but thins to about 20 feet thick beneath the Eastern

Meadows area. The graded sands that are prominent, beneath the coarse sand, in the cross-sections shown in Figures 4 and 5 are not prominent along the cross-section shown in Figure 6. The lower sandy clay that was used as the marker to terminate the probeholes is at about 155 to 175 feet AMSL along Figure 6.

Figure 7 provides a south-north cross-section (D-D') through the Vista View development that is east of Coliseum Boulevard. The south end of the cross-section begins at a probehole (PH-58) on East Gardendale Drive and terminates immediately north of the intersection of the northern lanes of North Boulevard with the main Kilby ditch. The fine- to coarse-grained sand with gravel lithofacies is 10 to 20 feet thick except at probehole PH-49, where it is about 30 feet thick, and at the extreme north end of the cross-section, where it has pinched out and is replaced by the graded sand. The surficial sandy clay is continuous throughout the cross-section except at PH-49, where it is absent and there are about 30 feet of the fine- to course-grained sand lithofacies. PH-49 is within the area of a historical gravel quarry.

Based on the available data and information, the "graded-sand" and the 10- to 40-foot-thick "fine- to coarse-grained sand with gravel" lithofacies are hydraulically connected and are a single aquifer. Occurrences of TCE in ground-water samples from throughout the water column are indicative of this "single-aquifer" aspect of these two lithofacies. The fine- to coarse-grained sand with gravel lithofacies is laterally and vertically continuous and probably conveys most of the ground water. The lower sandy clay lithofacies, which was used as the marker to terminate probeholes, dips to the south-southwest. This lower clay is thin in some parts of the CB site and may be laterally discontinuous.

5.2.2 Ground-water Elevations

Based on measurements since 1999 (see Table 1), ground water at the CB site is between 7 and 25 feet BLS or 195 and 180 feet AMSL. There is no evidence, to date, of perched water at the CB site. Contours of ground-water elevations are provided in Figures 8 and 9 for June and October 2000, respectively. There are two Figures, 10 and 11, for the contours of ground-water elevations for March 2001. In late February and early March 2001, nine additional piezometers were constructed along parts of the Kilby ditches that are east of Coliseum Boulevard. The piezometers were constructed so that the interactions of the ditches with the ground water could be evaluated. Figure 10 provides ground-water contours that are not based on the data from the piezometers that are along the ditches. Figure 11 provides ground-water contours that include the data from the piezometers that are along the ditches. Shown on these Figures are hydraulic-gradient vectors that indicate the directions and magnitudes of ground-water flow. These computer-generated contours were used to provide the general characteristics of the ground-water flow field and do not imply exact locations of known hydraulic parameters.

Review of the ground-water contours shown on Figures 8 and 9 indicate that there is a southeast-northwest ground-water divide that extends generally from the ALDOT Complex to the Montgomery Zoo. Ground-water flow was southwestward and northeastward from this divide during June and October 2000. There were about 5 inches of rainfall a few days before the March 2001 ground-water measurements. Review of Figures 10 and 11 indicates that recharge from this rainfall caused the water table at and near the Montgomery Zoo to rise and dip southward at the southeastern side of the Zoo. This southward dip reversed the hydraulic gradient such that there was ground-water flow towards the Eastern Meadows neighborhood and the ALDOT Complex.

Parts of the ditches that convey stormwater at the CB site intersect ground water during wet periods. The potential for intersections of parts of the west and main Kilby ditches with the water table can be inferred from Figure 4. Figure 4 is a cross-section that includes a depiction of the

elevations of the bottoms of the west and main Kilby ditches. Also shown on Figure 4 are ground-water elevations that are based on the contours of the March 2001 ground-water elevations. Review of Figure 4 indicates that the water table probably intersected the ditches and that the ditches were a "sink" for ground-water flow. Conversely, ground water would be below the bottoms of the ditches during dry periods and the unlined parts of the ditch could become "sources" of recharge due to infiltrations of surface runoff into the shallow aquifer. The piezometers that were constructed along the ditches will be useful for evaluating the interactions of the ditches with the water table.

6. ANALYTICAL RESULTS

Past investigations have focused primarily on determining the lateral and vertical extents of TCE in ground water above the first distinct clay beneath the water table. Soil/sediment and ground-water samples have been collected and analyzed for TCE. In addition, surface-water samples have been collected from the west and main Kilby ditches since the discovery of TCE in the ditches in March and May 2000. The results of these analyses are discussed in the following sections. The laboratory results for the analyses of the soil/sediment, surface-water, ground-water, and vapor samples are provided in Appendix B.

6.1 Surface Water

Since July 2000, **TTL** has collected and analyzed water samples from the west and main Kilby ditches. These samples have been collected at least monthly. Samples were not collected in October 2000 because water was not flowing in the ditches. The samples that were collected in August, September, and November 2000 were collected either during or immediately following a storm event because the ditch did not contain water at the other times for sampling.

The results of the analyses of the samples from the ditches are compiled in Table 2. The locations of the sampling sites are shown on Plate 1. Site 1 (identified as SW-1 on Plate 1) is in the earthen part of the west Kilby Ditch where the ditch is south of Coliseum Parkway. Site 2 (SW-2; Plate 1) is immediately east of Coliseum Boulevard where the west Kilby Ditch emerges from the double culvert that is beneath Coliseum Boulevard. Site 3 (SW-3; Plate 1) is about 300 feet downstream of the confluence of the west Kilby Ditch with the main Kilby Ditch. Site 4 (SW-4; Plate 1) is from an unlined part of the west Kilby Ditch that is immediately south of Chisholm Street. Site 4, which was added after the August 2000 sampling event, is on the ALDOT Central Complex.

The results of the analyses of the samples are as follows:

- The samples from sites 1 and 4 did not contain TCE (detection concentration of 1.0 µg/L).
- Water samples from site 2 contained TCE for three of the sampling events. There were 100 µg/L of TCE in the most recent (February 27, 2001) sample from site 2. Cis-1,2-dichloroethene (cis-1,2-DCE); 1,1 dichloroethene (1,1-DCE); toluene; and trihalomethanes (see Table 2) also were detected in several of the samples on different dates.
- Water samples from site 3 contained TCE concentrations from 2.2 to 21.1 µg/L during 6 of the 8 sampling events. However, there also were three sampling events for which samples of water from site 3 contained small concentrations of TCE but there was no detectable TCE in the water samples from upstream site 2.

The water table, as described in the previous section, can intersect the bottoms of the ditches in the area east of Coliseum Boulevard. Periodic occurrences of TCE in water samples from the ditches verify this seepage of ground water, containing TCE, into the ditches. Comparisons of the elevations of the water table along the ditches with the elevations of the bottoms of the ditches and

also comparisons of the occurrences of TCE in water samples from along the ditches can be used to determine where dissolved TCE enters the ditches.

6.2 Soils/Sediments

Soil/sediment samples from probeholes PH-1 through PH-33 were collected near the land surface and at depths roughly equivalent to the depths of nearby sanitary sewers during the initial Geoprobe investigation at the CB site. Samples also were collected about 1 foot above the depth of the first saturated soils/sediments retrieved during lithologic sampling.

During the MIP investigation, soil/sediment samples were collected from probeholes PH-34 through PH-58. The samples were collected by real-time evaluations of the peak responses from the electron-capture detector of the MIP. The results of the MIP investigation have been reported in the April 16, 2001 ALDOT report (TTL, 2001b). Generally, TCE concentrations were greater in ground-water samples than in the corresponding soil/sediment samples.

The results of analyzing the soil/sediment samples that were collected contemporaneously with the ground-water samples are provided in Table 3. Detailed illustrations of the Geoprobe profiles for probeholes PH-17 through PH-58 are included in the MIP report noted above (TTL, 2001b). These profiles show the lithofacies and depth-corresponded concentrations of TCE, if any, in discrete soil/sediment samples from the probeholes.

A total of 189 soil/sediment samples were collected from probeholes PH-1 through PH-58. The concentrations of TCE in the 48 samples in which TCE was detected ranged from 1.2 to 162 micrograms per kilogram. The 48 samples that contained the TCE were collected within 1 to 2 feet of the water table or from beneath the water table.

As stated above, the TCE concentrations typically have been greater in ground-water samples than in soil/sediment samples. Soil/sediment sampling does not improve the understanding of the occurrences, potential sources, nor magnitudes of TCE in the subsurface over that gained

through ground-water sampling. Future investigations at the CB site should be focused on collecting and analyzing ground-water samples unless there are specific objectives associated with soil/sediment sampling that can not be achieved through ground-water sampling.

6.3 Ground Water

Analytical results from ground-water samples collected for the initial investigation of the Alfa property were used to develop figures and interpretations of the chlorinated solvents in ground water. The results from **TTL's** laboratory analyses of ground-water samples across the CB site are compiled in Table 4 and shown on Plate 2. **TTL** collected the ground-water samples by: 1) pumping samples from monitoring wells MW-1 through MW-9, which are on the ALDOT Complex, and from monitoring wells MW-1A through MW-5A, which are on the Alfa property; and, 2) using a Geoprobe Ground-Water Profiler and/or a 4-foot Geoprobe drop-out screen in probeholes. The samples from the monitoring wells provide vertically averaged concentrations for the screened intervals whereas the Geoprobe method provides discrete concentrations. The construction characteristics of the ALDOT monitoring wells and piezometers at the CB site are compiled in Table 5.

As described above, **TTL** used the MIP tool to determine depths for collecting samples for laboratory analyses. The MIP was determined to be useful for delineating ground water that contains at least 1,000 µg/L of TCE.

The concentrations of TCE and PCE for the Geoprobe ground-water and monitoring-well samples are shown, along with the lithofacies and the March 2001 ground-water elevations, on Figures 4 through 7. Review of the variations of TCE and PCE concentrations along the cross sections of Figures 4 through 7 provide for general indications of the lateral and vertical extents of TCE and PCE at the CB site. The general indications are summarized, by Figure, as follows:

- Figure 4: Ground-water samples at or near the water table in the Chisholm area generally contained smaller concentrations of TCE than similar samples in the Eastern Meadows, Vista View, and north of North Boulevard areas.

The greatest concentrations of TCE (up to about 2,000 µg/L) were in ground-water samples from immediately above the first distinct clay beneath the water table north of Eastern Meadows. Occurrences of TCE were more common in both the shallow and deep ground-water samples from the Eastern Meadows, Vista View, and North Boulevard areas (middle to northeast part of the cross-section) than in the samples from the Chisholm area. Samples from probeholes in the general Vista View area contained PCE whereas samples from the Chisholm area did not. The northeastern extent of TCE, along this cross-section, has not been established.

- Figure 5: TCE was not detected in ground-water samples near the south end of the cross-section. Shallow and/or deep ground-water samples collected from probeholes at or near the intersections of Fairground Road with Broadway Street (PH-11), Chisholm Street (PH-14), and Gardendale Drive (PH-12) contained elevated concentrations of TCE (greater than 1,000 µg/L). The concentration of TCE (12,200 µg/L) in the sample from the probehole at the intersection of Gardendale Drive with Fairground Road is an indicator of liquid TCE. The elevated concentration of TCE at the first distinct clay beneath the water table at this location is indicative of an area where there is the need for further assessment of the vertical extent of TCE.

- Figure 6: Ground-water samples from the monitoring wells along Coliseum Boulevard did not contain detectable TCE. Ground-water samples from probeholes in the Eastern Meadows area northward contained TCE. There are greater concentrations of TCE in the deeper ground-water samples than in the samples collected near the water table in the Eastern Meadows area. The northern extent of TCE along this cross-section has not been established. Again, there were small concentrations of PCE in the ground-water samples from the Eastern Meadows area.

- Figure 7: Ground-water samples from all the probeholes shown on this cross-section contained small concentrations of PCE. Except for probehole PH-51, there were TCE and PCE in shallow (near the water table) and in deep ground-water samples. The TCE concentrations in the shallow and deep ground-water samples along this cross-section are of the same magnitude. (There has been a disparity of shallow and deep TCE concentrations in ground-water samples from probeholes along the other

cross-sections.) The northern extent of TCE (less than 1 µg/L) has been established along this cross-section.

The concentrations of TCE in shallow and deeper ground-water samples are depicted in Figures 12 and 13. Figure 12 depicts the concentrations of TCE in ground-water samples collected, by **TTL**, within about 3 feet of the water table and, by GMC, within about 10 feet of the water table. Figure 13 depicts the concentrations of TCE in ground-water samples collected by **TTL** and by GMC from at least 20 feet below the water table. For Figure 13, however, samples from only 9 and 12 feet below the water table were collected from probeholes PH-50 and PH-51 because they were collected at the first distinct clay below the water table. Probeholes PH-50 and PH-51 are in the extreme northeast part of the CB site. The first distinct clay is quite shallow in this area, which resulted in use of these shallow samples.

Review of Figures 12 and 13 indicates that the extents of TCE are not well established in the northeast part of the CB site. Review of the contours of the concentrations in the shallow ground water indicate that there is an area of elevated TCE concentrations generally at the intersection of Broadway and Chisholm Streets with Fairground Road. There is another area of elevated TCE concentrations in the general area north of the intersection of East Gardendale Drive with Coliseum Boulevard. Review of the contours of the concentrations of TCE in the deeper ground-water samples indicates that TCE concentrations are elevated in the two areas described above for the shallow ground water. In addition, there is an area of elevated TCE concentrations in the Eastern Meadows area.

Review of the ground-water analyses compiled in Table 4 indicates that some of the samples contain other chlorinated organic compounds: carbon tetrachloride; cis-1,2-DCE; 1,1-DCE; vinyl chloride, and chloroform. Isomers of DCE and vinyl chloride in ground water typically are

degradation daughter products of reductive dechlorination reactions of PCE and TCE. Additional geochemical evaluations will be required to determine if dechlorination is occurring.

7. REFERENCES

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TABLE 1. Ground-Water Elevations; Coliseum Blvd. Plume Investigation; Montgomery, Alabama.

Well Identifier	Elevation of Land Surface (ft. AMSL)[1]	Elevation of Measuring Point[2] (ft. AMSL)	Screened Interval (ft. BLS)[3]	Date of Measurement	Depth to Water (ft. BMP)[4]	Ground-Water Elevation (ft. AMSL)
Monitoring Wells (ALDOT Central Complex)						
ALDOT MW1	215.16	218.42	14-63	10/20/99	22.04	196.38
				11/16/99	22.36	196.06
				3/7/00	23.04	195.38
				6/15/00	23.11	195.31
				7/19/00	23.43	194.99
				10/4/00	24.04	194.38
				3/7/01	23.74	194.68
ALDOT MW2	218.84	218.76	16-70	10/20/99	22.43	196.33
				11/16/99	22.76	196.00
				3/7/00	23.43	195.33
				6/15/00	23.37	195.39
				7/19/00	23.72	195.04
				10/4/00	24.41	194.35
				3/7/01	24.09	194.67
ALDOT MW3	211.23	211.01	15-51.5	10/19/99	14.94	196.07
				11/16/99	15.26	195.75
				3/7/00	15.73	195.28
				6/15/00	15.85	195.16
				7/19/00	16.20	194.81
				10/4/00	16.78	194.23
				3/7/01	16.22	194.79
				3/23/01	15.33	195.68
ALDOT MW4	214.14	213.79	13-62	10/20/99	17.93	195.86
				11/16/99	18.20	195.59
				3/7/00	18.69	195.10
				6/15/00	18.80	194.99
				7/19/00	19.11	194.68
				10/4/00	19.72	194.07
				3/7/01	19.08	194.71
ALDOT MW5	218.18	218.06	14.5-53.5	10/19/99	22.31	195.75
				11/16/99	22.59	195.47
				3/7/00	23.25	194.81
				6/15/00	23.28	194.78
				7/19/00	23.57	194.49
				10/4/00	24.13	193.93
				3/7/01	23.63	194.43
ALDOT MW6	218.82	218.76	15.5-59.5	10/19/99	22.88	195.88
				11/16/99	23.19	195.57
				3/7/00	24.04	194.72
				6/15/00	24.11	194.65
				7/19/00	24.35	194.41
				10/4/00	24.86	193.90
				3/7/01	24.70	194.06

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Well Identifier	Elevation of Land Surface (ft. AMSL)[1]	Elevation of Measuring Point[2] (ft. AMSL)	Screened Interval (ft. BLS)[3]	Date of Measurement	Depth to Water (ft. BMP)[4]	Ground-Water Elevation (ft. AMSL)
ALDOT MW7	218.05	217.97	20-64	10/20/99	22.34	195.63
				11/16/99	22.60	195.37
				3/7/00	23.10	194.87
				6/15/00	23.19	194.78
				7/19/00	23.48	194.49
				10/4/00	24.07	193.90
				3/7/01	23.42	194.55
ALDOT MW8	218.72	218.62	17-61	10/19/99	22.00	196.62
				11/16/99	22.29	196.33
				3/7/00	23.11	195.51
				6/15/00	23.13	195.49
				7/19/00	23.45	195.17
				10/4/00	24.12	194.50
				3/7/01	24.06	194.56
ALDOT MW9	217.20	216.97	17-56	10/19/99	20.43	196.54
				11/16/99	20.78	196.19
				3/7/00	21.69	195.28
				6/15/00	21.62	195.35
				7/19/00	21.97	195.00
				10/4/00	22.70	194.27
				3/7/01	22.65	194.32
			Piezometers			
PZ1	221.26	220.93	21.5-30.5	3/7/00	25.81	195.12
				6/15/00	25.62	195.31
				7/19/00	26.01	194.92
				10/4/00	26.75	194.18
				3/7/01	26.67	194.26
PZ2	207.30	207.20	15.5-24.5	3/7/00	11.93	195.27
				6/15/00	12.36	194.84
				7/19/00	12.78	194.42
				10/4/00	13.32	193.88
				3/7/01	11.05	196.15
PZ3	220.67	220.50	24-34	3/7/00	25.18	195.32
				6/15/00	25.13	195.37
				7/19/00	25.49	195.01
				10/4/00	26.27	194.23
				3/7/01	26.12	194.38
PZ4	216.66	216.19	26.5-35.5	3/7/00	27.13	189.06
				6/15/00	26.94	189.25
				7/19/00	27.33	188.86
				10/4/00	28.20	187.99
				3/7/01	28.45	187.74
PZ5	204.82	204.72	15-19.8	6/15/00	10.14	194.58
				7/19/00	10.60	194.12
				10/4/00	11.13	193.59
				3/7/01	8.45	196.27

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Well Identifier	Elevation of Land Surface (ft. AMSL)[1]	Elevation of Measuring Point[2] (ft. AMSL)	Screened Interval (ft. BLS)[3]	Date of Measurement	Depth to Water (ft. BMP)[4]	Ground-Water Elevation (ft. AMSL)
PZ6	212.55	212.41	23-27.8	6/15/00	20.00	192.41
				7/19/00	20.45	191.96
				10/4/00	21.22	191.19
				3/7/01	18.99	193.42
PZ7	206.22	206.20	17-21.8	6/15/00	11.69	194.51
				7/19/00	12.15	194.05
				10/4/00	12.96	193.24
				3/7/01	10.00	196.20
PZ8	209.58	209.51	17-21.8	6/15/00	15.88	193.63
				7/19/00	16.39	193.12
				10/4/00	16.99	192.52
				3/7/01	13.46	196.05
PZ9	205.28	205.12	17-21.8	6/15/00	13.40	191.72
				7/19/00	13.90	191.22
				10/4/00	14.59	190.53
				3/7/01	10.90	194.22
PZ10	214.37	213.93	23-27.8	6/15/00	19.87	194.06
				7/19/00	20.32	193.61
				10/4/00	21.20	192.73
				3/7/01	20.75	193.18
PZ11	212.00	211.76	27-31.8	6/15/00	23.38	188.38
				7/19/00	23.87	187.89
				10/4/00	24.76	187.00
				3/7/01	23.60	188.16
PZ12	212.56	212.26	20-25	10/4/00	19.41	192.85
				3/7/01	16.18	196.08
PZ13	208.30	207.95	20-25	10/4/00	14.04	193.91
				3/7/01	11.20	196.75
PZ14	204.83	204.54	15-20	10/4/00	11.53	193.01
				3/7/01	8.34	196.20
PZ15	220.62	220.37	44-49	10/4/00	39.62	180.75
				3/7/01	40.31	180.06
PZ16	193.47	193.44	8-13	10/4/00	6.89	186.55
				3/7/01	4.89	188.55
				3/23/01	4.79	188.65
PD-1	206.33	205.97	10-19.8	6/15/00	11.22	194.75
				7/19/00	11.55	194.42
				10/4/00	12.11	193.86
				3/7/01	10.53	195.44
				3/23/01	9.50	196.47
PD-2	201.86	201.74	13-17.8	6/15/00	7.24	194.50
				7/19/00	7.54	194.20
				10/4/00	8.06	193.68
				3/7/01	6.49	195.25
				3/23/01	5.65	196.09

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Well Identifier	Elevation of Land Surface (ft. AMSL)[1]	Elevation of Measuring Point[2] (ft. AMSL)	Screened Interval (ft. BLS)[3]	Date of Measurement	Depth to Water (ft. BMP)[4]	Ground-Water Elevation (ft. AMSL)
PD-3	202.62	202.52	15-19.8	6/15/00	10.77	191.75
				7/19/00	11.00	191.52
				10/4/00	11.30	191.22
				3/7/01	9.15	193.37
				3/23/01	9.01	193.51
PD-4	202.22	202.15	10-20	6/15/00	8.58	193.57
				7/19/00	8.80	193.35
				10/4/00	9.21	192.94
				3/7/01	7.59	194.56
				3/23/01	7.42	194.73
PD-101	200.83	200.76	12.5-16.5	2/27/01	7.35	193.41
				3/7/01	6.82	193.94
				3/23/01	6.84	193.92
PD-102	205.55	205.52	16.5-20.5	2/27/01	13.25	192.27
				3/7/01	12.00	193.52
				3/23/01	11.45	194.07
PD-103	208.55	208.29	18.5-22.5	2/27/01	15.32	192.97
				3/7/01	13.90	194.39
				3/23/01	13.21	195.08
PD-104	200.33	200.01	11-14	2/27/01	8.60	191.41
				3/7/01	11.18	188.83
				3/23/01	11.15	188.86
PD-105	199.39	199.20	12-15	2/27/01	8.47	190.73
				3/7/01	8.02	191.18
				3/23/01	7.84	191.36
PD-106	199.73	199.59	14.5-17.5	2/27/01	14.51	185.08
				3/7/01	14.49	185.10
				3/23/01	9.40	190.19
PD-107	205.87	205.63	17.5-20.5	2/27/01	17.60	188.03
				3/7/01	17.60	188.03
				3/23/01	17.54	188.09
PD-108	205.82	205.58	14.5-17.5	2/27/01	11.29	194.29
				3/7/01	10.71	194.87
				3/23/01	9.95	195.63
PD-109	201.70	204.59		3/23/01	9.97	194.62
Monitoring Wells (Vista View Development)						
Alfa MW-1A	213.99	213.53	32.8-42.8	11/16/99	18.65	194.88
				3/7/00	18.87	194.66
				6/15/00	19.06	194.47
				7/19/00	19.36	194.17
				10/4/00	19.92	193.61
				3/7/01	19.05	194.48

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Well Identifier	Elevation of Land Surface (ft. AMSL)[1]	Elevation of Measuring Point[2] (ft. AMSL)	Screened Interval (ft. BLS)[3]	Date of Measurement	Depth to Water (ft. BMP)[4]	Ground-Water Elevation (ft. AMSL)
Alfa MW-2A	206.24	206.01	34.5-44.5	11/16/99	12.60	193.41
				3/7/00	11.57	194.44
				6/15/00	12.77	193.24
				7/19/00	13.20	192.81
				10/4/00	13.54	192.47
				3/7/01	9.95	196.06
Alfa MW-3A	209.85	209.67	30.5-40.5	11/16/99	14.21	195.46
				3/7/00	14.40	195.27
				6/15/00	14.62	195.05
				7/19/00	15.02	194.65
				10/4/00	15.65	194.02
				3/7/01	14.15	195.52
Alfa MW-4A	213.27	213.18	38.5-48.5	11/16/99	18.19	194.99
				3/7/00	18.78	194.40
				6/15/00	18.81	194.37
				7/19/00	19.09	194.09
				10/4/00	19.61	193.57
				3/7/01	18.77	194.41
Alfa MW-5A	200.26	203.42	14.2-24.2	11/16/99	16.50	186.92
				3/7/00	16.10	187.32
				6/15/00	16.69	186.73
				7/19/00	16.79	186.63
				10/4/00	16.79	186.63
				3/7/01	14.97	188.45
				3/23/01	14.79	188.63

[1] Feet above mean sea level. Elevations of land surface and measuring points of monitoring wells at ALDOT Complex and piezometers PZ5 through PZ16 and PD-1, PD-2, PD-3, and PD-4 were surveyed by Larry E. Speaks & Associates. Elevations of land surface and measuring points of Alfa monitoring wells and piezometers PZ1 through PZ4 were surveyed by Goodwyn, Mills & Cawood.

[2] Top of casing.

[3] Feet below land surface.

[4] Feet below measuring point.

Table 2. Results of analyses of surface water samples collected from West Kilby ditch and Main Kilby ditch; Coliseum Boulevard Plume Investigation, Montgomery Alabama. [Locations of surface water sample sites are shown on Plate 1.]

	Site 1*	Site 2*	Site 3**	Site 4*
Concentrations are expressed in micrograms/liter				
July 24, 2000	(No storm events several days prior to sampling)			
Trichloroethylene	NS	15.0	10.2	NS
cis, 1,2-Dichloroethene	NS	2.5	2.8	NS
Toluene	NS	13.4	<1.0	NS
Chloroform	NS	3.2	<1.0	NS
August 2, 2000	(storm event during sampling)			
Trichloroethylene	<1.0	<1.0	<1.0	NS
August 11, 2000	(storm event prior evening - August 10, 2000)			
Trichloroethylene	<1.0	<1.0	2.1	<1.0
Toluene	<1.0	1.1	<1.0	<1.0
September 18, 2000				
Trichloroethylene	NS	<1.0	2.1	NS
Bromodichloromethane	NS	6.2	1.8	NS
Dibromochloromethane	NS	1.5	<1.0	NS
Chloroform	NS	41.6	10.3	NS
November 9, 2000	(storm event during sampling)			
Trichloroethylene	<1.0	<1.0	<1.0	<1.0
December 15, 2000				
Trichloroethylene	<1.0	<1.0	8.1	<1.0
Toluene	<1.0	2.5	<1.0	<1.0
January 31, 2001				
Trichloroethylene	<1.0	34.5	17.4	<1.0
Chloroform	<1.0	1.3	<1.0	<1.0
February 27, 2001				
Trichloroethylene	<1.0	100	21.1	<1.0
1,1 - Dichloroethene	<1.0	1.1	<1.0	<1.0
cis, 1,2-Dichloroethene	<1.0	1.5	1.4	<1.0
Chloroform	<1.0	1.2	<1.0	<1.0

* West Kilby ditch
** Main Kilby ditch