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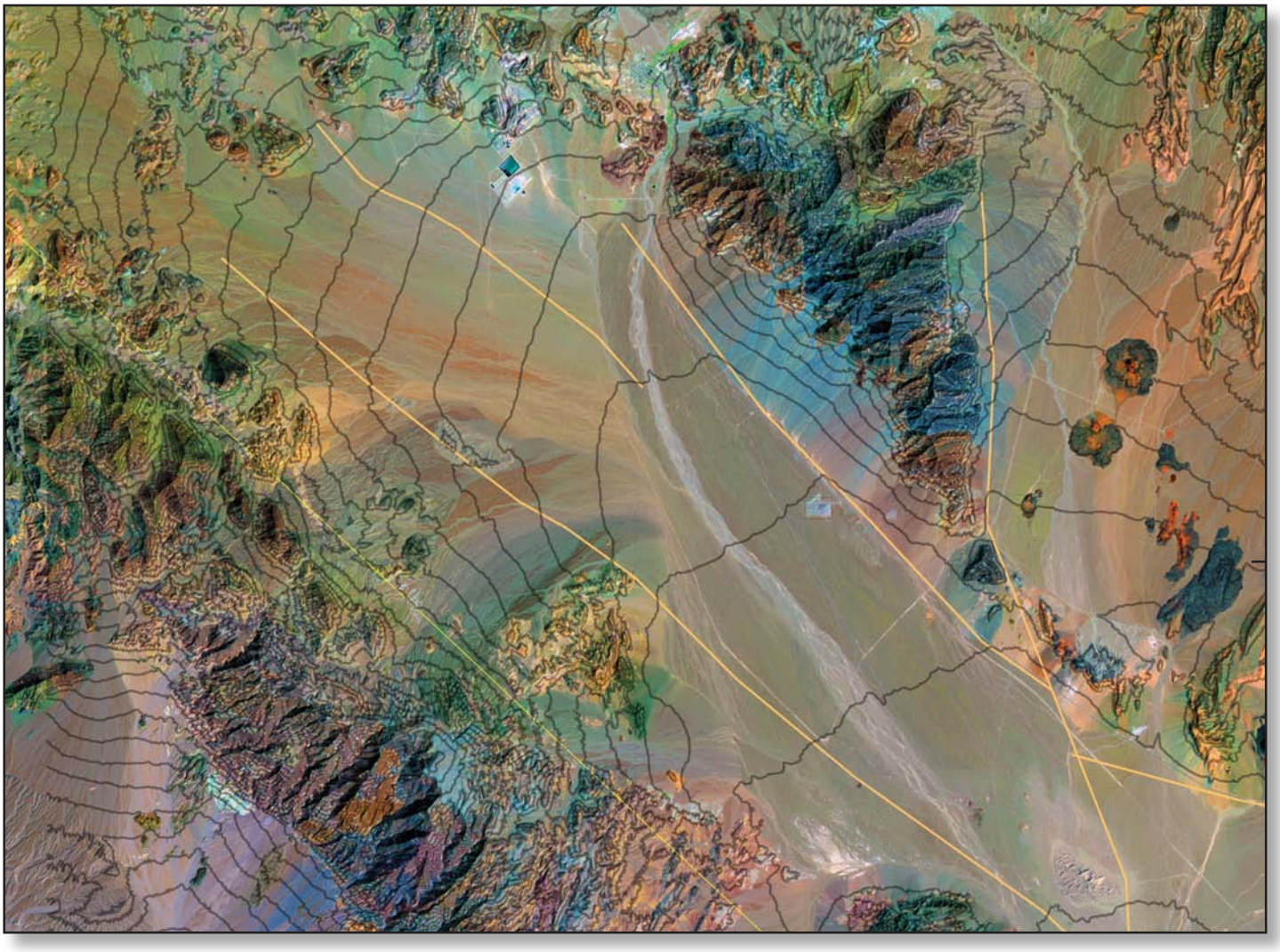
Characterization of Geologic Deposits in the Vicinity of US Ecology, Amargosa Basin, Southern Nevada



Scientific Investigations Report 2010–5134

U.S. Department of the Interior
U.S. Geological Survey

Cover: LANDSAT5 Satellite image of the vicinity of US Ecology, Armargosa Basin, southern Nevada.

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By Emily M. Taylor

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Conversion Factors

SI to Inch/Pound

Multiply	By	To obtain
	Length	
centimeter (cm)	0.3937	inch (in.)
millimeter (mm)	0.03937	inch (in.)
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
meter (m)	1.094	yard (yd)
	Flow rate	
millimeter per year (mm/yr)	0.03937	inch per year (in/yr)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F=(1.8×°C)+32$$

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88).

Horizontal coordinate information is referenced to the North American Datum of 1927 (NAD 27).

Elevation, as used in this report, refers to distance above the vertical datum.

Abbreviations and Acronyms

ADRS	Amargosa Desert Research Site
GPS	Global Positioning System
IRSL	Infrared Stimulated Luminescence
OSL	Optically Stimulated Luminescence
TL	Thermoluminescence
USE	US Ecology
ka	thousand years
m.y.	million years

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By Emily M. Taylor

Abstract

Multiple approaches have been applied to better understand the characteristics of geologic units exposed at the surface and buried at depth in the vicinity of US Ecology (USE), a low-level commercial waste site in the northern Amargosa Desert, Nevada. Techniques include surficial geologic mapping and interpretation of the subsurface using borehole data. Dated deposits at depth were used to estimate rates of sediment accumulation. The subsurface lithologies have been modeled in three dimensions. Lithologic cross sections have been created from the three-dimensional model and have been compared to resistivity data at the same location. Where deposits appear offset, a fault was suspected. Global Positioning System elevation transects were measured and trenches were excavated to locate a strand of the Carrara Fault. The presence of the fault helps to better understand the shape of the potentiometric surface. These data will be used to better understand the hydrologic parameters controlling the containment of the waste at US Ecology.

Quaternary geologic units exposed at the surface, in the vicinity of US Ecology, are derived from the alluvium shed off the adjacent range front and the Amargosa River. These deposits vary from modern to early Pleistocene in age. At depth, heterogeneous sands and gravel occur. Observed in deep trenches and boreholes, the subsurface deposits are characterized as fining-upward sequence of sediment from 5- to 8-meters thick. No volcanic units or fine-grained playa deposits were described in the boreholes to a depth of 200 meters. Based on Infrared Stimulated Luminescence dated core samples, short-term rates of sediment accumulation (<70,000 years) are an average of 2.7 millimeters per year, however, long-term rates (<3,900,000 years) are orders of magnitude less. Resistivity data, when compared to lithologic cross sections, generally are consistent with lithology grain size and probable soil carbonate accumulations. Surface resistivity displays a fining-upward sequence of sediments at the surface with a soil carbonate imprint. Finally, trenching north of US Ecology successfully exposed offset Quaternary deposits on a splay of the Carrara Fault. Holocene deposits do not appear to be faulted, however, a fault zone does intersect middle and late Pleistocene aged units.

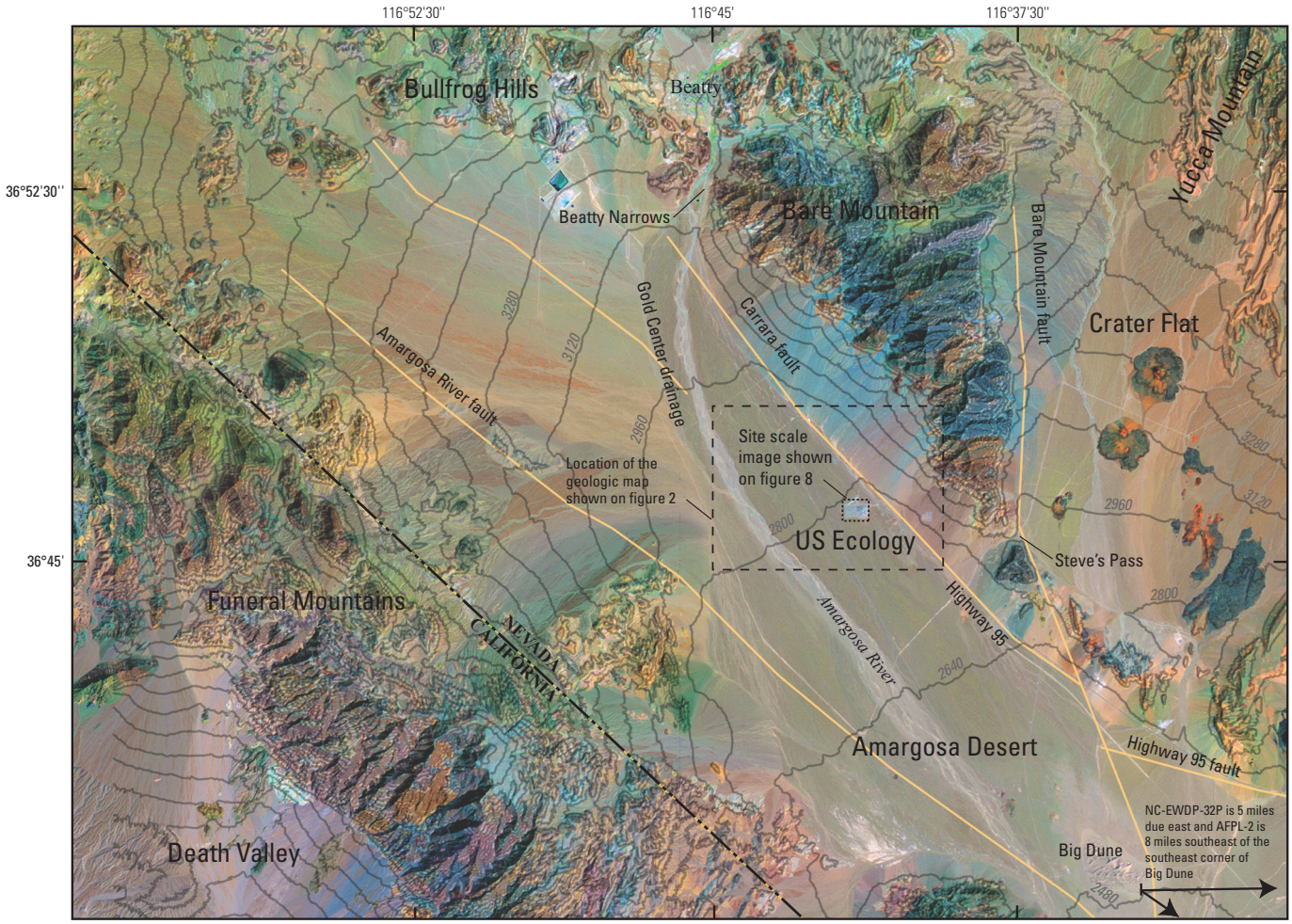
Introduction

US Ecology (USE) is a low-level waste site located about 17 kilometers (km) southeast of Beatty, Nevada, in the Amargosa Desert. The waste site is a fenced rectangle of land measuring approximately 400 by 800 meters (m) on the floor of the Amargosa River Valley. It is flanked to the east by Bare Mountain and to the west by the modern Amargosa River. Detailed site monitoring is done by the U.S. Geological Survey (USGS) at the Amargosa Desert Research Site (ADRS), located just outside the southwest corner of USE. ADRS is monitored to track any possible movement of the waste beyond the facility (fig. 1).

The purpose of this report is to better understand the hydrologic parameters controlling the containment of the waste. Several geologic, hydrologic, and geophysical studies have been completed to better understand the evolution of the Amargosa Basin, in the vicinity of ADRS. Techniques from these studies will be integrated to characterize the study area. These numerous techniques include surficial geologic mapping and reconstruction of the subsurface using borehole data. The subsurface lithologies have been modeled in three dimensions. Lithologic sections have been created from the three-dimensional model and have been compared to resistivity data at the same location. Where deposits appear offset, a fault was suspected. Global Positioning System (GPS)-elevation transects were measured and trenches were excavated to locate a strand of the Carrara Fault. The presence of the fault helps to better understand rises in the potentiometric surface.

Surficial Geology of the Upper Amargosa River Valley

The most detailed surficial map of the study area was made in 1988 by Swadley and Parrish (1988) who had been producing Quaternary geologic maps as part of the proposed high-level nuclear waste site at Yucca Mountain, which is located 19 km to the west. Swadley contributed to mapping that extended from the Amargosa Desert, north to Pahute



Contour Interval = 160 feet (approximately 50 meters)

Combining LANDSAT 5 spectral bands 2, 5 and 7 in RGB space created this false-color composite image. Individual bands were processed to display their full dynamic range. The image was further processed in hue-saturation space to emphasize specific geologic feature. On the image, bedrock exposures of carbonate rocks appear in shades of blue and green and rhyolitic volcanic rocks are in shades of tan and orange. Basaltic rocks in Crater Flat appear as discrete nearly black features surrounded by basin fill, which appears as smooth multi-colored deposits. Active drainages are light blue. The area is sparsely vegetated.

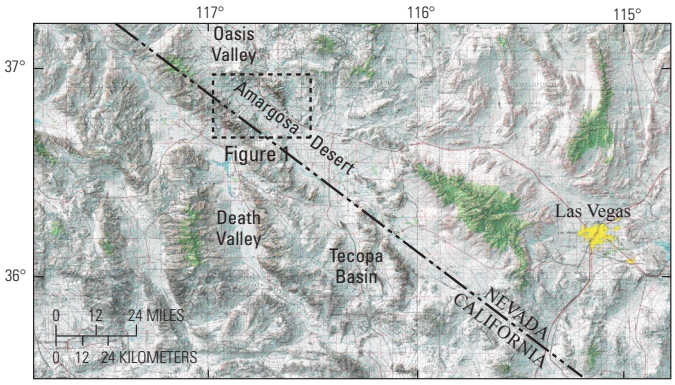
0 1 2 3 4 5 MILES
0 2 4 6 KILOMETERS

EXPLANATION

Fault (from Workman and others, 2002)

State boundary

US Ecology boundary



Index Map

Figure 1. LANDSAT 5 satellite image of the vicinity of US Ecology. This satellite image has been processed to enhance the surficial Quaternary geologic units. In some cases, particularly on the southwest flanks of Bare Mountain, similar-aged deposits vary in color from blue to purple because the alluvium is composed of different rock types. Typically, however, the older, elevated fans are darker because of the dense well-packed desert pavement and the modern washes are light.

Mesa, and east to the Specter Range. This mapping was completed at a scale of 1:12,000 in the field and published on a quadrangle scale of 1:24,000 (fig. 2). More recently the original nomenclature was changed to a numbering scheme (Keefer and others, 2004) and is included below in parentheses. Other regional maps have been made that include this area, but the geologic mapping units have been simplified from the original mapping and are not used here. The surficial geologic map units range in age from Holocene to Plio-Pleistocene—see Swadley and Parrish (1988) for more detailed descriptions.

Holocene Deposits

Q1ab (Q7-6) Alluvial deposits—gravel, gravelly sand, silty sand, and sandy silt. Forms active channel (Q1a) and low terrace deposit (Q1b), 1–2 m above the active drainage, where bar and swale topography is well expressed. Upper surface is periodically flooded. Little or no soil development. Q1ab is less than 10-m thick.

Late Pleistocene to Early Holocene Deposits

Q1s (Q5s) Alluvial sheet sand deposits—fluvially reworked sand that may contain scattered pebbles. Unit surface is smooth and typically less than 2-m thick. Q1s commonly overlies Q2c, Q2s, and Q1c deposits. Unit also is combined with Q2s and mapped as Q1s+Q2s where the features of Q1s are dominant to those of Q2s, but too subtle to subdivide in the field. Weak development of soil horizons and minor accumulation of secondary calcium carbonate on gravel clasts and disseminated in soil matrix.

Q1c (Q5) Alluvial deposit—gravel, gravelly sand, and silty sand. Clasts commonly are less than 30 centimeters (cm) but adjacent to mountain front, clasts may exceed 1 m in diameter. Unit forms terraces along washes and alluvial fans on the flanks of Bare Mountain. Unit surface is subdued and lacks bar and swale topography. Incipient B horizon formation contains both accumulations of secondary carbonate on gravel clasts as well as soil "reddening" associated with clay illuviation.

Late and Middle Pleistocene Deposits

Q2bc (Q4-3) Alluvial gravel with a fine-grained matrix of sand and silt. Units cannot be subdivided on the basis of topographic position and geomorphic form. Unit forms terraces inset along some washes and alluvial fans on the flanks of Bare Mountain. Q2bc is frequently buried by Q1c, and is preserved as patchy outcrops in the basin axis. These outcrops are distinguished by the well-packed and well-sorted pavement surface. Clasts as large as 0.5 m are common in range front fans. Soils have well-developed calcium-carbonate-rich horizons that form dense zones of cemented sand and gravel.

Q2s (Q3s) Alluvial sheet sand deposits. Sand and minor gravel up to 10 percent. Unit also is combined with Q1s and mapped as Q2s+Q1s where the features of Q2s are dominant to those of Q1s, but too subtle to subdivide in the field. Unit typically is a thin mantle of reworked eolian and fluvial sands with a soil characterized by disseminated calcium carbonate in well-developed soil horizons. Gravel are coated in carbonate-rich horizons.

Early Pleistocene and Pliocene (?) Deposits

QTa (Q1) Alluvial and minor colluvial deposits. Poorly-sorted gravel deposited as alluvial fans that now form gently rounded ridges on the Bare Mountain range front and a discrete mound east and south of USE. The knoll has exposed bedrock on its northeast side adjacent to Highway 95, but is draped by QTa aged gravel. The surface, where the pavement has not been eroded, contains discrete, white, silica platelets. These platelets are derived from the eroded densely cemented soil at depth. The white platelets are distributed on the surface and incorporated into the well-packed pavement. The soil is characterized by laminar accumulations of secondary calcium carbonate, and is further cemented by dense amorphous silica derived from the dissolution of the ash-rich volcanic rocks. The deposit typically is stripped down to the top of this cemented zone, or stripped and blanketed with a thin sequence of young eolian fines that support the desert pavement.

The exposed surficial geology in the vicinity of ADRS is characterized by four Quaternary/Tertiary depositional environments (Swadley and Parrish, 1988, Keefer and others, 2004) (fig. 2). The first environment is range front alluvial fan assemblages that prograde into the Amargosa Basin. These fans occur east of USE on the flanks of Bare Mountain. The fans range in age from Plio-Pleistocene to Holocene and typically are coarse-grained gravel shed as debris flows. The oldest fans are highest in elevation, with the progressively younger fans inset below. The secondly depositional environment is an axial drainage system controlled by the Amargosa River and the Gold Center drainages, which introduce exotic alluvium into the basin from upstream. Exotic alluvium is derived from bedrock that does not occur in the mountains surrounding the Amargosa Basin, but bedrock found in distant mountain ranges and transported and deposited into the Amargosa Basin. The axial drainage deposits contain basalt clasts that are lacking in the locally derived fans. These predominantly Pleistocene deposits typically are coarse sand and gravel and are rarely exposed at the surface. The third depositional component, exposed at the surface, is eolian or reworked eolian sediments derived from once-active drainages, exposed playa sediments, and groundwater or palustrine deposits. These fine-grained sediments provide an important and ubiquitous component to the surficial deposits, both as infiltrated fines and surface deposits. This fine-grained unit contains little or no reworked gravel clasts. Where this unit occurs as Holocene sheet wash, it typically is about 1-m thick and buries the older alluvium. The sheet wash occurs as thin darkly pavemented terraces parallel to the active drainages (fig. 2). A fourth depositional component, not

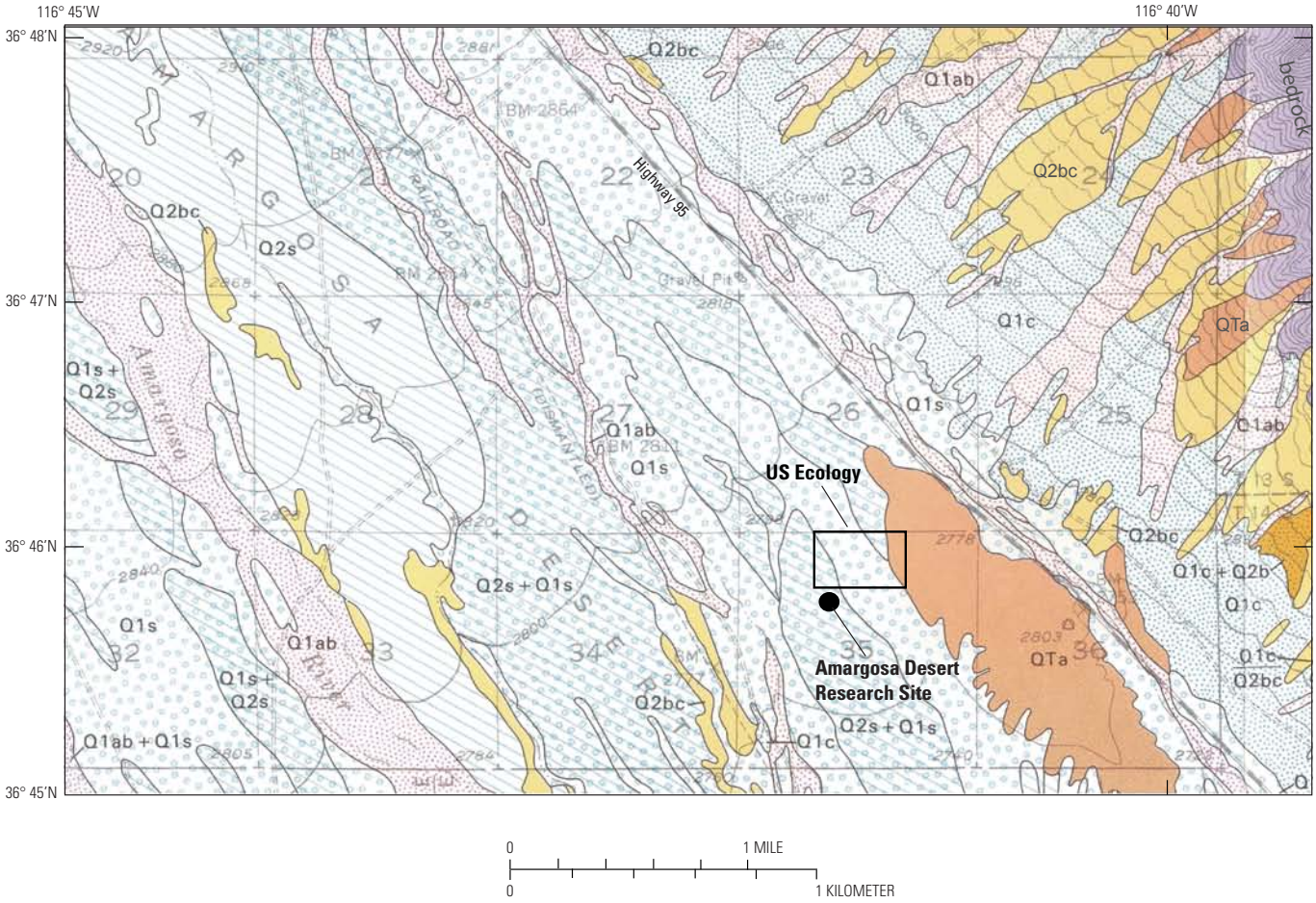
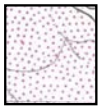


Figure 2. Vicinity of the Amargosa Desert Research Site. See Swadley and Parrish (1988) for more detailed descriptions. Unit in parentheses, in explanation on page 5, is unit nomenclature from Keefer and others, 2004.

EXPLANATION

Holocene deposits:



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Q2s (Q3s)—Alluvial sheet sand deposits. Sand and minor gravel up to 10 percent. Unit also is combined with Q1s and mapped as Q2s+Q1s where the features of Q2s are dominant to those of Q1s, but too subtle to subdivide in the field. Unit typically is a thin mantle of reworked eolian and fluvial sands with a soil characterized by disseminated calcium carbonate in well-developed soil horizons. Gravel are coated in carbonate rich horizons.

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Undifferentiated bedrock

Figure 2. Vicinity of the Amargosa Desert Research Site. See Swadley and Parrish (1988) for more detailed descriptions. Unit in parentheses, in explanation above, is unit nomenclature from Keefer and others, 2004.—Continued

exposed at the surface in the vicinity of USE, is the uniform fine-grained groundwater discharge or playa deposits. They are a primary source of the locally derived eolian component. These deposits may contain thin gravel beds derived from alluvial fans or active drainages, or both, that have been deposited into the playa or palustrine environment. Both paleodischarge and playa sediments occur where water has intersected the land surface. All of the deposits described above locally have been reworked by surficial processes.

The fan assemblages that flank western Bare Mountain (fig. 2) indicate a quiescent range front. Active range fronts are draped with young fans because vertical uplift provides material that is eroded downslope (Bull, 1991). Strike-slip offset on the range-front fault creates offset drainages which are not observed in the study area. The projection of the Carrara Fault, discussed later, does not appear to offset any modern drainages. The predominantly Pleistocene fans are preserved at the range front because of basin subsidence or change in the active drainage gradient. Fans adjacent to the range front are incised and preserved, rather than buried by younger alluvium. The subsidence is either in the immediate Amargosa Basin or down gradient in basins connected to or captured by the Amargosa River.

The relative ages of the mapped units primarily are determined by the amount of soil development on each surface. The older units have thicker and denser accumulations of secondary soil carbonate. The time of fan formation and the isolation or shift in the drainage pattern on the fan, are reflected by the soils that have formed on the fan assemblages. Once alluviation ceases because the active drainage has incised the surface, either at the range front or associated with the axial drainages, abandoned surfaces begin to be affected by the process of soil formation. In the study area, the predominant soil forming process is the addition of eolian fines into gravelly alluvium, resulting in "plugged" depositional systems, and the subsequent accumulation of secondary soil carbonate. The soil carbonate is primarily derived from the dissolution and reprecipitation of carbonate from the eolian fines and limestone parent material. The location of the secondary soil carbonate is controlled by the wetting front. Greater amounts of secondary carbonate indicate greater relative age. However, once a unit is buried it is out of the zone of accumulation, so similar-aged deposits at depth will have less soil development than those that have been continually exposed at the surface. In the basin, deposits correlated to the fan deposits occur as narrow ridges above the modern Amargosa River (fig. 2).

The Amargosa and Gold Center River deposits are oriented in the basin perpendicular to the fan assemblages and parallel to the modern drainage (fig. 1). The basin deposits have truncated and interfingered with the range front fans as the Amargosa River periodically has migrated across the basin. Late Quaternary fine-grained sheet wash deposits overlie alluvial deposits that were previously exposed as terraces above the active washes. The older alluvium, with a well-developed soil, is located about 1 m below the surface and is nearly ubiquitous in exposures in the Amargosa Desert. This buried unit is coincident in age to the mid-Pleistocene high terrace at Fortymile Wash on the east side of Yucca Mountain (Potter and others, 2002) and predates the incision of Fortymile Canyon. The well-developed soil on this Pleistocene deposit represents a long period of surface stability in the late Quaternary, prior to the deposition of the fine-grained sheet wash deposit.

Evolution of the Amargosa Basin

The Amargosa Basin periodically has been internally drained, and the Amargosa River did not exit the basin in the past as it does today (Taylor and Sweetkind, 2010; Menges, 2008). The present Amargosa River flows from Oasis Valley, north of Beatty, through the Beatty Narrows into the Amargosa Desert. It continues southward out of the Amargosa Desert at Ash Meadows into the Tecopa Basin and eventually ends in Death Valley. Flow typically occurs seasonally with the exception of the Beatty Narrows and a small reach in the center of the basin, west of Stateline, where water intersects the surface year round.

The formation of the Amargosa Basin culminated around 10 m.y. (Fridrich and others, 2007). Volcanic rocks older than 10 m.y., have been faulted and no longer preserve the slope of the original ash-flow deposition. These Miocene volcanic rocks were deformed and tilted during the basin evolution. South of USE, volcanic tuffs and basalts often cap older rocks that form the mountains surrounding the Amargosa Basin. Volcanic rocks younger that 10 m.y. are flat lying and have not undergone deformation. The late Quaternary Lathrop Wells cone and the Pliocene basalt flows in Crater Flat are examples of these undeformed young volcanic rocks.

The Amargosa Basin was internally drained until the Amargosa Narrows connected Oasis Valley to the Amargosa Basin in late middle Pleistocene time (Menges, 2008). Prior to the downcutting at the Amargosa Narrows, basin fill was exclusively derived from the ranges surrounding the Amargosa Basin. After the integration of the Amargosa River, alluvial sediments from outside the basin margins were introduced and incorporated into the local lithologies. Exotic basalt fragments, derived from eruptive centers north of Oasis Valley are on the surface and incorporated into the surficial basin deposits. Although sediment entered the system from the headwaters of the Amargosa River in Oasis Valley, and minor surrounding drainages, a period of time existed when material was added to the Amargosa Basin from the north, but the river did not exit the Amargosa Basin (Taylor and Sweetkind, 2010). The Tecopa and Amargosa Basins were not integrated until the Amargosa River breached at the Eagle Mountain narrows, south of Ash Meadows, between 150–50 ka (Menges, 2008). The elevation difference between the Ash Meadows area and the Tecopa Basin is less than 20 m at Eagle Mountain. When the Amargosa River integrated the two basins during the Pleistocene, the change in the stream gradient was relatively subtle. Erosion into the Ash Meadows deposits resulted

from the integration of the two basins. When the Amargosa River breached the Tecopa Basin and became integrated with Death Valley, massive downcutting exposed tens of meters of palustrine deposits in the Tecopa Basin because of the vast elevation difference between the Tecopa and Death Valley Basins.

Converging alluvial fans, terrace alluvium, and fine-grained playa/palustrine deposits have filled the basin since the Pliocene. In the Ash Meadows area at the southern end of the basin, the regional aquifer intersects the surface, which results in the accumulation of paleodischarge deposits (Belcher, 2004). These deposits extend to depths of hundreds of meters, which indicate that the regional aquifer has intersected the surface at this locality for a long time (Taylor and Sweetkind, 2010). Similar paleodischarge or palustrine deposits are exposed to the south, in the Tecopa and Shoshone areas. Playas are still active in the Amargosa Desert, including Franklin playa near Crystal.

Estimated Rates of Basin Aggradation in the Vicinity of US Ecology

Rates of alluvial aggradation in the vicinity of ADRS have been determined by dated borehole sediments (table 1, fig. 3). Fine-grained alluvium was dated by Thermoluminescence (TL) and Infrared Stimulated Luminescence (IRSL or Optically Stimulated Luminescence (OSL) on feldspar). Dating deposits by TL and IRSL is dependent on the assumption that the deposits were exposed to the sun long enough to "zero" the traps used to date the sediments. Sediment traps measured for TL are reset by exposure to the sun much more slowly that those measured for IRSL. TL samples, therefore, have a higher likelihood of not being completely reset, and may preserve an older signature or sediment age. An older age will result in a slower aggradation rate than a younger age at the same depth. In the borehole data from ADRS, the sediment

Table 1. Ages of deposits dated in the vicinity of US Ecology.

[Thermoluminescence (TL) and Infrared Stimulated Luminescence (IRSL) ages were obtained from boreholes UZB-1 and UZB-2, and modern eolian, and fluvial samples at the Amargosa Desert Research Site. A volcanic ash in borehole AFPL-2 and a basalt sample intersected in NC-EWDP-32P also were dated. Subsamples or splits of the same sample are labeled a, b or c. m, meters]

Borehole or sample	Top (m)	Bottom (m)	Ash age	TL age	IRSL age
Modern eolian	0	0.1		6,740 ± 220	3,160 ± 110
Modern fluvial-1	0	0.1		5,020 ± 240	1,350 ± 90
Modern fluvial-2	0	0.1		4,090 ± 320	1,460 ± 70
UZB-1.1a	5.7	5.78		39,200 ± 3,100	23,600 ± 1,100
UZB-1.1b	5.7	5.78		29,900 ± 3,500	
UZB-1.2a	8.93	9.01		40,300 ± 2,500	
UZB-1.2b	8.93	9.01		35,400 ± 3,500	
UZB-1.3a	17.83	17.91		37,700 ± 1,400	38,300 ± 1,200
UZB-1.3c	17.83	17.91		25,400 ± 1,800	36,800 ± 2,000
UZB-2.1a	36.31	36.39		49,500 ± 5,800	42,900 ± 4,200
UZB-2.1b	36.31	36.39			55,700 ± 6,400
UZB-2.2a	48.37	48.45		43,700 ± 10,600	50,000 ± 2,200
UZB-2.2b	48.37	48.45		55,900 ± 4,100	48,400 ± 2,800
UZB-2.2c	48.37	48.45		41,900 ± 4,700	
UZB-2.3b	60	60.08		55,700 ± 11,700	65,700 ± 4,100
UZB-2.3a	60	60.08		56,800 ± 2,600	
AFPL-2	13.5	14	640,000		
NC-EWDP-32P	120.4	149.96	3,865,000 ± 125,000		

samples dated by IRSL tended to be younger than the ages determined by TL only for the samples less than 30 Ka. As a result, in these samples, higher aggradation rates are estimated from the IRSL samples than the TL samples (fig. 3).

Buried volcanic units, found in boreholes in the vicinity of USE, also were dated. One volcanic ash intersected between 13.5 and 14.0 m in AFPL-2 (fig. 1), southeast of USE, was correlated by geochemical analyses to the Lava Creek B ash (Sarna-Wojcicki, written commun., 2000). A basalt, intersected near Lathrop Wells between 120 and 150 m (Nye County NC-32P), was dated by K-Ar methods. The 640-Ka age of the Lava Creek B ash is well documented (Izett and others, 1992; Sarna-Wojcicki and others, 1987), and the 3.74–3.99 m.y. age for the buried basalt from borehole NC-EWDP-32P (R. Spengler, written commun., 2005), south of Lathrop Wells Cinder Cone, is within the expected range of regional basalts.

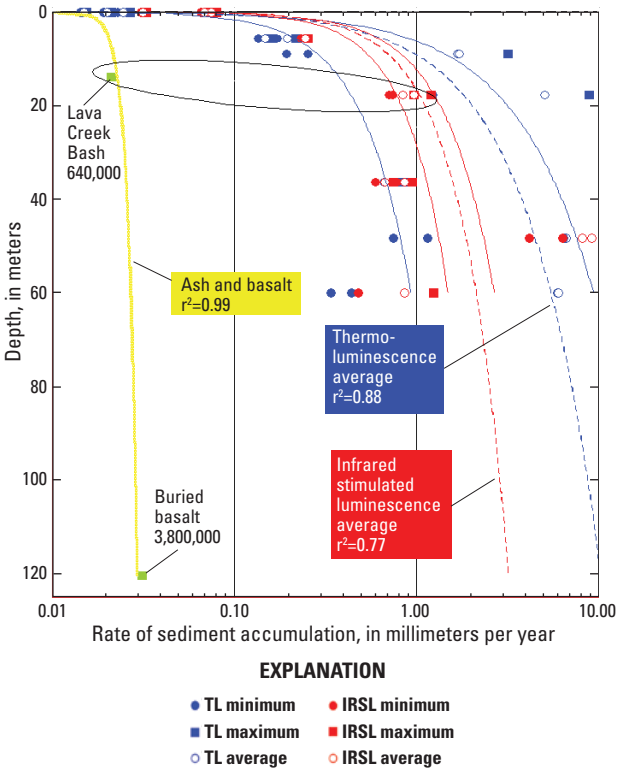


Figure 3. Rates of sediment accumulation in comparison to depth of sample. Thermoluminescence data are blue and Infrared Stimulated Luminescence data are red. The maximum and minimum is the possible range determined by the +/– of the age estimate. Closed circles are the minimum, squares are the maximum, and open circles are the average rate. Solid lines are the best fit curves for the maximum and minimum data, and the dashed line is the best fit average rate. Long-term average rates, based on the ages of the ash and basalt, reflect a relatively constant steady rate of aggradation. Greater sensitivity can be determined from the younger Thermoluminescence and Infrared Stimulated Luminescence ages in the top 60 meters. Average rates of accumulation do not always fall as the midpoint between the maximum and minimum rates because of the errors bounding any given age (see Appendix 1).

Compounded by the inherent assumptions in dating deposits by TL and IRSL, it is important to remember the complexity of an alluvial/fluvial system. Long-term accumulation is the result of aggradation and erosion, controlled by both climatic effect and the tectonic processes. Episodes of aggradation can be followed by periods of erosion or incision, reducing a sequence of deposits to little or nothing. In arid alluvial environments, maximum aggradation occurs when precipitation is high and vegetation is low and erosion is typically the result of changes in the base level of the alluvial drainage. In this paper I set some of these problems aside, accept these known problems, and attempt to look at long-term aggradation rates using the buried dated deposits.

The Lava Creek B Ash was deposited across the Western U.S. when the continental glaciers were retreating and the cool, dry climate was changing to a warmer and wetter, interpluvial climate (Dethier, 2001). In the arid Southwest, these conditions are conducive to aggradation because the decrease in the vegetation and increase in precipitation destabilizes hillslopes and sediment is available for alluviation (Bull, 1991). Slope deposits are bound less by plant roots, and material is made available for transport. Sequences of alluviation are repeated throughout the Pleistocene (10 ka to 2.6 m.y.) as the continental climate fluctuated between cool, dry pluvials and warm, wet interpluvials. These stacked sequences are observed at USE. Long-term aggradation rates determined by the ash (640 ka) and basalt (3,865 ka) samples indicate a rate of accumulation between 0.02 and 0.03 mm/yr (2–3 cm/ka). The details of single climatic changes are lost over time. Long-term rates are dramatically different than the record of alluviation during the last 70 ka that was suggested by the TL and IRSL dates.

In the vicinity of USE, I have the unusual luxury of a large number of sediment dates over a relatively shallow sequence—the top 60 m of deposition (table 1). The samples include modern eolian, fine-grained fluvial deposits and subsurface alluvial samples collected from USGS boreholes UZB-1, 2, and 3. These boreholes are located in the southwest corner of USE, in and adjacent to ADRS. Borehole samples were dated at about 10-m intervals, and each sample was split into two subsamples for analyses. The splits were all dated. Older deposits are deeper, and the ages indicate generally that the sediment accumulated at a relatively constant rate (fig. 4). By determining the thickness of the material accumulated over time and the age of the deposit, rates of accumulation can be calculated (fig. 5).

Modern alluvium, sampled from the active channel, was greater than 7,000 years old when dated by TL, and about half that age when dated by IRSL. Both TL and IRSL dating methods assume samples exposed to prolonged direct sunlight will be “zeroed” and the dating clock reset once the sediments are exposed at the surface. Fine-grained deposits in active alluvial systems, however, do not appear to remain in direct exposure to sunlight long enough to remove the old luminescent signature. Thus, buried deposits may be younger than analyzed, which suggests faster rates of accumulation than calculated here.

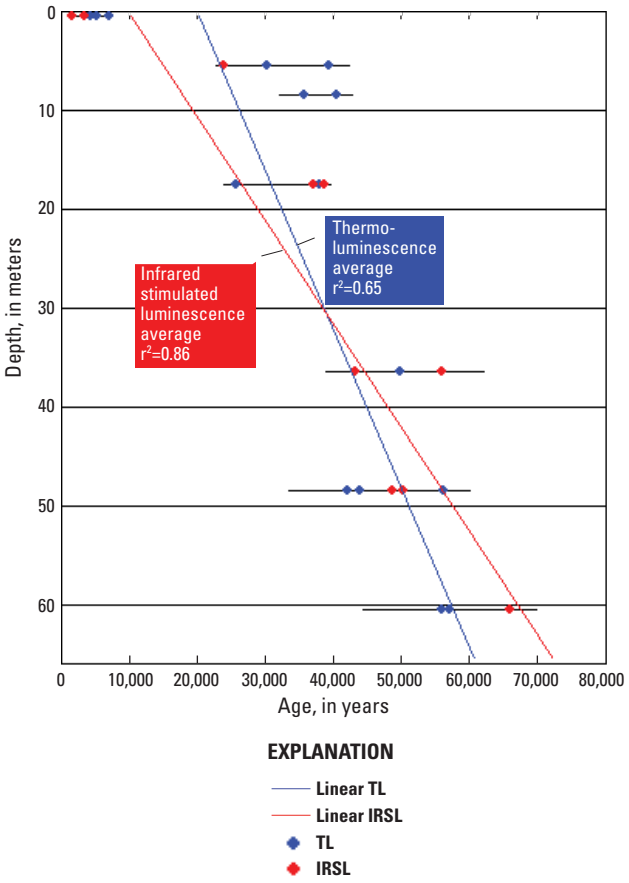
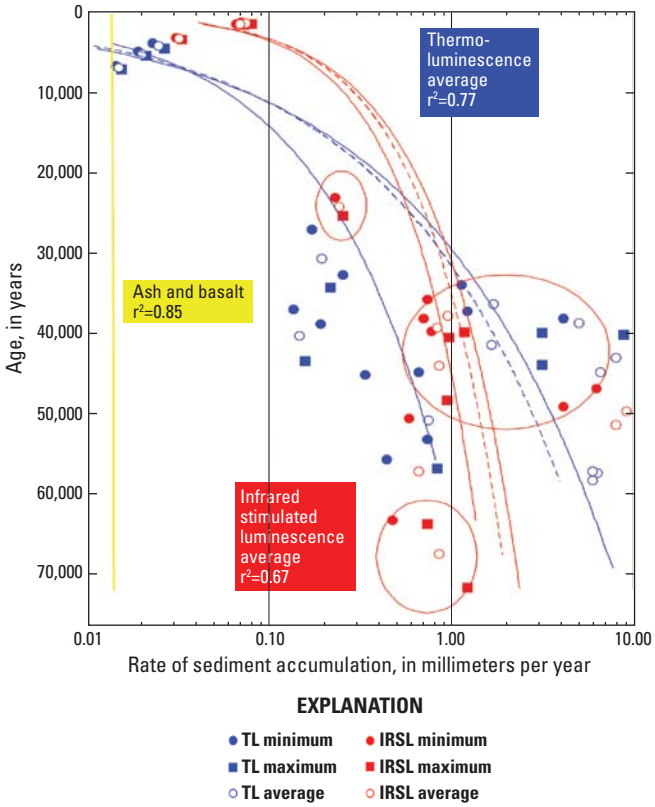


Figure 4. Sediment age in comparison to depth of sample. Blue circles are the Thermoluminescence data, and red circles are the Infrared Stimulated Luminescence data. Bars represent the range of ages for all samples at that depth. The relation of the age to depth is expressed by the linear regression (r^2 value) from both dating techniques. The r^2 value for the Infrared Stimulated Luminescence samples is significantly higher than the r^2 value for the Thermoluminescence samples, indicating a more reliable technique.



Range of rates of accumulation, excluding modern wash samples

Thermoluminescence	0.9–6.9 (average = 3.9 millimeters/year)
Infrared stimulated luminescence	1.7–3.77 (average = 2.7 millimeters/year)
ash + basalt	0.02–0.03 (average = 0.025 millimeters/year)

Figure 5. Rates of sediment accumulation in comparison to age of sample. Thermoluminescence data are blue and Infrared Stimulated Luminescence data are red. The maximum and minimum delineate the possible range determined by the +/– of the age estimate. Closed circles are the minimum, squares are the maximum, and open circles are the average rate. Solid lines are the best fit curves for the maximum and minimum data, and the dashed line is the best fit average rate. Infrared Stimulated Luminescence data tend to cluster around 20,000, 36,000 and 65,000 years.

Sample ages for the borehole sediments varied from 5 to 60 ka. Excluding the modern wash samples, average rates of accumulation based on the TL method vary from 0.9 to 6.9 mm/yr (average = 3.9 mm/yr) and on the IRSL method from 1.7 to 3.7 mm/yr (average = 2.7 mm/yr). These values are much greater than the long-term average (0.025 mm/yr) based on the ash and basalt samples (0.64–3.8 m.y.).

Detailed regional climatic records of the time period between 4.5 and 500 ka (Winograd and others, 1992 and 2006) indicate that maximum cool-dry periods occurred at ≈75 and ≈34 ka followed by steady warming. This record also indicates a relatively abrupt warming trend at ≈17 ka. These climate changes, regionally recorded, should result in periods when material is available for transport and increased rates of accumulation occur—climatic transitions from relatively cool-dry climates to warm-wet periods. Sediment ages from the borehole data tend to cluster around 20, 35–45 and 60–70 ka (fig. 5) indicating periods of sediment accumulation.

Borehole sediments of similar age display a wide range of accumulation rates (fig. 5), although samples dated by IRSL tend to have less variability. At about 20 ka, between 35 and 45 ka, and between 60 and 70 ka there are clusters of samples that may represent sediment accumulation associated with climate warming at ≈17, ≈34, and ≈75 ka.

The large discrepancy between the long-term rate and the rates in sediments less than 70 ka may be explained in several ways. The rates of sediment accumulation are different in the two data sets (fig. 3). At a depth of 15 ± 2 m, the aggradation rate at the ash site is 0.02 mm/yr. At a similar depth at the ADRS site, the aggradation rate is 1 mm/yr as determined by IRSL. The sediment source for the two areas is different—one being from the Amargosa River (borehole data) and the other from Fortymile Wash (ash and basalt data). ADRS is adjacent to a once-active tectonic range front at Bare Mountain, rather than in the center of the basin. Sediment is being introduced from the migrating Amargosa River as well as shedding off the range front fans. Fortymile Wash may not be a good analog to ADRS. A second possibility is that the TL and IRSL ages may be much too young resulting in too rapid aggradation rates. However, it is more likely that the ages are too old, rather than too young, because sediment traps dated by luminescence may not be completely emptied by sunlight in alluvial system. Finally, long-term rates tend to reflect gains and losses in the depositional history while short-term rates record extremes. Sediment is removed as changes occur in the basin evolution, including stream capture. These erosional periods are reflected in the long-term rate and may or may not be part of the shorter term record.

Intuitively we know that rates have decreased as the basin has become more tectonically quiescent (Fridrich and others, 1999). This also can be verified by solving the rate curve for greater depths where aggradation rates approach 20 mm/yr at the contact between the Paleozoic basement and the Tertiary basin fill.

Three-Dimensional Lithologic Model of the Subsurface Geology

Data were compiled from 57 boreholes representing nearly 2,000 depth intervals or records (table 2, Appendix 1). Ten other boreholes were added to the model that were located outside the USE model boundary. Boreholes ranged in depth from 10 to 200 m. The average depth of the boreholes was 85 m, with the majority falling between 90 and 135 m (fig. 6). The data varied in quality from detailed lithologic descriptions collected by an onsite geologist during the time of the drilling, to brief summaries at 10-foot increments. The most common description varies from between one and ten words that describe a change recognized by the driller as a different unit is penetrated—fine grained to coarse grained and presence or absence of large rocks, poorly consolidated to well indurated, rock type or abrupt color changes, are good examples.

If the physical characteristics of the surficial geology exposed at the surface are understood, these geologic mapping criteria can be used to simplify the subsurface geology. Alluvial units can be distinguished from fine-grained playa/palustrine deposits. Proximal coarse-grained deposits can be distinguished from distal deposits and interbedding can be recognized. After the drillers' descriptions were simplifed to 11 lithologic units, they were correlated to stratigraphic units consistent with the geologic mapping (table 3).

The lithologic units, derived from the drillers' descriptions, were used to construct a lithology model using RockWorks 14 (RockWare, Inc., Denver, Colo.). The three-dimensional lithology solid model was created from the borehole data using a solid modeling method within RockWorks 14 called horizontal lithoblending. This is a cell-based modeling approach where solid-model cell nodes sequentially are assigned properties by looking outward horizontally from each borehole in search circles of ever-increasing diameter. Cell dimensions for the modeling were 10 m in the horizontal dimensions and 5 m in the vertical dimension. The algorithm assigns the lithology values from the borehole data in each vertical interval to cells immediately surrounding each borehole. Then the interpolation moves out by a cell, and assigns the next "circle" of cells a lithology value for each vertical interval. The interpolation continues in this manner until the program encounters a cell that is already assigned a lithology (presumably interpolating towards it from an adjacent borehole), in which case it skips the node assignment step. The interpolated data in the resulting solid model have the appearance of stratigraphic units, with aspect ratios that emphasize the horizontal dimension over the vertical dimension.

In order to produce smoothly varying facies trends, the three-dimensional interpreted facies solid model was created using an inverse-distance algorithm. In this method, the facies value of each cell is assigned based on the weighted average of neighboring data points, and the value of each data point is weighted according to the inverse of its distance from the cell. Distant control points have less effect on the assignment of the facies value to each cell. During the interpolation a weighting

Table 2. Summary of borehole data.

[Ten different companies drilled exploratory and/or monitory dill holes at the USE site. The first column has numbers 1 through 10 to indicate the different companies. m, meter]

	Site identification (by symbol color)	Easting	Northing	Elevation (m)	Total depth (m)	Depth to water (m)
1	AquAeTer MW-318	527981.11	4069216.49	847.3	91.4	86.8
1	AquAeTer MW-319	527461.01	4069236.55	848.8	96.9	88.4
1	AquAeter MW-325	527126.00	4068692.00	847.3	118.6	110.4
1	AquAeTer MW-326	527421.00	4068696.00	847.3	113.4	109.6
1	AquAeTer MW-327	527635.00	4068695.00	844.7	109.7	103.1
2	G&M Inc 001	527232.36	4068862.41	848.4	111.6	103.9
2	G&M Inc 002	527337.56	4068729.30	847.3	118.9	108.5
2	G&M Inc 600	527657.37	4069284.87	848.4	153.0	93.4
2	G&M Inc 601	527778.20	4068729.31	843.6	128.0	99.0
2	G&M Inc 602	527763.78	4068819.64	843.6	126.5	100.1
2	G&M Inc 603	527815.15	4068730.44	843.6	126.5	98.1
2	G&M Inc 604	527899.03	4068730.45	844.3	133.0	98.2
2	G&M Inc 605	527987.94	4068730.36	844.1	134.7	97.4
3	GSI 304	527967.19	4068952.04	845.8	115.8	87.8
3	GSI 305	528065.09	4068953.47	845.2	115.8	86.3
3	GSI 306	528064.75	4069046.52	846.1	115.8	91.4
4	IT Corp 500	527935.15	4068729.32	846.0	91.0	no data
4	IT Corp 501	527950.02	4068729.24	846.0	31.8	no data
5	Law Eng 101	527951.00	4069139.18	846.4	42.7	no data
5	Law Eng 102	528046.61	4069064.81	846.1	29.0	no data
5	Law Eng 103	527859.90	4069033.25	846.4	30.2	no data
5	Law Eng 104	527948.48	4068960.44	845.8	47.5	no data
5	Law Eng 105	527491.64	4069016.46	848.0	30.2	no data
5	Law Eng 106	527237.79	4069073.97	848.9	48.8	no data
5	Law Eng 107	527437.69	4069150.53	848.3	22.7	no data
5	Law Eng 301	527586.81	4069147.60	847.3	117.3	no data
5	Law Eng 302	527442.41	4068736.51	846.1	108.2	no data
5	Law Eng 303	527940.68	4068747.66	844.3	106.7	no data
5	Law Eng Trench 10-1	527370.42	4068814.46	847.3	18.3	no data
5	Law Eng Trench 22-1N	527364.45	4068995.01	846.7	16.0	no data
5	Law Eng Trench 22-2S	527368.89	4068903.83	847.3	17.4	no data
5	Law Eng Trench 22-3W	527244.93	4068948.23	847.0	10.7	no data
5	Law Eng W-2	527464.22	4068740.08	845.8	111.3	no data
6	Mark Group 308	528066.22	4068844.76	844.9	103.0	92.5
6	Mark Group 309	528064.84	4068735.44	844.8	103.6	94.3
6	Mark Group 310	528081.69	4069051.46	846.2	92.2	86.1
6	Mark Group 311	527902.55	4068735.32	844.7	100.6	92.8
6	Mark Group 312	527747.90	4068944.35	847.1	93.0	86.7
6	Mark Group 312A	527743.12	4068935.64	847.0	91.9	87.0
6	Mark Group 313	527648.13	4069300.23	848.8	97.5	87.5
6	Mark Group 314	527762.20	4068836.54	846.3	102.4	92.1
6	Mark Group 315	527821.53	4068730.22	845.0	103.6	93.2

Table 2. Summary of borehole data.—Continued

[Ten different companies drilled exploratory and/or monitory dill holes at the USE site. The first column has numbers 1 through 10 to indicate the different companies. m, meter]

	Site identification (by symbol color)	Easting	Northing	Elevation (m)	Total depth (m)	Depth to water (m)
6	Mark Group 316	528070.06	4068934.46	845.9	94.5	88.2
6	Mark Group 317	527983.41	4068735.80	844.7	103.6	93.4
6	Mark Group 400	527750.41	4068929.22	846.6	163.7	86.3
6	Mark Group 401	528083.05	4068920.13	845.2	128.0	87.5
6	Mark Group 402	527967.13	4069176.07	846.9	49.8	no data
6	Mark Group 402B	527972.60	4069176.42	846.9	11.4	no data
6	Mark Group 402C	527976.51	4069175.77	847.2	132.9	86.0
6	Mark Group 403	527952.04	4068729.84	843.9	200.6	91.7
7	Perc Est AFCA1	542415.00	4046485.00	731.0	14.5	no data
7	Perc Est AFCA2	542412.00	4046485.00	731.0	12.0	no data
7	Perc Est AFCA3	542273.00	4046225.00	736.0	14.5	no data
7	Perc Est AFCA4	542386.00	4045260.00	728.0	10.1	no data
7	Perc Est AFCA5	541844.00	4044830.00	734.0	10.1	no data
7	Perc Est AFPL1	545661.00	4044432.00	724.0	14.6	no data
7	Perc Est AFPL2	545501.00	4044236.00	715.0	16.6	no data
7	Perk Est ARAS1	528846.00	4062684.00	807.0	46.5	14.2
7	Perk Est ARRB1	521815.00	4072299.00	886.0	48.5	14.8
7	U.S. Geological Survey No 1	527393.77	4068697.29	844.3	175.0	99.4
8	Site Well 1961	527665.65	4068947.67	847.5	175.3	96.0
9	U.S. Ecology MW-315A	527826.23	4068730.38	847.0	98.0	no data
9	U.S. Ecology MW-323	527668.62	4068945.01	847.0	91.0	no data
10	U.S. Geological Survey MR3	527389.20	4068719.60	845.8	123.4	112.5
10	U.S. Geological Survey UZB-1	527257.93	4068633.22	846.0	48.2	44.2
10	U.S. Geological Survey UZB-2	527256.70	4068644.70	846.0	114.7	109.0
10	U.S. Geological Survey UZB-3	527336.40	4068713.20	847.3	114.5	110.0

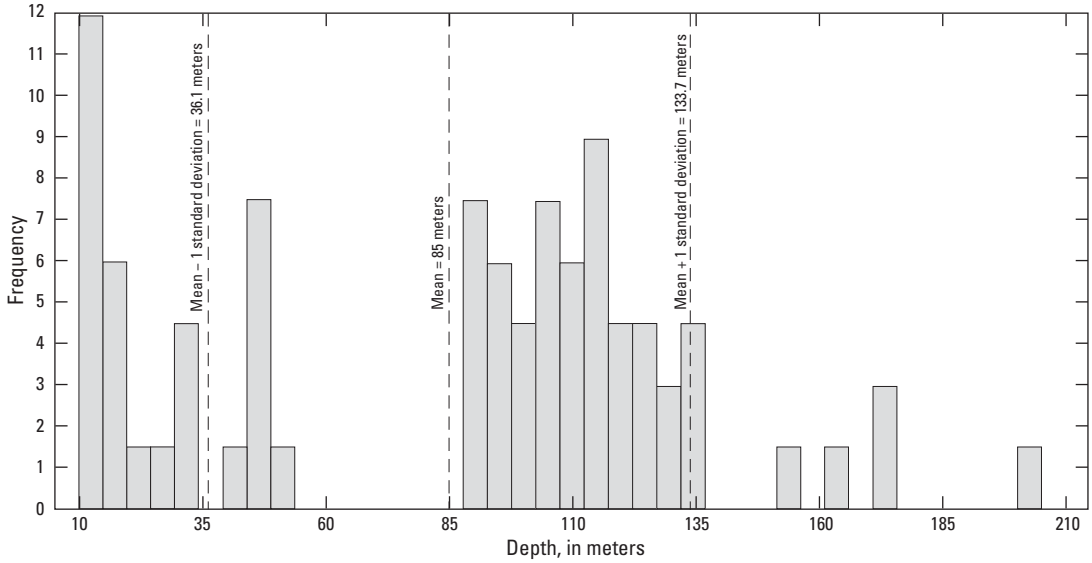


Figure 6. Frequency of borehole depths. The 67 boreholes vary in depth from 10 to 200 meters with an average depth of 85 meters. Most boreholes are between 36- and 133-meters deep.

Table 3. Simplified drillers' descriptions used to construct the lithologic model.

Drillers' nomenclature (lithology)	Lithology (simplified drillers' nomenclature)	Generalized stratigraphy	Detail stratigraphy
boulders; boulders and gravel; gravel; limestone/dolomite slide block; rock	gravel	alluvium	proximal alluvium
alluvium; boulders and clay; boulders and sand; caliche (when interbedded with sand and gravel); gravel and clay; sand and rock; sand, gravel and cobbles; sandy gravel; soft caliche	sand and gravel	alluvium	mid-slope alluvium
clayey, gravelly sand muddy; conglomerate; muddy gravelly sand; muddy sandy gravel; sand, gravel and clay; sand clay and boulders; sand clay and gravel; sandy gravel with some silt; silty sand and gravel; soil, unconsolidated conglomerate	sand, clay and gravel	alluvium	distal alluvium
sand, clay and some gravel; clayey gravelly sand, gravelly sand with some silt	sand, clay and trace gravel	alluvium/eolian	sheetwash/eolian and alluvium interfingered
gravelly sand; sand and some gravel; sand with lenes of gravel	sand and trace gravel	alluvium/eolian	distal alluvium, sheetwash or eolian
sand; sandstone	sand	alluvium/eolian	sheetwash or eolian
muddy sandstone; loam; silt and clay; silty sandstone	sand and clay	playa/palustrine	playa or palustrine
clay, sand, gravel; reworked coarse tuff; sandy clay and gravel	clay, sand and gravel	playa/palustrine/alluvium	playa/alluvium interfingered or palustrine
clay, sand and trace gravel; gravelly, sandy mudstone; sandy silt and a trace gravel	clay, sand and trace gravel	playa/palustrine/alluvium	playa/alluvium interfingered or palustrine
clay with gravel beds; clay with trace gravel; clay and boulders; clay and rock; gravelly clay; sandy siltstone	clay and gravel	playa/palustrine/alluvium	playa/alluvium interfingered or palustrine
clay and silt; marl (calcareous clay and sand); mudstone; reworked tuff; sandy clay; sandy shale; sandy siltstone; siltstone; silty clay; silty mudstone	clay and sand	playa	playa

factor of two was used in the inverse distance algorithm. In addition, the interpolation was done using an anisotropic algorithm, where the inverse-distance method searches specifically at the closest point in each 90-degree zone around the cell when assigning the cell value. The borehole data also were declustered to minimize the effects of nonuniformly spaced holes. The model size is 916-m (easting) by 706-m (northing) by 100-m thick and is centered over the 800 by 400 m USE site. Horizontal layers are 5-m thick. Fence diagrams and isosurfaces, or bubble diagrams, of the individual units were constructed from the lithologic model. These diagrams make it possible to understand the depositional characteristics of the subsurface sediments and to characterize the geologic characteristics that control the local hydrology.

The units intersected at the site vary from coarse-grained gravel, to sand, to clayey sand (figs. 7, 8, and 9). Coarse-grained sand and gravel represent the most common lithologic units intersected. Interbedded with the heterogeneous coarse alluvium are irregular lenses of fine-grained sandy clay with infrequent lenses of coarse-grained gravel. The most striking feature of the subsurface geology is the uniformly stacked fining-upward sequences (fig. 7). Sand and gravel grades upward to a finer sandy or clayey deposit. As observed in the trench wall at USE, this sequence repeats at depth in intervals that range from 5 to 8 m. Each sequence represents a single alluvial deposit. Deposition probably occurred rapidly during a single flood derived from the active axial drainage.

There is no subsurface evidence that playa deposits exist below USE. There are fine-grained intervals, however, they are thin and not continuous and probably record overbank or recessional facies of the stream discharge. These clayey deposits are offset in the fence diagram and were used to locate a splay of the Carrara Fault which is discussed in the "Activity on the Carrara Fault" section of this report. At the USE site, no volcanic units were intersected in any of the boreholes.

The distribution of different lithologic sediment types is shown on the three-dimensional lithologic model (fig. 10). The dominant lithologies in the study area are coarse sand and gravel, sandy, and clayey facies. Coarse sand and gravel are exposed as discrete layers. Interbedded between coarse layers are a combination of sandy and clayey facies, sandy facies are predominant. These stacked sequences also are observable in the trenches at USE (fig. 7).

Comparison of Direct Current Resistivity Profile Data to the Three-Dimensional Lithologic Model

A detailed direct-current resistivity study was completed in the vicinity of USE (Abraham and Lucius, 2004, Abraham, written commun., 2004). The features resolved in the resistivity data are controlled by moisture, sediment size, and accumulation of soluble salts. These data have been compared at the same locations to profiles that intersect the lithologic model (figs. 11 and 12). The boreholes at USE are not adjacent to the resistivity lines, so the model was built using data in the basin-wide Amargosa data set (Taylor and Sweetkind, 2007). The USE borehole data are between 130 and 500 m from the projected resistivity lines. As seen in the lithology model (fig. 10) and in trench exposures at USE (fig. 7), the subsurface is characterized by repeated fining-upward sequences between 5- and 8-m thick. Neither the resistivity nor the lithology model, in the vicinity of the resistivity lines, can resolve these stacked sequences, however, these data do display some coarse sedimentological features.

High resistivity values in the top 4 m (red, >150 ohm-m) indicate a dry environment of unsaturated soil and sediment. Most water that enters the system is lost to evapotranspiration which results in sediments with little or no moisture at the surface. A small amount of moisture does reach greater depths (Stonestrom and others, 2003). Below the dry surface and above an intermediate resistivity layer (green to yellow, 80-140 ohm-m) is a layer with higher water content (blue, <40 ohm-m) (fig. 12). The blue layer probably is composed of coarse gravel found at the base of the fining-upward fluvial sequence. Where abrupt changes in sediment texture occur, water tends to hang up, which results in the precipitation of dissolved salts, primarily calcium carbonate. The lithology model suggests that the wetter zone is found where a depositional unconformity occurs between the coarse sand and gravel and the underlying fining-upward sequence. Moist zones that are enriched in secondary carbonate produce a signature of lower resistivity values. Deposits with higher water content, or lower resistivity, also occur in sediments near the modern water table.

Resistivity lines display, from the surface downward, the dry fine-grained surface, a moist or carbonate-enriched 3–5-m-thick zone of coarse material and, at depth, repeated stacked fining-upward sequences (fig. 12*A*, line 1). Lines 1 and 3 (figs. 12*A* and 12*C*) are perpendicular to the basin axis, and the highly resistant zones (red pockets), at depth, probably are paleochannels of coarse gravel lenses. The three-dimensional lithology model also indicates that, at this location, these gravel lenses are present. Line 4 (fig. 12*D*) lacks any evidence of the buried high resistivity layer. Line 4 is parallel to the basis axis and primarily on the elevated ridge of Tertiary gravel. This deposit is capped by a dense soil horizon of cemented secondary carbonate. Moisture that falls on this old surface only infiltrates through fractures in the cemented zone. No intermediate moisture zone is present on line 4, except at the north end, off the elevated ridge, on younger deposits where water infiltrates from the surface. There is corresponding fine-grained material, in this area, in the lithology model.

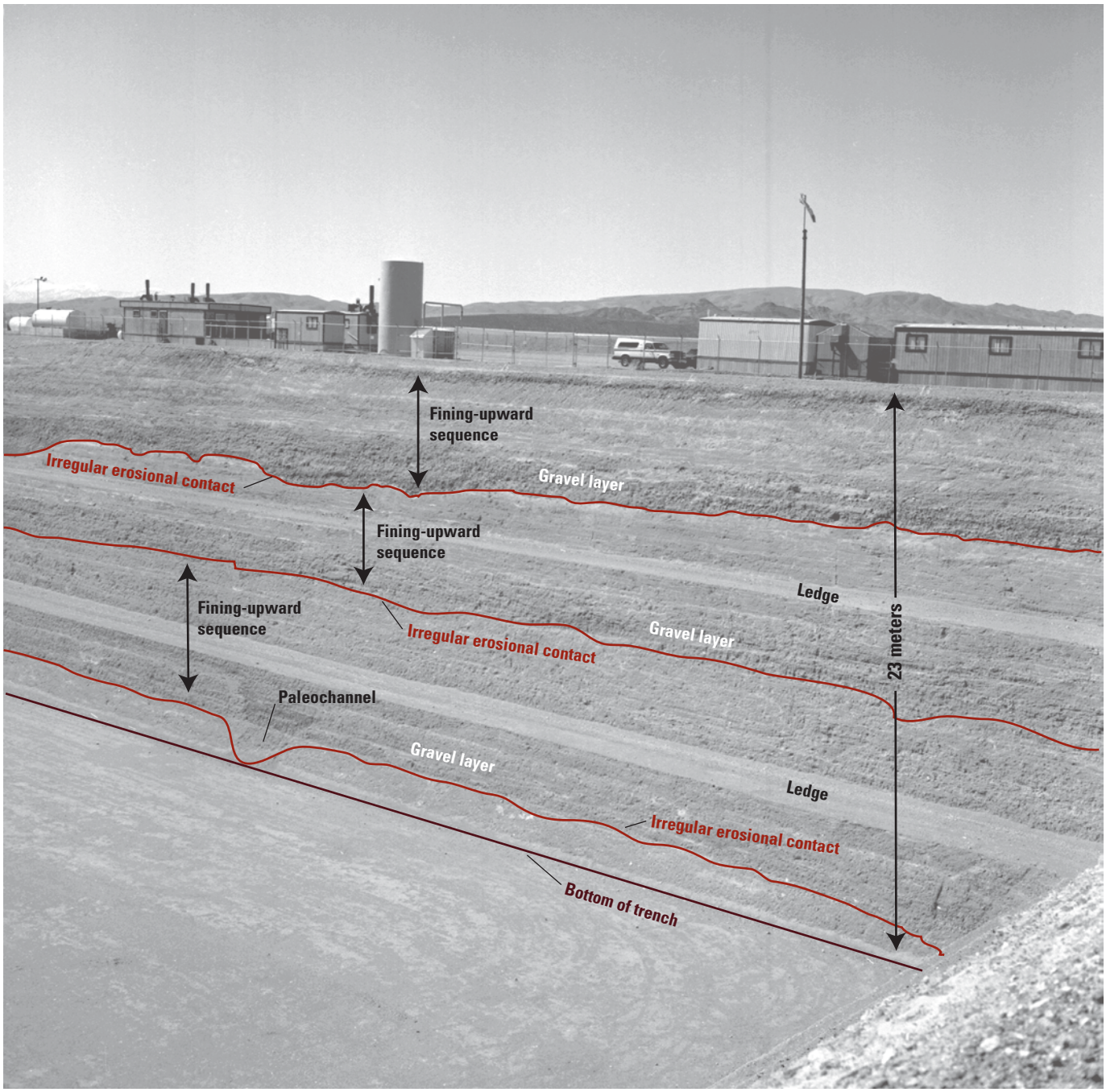


Figure 7. Trench 11 at US Ecology. In the 23 meters exposed in Trench 11 at US Ecology, 3 discrete fining-upward sequences, which vary in thickness from 7 to 8 meters, are exposed as well as a buried paleochannel. Each sequence is characterized by an erosional sand and gravel unit, at the base, that has eroded into the top of the unit below. This abrupt irregular contact is observable in the photograph. Above the sand and gravel are increasing finer units until the depositional unconformity, defined as the base of the next sand and gravel. These sequences are well preserved in the borehole data.

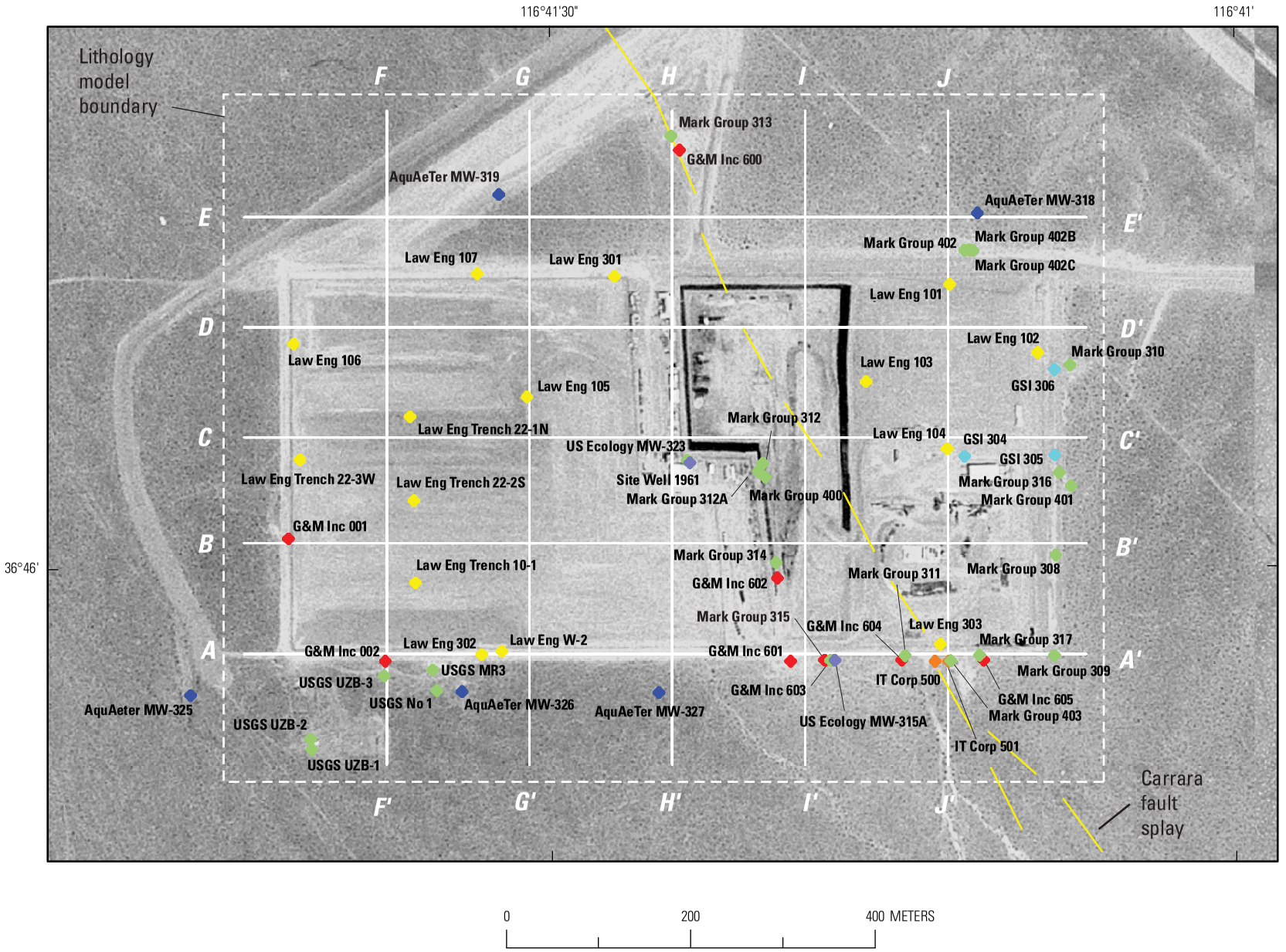


Figure 8. Locations of boreholes, fence diagram, and mapped faults. The boreholes are labeled and color coded by the drilling contractor (see table 2). The fence diagram is green and labeled at each panel end. The Carrara Fault splay, located by trenches in this study, is dashed where buried or projected and solid, north of US Ecology, where it is located by trenches. The main trace of the Carrara Fault is parallel and northeast of the splay.

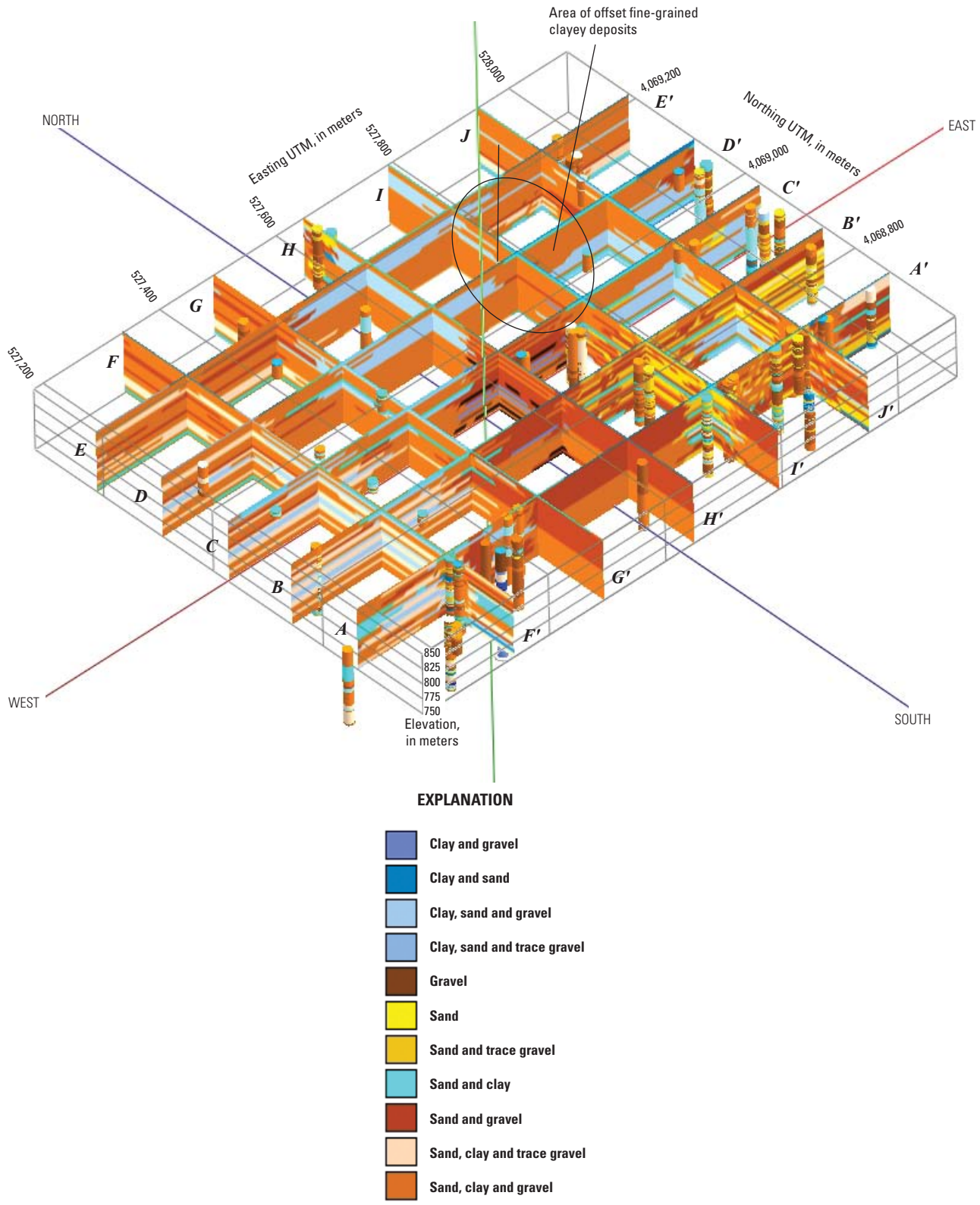


Figure 9. Lithologic fence diagram of the deposits below US Ecology. This model is 100-m thick and displays a thick package of heterogeneous gravel, sand, and clayey sand, which were deposited in an alluvial system. No sequence of playa/palustrine deposits or volcanic rocks were intersected. The lithologic logs are represented as vertical cylinders. The model extrapolates the known data from the logs until it intersects another log that is generating data in a horizontal direction. There is more detail, in the model, where the lithologic logs contain more information.

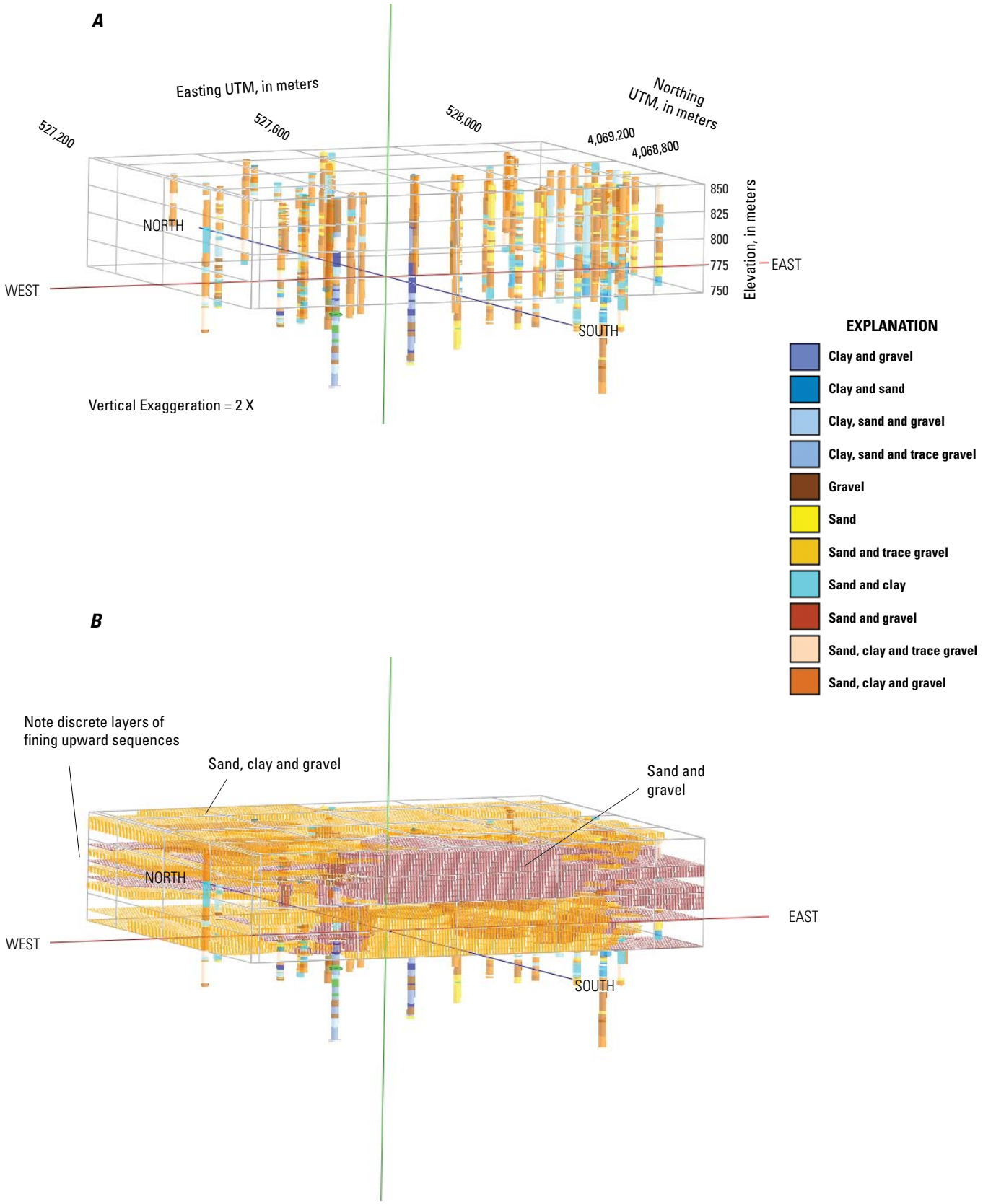


Figure 10. Distribution of sediments in the three-dimensional lithologic model that are predominantly (*A*) coarse sand and gravel, (*B*) sandy, (*C*) clayey lithologies. Each diagram is bound by the three-dimensional lithologic model. Diagram is oriented northeast about 10 degrees above the horizon.

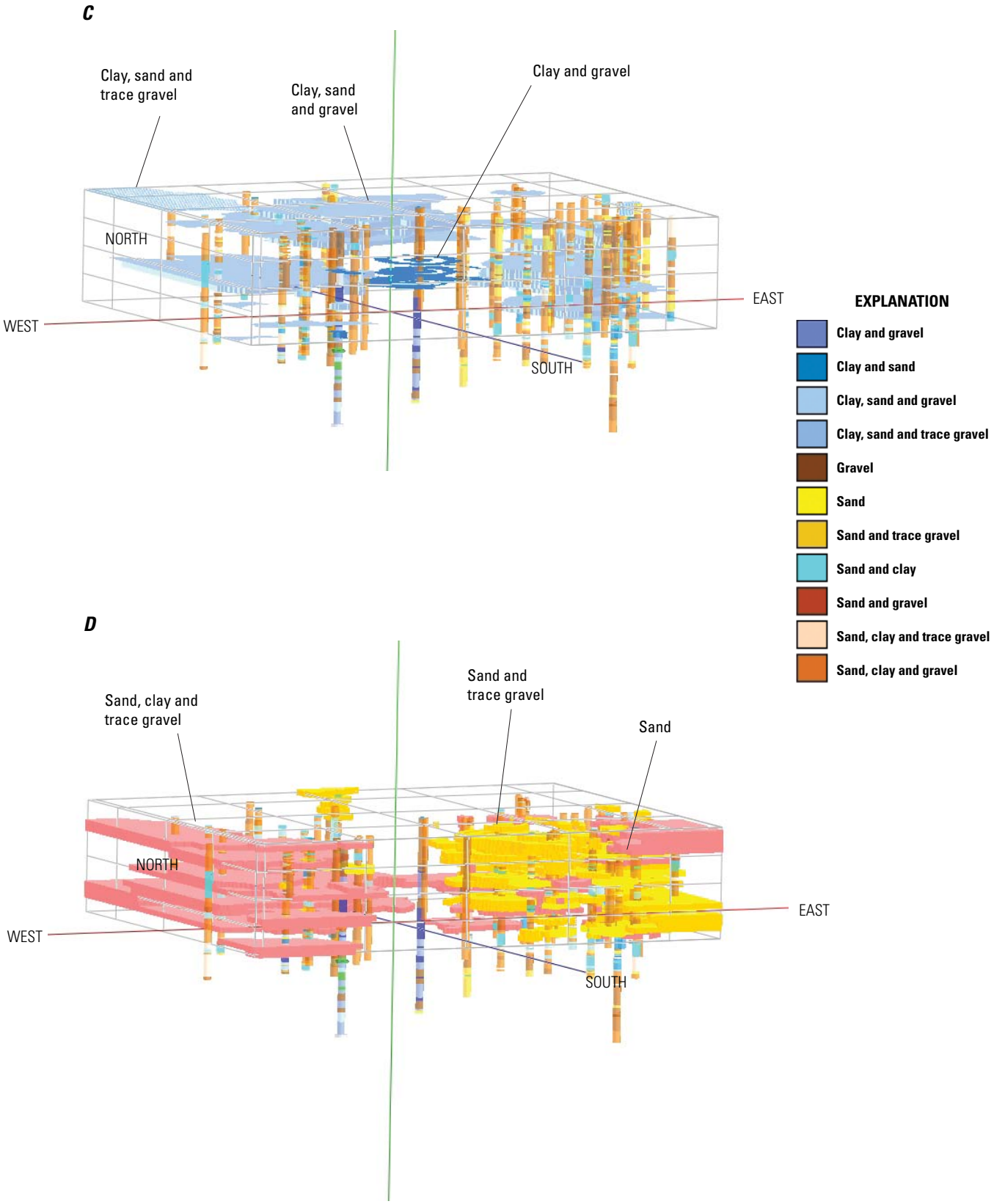


Figure 10. Distribution of sediments in the three-dimensional lithologic model that are predominantly (*A*) coarse sand and gravel, (*B*) sandy, (*C*) clayey lithologies. Each diagram is bound by the three-dimensional lithologic model. Diagram is oriented northeast about 10 degrees above the horizon.—Continued

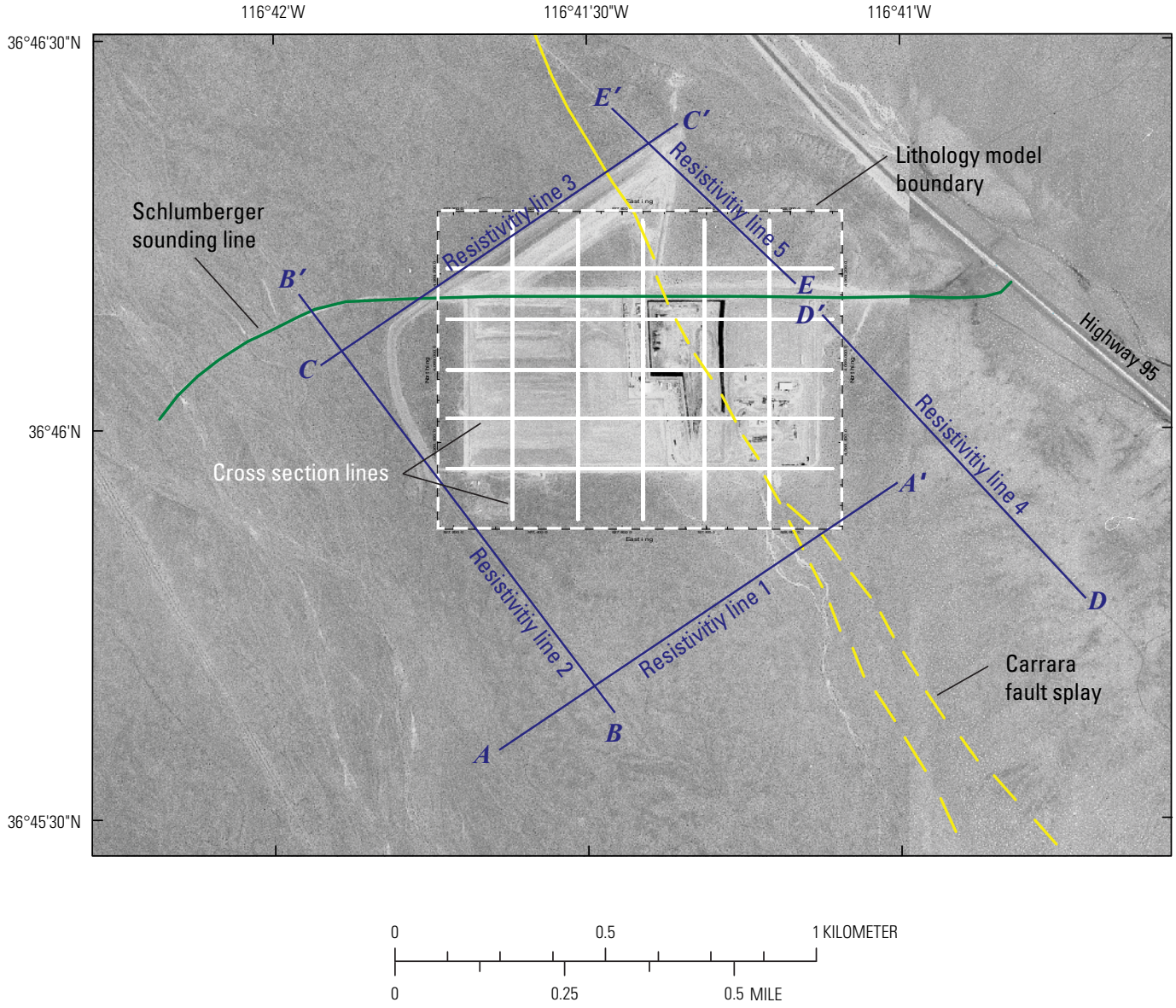


Figure 11. Location of resistivity lines, fence diagram, and model boundary. The resistivity lines are blue, the Schlumberger sounding line is dark green, the cross sections are light green and the model boundary is black. The majority of the resistivity lines fall outside the area where the high density of boreholes exists.

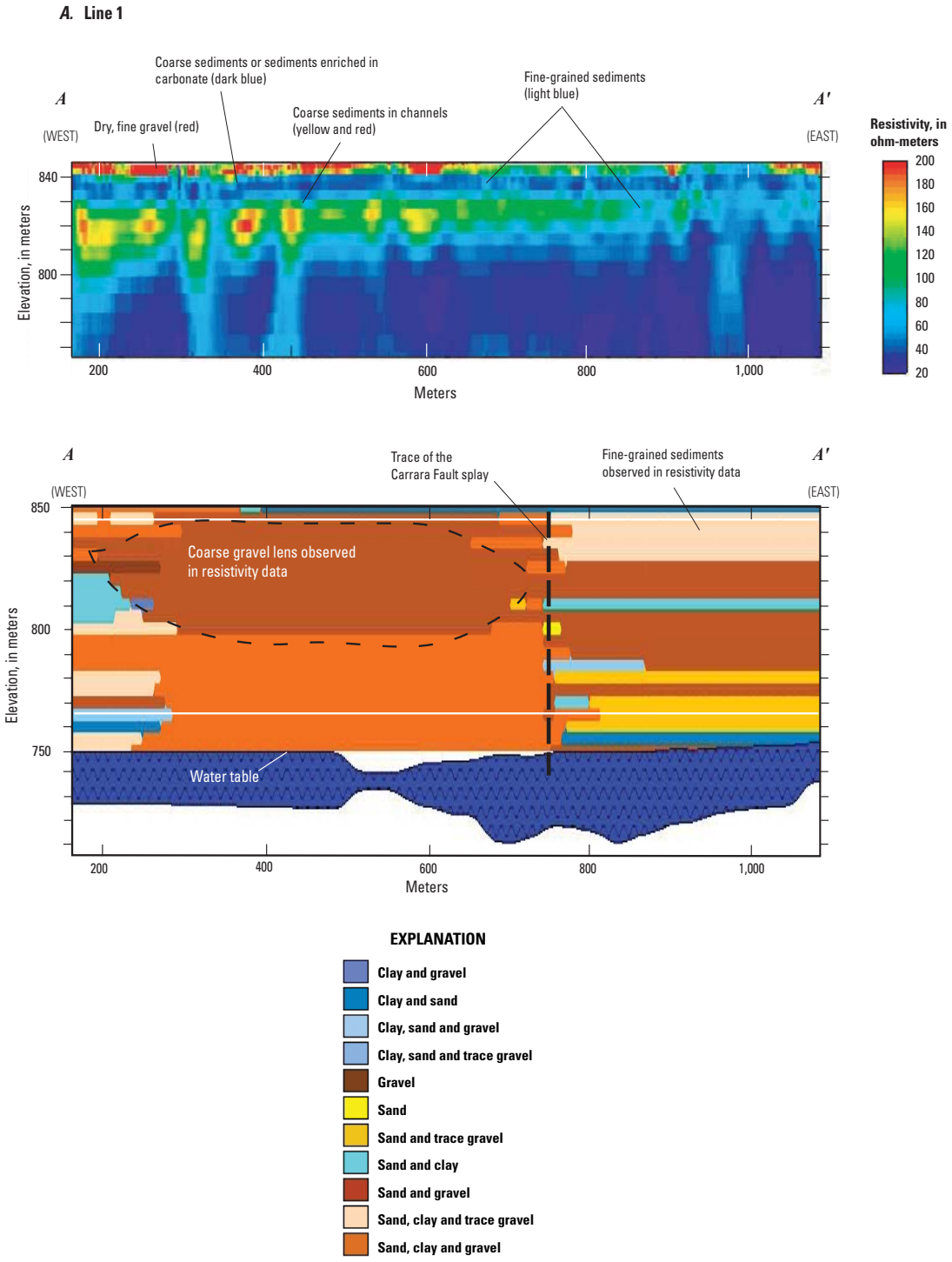


Figure 12. Comparison of the resistivity profiles (top) to the lithology profiles (bottom) along 5 lines surrounding USE. (*A*) line 1 (*A*-*A*′); (*B*) line 2 (*B*-*B*′); (*C*) line 3 (*C*-*C*′); (*D*) line 4 (*D*-*D*′); and (*E*) line 5 (*E*-*E*′). Current resistivity data (top) compared to lithologic model (bottom) at the same location. All data are at the same scale, and the area that is in both diagrams is between the two white lines on the lithology diagram. The lithology model is deeper than the resistivity data and includes the top of the water table. The base of the water table is an artifact of drill hole depth. Vertical scales are equal, and resistivity data are above the modern water table. Higher resistivity levels are warm colors (less than 150 ohm-m) and indicate dry sediments. Lower resistivity values are cooler colors and indicate wetter sediments, the presence of dissolved soluble salts or fine-grained sand and clay.

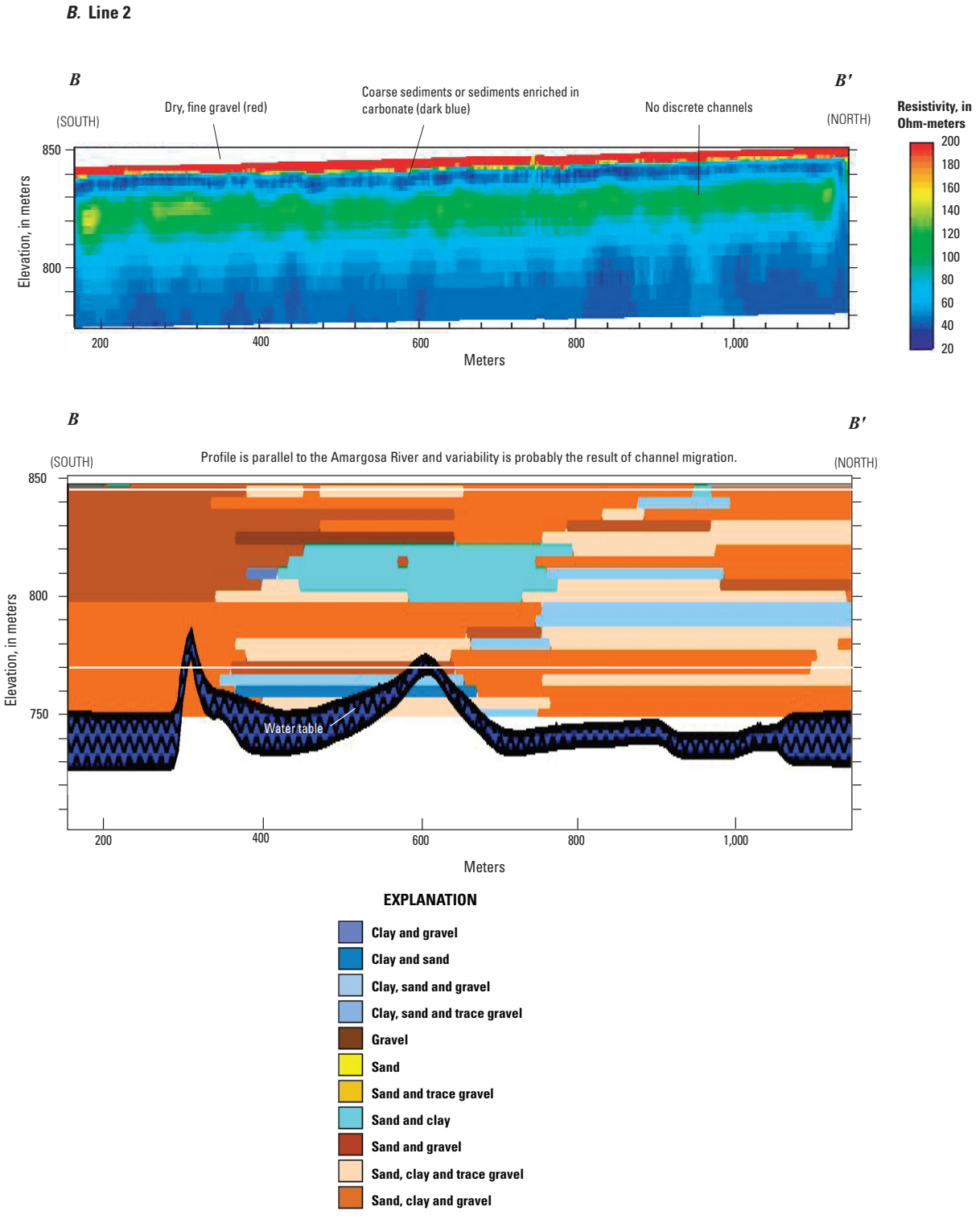


Figure 12. Comparison of the resistivity profiles (top) to the lithology profiles (bottom) along 5 lines surrounding USE. (*A*) line 1 (*A*-*A*′); (*B*) line 2 (*B*-*B*′); (*C*) line 3 (*C*-*C*′); (*D*) line 4 (*D*-*D*′); and (*E*) line 5 (*E*-*E*′). Current resistivity data (top) compared to lithologic model (bottom) at the same location. All data are at the same scale, and the area that is in both diagrams is between the two white lines on the lithology diagram. The lithology model is deeper than the resistivity data and includes the top of the water table. The base of the water table is an artifact of drill hole depth. Vertical scales are equal, and resistivity data are above the modern water table. Higher resistivity levels are warm colors (less than 150 ohm-m) and indicate dry sediments. Lower resistivity values are cooler colors and indicate wetter sediments, the presence of dissolved soluble salts or fine-grained sand and clay.—Continued

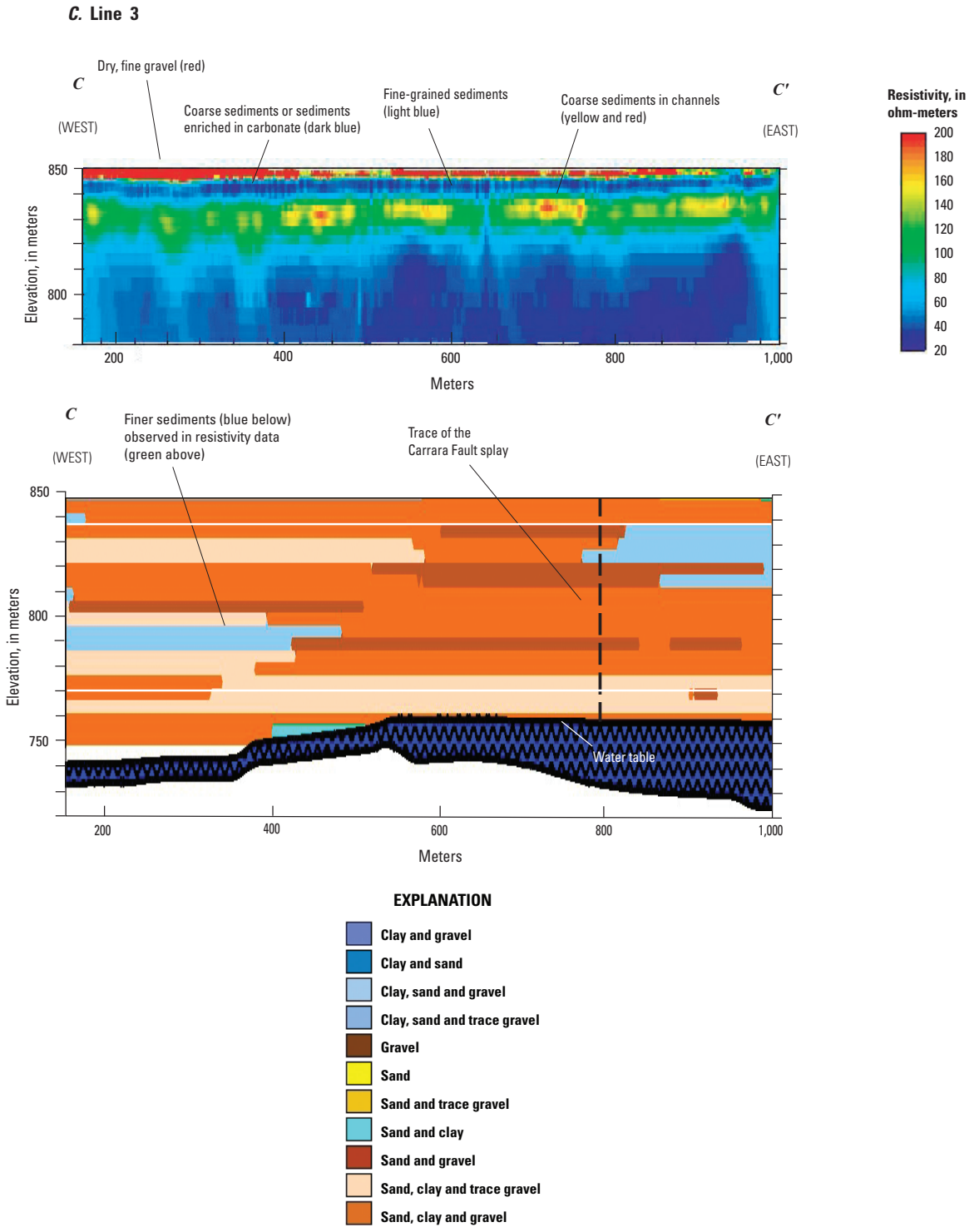


Figure 12. Comparison of the resistivity profiles (top) to the lithology profiles (bottom) along 5 lines surrounding USE. (*A*) line 1 (*A-A'*); (*B*) line 2 (*B-B'*); (*C*) line 3 (*C-C'*); (*D*) line 4 (*D-D'*); and (*E*) line 5 (*E-E'*). Current resistivity data (top) compared to lithologic model (bottom) at the same location. All data are at the same scale, and the area that is in both diagrams is between the two white lines on the lithology diagram. The lithology model is deeper than the resistivity data and includes the top of the water table. The base of the water table is an artifact of drill hole depth. Vertical scales are equal, and resistivity data are above the modern water table. Higher resistivity levels are warm colors (less than 150 ohm-m) and indicate dry sediments. Lower resistivity values are cooler colors and indicate wetter sediments, the presence of dissolved soluble salts or fine-grained sand and clay.—Continued

D. **Lines 4 and 5**

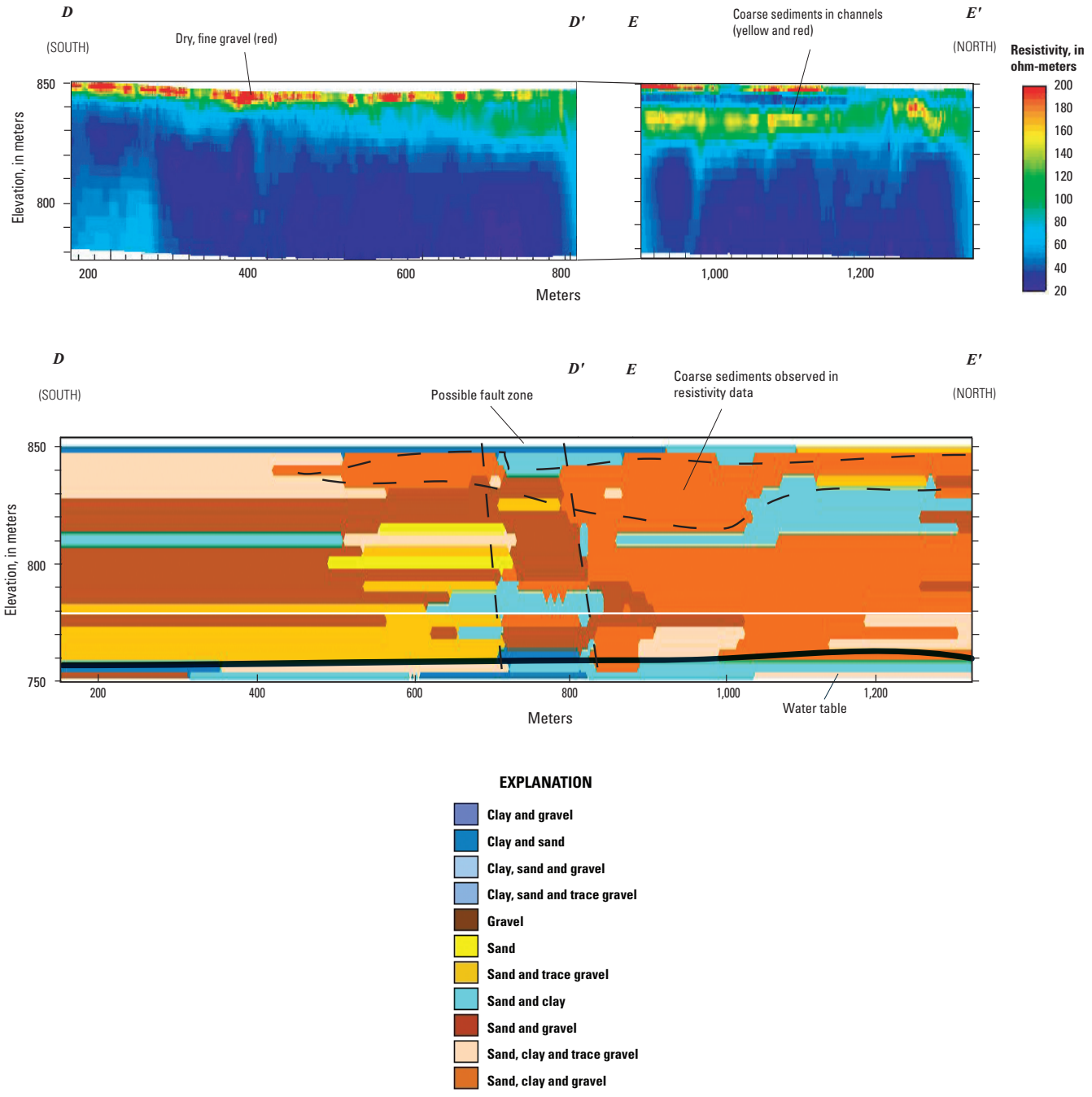


Figure 12. Comparison of the resistivity profiles (top) to the lithology profiles (bottom) along 5 lines surrounding USE. (*A*) line 1 (*A-A′*); (*B*) line 2 (*B-B′*); (*C*) line 3 (*C-C′*); (*D*) line 4 (*D-D′*); and (*E*) line 5 (*E-E′*). Current resistivity data (top) compared to lithologic model (bottom) at the same location. All data are at the same scale, and the area that is in both diagrams is between the two white lines on the lithology diagram. The lithology model is deeper than the resistivity data and includes the top of the water table. The base of the water table is an artifact of drill hole depth. Vertical scales are equal, and resistivity data are above the modern water table. Higher resistivity levels are warm colors (less than 150 ohm-m) and indicate dry sediments. Lower resistivity values are cooler colors and indicate wetter sediments, the presence of dissolved soluble salts or fine-grained sand and clay.—Continued

Activity on the Carrara Fault

The Carrara Fault has been of interest because of its proximity to USE and ADRS. The Carrara Fault is strike-slip feature that trends northwest to southeast along the general alignment of U.S. Highway 95 from the vicinity of Beatty to the southern end of Bare Mountain (Workman and others, 2002, Connor and others, 2000, fig. 1). Evidence for Quaternary activity on the Carrara Fault is expressed in aeromagnetic interpretations, the presence of suspected scarps, and the Quaternary uplift of elevated QTa gravel (Slemmons, 1997, figs. 13 and 14). Little or no geomorphic expression in Quaternary deposits suggests that recurrence of surface faulting is greater than 10,000 yrs (Anderson and Klinger, 1998). Prior to the faulted exposure described below and the three-dimensional lithologic model, many argued that most of the phenomena attributed to faulting could be explained by normal fluvial processes. The lithology model provided subsurface evidence of offset fine-grained units in the vicinity of the west splay of the Carrara Fault (fig. 9).

Suspicion has always existed that the old, elevated gravels that drape a bedrock core, south of USE (QTa on fig. 2, fig. 13), is a transpressional structure formed along a left stepover between two segments of the Carrara Fault. Based on drainage density, stream order, cross-cutting relation and different ^{10}Be exposure ages on desert pavement along the ridge crest, the uplift postdates the majority of ridge uplift and probably occurred in the late Pleistocene (Spies and others, 2000). The elevated gravels were isolated and no longer received deposition either from the Amargosa River or alluviation from the Bare Mountain fans to the east.

There also is a hydrologic gradient along the projection of the Carrara Fault, described below, that suggests a structural control of the change in water elevation. A cross section defined by a Schlumberger sounding (Bisdorf, 2002) on the north edge of USE also provided evidence for the presence of the fault (fig. 14). Ultimately, eight trenches were excavated on suspected surface traces of the fault to expose offset depositional units and to better understand the timing of Quaternary tectonics on the Carrara Fault.

Three trenches (USE306-2, 5, and 7) were mapped and the units described in detail (fig. 13, table 4). Photographs with mapped units exposed in trenches USE306-2 and 7 are included here. None of the trenches south of USE (USE306-1 through 5) exposed any faulted or fractured alluvial units. A subtle break in slope visible in the field, and also visible on the contour map produced from GPS measurements, was used to locate the trenches (fig. 13). Trench USE306-2 exposed a continuous section of mapping unit Q3, a late Pleistocene (approximately 150-300 ka, Potter and others, 2002) deposit characterized by a well-developed soil (fig. 15, table 4). Secondary carbonate is accumulated in a dense well-cemented horizon that is typical of correlative soils on the Bare Mountain fans and basin deposits (Swadley and Parrish, 1988, Potter and others, 2002). The absence of offset or fractured units indicates that the trenches did not intersect the fault or there has not been surface rupture since the deposition of unit Q3 in this area. Mapping unit Q3 surrounds, but does not drape QTa. If the QTa ridge is fault bounded by the proposed splay of the Carrara Fault, offset predated the deposition of Q3.

North of USE, trenches USE306-7 and 8 expose offset Quaternary deposits. Trench USE306-7 is described here (fig. 16, table 4) where one tectonic offset is recorded in the alluvium. Moderately well-developed vertical fault planes define a fault zone in Q3 and Q4 deposits of late Pleistocene age in Trench USE306-7 (fig. 16). The fault planes are truncated by early Holocene Q5 deposits that do not appear to be offset. The offset Q4 deposits record probable strike-slip movement after soil development on unit Q4, the youngest deposit clearly offset. Unit Q4 is late Pleistocene in age, approximately 40-85 ka (Potter and others, 2004). Unit Q5, which does not appear to have been ruptured, ranges in age from 2 to 18 ka (Potter and others, 2004).

Potentiometric Surface

The elevation of the water table was contoured with all the available data, irrespective of the date sampled (table 4). These data were compared to the time-sensitive compilation (Walvoord and others, 2005). In the center of USE, water is intersected less than 100 m below the surface and increases to more than 110 m in the southwest corner (fig. 17). The gradient may be controlled by grain size in the depositional units at depth or by the buried splay of the Carrara Fault.

Acknowledgments

This study benefited from discussions and field work with Dennis O'Leary, Dave Stonestrom, Dave Prudic, and Brian Andraski. Thanks to John Whitney and Don Sweetkind for their helpful reviews of this document.

Summary and Conclusions

Geologic mapping by Swadley and Parish (1988) provided field evidence of the relation of the three major sources of surficial material exposed in the vicinity of US Ecology. Alluvial fans provide locally derived sediment for alluvium entering the Amargosa Basin. Alluvium in the basin axis is derived from the two major drainages that enter the basin from the north—the Amargosa River and the tributary Gold Center drainage. Eolian fines and flood sands are incorporated into the coarse alluvial material, plugging and burying deposits once exposed at the surface.

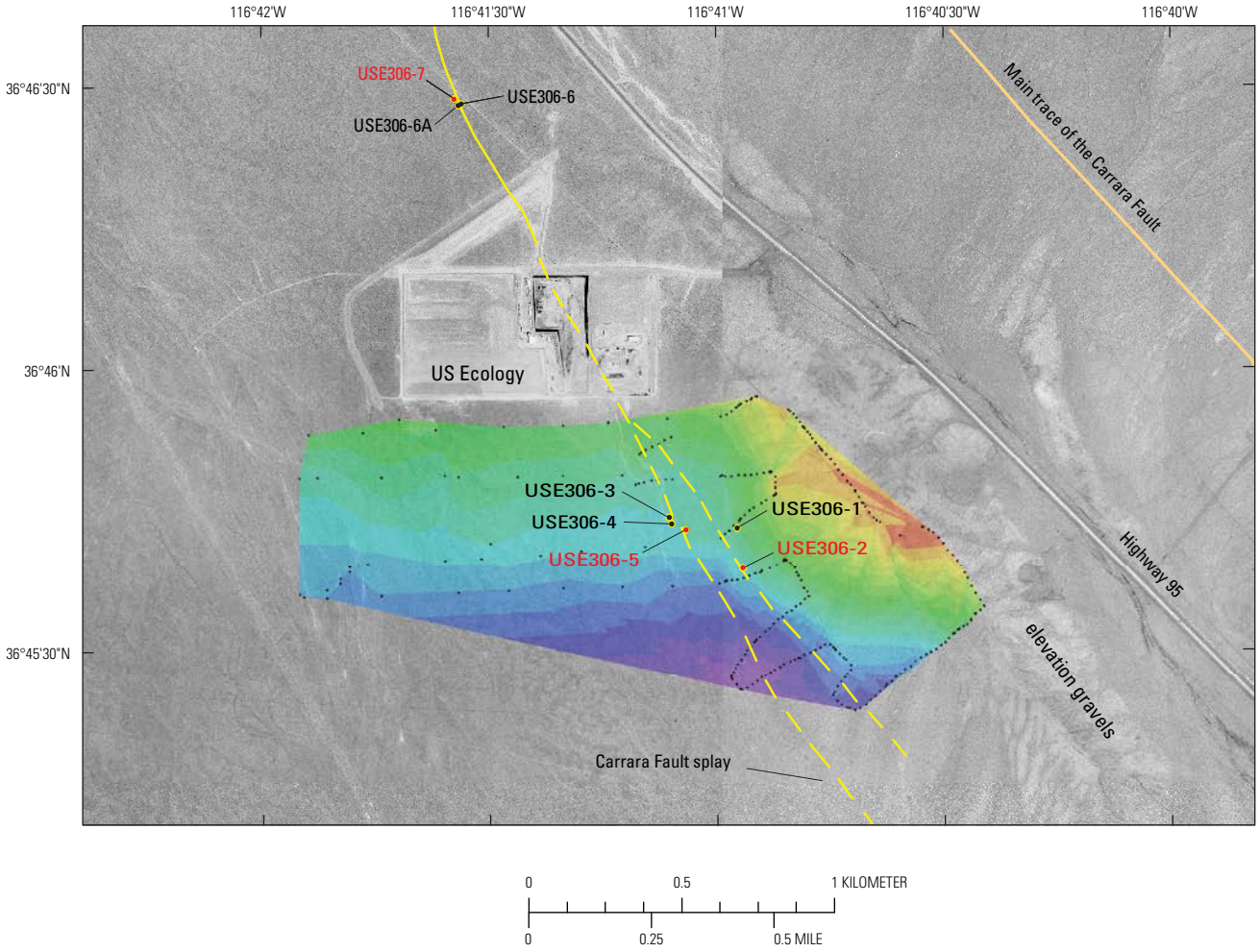


Figure 13. Contoured surface map to locate the Carrara Fault, trench locations, and projected Carrara Fault strand. The surface contour map was made from Global Positioning System reading and used to locate the Carrara Fault, trench locations, main trace of the Carrara Fault (orange, from Workman and others, 2002) and the projected Carrara Fault strand (yellow lines, dashed where buried). Eight trenches were excavated to determine if there is Quaternary offset on a projected strand of the strike-slip Carrara Fault. The trenches are labeled (USE06-1 through 6), and the three trenches with labels in red have detailed unit descriptions (USE06-2, 5, and 7). The Carrara Fault is dashed where inferred, but either not intersected or units intersected were not offset. A Global Positioning System survey was completed, and the data points were contoured to better estimate the location of the fault. The color contoured area represents an elevation change of about 17 meters, and each color contour is approximately 1 meter. The small black dots in the contoured area are the 278 locations at which the Global Positioning System measurements were made.

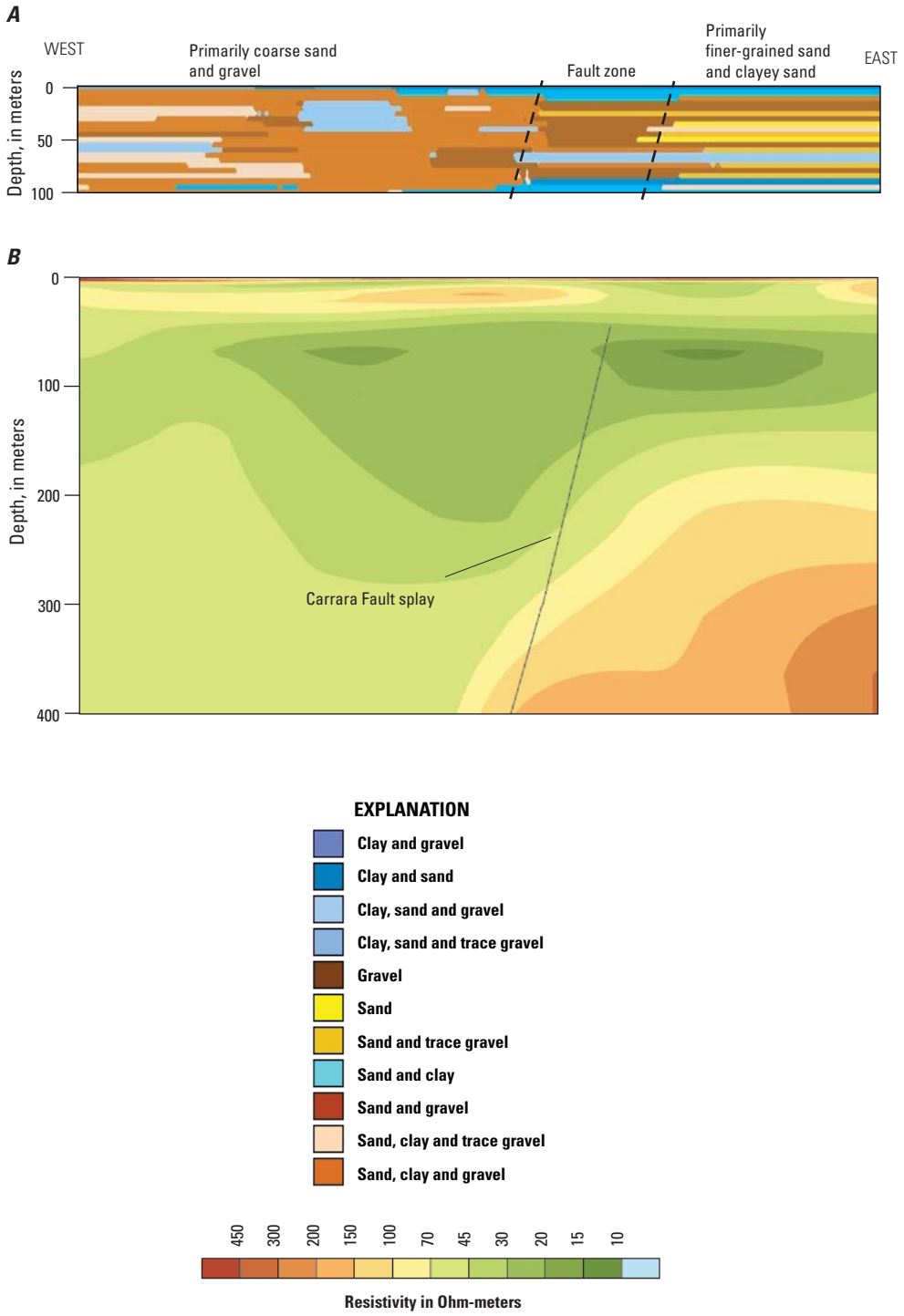


Figure 14. Comparison of (*A*) lithology model and (*B*) Schlumberger sounding at the location of the inferred splay of the Carrara Fault. A cross section of the lithology model, made at the same location as the Schlumberger sounding (Bisdorf, 2002), supports the resistivity data suggesting the presence of a splay of the Carrara Fault. Lithologic units west of the subsurface interpretation primarily are coarse sand and gravel and east, finer-grained sand and clayey sand. Vertical and horizontal scales are equal.

Table 4. Soil unit descriptions of deposits exposed in trenches USE306-2, 5, and 7.

[bd, boulder; cob, cobble; peb, pebble; grav, gravel]

Stratigraphic unit	Horizon (boundary)	Depth or thickness range (cm)	Color		Texture	Structure (primary and secondary)	Consistence (dry, moist, wet)	Clay films	Secondary $CaCO_3$ (gravel and disseminated)	Percent gravel bd >10″ cob 2–10″ peb 1/16–2″ grav < 1/16″ (1)	Parent material and lithology—sorting, angularity, bedding, imbrication, support	Miscellaneous—roots, pores, SiO_2, oxidation, salts, concretions
			Dry (<gravel or ped face)	Wet (<gravel or ped face)								
USE306-2												
Q3	Av (as)		10YR 7/2	10YR 4.5/4	SL	3 ves m to pl	lo, np		disseminated	<10		
Q3	Bk1 (cw)		10YR 7.5/2	10YR 5/4	SL	2 co sbk	sh, hp		II and diss	20		
Q3	Bk2 (gs)		7.5YR 8/2	7.5YR 4/3	S	2 m to co pl	sh, np		III and weak plates	30–40		
Q3	Bk3		7.5YR 8/2	7.5YR 4/3	S	m	sh		III	30–40		hz disappears
Q3	Bk4		7.5YR 6/3	7.5YR 4/3	S	m to 3 m pl	sh		I, stringers III	30–40		
USE306-5												
Q5	Av (as)		10YR 6.5/2	10YR 4.5/3	SL	2 m to co pl	ns, np, so			<10		
Q5	Bk1 (as)		10YR 6/3	10YR 5/4	SL	sg	ns, np, so			<10		browner than horizon below
Q5	Bk2 (cs)		10YR 8/2.5–7/3	10YR 5/4	LS +	f to co sbk	sh, np, vss		II	20–30		base of silty sand

Table 4. Soil unit descriptions of deposits exposed in trenches USE306-2, 5, and 7.—Continued

[bd, boulder; cob, cobble; peb, pebble; grav, gravel]

Strati-graphic unit	Horizon (boundary)	Depth or thickness range (cm)	Color		Texture	Structure (primary and secondary)	Consis-tence (dry, moist, wet)	Clay films	Secondary $CaCO_3$ (gravel and dissemi-nated)	Percent gravel bd >10" cob 2–10" peb 1/16–2" grav < 1/16" (1)	Parent material and lithology—sorting, angularity, bedding, imbrication, support	Miscella-neous—roots, pores, SiO_2, oxida-tion, salts, concretions
			Dry (<gravel or ped face)	Wet (<gravel or ped face)								
Q5	2Bk3		10YR 8/3	10YR 5/3	SL	m to sg, weakly pl in places	ns, np		II+ to III	80		
USE306-5—Continued												
Q5	2Bk4 (as)		10YR 7/2	10YR 4/3	SL–	m to sg	ns, np		II–	80, peb cob grav	weakly imbricated, poorly con-solidated	
Q3	3Btkb (as)		7.5YR 5/4	7.5YR 4/4	SL	2 f to m abk	ns, np	n cf gr	I	50–70, peb grav		top of buried soil (Q3)
Q3	3Kb		7.5 YR 7.5/2	7.5YR 5/6	SL	m to 1–2 m abk	ns, p		III	peb grav		not inter-sected by possible fracture, unit is eroded by channel in places
USE306-7												
Q5	Av (ac)	10–20	10YR 6/2	10YR 4/3	SL	thin plates <3 cm						
Q5	AB					2 m to co sbk			I	<10		
Q5	Bk1 (ac)		10YR 7/2	10YR 5/3	LS	erodes to mas-sive columnar structure			carbonate coats pf			

Table 4. Soil unit descriptions of deposits exposed in trenches USE306-2, 5, and 7.—Continued

[bd, boulder; cob, cobble; peb, pebble; grav, gravel]

Stratigraphic unit	Horizon (boundary)	Depth or thickness range (cm)	Color		Texture	Structure (primary and secondary)	Consistence (dry, moist, wet)	Clay films	Secondary $CaCO_3$ (gravel and disseminated)	Percent gravel bd >10″ cob 2–10″ peb 1/16–2″ grav < 1/16″ (1)	Parent material and lithology—sorting, angularity, bedding, imbrication, support	Miscellaneous—roots, pores, SiO_2, oxidation, salts, concretions
			Dry (<gravel or ped face)	Wet (<gravel or ped face)								
USE306-7—Continued												
Q5	2Bk2 (gs)		10YR 7/2	10YR 4/3	S	sg			I+ to II–	peb cob grav	mod imbrication	> infiltrated silt than hz below
Q5	2Bk3 (ac)		10YR 5.5/2	10YR 3/3	v co S	sg			I– thin and patchy	70, peb cob grav		
Q4	3Bk1b1 (gw)	50	10YR 6/2	10YR 4/4	S	2 f to m sbk	ns, np		II to filaments	peb grav		
Q4	4Bk2b1 (ac)		10YR 5/1	10YR 3/2.5	S	sg	ns, np		I+ patchy	peb cob grav	mod well imbrication	
Q3	5Kb2		10YR 6.5/2	10YR 4/4		m to sg	ns, np		III	peb grav	poor to mod imbrication	

Explanation of soil and unit descriptions (Birkeland, 1999).

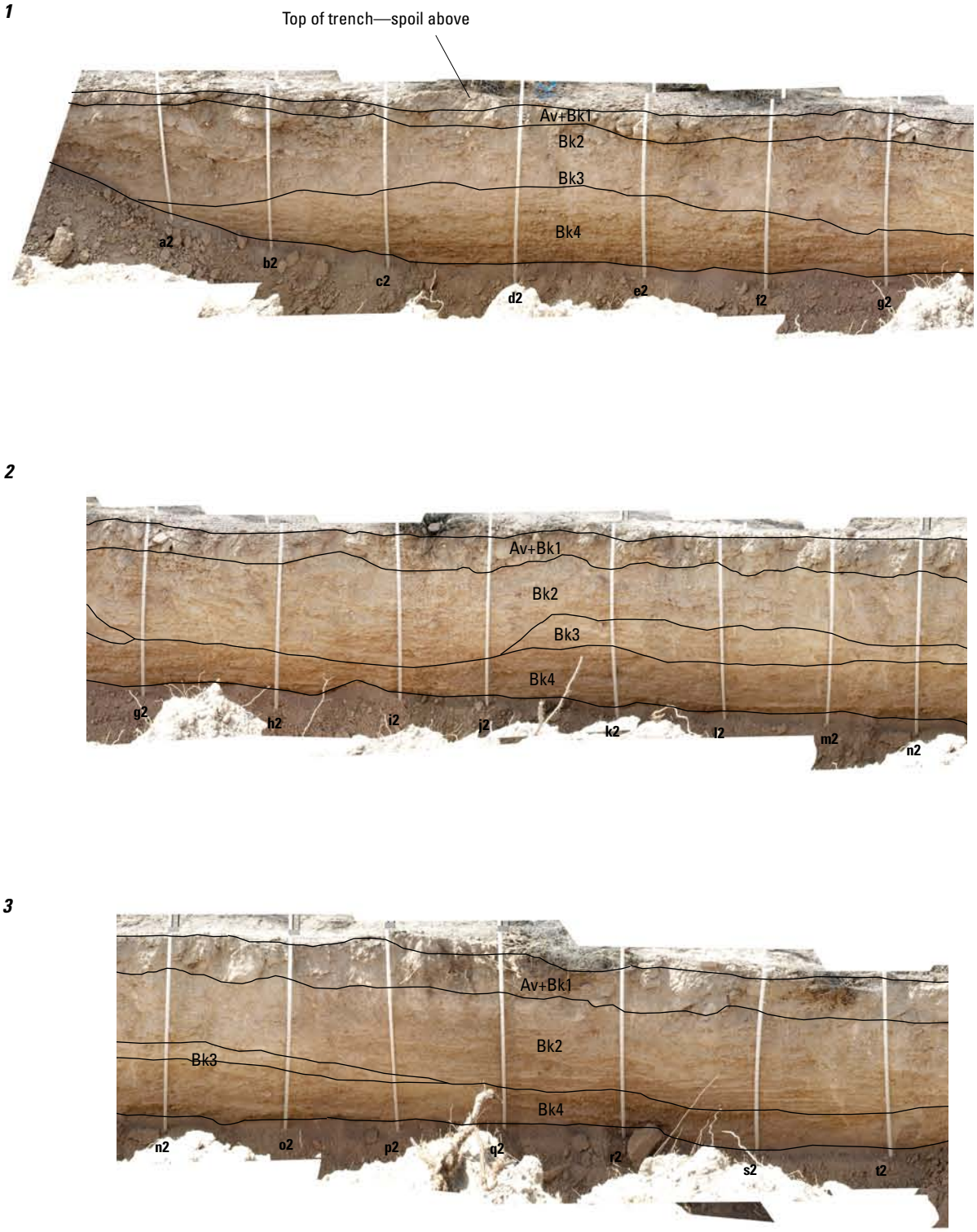
Master Horizon	
A	Organic matter accumulation, zone of elluviation of clay, sesquioxides, silica, gypsum, carbonate, and/or salts
B	Horizon with redder color, stronger structure development, and/or accumulation of secondary illuvial materials
K	Horizon engulfed with carbonate to the extent that the horizon morphology is determined by the carbonate
C	Horizon that may be similar to parent material, includes unaltered and weathered material

Subordinate Horizon Departures	
b	buried soil horizon
k	accumulation of carbonates
t	accumulation of clay
v	vesicular structure

Horizon Boundary		
Distinctness	**Topography**	**Soil Texture**
a, abrupt	s, smooth	v co, very coarse
c, clear	w, wavy	S, sand
g, gradual		LS, loamy sand
		SL, sandy loam

Soil Structure		
Grade	**Size**	**Type**
m, massive	vf, very fine (v thin)	sg, single grain
sg, single grained	f, fine (thin)	pl, platey
v1, very weak	m, medium	pr, prismatic
1, weak	co, coarse (thick)	cpr, columnar
2, moderate	vco, very coarse (v thick)	abk, angular blocky
3, strong		sbk, subangular blocky

Soil Consistency/Plasticity		
Dry	**Moist**	**Wet**
lo, loose	lo loose	so,po non-sticky or plastic
so, soft	vfr very friable	vss,vps very slightly sticky or plastic
sh, slightly hard	fr friable	ss,ps slightly sticky or plastic
h, hard	fi firm	s,p sticky or plastic
vh, very hard	vfi very firm	vs,vp very sticky or plastic
eh, extremely hard	efi extremely firm	



Trench USE306-2 East end of the south wall

Figure 15. Trench USE306-2. Trench USE306-2 separated into six sections from east to west (1–6). None of the deposits exposed in the trench have been offset, and there are no fractures to suggest any movement as a result of tectonic activity. White poles are approximately 1 meter apart, and the trench is about 1.7 meters deep.

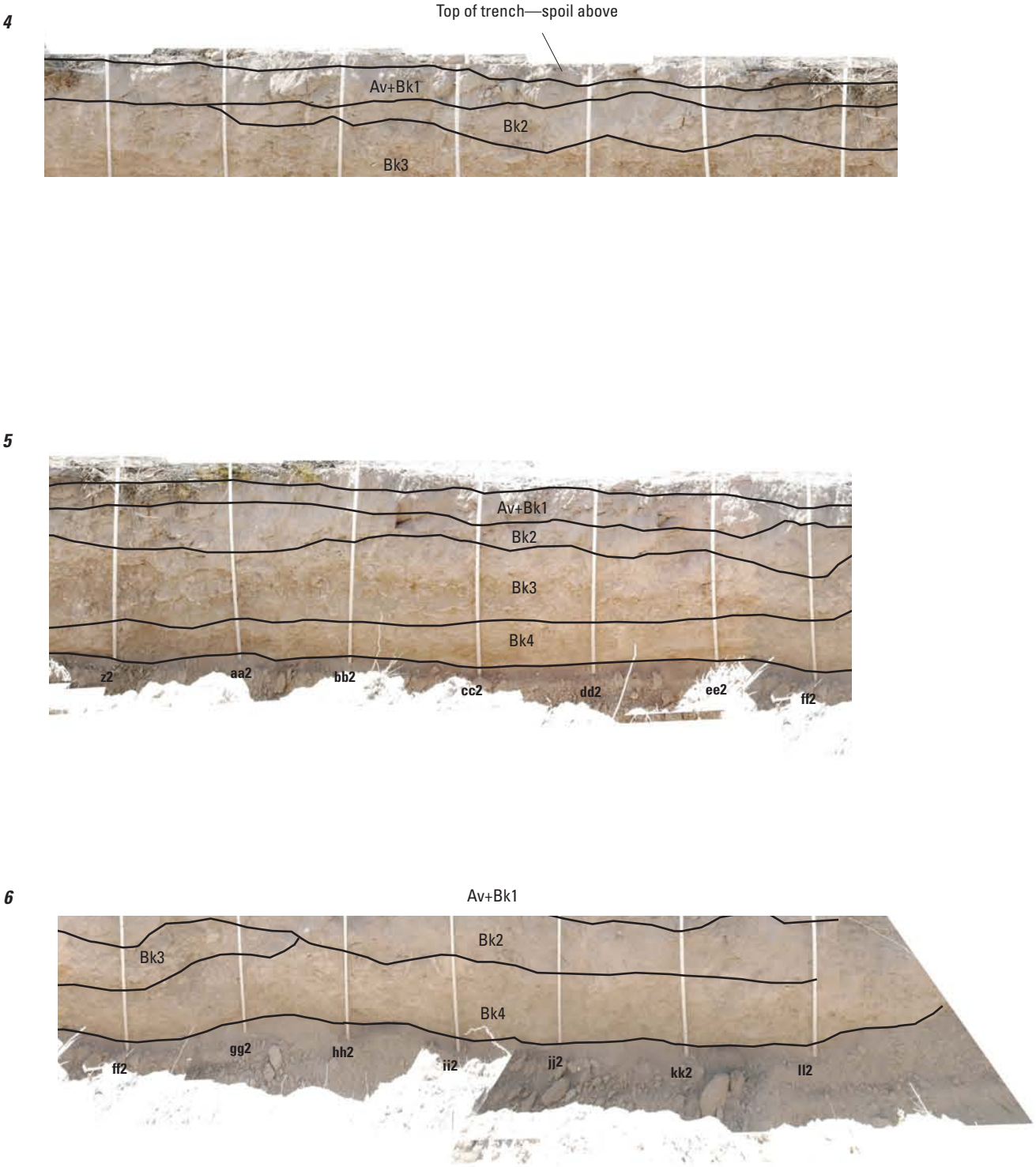


Figure 15. Trench USE306-2. Trench USE306-2 separated into six sections from east to west (1–6). None of the deposits exposed in the trench have been offset, and there are no fractures to suggest any movement as a result of tectonic activity. White poles are approximately 1 meter apart, and the trench is about 1.7 meters deep.—Continued

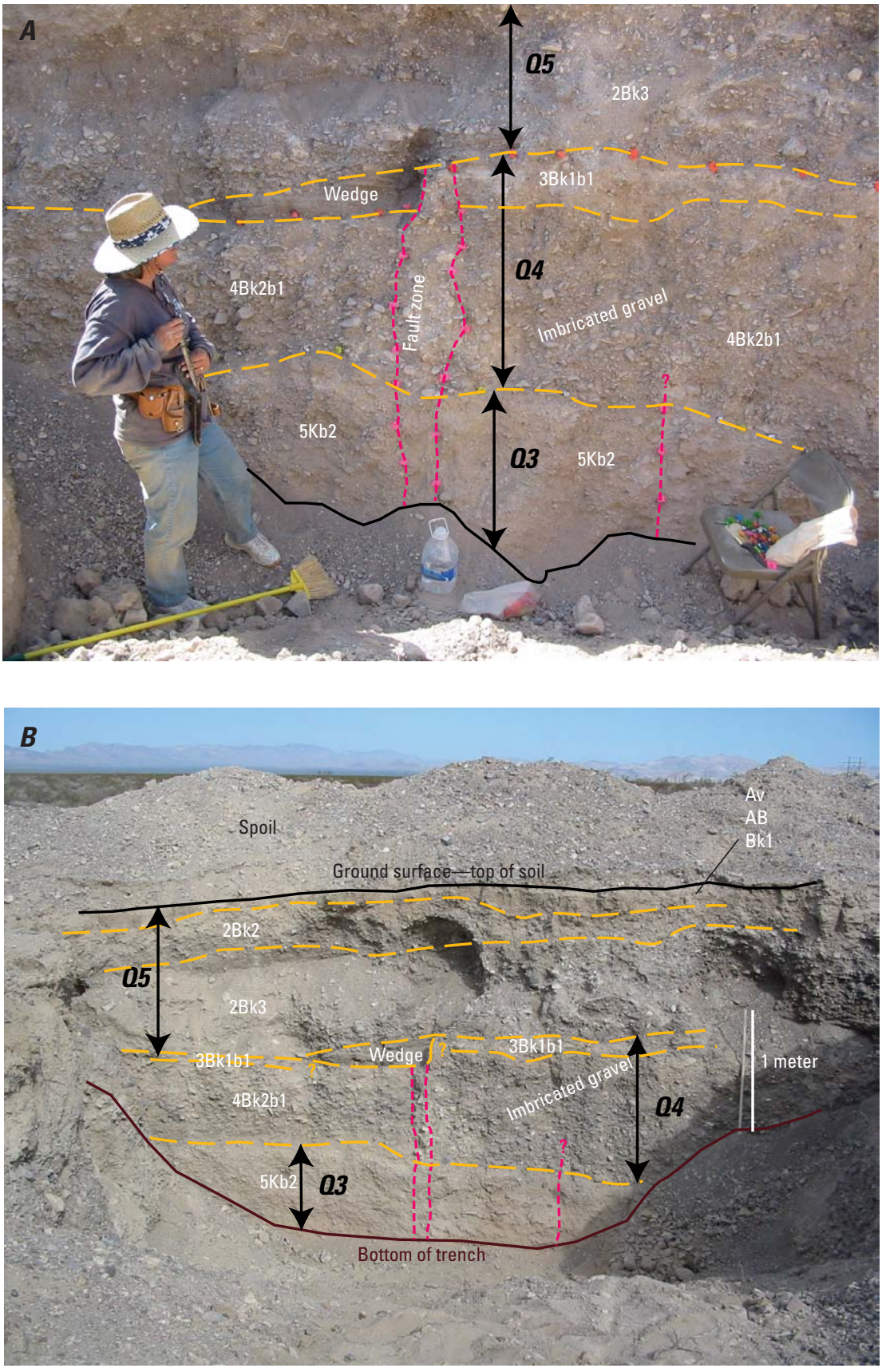


Figure 16. Exposure of the Carrara Fault in Trench USE306-7 (*A*) centered in the fault zone, and (*B*) the entire trench exposure.

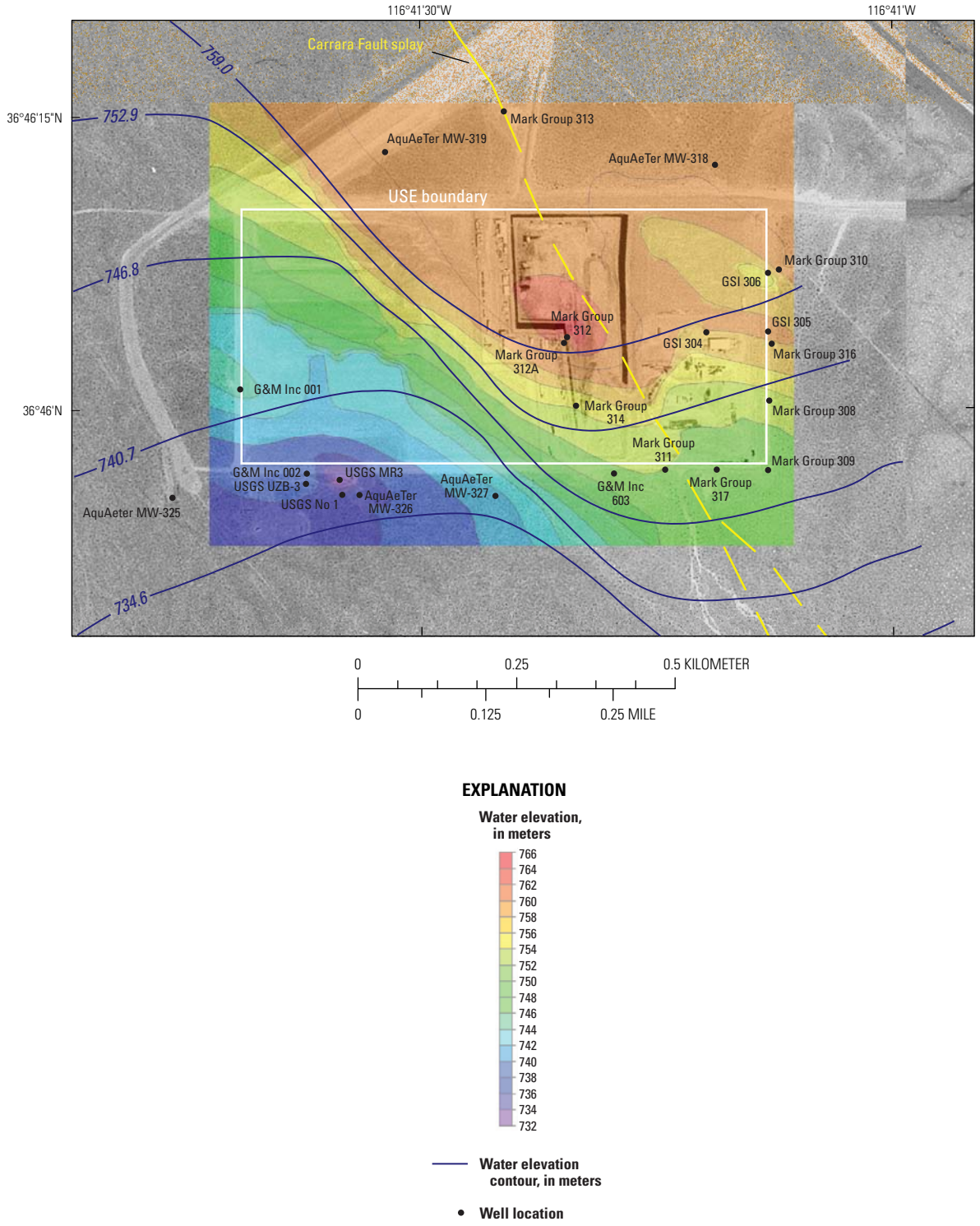


Figure 17. Comparison of the long-term average and the time-dependent water elevation (meters). The 37 boreholes with water elevations, used to generate the colored contours, are located with a filled circle. All water levels were used, irrespective of sampling date, so the color contours represent a long-term average. The red lines are from Walvoord and others (2005) and were generated from time-sensitive water-elevation data. The gradient may be controlled by grain size in the depositional units at depth, or by the buried splay of the Carrara Fault.

The Amargosa Basin was closed until the headwaters of the Amargosa River connected the basin to Oasis Valley at the Beatty Narrows between 150 and 50 ka. The basin remained closed and water did not exit the basin at Eagle Mountain and flow into the Tecopa Basin until the late Pleistocene (approximately 130 ka).

Groundwater has intersected the surface of the basin in the vicinity of Ash Meadows. These deposits were eroded when the Amargosa River was integrated with the Tecopa Basin. The fine-grained groundwater deposits were eroded and exposed above the active drainage. The Amargosa River was integrated from Oasis Valley to Tecopa Basin and seasonally flowing.

Optically Simulated Luminescence technique was used to date borehole sediment samples at USE. Along with dated buried volcanic ash and basalt, these ages provided estimated rates of alluvial valley aggradation. Thermoluminescence (TL) appears to over estimate late Pleistocene aggradation rates, probably because fine-grained sediment is not "zeroed" prior to burial. Long-term aggradation rates determined from the volcanic samples are low (0.02 mm/yr). Climatic or tectonic effects, or both, are recorded in the deposits less than 70 ka from the borehole samples. These samples may range in age from 5 to 65 ka and may support the hypothesis that alluviation occurred following regional climate shifts from pluvial to interpluvial climates when material was available to transport.

Geologic data compiled from 67 boreholes at USE and from surrounding studies were used to construct a three-dimensional lithologic model of the subsurface at USE. No volcanic units or fine-grained playa/palustrine deposits were present and intersected. The top 100 meters is characterized by repeated stacks of fining-upward alluvial sequences between 4- and 5-m thick. Coarse gravel, eroded into the underlying alluvium, grades upward to finer sand and sandy clay. The three-dimensional model displays offset fine-grained deposits that are coincident with a geophysical projection of the Carrara Fault.

Trenches were excavated across projections of the subsurface lineament. Quaternary deposits as old as 150–300 ka were not offset south of the waste site, however, trenches north of USE did display offset as young as 40–85 ka. Because of the strike-slip nature of the fault, total offset was not determined in this study.

Resistivity profiles were compared to the modeled subsurface lithologies above the water table to better understand the parameters measured in the resistivity profiles. Moisture, sediment size and accumulation of secondary salts control resistivity values observed in the vicinity of USE.

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Appendix 1. Compilation of Borehole and Aquifer Data

Appendix 1. Compilation of borehole and aquifer data.

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Easting (m)	Northing (m)	Elevation (ft)	Elevation (m)	Total depth (ft)	Total depth (m)
AquAeTer MW-318	527981.11	4069216.49	2780	847.30	300	91.44
AquAeTer MW-319	527461.01	4069236.55	2785	848.85	318	96.93
AquAeter MW-325	527126.00	4068692.00	2780	847.30	389	118.57
AquAeTer MW-326	527421.00	4068696.00	2780	847.30	372	113.39
AquAeTer MW-327	527635.00	4068695.00	2771	844.70	360	109.73
G&M Inc 001	527232.36	4068862.41	2783	848.36	366	111.63
G&M Inc 002	527337.56	4068729.30	2780	847.30	390	118.87
G&M Inc 600	527657.37	4069284.87	2783	848.42	502	153.01
G&M Inc 601	527778.20	4068729.31	2768	843.59	420	128.02
G&M Inc 602	527763.78	4068819.64	2768	843.58	415	126.49
G&M Inc 603	527815.15	4068730.44	2768	843.58	415	126.49
G&M Inc 604	527899.03	4068730.45	2770	844.28	436	132.95
G&M Inc 605	527987.94	4068730.36	2769	844.09	442	134.66
GSI 304	527967.19	4068952.04	2775	845.82	380	115.82
GSI 305	528065.09	4068953.47	2773	845.24	380	115.82
GSI 306	528064.75	4069046.52	2776	846.12	380	115.82
IT Corp 500	527935.15	4068729.32	2776	846.00	299	91.00
IT Corp 501	527950.02	4068729.24	2776	846.00	104	31.82
Law Eng 101	527951.00	4069139.18	2777	846.43	140	42.67
Law Eng 102	528046.61	4069064.81	2776	846.12	95	28.96
Law Eng 103	527859.90	4069033.25	2777	846.43	99	30.18
Law Eng 104	527948.48	4068960.44	2775	845.82	156	47.55
Law Eng 105	527491.64	4069016.46	2782	847.95	99	30.18
Law Eng 106	527237.79	4069073.97	2785	848.87	160	48.77
Law Eng 107	527437.69	4069150.53	2783	848.26	74	22.71
Law Eng 301	527586.81	4069147.60	2780	847.34	385	117.35
Law Eng 302	527442.41	4068736.51	2776	846.12	355	108.20
Law Eng 303	527940.68	4068747.66	2770	844.30	350	106.68
Law Eng Trench 10-1	527370.42	4068814.46	2780	847.34	60	18.29
Law Eng Trench 22-1N	527364.45	4068995.01	2778	846.73	52	16.00
Law Eng Trench 22-2S	527368.89	4068903.83	2780	847.34	57	17.37
Law Eng Trench 22-3W	527244.93	4068948.23	2779	847.04	35	10.67
Law Eng W-2	527464.22	4068740.08	2775	845.82	365	111.25
Mark Group 308	528066.22	4068844.76	2772	844.94	338	103.02
Mark Group 309	528064.84	4068735.44	2772	844.77	340	103.63
Mark Group 310	528081.69	4069051.46	2776	846.19	302	92.20
Mark Group 311	527902.55	4068735.32	2771	844.73	330	100.58
Mark Group 312	527747.90	4068944.35	2779	847.13	305	92.96
Mark Group 312A	527743.12	4068935.64	2779	847.00	301	91.90
Mark Group 313	527648.13	4069300.23	2785	848.85	320	97.54
Mark Group 314	527762.20	4068836.54	2776	846.26	336	102.41
Mark Group 315	527821.53	4068730.22	2772	845.02	340	103.63
Mark Group 316	528070.06	4068934.46	2775	845.87	310	94.49

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Easting (m)	Northing (m)	Elevation (ft)	Elevation (m)	Total depth (ft)	Total depth (m)
Mark Group 317	527983.41	4068735.80	2771	844.75	340	103.63
Mark Group 400	527750.41	4068929.22	2777	846.58	537	163.68
Mark Group 401	528083.05	4068920.13	2773	845.24	420	128.02
Mark Group 402	527967.13	4069176.07	2779	846.92	163	49.83
Mark Group 402B	527972.60	4069176.42	2779	846.92	37	11.43
Mark Group 402C	527976.51	4069175.77	2779	847.19	436	132.89
Mark Group 403	527952.04	4068729.84	2769	843.90	658	200.56
Perc Est AFCA1	542415.00	4046485.00	2398	731.00	48	14.51
Perc Est AFCA2	542412.00	4046485.00	2398	731.00	39	12.04
Perc Est AFCA3	542273.00	4046225.00	2415	736.00	47	14.48
Perc Est AFCA4	542386.00	4045260.00	2388	728.00	33	10.06
Perc Est AFCA5	541844.00	4044830.00	2408	734.00	33	10.06
Perc Est AFPL1	545661.00	4044432.00	2375	724.00	48	14.60
Perc Est AFPL2	545501.00	4044236.00	2346	715.00	54	16.55
Perk Est. ARAS1	528846.00	4062684.00	2648	807.00	153	46.49
Perk Est. ARRB1	521815.00	4072299.00	2907	886.00	159	48.50
Site Well 1961	527665.65	4068947.67	2780	847.50	575	175.26
US Ecology MW-315A	527826.23	4068730.38	2779	847.00	321	97.99
US Ecology MW-323	527668.62	4068945.01	2779	847.00	298	90.98
USGS MR3	527389.20	4068719.60	2775	845.82	405	123.44
USGS No 1	527393.77	4068697.29	2770	844.30	574	175.00
USGS UZB-1	527257.93	4068633.22	2776	846.00	158	48.25
USGS UZB-2	527256.70	4068644.70	2776	846.00	376	114.66
USGS UZB-3	527336.40	4068713.20	2780	847.30	375	114.45

Appendix 1. Compilation of borehole and aquifer data.

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-318	0.00	7.62	sand, clay and gravel	Pale yellowish brown (10YR6/2), well graded, fine-grained silty sand, (60–70%) with fine-grained gravel (20%), subrounded, dry. At 15 ft gravel decrease to 5%.
Aquaeter MW-318	7.62	10.67	sand, clay and gravel	Light brown to yellowish (5YR6/4), well graded, fine gravel (50%) with coarse to fine sand (30%) and silt (15%), fine-grained angular, dry. At 30 ft brown to gray (5YR5/2), well graded, fine-grained gravel (50%) with coarse to fine-grained sand and silt (40%), coarse-grained gravel (5%), dry (40%).
Aquaeter MW-318	10.67	12.19	sand and gravel	Brown to gray (10YR6/2), fine and coarse sand (60–70%) with fine-grained gravel. At 40 in change to moderate yellowish brown (10YR5/4).
Aquaeter MW-318	12.19	24.38	sand, clay and gravel	At 45 ft same as above. At 50 ft brown, medium to coarse-grained silty sand (70%), fine-grained gravel (10–20%) subangular. At 55 ft brown (5YR5/6), fine to coarse-grained (30–40%) silty sand with large-grained (2 in) subangular gravel (10%). At 60 ft foam on. At 65 ft moderate brown (5YR4/4), fine to medium-grained gravel (50%) surrounded and coarse-grained (11/2 in diameter) (10%), dry. At 75 ft light brown (5YR5/6), fine-grained silty, sand (60%) with fine-grained gravel subangular (30% gravel and coarse sand (10%), dry, easy drilling in the 60–78 zone sample MW-318 (78–80), head space analysis from 2 in split spoon.
Aquaeter MW-318	24.38	25.91	sand, clay and gravel	Same as above. Foam on.
Aquaeter MW-318	25.91	28.96	sand and gravel	Light brown (5YR6/4), coarse-grained sand (≤2 in) (60%), coarse-grained sand (30%) fines not present in cuttings, rig chatter heavy. At 90 ft moderate brown (5YR3/4), poorly graded, fine-grained gravel (80–90%), subangular with 10% coarse sand, cemented/hard layer and hard drilling.
Aquaeter MW-318	28.96	30.48	sand, clay and gravel	Moderate-grained brown (5YR3/4), fine to medium silty sand (80%) with fine-grained gravel (15%), subangular and broken, and clay.
Aquaeter MW-318	30.48	32.00	sand and gravel	Moderate brown (5YR3/4), fine-grained gravel subangular (70%) with coarse sand (20%), and coarse-grained gravel (10%) to 2 in.
Aquaeter MW-318	32.00	33.53	sand, clay and gravel	Light olive brown (5YR5/6), medium to coarse-grained silty sand (60–70%), fine gravel (30%) subangular to subrounded.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-318	33.53	35.05	clay, sand and gravel	Moderate brown (5YR3/4), cohesive sandy silt (70%) with clay and (highly compact), fine-grained gravel (10%).
Aquaeter MW-318	35.05	36.58	sand and gravel	Gray-brown (5YR5/2), poorly graded, fine-grained gravel (90%) subangular with coarse-grained sand (10%).
Aquaeter MW-318	36.58	48.77	sand, clay and gravel	Note, Foam drilling affects color of material. Continuous rig chatter, gravel 120–140 ft. At 125 ft pale brown (5YR5/2), coarse-grained sand (60%) with silt (10%), and subangular fine-grained gravel (30%). At 130 ft same as above. At 135 ft same as above. At 140 ft 5% medium gravel. Decrease to 5% fine-grained gravel. At 145 ft light brown (5YR6/4), poorly graded, fine to medium-grained silty sand (80–90%) with fine-grained gravel (10%). At 150 ft pale brown (5YR5/2), well graded, medium to coarse-grained sand (70%) and silty fine-grained gravel (30%). At 155 ft pale brown (5YR5/2), coarse-grained silty sand (70%) with fine-grained subangular gravel (30%).
Aquaeter MW-318	48.77	53.34	sand, clay and gravel	Rig chatter, layer was very compact. 100 gallons of water/foam added. At 165 ft pale brown (5YR5/2) subangular-subrounded gravel. At 170 ft same as above.
Aquaeter MW-318	53.34	60.96	sand, clay and gravel	Pale brown (5YR5/2), silty and clayey coarse-grained sand (80%) with poorly sorted fine-grained subangular gravel. Heavy rig chatter. At 180 ft pale brown (5YR5/2), coarse-grained silty sand (60%), and subangular fine-grained gravel (40%). At 185 ft same as above. At 190 ft same as above. At 195 ft same as above.
Aquaeter MW-318	60.96	62.48	sand, clay and gravel	Fine-grained (50%) and coarse-grained (5–10%) subrounded to subangular gravel with coarse-grained silty sand (40%).
Aquaeter MW-318	62.48	68.58	sand, clay and gravel	Pale brown (5YR5/2), well graded, coarse-grained silty sand (70%) with subangular fine-grained gravel. At 210 ft rig chatter. At 215 ft same as above. At 220 ft light brown (5YR5/6), well graded, coarse-grained sand (60%) with fine-grained silty sand (20%) and fine-grained gravel subangular.
Aquaeter MW-318	68.58	73.15	sand and gravel	Moderate brown (5YR4/4), fine-grained subangular to subrounded gravel (70%) with medium (10%) to coarse-grained sand (20%). At 230 ft moderate brown (5YR4/4/), well graded, fine-grained subangular gravel (60%) with medium to coarse-grained sand (20%), and fine-grained silty sand (20%). At 235 ft light brown (5YR4/4), poorly graded, fine-grained gravel (90%) with coarse-grained sand (20%).

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-318	73.15	85.34	sand, clay and trace gravel	Foam Off. At 245 ft moderate brown (5YR3/4), well graded, silty fine to coarse-grained sand (70%), fine silty sand (30%), well graded with fine-grained subangular gravel. Wet drilling fluids from moisture from above. At 250 ft same as above. At 255 ft same as above. 260 ft moderate brown (5YR3/4), silty fine to coarse-grained sand (80%) with fine-grained, fine subangular gravel damp/moist. Sample taken MW-318 (260–262 ft). At 265 ft moderate brown (5YR4/4), hard, poorly graded, fine- (85%) to medium- (15%) grained silty sand with few fine-grained gravel fragments, very damp. At 275 ft medium-grained sand increase to 30% still mostly fines, very similar lithology to where water was found in MW-319.
Aquaeter MW-318	85.34	91.44	sand and clay	Foam off. Having trouble establishing circulation. Hole bridge at ≈250 ft. At 285 ft. Bit is free circulation restored. Harder drilling 285–287 ft. At 287 ft moderate brown (5YR4/4), hard, very fine-grained silty sand (80%) with medium to coarse-grained sand (20%) hard drilling. At 290 ft moderate brown (5YR4/4), fine-grained silty sand (70%) with coarse-grained sand (20%) and medium-grained sand (10%) very moist. At 295 ft moderate brown (5YR4/4), very fine-gained silty sand (80%), medium and coarse sand (20%) moist. At 300 ft very compact layer hard drilling.
Aquaeter MW-319	0.00	4.57	sand, clay and gravel	At 5 ft brown, fine sand with silt, and fine to large gravel, dry. At 10 ft same as above fine gravel (5–10%) and coarse gravel (increased to 25%) gravel is subrounded to subangular.
Aquaeter MW-319	4.57	6.10	sand, clay and gravel	Brown, well graded, coarse subangular gravel (≤3 in size) with subrounded fine gravel, sand and silt, dry.
Aquaeter MW-319	6.10	9.14	sand, clay and gravel	Brown, fine to coarse subangular gravel (40%) with fine to coarse-grained sand (30%) and silt, dry. Rig chatter. At 25 ft increase fine sand and silt to 40%.
Aquaeter MW-319	9.14	12.19	sand, clay and gravel	Brown, fine-grained sand and silt (60%) with fine subangular gravel, dry. At 40 ft heavy rig chatter, lost air circulation on rig with fine sand cave in.
Aquaeter MW-319	12.19	19.81	sand and gravel	Foam Drilling. Brown, well graded, subangular fine gravel (60%) with sand, dry. At 45 ft brown, fine to coarse gravel (50%) (≤1 in) with coarse sand (30%), dry. At 50 ft minor rig chatter. Driller indicates formation is tightly packed but not cemented. At 55 ft less borehole cave-in easier drilling. At 60 ft dark brown, fine gravel, subrounded with coarse sand, dry.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-319	19.81	24.38	sand, clay and gravel	Dark brown, fine-grained silty sand (60%) with gray to brown subangular fine gravel (20%), dry.
Aquaeter MW-319	24.38	25.91	sand, clay and gravel	Same as above.
Aquaeter MW-319	25.91	36.58	sand and gravel	Brown, well graded, fine gravel (60%) subangular to angular with very coarse sand, dry. At 90 ft brown, coarse angular to subangular (to 2 in) gravel with coarse angular sand, dry. At 95 ft moderate brown (5YR4/4), fine gravel (60%), subangular with very coarse sand (30%) and minor gravel (≤2 in) and fine-grained sand and silt, dry. At 100% light brown (5YR5/6), well graded, coarse subangular gravel (≤2 in) with fine-grained silty sand (15–20%), dry. At 105 ft rig chatter gravel appears to be broken. At 110 ft harder drilling, well graded material angular and broken. At 115 ft darker brown (5YR3/4), fine and coarse gravel, (70%) (1/2–1 in size) with very coarse sand, dry.
Aquaeter MW-319	36.58	42.67	sand, clay and gravel	Moderate brown (5YR4/4), well graded fine gravel (60–70% with coarse sand and some silt, subangular, dry. At 125 ft larger gravel, same coarse gravel. At 130 ft increased fine-grained sand and silt to 10%, gravel is rounded. At 135 ft color is impacted by wetness (foam). Rig chatter and hard drilling 136–138 ft.
Aquaeter MW-319	42.67	45.72	sand, clay and gravel	Light brown (5YR5/6), coarse-grained sand with silt (70%) with fine gravel (20%), dry. At 145 ft color change to moderate brown (5YR4/4).
Aquaeter MW-319	45.72	48.77	sand, clay and gravel	Moderate brown (5YR4/4), well graded, coarse to medium-grained sand with fine gravel subangular and broken and silt, dry. At 155 ft moderate brown (5YR4/4), medium to coarse-grained sand with silt, and fine subrounded gravel, dry.
Aquaeter MW-319	48.77	59.44	sand, clay and gravel	Light brown (5YR5/6), medium to coarse-grained sand and silt (60%) with fine gravel, dry. At 170 ft rig chatter at 170 ft, increase fine gravel to 30%. At 175 ft heavy rig chatter at 175 ft. At 180 ft lighter brown (5YR5/6), poorly graded, coarse sand and silt (80%), fine angular gravel, dry. At 185 ft moderate brown (5YR4/4), coarse-grained sand with silt (60%) and increased fine gravel (30%), dry.
Aquaeter MW-319	59.44	60.96	sand and gravel	At 195 ft moderate brown (5YR4/4), well graded, coarse-grained sand with fine subangular gravel. Hard drilling 195–215 ft.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-319	60.96	64.01	sand, clay and gravel	Pale brown (5YR5/2), and gray coarse-grained sand and silt (70%) with subangular broken fine gravel. Hard drilling-heavy chatter 200–205 ft. At 205 ft moderate brown (5YR4/4), coarse sand and silt, increase fine broken and subangular gravel (25–30%).
Aquaeter MW-319	64.01	65.53	sand, clay and gravel	Moderate brown (5YR4/4), well graded, coarse sand (50%) with fine subangular to subrounded gravel (40%), dry.
Aquaeter MW-319	65.53	67.06	sand, clay and gravel	Moderate brown (5YR4/4), fine gravel (60%), angular and broken with coarse-grained sand and minor silt and clay, dry.
Aquaeter MW-319	67.06	70.10	sand, clay and gravel	Moderate brown (5YR4/4), coarse subrounded to subangular sand (60%) with fine to coarse subangular gravel (30%), rig chatter and hard drilling, dry. At 225 ft same as above-increase fine-grained sand and silt to 20%, dry.
Aquaeter MW-319	70.10	73.15	sand, clay and gravel	Moderate brown (5YR4/4), fine to coarse (1 in) subangular gravel (60%) with coarse-grained sand (30%) and minor silt and clay, dry. At 235 ft dark brown (5YR3/4), well graded, fine to coarse gravel (60%) with coarse-grained sand (20%) and fine-grained sand and silt (20%), angular to subangular. Drilling paused to install 8 in casing down to 240 ft.
Aquaeter MW-319	73.15	85.34	sand, clay and trace gravel	Foam off. Moderate brown (5YR3/4), poorly graded, fine-grained sand and silt, (70%) with coarse-grained sand and minor fine gravel (5%). At 245 ft wet possibly from foam use above. At 250 ft wet, possibly from foam use above. At 255 ft wet, possibly from foam use above. At 260 ft silty sand with scarce gravel believed to be in the water table no odor is present that would indicate foam or drilling fluids. Water not present to 260 ft, very moist cuttings. At 265 ft dark brown (5Y3/4), silty sand with minor fine gravel, very moist. At 270 ft same as above, coarse to very coarse-grained sand, minor gravel is believed to be cave-in, very moist. At 275 ft moderate brown (5YR3/4), coarse to medium-grained sand with silt (35–40%) minor (5%) fine gravel, very moist. At 280 ft same as above, water level checked but 1/41/41/4
Aquaeter MW-319	85.34	92.96	sand, clay and gravel	Color change to pale brown (5YR/2), water level checked but not detected. At 285 ft increase silt to 40–50%, losing circulation in formation, no cuttings return. At 290 ft circulation reestablished, formation had caved on top of drill bit, drilling slowly to maintain circulation. At 300 ft pale brown (5YR5/2), well graded, coarse to medium-grained silty sand with fine gravel (5–10%). Gravel above may have been caved material.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-319	92.66	96.93	sand and clay	Gray-brown, medium to coarse-grained sand (60%) with silt and fine sand (40%), dry. At 310 ft harder layer encountered, no cuttings returned, drilling is advancing but not returning cuttings due to cave in above bit. Based on slow advance of borehole this layer appears to be relatively hard. At 315 ft no return. Bottom at 318 ft.
Aquaeter MW-325	0.00	6.10	sand, clay and gravel	Brown, well graded, coarse to medium subrounded to subangular sand (50–60%) with large gravel ≤2 in, minor silt, dry. At 5 ft same as above. At 10 ft same as above. At 15 ft same as above, gravel is smaller and subangular.
Aquaeter MW-325	6.10	9.14	sand, clay and gravel	Brown, poorly graded, fine to medium-grained sand and silt (70%) with fine subangular gravel, dry. At 25 ft same as above.
Aquaeter MW-325	9.14	12.19	sand, clay and gravel	Brown, well graded, coarse and fine subangular gravel with medium-grained sand and silt, dry sample collected at 30 ft from cuttings for chemical analysis. At 35 ft brown, well graded, fine subrounded to subangular gravel with fine to medium-grained sand and silt, dry.
Aquaeter MW-325	12.19	18.29	sand, clay and gravel	Brown, well graded, fine subangular gravel with coarse-grained sand, less fine to medium-grained sand and silt than above, dry. At 45 ft same as above, switch to drill drive. At 50 ft same as above gravel is slightly larger than above. Sand is of all sizes. At 55 ft same, fine-grained subangular gravel.
Aquaeter MW-325	18.29	24.38	sand, clay and gravel	Brown, well graded, fine to coarse-grained sand with fine subangular gravel and silt, dry. At 65 ft same as above, slow drilling. At 70 ft same as above, minor fine gravel. At 75 ft same as above, sand and silt (70–80%), fine subangular gravel.
Aquaeter MW-325	24.38	36.58	sand and clay	Same as above as above. At 85 ft gray, well graded, fine broken gravel with coarse-grained sand and silt, dry. At 90 ft same as above, sand fine to medium-grained, dry, increase in speed of drilling, casing parted at 96 ft, open hole drilling. At 95 ft same as above, gravel is slightly larger, rig chatter at 98.0 ft. At 100 ft brown, well graded, fine subangular, broken gravel (≤1/2 in) with coarse-grained sand, minor silt, dry. At 105 ft same as above. At 110 ft same as above. At 115 ft same as above, rig chatter. At 120 ft same as above.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-325	36.58	48.77	sand and clay	Same as above as above. At 125 ft same as above as above, rig chatter. At 130 ft brown, well graded, fine gravel with fine-grained sand and silt (40–50%) and minor coarse gravel fragments, dry. Easier drilling. At 135 ft same as above. At 140 ft same as above. At 145 ft same as above, east drilling. At 150 ft same as above. At 155 ft same as above. At 160 ft physical analyses sample.
Aquaeter MW-325	48.77	50.29	sand, clay and gravel	Brown (5YR6), well graded, fine-grained subangular gravel (50%), fragments with fine to coarse-grained sand (40%), and silt (10%), dry.
Aquaeter MW-325	50.29	53.34	sand, clay and gravel	Brown (5YR6), well graded, fine to medium-grained sand (60%) with fine subangular gravel (20%) and silt (20%), dry, easy drilling. At 170 ft same as above, sand (50%), gravel (30%), silt (20%), dry, easy drilling.
Aquaeter MW-325	53.34	56.39	sand, clay and gravel	Brown (5YR6), well graded, subangular fine gravel (70%) with fine-grained sand (20%) and silt (10%), dry. At 180 ft same, gravel (50%), sand (40%), silt (10%).
Aquaeter MW-325	56.39	60.96	sand and gravel	Brown (5YR5), well graded, fine to coarse-grained sand (70%) with subangular gravel (30%), dry. At 190 ft same as above, sand (60%), gravel (40%). At 195 ft same as above.
Aquaeter MW-325	60.96	62.48	clay, sand and gravel	Brown (5YR5), well graded, fine to coarse-grained gravel (70%) with fine-grained sand (20%) and clay (10%), slight moisture.
Aquaeter MW-325	62.48	67.06	clay, sand and gravel	Brown (5YR5), well graded, fine to coarse-grained sand (50%) with fine-grained subangular gravel (40%) and silt (10%, dry. At 210 ft same as above. At 215 ft same as above, sand (50%, gravel (30%), silt (23%), dry more dust, dry.
Aquaeter MW-325	67.06	70.10	sand, clay and gravel	Brown, well graded, fine subangular gravel (50%) with fine to coarse-grained sand (30%) and silt (20%), dry. At 225 ft same as above, slight moisture.
Aquaeter MW-325	70.10	73.15	sand, clay and gravel	Brown (5YR6), well graded, fine to coarse-grained sand (60%) with fine subangular gravel (40%), slight moisture. At 235 ft same as above, sand (60%), gravel (30%), silt (10%).

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-325	73.15	80.77	sand, clay and gravel	Brown (5YR6), well graded, fine to coarse-grained sand (60%) with gravel (30%), and silt (10%), slight moisture in sample bag. At 245 ft brown (5YR5), well graded, fine to medium-grained sand (60%) with fine-grained subangular gravel (20%), and silt (20%), dry. At 250 ft same as above. At 255 ft same as above. At 260 ft same as above, discharge hose plugged, logged from cuttings at well head.
Aquaeter MW-325	80.77	83.82	sand, clay and gravel	Brown (5YR6), well graded, fine subangular gravel (50%) with fine to medium-grained sand (40%) and silt (10%), dry. Rig chatter. At 270 ft same as above.
Aquaeter MW-325	83.82	85.34	sand, clay and gravel	Gray-brown (5YR8), hard, fine to coarse-grained sand (60%) with fine subangular gravel (20%) and silt (20%), dry, cemented. At 280 ft drill is slower, finer cuttings more dust.
Aquaeter MW-325	85.34	88.39	sand, clay and gravel	Gray-brown (5YR8), hard, fine to coarse-grained sand (70%) with fine subangular gravel (10%) and silt (20%), dry, rig chatter. At 285 ft same as above, dusty with heavy chatter.
Aquaeter MW-325	88.39	89.92	sand, clay and trace gravel	Brown (10YR7), fine to coarse-grained silty sand (50%) with gravel (10%), dry, easier drilling.
Aquaeter MW-325	89.92	94.49	sand, clay and trace gravel	Brown (10YR7), well graded, fine to coarse-grained sand silt (60%) with fine subangular gravel (5%), dry. At 300 ft same as above, silt (60%), sand (40%), no gravel, dry. At 305 ft same as above.
Aquaeter MW-325	94.49	96.01	clay, sand and gravel	Brown (5YR6), hard, fine to coarse-grained sand (50%) with silt (40%), and fine gravel (10%), dry heavy rig chatter.
Aquaeter MW-325	96.01	97.54	clay, sand and gravel	Brown (5YR6), fine to coarse-grained sandy silt (50%) with fine subangular gravel (10%), dry.
Aquaeter MW-325	97.54	99.06	sand, clay and gravel	Brown (5YR6), well graded, fine to coarse-grained sandy (30%) gravel, subangular with silt (20%), dry, rig chatter.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-325	99.06	109.73	sand, clay and trace gravel	Brown (5YR6), well graded, fine to coarse-grained sand (50% with silt (45%) and minor gravel (5%), dry, rig chatter. Same as above, rig chattering but cuttings are ground fine. At 330 ft same as above. At 335 ft same as above. Silt (50%), sand (45%), gravel (5%). At 340 ft same as above, silt (60%), sand (35%), gravel (5%). Heavy chatter-large gravel being returned in cuttings hard drilling. At 345 ft same as above, silt (70%), sand (25%), slight moisture in silt. Lots of gravel being returned from borehole. At 350 ft same as above, very hard drilling at 349 ft. Rig chattering, slight moisture in silt hard drilling, gravel in cuttings is fine grain to medium. At 355 ft broke through hard layer at 355 ft silt (60%), sand (40%), slight moisture.
Aquaeter MW-325	109.73	118.57	sand, clay and trace gravel	Brown, well graded, fine to medium-grained sandy (40%) silt with clay (60% silt and clay), damp, no water. At 365 ft same as above, damp. Hard layer at 368 ft. At 370 ft same as above, rig chattering, damp in fine portion. 1/4–3/4 in gravel was returned in drill cuttings due to use of foam in 10 in borehole gravel portion of lithology was not fully returned during 8– boring. At 375 ft easier drilling. Same as above, increased clay more fines (80%) fine to medium-grained sand (20%), increased moisture in fines but no water observed. At 380 ft same as above, damp. At 385 ft same as above, damp, hard drilling. Same as above, bottom at 388.5 ft.
Aquaeter MW-325	118.57	118.87	sand, clay and trace gravel	Split spoon sample 389–391 ft. At 390 brown, fine to medium-grained clayey sand with 10% fine gravel, wet.
Aquaeter MW-325	118.87	121.92	sand and gravel	From 335–389 ft, gravel portion of lithology not represented during pilot hole (drilled day). Use of foam for 10 in borehole recovered fine to coarse gravel during reaming operation.
Aquaeter MW-326	0.00	12.19	sand and gravel	Tan, well graded, subangular to subrounded fine gravel with fine to coarse-grained sand, dry. At 10 ft same as above. At 15 ft same as above, increase gravel size to 1 in gravel. At 20 ft tan, well graded, subangular to subrounded fine gravel with fine to mostly coarse-grained sand, dry. At 25 ft tan, well graded, fine-grained gravel with very coarse sand with some medium sand, dry. At 30 ft Tan, well graded, subangular fine to coarse gravel with coarse sand, dry. At 35 ft same as above.
Aquaeter MW-326	12.19	13.72	sand and gravel	Tan, well graded, fine gravel with coarse to medium-grained sand, dry.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-326	13.72	19.81	sand and clay	Tan, well grade, fine to coarse-grained sand, with 30–40% silt, dry. At 50 ft same as above with fine gravel. At 55 ft same as above, larger gravel not present in cuttings. Suspected cave-in and rig inability to return larger fragments to surface. Foam drilling began at ≈58 ft. At 60 ft same as above, increase gravel size to 1 in.
Aquaeter MW-326	19.81	24.38	sand and gravel	Brown, subangular to subrounded fine gravel, some pieces ≤1 in with sand, dry. At 70 ft same as above, foam off, no lift of gravel. At 75 ft brown, well graded, subangular fine gravel with coarse-grained sand.
Aquaeter MW-326	24.38	27.43	sand	Brown, well graded, subrounded to subangular, coarse-grained sand, dry. At 85 ft same as above.
Aquaeter MW-326	27.43	36.58	sand and gravel	Brown, well graded, subangular to subrounded fine to coarse gravel with very coarse-grained sand, dry. At 95 ft same as above. At 100 ft brown, subangular fine gravel, some pieces ≤1 in with coarse-grained sand, dry. At 110 ft same as above. At 115 ft same as above.
Aquaeter MW-326	36.58	38.10	sand and gravel	Brown, coarse-grained sand with subangular gravel, dry. At 125 ft brown, well graded, subangular fine gravel 1/4–1/2 in with sand, dry.
Aquaeter MW-326	38.10	44.20	sand and gravel	Brown, well graded, subangular fine gravel 1/4–1/2 in with sand, dry. At 130 ft well graded, subangular fine gravel with coarse-grained sand, dry. At 135 ft same as above. At 140 ft same as above.
Aquaeter MW-326	44.20	48.77	sand, clay and gravel	Brown, coarse-grained sand with subangular fine gravel, dry. At 150 ft same as above. At 155 ft same as above. Soils show high cohesion with possible presence of silt/fine sand. Drilling foam makes it hard to differentiate grain-sizes.
Aquaeter MW-326	48.77	51.82	sand and gravel	Brown, fine to coarse subangular gravel with coarse-grained sand, dry. At 165 ft same as above.
Aquaeter MW-326	51.82	54.86	sand and gravel	Brown, well graded, coarse-grained sand with fine subangular gravel. At 175 ft same as above, slightly larger gravel.
Aquaeter MW-326	54.86	57.91	sand and gravel	Brown, poorly graded, coarse-grained sand with 5–10% gravel, dry. At 185 ft same as above.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-326	57.91	60.96	sand and gravel	Brown, well graded, fine to coarse gravel with subangular, coarse-grained sand, dry. At 195 ft brown, fine subangular gravel with coarse-grained sand, dry.
Aquaeter MW-326	60.96	73.15	sand and gravel	Same as above. At 205 ft same as above, gravel increased size slightly. At 210 ft same as above. At 215 ft same as above. At 220 ft same as above, rig chatter at 220 ft. At 225 ft same as above, rig chatter. At 230 ft same as above, rig chatter. At 235 ft same as above.
Aquaeter MW-326	73.15	85.34	sand and gravel	Same as above, rig chatter, gravel is broken and angular. At 245 ft same as above. At 250 ft same as above, rig chatter. At 255 ft same as above, rig chatter. At 260 ft same as above. At 265 ft same as above. At 270 ft same as above. At 275 ft same as above water added ≈160 gallons.
Aquaeter MW-326	85.34	91.44	sand and gravel	Same as above. At 285 ft same as above, harder drilling 275–285 ft driller suspects cemented formation. At 290 ft same as above. At 295 ft same as above.
Aquaeter MW-326	91.44	97.54	sand, clay and gravel	Brown, fine to medium-grained clayey sand with minor fine subangular gravel, cemented, dry. At 305 ft same as above, rig chatter. At 310 ft same as above, rig chatter. At 315 ft same as above, rig chatter and hard-drilling.
Aquaeter MW-326	97.54	109.73	sand, clay and gravel	Same as above. At 325 ft same as above. At 330 ft same as above. At 335 ft same as above. At 340 ft same as above. At 345 ft same as above. At 350 ft same as above. At 355 ft same as above. Static water level at 356 ft, water added ≈50 gallons.
Aquaeter MW-326	109.73	112.78	sand, clay and gravel	Same as above, cemented layer. At 365 ft brown, fine to coarse-grained silty sand with minor clay, wet, 366–370 ft rig chatter stopped, easier drilling.
Aquaeter MW-326	112.78	113.39	sand, clay and gravel	Bottom At 372 ft.
Aquaeter MW-327	0.00	6.10	sand and gravel	Brown, well graded, subangular to subrounded gravel with medium to coarse-grained sand, dry. At 10 ft same as above, increase in medium to coarse-grained sand, dry. At 15 ft same as above.
Aquaeter MW-327	6.10	7.62	sand and gravel	Brown, poorly graded, medium to coarse-grained sand (90%) with some fine gravel, dry.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-327	7.62	12.19	sand and gravel	Brown, well graded, fine to coarse gravel with coarse to medium-grained sand subangular, dry. At 30 ft increase gravel size to 2 in, subangular size with sand, dry. At 35 ft same as above.
Aquaeter MW-327	12.19	24.38	sand and gravel	Same as above with gravel ≤1 1/4 in size. At 45 ft no return of larger gravel to surface. Rig does not have enough lift because air flow restriction by filter on compressor, dry. At 50 ft no return, change to drill and drive. At 55 ft brown, well graded, coarse gravel with coarse to medium-grained sand, subangular to subrounded, dry. At 60 ft, increased silt and sand, dry. At 65 ft same as above, open hole drilling. At 70 ft same as above, open hole drilling. At 75 ft brown, well graded, subangular to subrounded fine to coarse gravel ≤1 in with fine to coarse-grained silty sand, dry.
Aquaeter MW-327	24.38	36.58	sand and gravel	Same as above with increased gravel size, ≤1 1/2 in. At 85 ft brown, well graded, fine subrounded gravel with coarse-grained, silty sand, subrounded. Add in external air compressor for supplemental air. At 90 ft same as above with rig chatter at ≈90 ft, hard layering. At 95 ft same as above. At 100 ft same as above. At 105 ft same as above with rig chatter, hard layering. At 110 ft same as above with rig chatter, hard layering. At 115 ft same as above.
Aquaeter MW-327	36.58	48.77	sand and gravel	Same as above. 125 ft brown, fine to medium-grained silty sand with 10–20% fine gravel, dry. At 130 ft same as above, easy drilling. At 135 ft same as above with rig chatter at 1 35 ft with and minor fine to coarse gravel return. At 140 ft same as above. At 145 ft same as above, easy drilling. At 150 ft same as above. At 155 ft same as above.
Aquaeter MW-327	48.77	49.07	sand and gravel	Same as above.
Aquaeter MW-327	49.07	53.34	sand, clay and gravel	Brown, well graded, medium to fine-grained silty sand with 25% fine-gained gravel, subrounded, dry. At 165 ft same as above. At 170 ft same as above.
Aquaeter MW-327	53.34	56.39	sand, clay and gravel	Brown, fine subangular to subrounded gravel with slightly silty coarse sand. At 180 ft same as above, rig chatter.
Aquaeter MW-327	56.39	60.96	sand, clay and gravel	Brown, well graded, medium to coarse-grained silty sand with fine subrounded gravel, rig chatter, dry. At 190 ft brown, well graded, fine to medium-grained silty sand (50–60%) with subrounded fine gravel, dry. At 195 ft same as above.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Aquaeter MW-327	60.96	62.48	sand, clay and gravel	Brown, well graded, fine subrounded gravel with medium to coarse-grained silty sand.
Aquaeter MW-327	62.48	73.15	sand, clay and gravel	Brown, well graded, medium-grained silty sand with fine subrounded gravel dry. At 210 ft same as above. At 215 ft same as above. At 220 ft same as above. At 225 ft brown, fine to coarse-grained silty sand with fine gravel, dry. At 230 ft same as above. At 235 ft medium to coarse-grained silty sand (80%) with fine, subrounded gravel, dry.
Aquaeter MW-327	73.15	79.25	sand, clay and gravel	Same as above. At 245 ft same as above, easy drilling. At 250 ft same as above, easy drilling. At 255 ft same as above, easy drilling, lost circulation at 250 ft, 255 ft no return from borehole, 40–50 ft interval open.
Aquaeter MW-327	79.25	85.34	sand, clay and gravel	Brown, well graded, fine subangular gravel with medium to fine-grained sand, dry. At 265 ft same as above, easy drilling, rig air in being lost to the formation. At 270 ft well graded, fine to coarse gravel with silty sand, subangular to subrounded, dry. At 275 ft same as above.
Aquaeter MW-327	85.34	86.87	sand, clay and gravel	Same as above.
Aquaeter MW-327	86.87	91.44	sand, clay and gravel	Brown, fine to medium-grained silty sand (50%) with fine subangular gravel, dry. At 290 ft brown-gray, poorly graded, medium to coarse-grained sand with 10–15% fine subangular to subrounded gravel, dry. At 295 ft same as above with thin layer of fine silty sand with minor fine gravel driller reports cemented layer.
Aquaeter MW-327	91.44	97.54	sand, clay and gravel	Brown, well graded, coarse-grained silty sand with fine subangular gravel, rig chatter and harder drilling cemented layer, dry. At 305 ft same as above. At 310 ft brown, fine-grained silty sand (75%) with fine gravel, rig chatter, dry. At 315 ft same as above, cemented.
Aquaeter MW-327	97.54	100.58	sand, clay and gravel	Same as above, hard drilling. At 325 ft same as above.
Aquaeter MW-327	100.58	109.73	sand, clay and gravel	Brown, well graded, fine to coarse subrounded gravel with silty sand, dry. At 335 ft same as above. Static groundwater 335 ft. At 340 same as above, rig chatter. At 345 ft same as above, rig chatter. At 350 ft same as above. At 355 ft same as above. Groundwater detected in bore hole at ≥356 ft and rising, slight increase in sand and silt moist sample at 360 ft.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 001	0.00	12.19	sand, clay and gravel	Silty gravel, silty gravel, brown (7.5YR5/2), 20% low plasticity fines, 20% fine to coarse sand, 60% fine to coarse gravel, trace cobbles Iron oxide staining on grains. At 5 ft, increase in moisture.
G&M Inc 001	12.19	15.54	sand, clay and trace gravel	Silty sand, silty sands, brown (7.5YR5/4), 30% low plasticity fines, 60% very fine to medium sand, round to subrounded, 10% fine gravel, iron oxide staining on grains, very dense.
G&M Inc 001	15.54	18.29	sand, clay and gravel	Silty gravel, silty gravel, brown (7.5YR5/4), 25% low plasticity fines, 20% fine to coarse sand, 55% fine to coarse gravel, iron oxide staining on grains.
G&M Inc 001	18.29	19.81	sand and trace gravel	Gravelly sand, gravelly sand, brown (7.5YR5/4), 5–10% low plasticity dry fines, 80–85% fine to medium sand, 5–10% fine to coarse gravel, very dense,.
G&M Inc 001	19.81	21.34	sand and gravel	Sandy gravel, sandy gravel, brown (7.YR5/4), 10% low plasticity fines, 30% fine to coarse sand, 60% fine to coarse gravel, round to subrounded, moderate iron oxide staining on grains.
G&M Inc 001	21.34	24.38	sand, clay and gravel	Silty sand, silty sands, brown (7.5YR5/4), 25% low plasticity fines, 20% fines to coarse sand, 55% fine to coarse gravel, iron oxide staining on grains. At 75 ft 1–foot interbeds of gravel.
G&M Inc 001	24.38	27.43	sand, clay and trace gravel	Silty sand, silty sands, brown (10YR5/3), 20% low plasticity fines, 70% very fine to medium sand, subrounded, 10% fine gravel, trace iron oxide staining on grains.
G&M Inc 001	27.43	28.96	sand and trace gravel	Gravelly sand, gravelly sand, brown (10YR5/3), 5–10% low plasticity fines, 50% fine to coarse sand, 40–45% fine to coarse gravel, moderate iron oxide staining on grains.
G&M Inc 001	28.96	32.92	sand, clay and trace gravel	Silty, sand, silty sands, brown (7.5YR5/4), 20% low plasticity fines, 75% very fine to medium sand, 5% fine gravel, abundantly iron oxide staining on grains. At 100 ft, increase in fine gravel to 10%.
G&M Inc 001	32.92	39.62	sand, clay and gravel	Silty gravel, silty gravel, brown (7.5YR5/4), 20% low plasticity fines, 10% sand, 70% fine to coarse gravel, abundant iron oxide staining on grains.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 001	39.62	42.98	clay, sand and gravel	Clayey gravel, sandy clay gravel, brown (7.5YR5/4), 20–30% moderate plasticity fines, 70% fine to coarse gravel.
G&M Inc 001	42.98	45.72	sand, clay and trace gravel	Silty sand, silty sands, brown (7.5YR5/4), 20% low plasticity fines, 75% fine to medium sand, 5% fine gravel, dense, abundant iron oxide staining on grains.
G&M Inc 001	45.72	48.77	sand and clay	Clayey sand, sandy clay, light brown (7.5YR6/4), 20–25% moderate plasticity fines, 65–70% very fine to medium sand, 5–10% fine to coarse gravel, abundant iron oxide staining on grains.
G&M Inc 001	48.77	54.86	sand, clay and trace gravel	Silty sand, clayey sand, silty sands-sandy clay, brown (7.5YR5/4), 10–15% low to moderate plasticity fines, 85% fine to coarse sand, 5% fine to coarse gravel, dense, abundant iron oxide staining on grains. At 175 ft increase in gravel to 20%.
G&M Inc 001	54.86	60.96	clay, sand and gravel	Clayey gravel, sandy clay gravel, sandy gravel, reddish brown (5YR5/4), 15% moderate plasticity fines, 15–20% fine to coarse sand, 60–70% fine to coarse gravel, at 181 ft sandy gravel, dense, abundant iron oxide staining, including limonitic staining.
G&M Inc 001	60.96	64.01	clay, sand and gravel	Clayey gravel, sandy clay gravel, reddish brown (5YR5.4), 15% moderate plasticity fines, 10–15% fine to coarse sand, 75–80% gravel, weathering of minerals to clay. Iron oxide staining on grains, dense.
G&M Inc 001	64.01	65.53	sand, clay and trace gravel	Silty sand, silty sands, brown (7.5YR5/4) 25% low plasticity fines, 65% fine to coarse sand, 10% fine gravel, moderate iron oxide staining on grains.
G&M Inc 001	65.53	68.58	Gravel	Gravel, sandy gravel, at 216 ft very hard drilling. Brown (7.5YR5/4), fine to coarse. At 220 ft, too dense to recover sample.
G&M Inc 001	68.58	71.93	sand, clay and trace gravel	Silty sand, silty sands, light brown (7.5YR6/4), 20% low plasticity fines, 75% very fine to medium sand, 5% fine gravel,.
G&M Inc 001	71.93	73.15	Gravel	Gravel, sandy gravel, brown (7.5YR5/4), fine to coarse gravel, very dense.
G&M Inc 001	73.15	74.68	Gravel	Gravel, sandy gravel, light brown (7.5YR6/4), fine to coarse gravel, cobbles, very dense.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 001	74.68	76.20	sand, clay and gravel	Silty gravel, silty gravel, light brown (7.5YR6/4), 20% low plasticity fines, 10%, sand, 70% fine to coarse gravel, occasional cobbles.
G&M Inc 001	76.20	76.81	Gravel	Gravel, sandy gravel, light brown (7.5YR6/4), fine to coarse gravel and cobbles, very dense.
G&M Inc 001	76.81	79.25	clay, sand and gravel	Clayey gravel, sandy clay gravel, brown (7.5YR5/4), 20% moderate plasticity fines, 10% fine to coarse sand, 70% fine to coarse gravel, dense.
G&M Inc 001	79.25	83.82	sand, clay and gravel	Silty gravel, silty gravel, brown (7.5YR5/4), 20% low to moderate plasticity fines, 15–20% fine to medium sand, 60–65% fine to coarse gravel, subangular, dense, trace iron oxide staining on grains. At 263–263.5 ft moisture increases. At 266–267 ft moisture increases.
G&M Inc 001	83.82	85.34	sand, clay and trace gravel	Gravelly silt, silt and very fine sand, brown (7.5YR5/4), 60% low plasticity fines, 15% fine to medium sand, 25% fine to coarse gravel, very dense.
G&M Inc 001	85.34	88.39	sand and clay	Clayey sand, sandy clay, brown (7.5YR5/4), 20% moderate plasticity fines, 60% very fine to medium sand, 10% fine to coarse gravel and cobbles, very dense.
G&M Inc 001	88.39	96.32	sand, clay and gravel	Sandy gravel, sandy gravel, brown (7.5YR5/4), 5–10% low plasticity fines, 25% fine to coarse sand, 65–70% gravel and cobbles, metaquartzite and other metamorphics, very dense. At 295 ft 6 in interbeds of silty to clayey gravel, increase of moisture through interbeds.
G&M Inc 001	96.32	97.54	sand and trace gravel	Gravelly sand, gravelly sand, light brown (7.5YR6/4), 15% low plasticity fines, 70% fine to coarse sand, 15% fine to coarse gravel, very dense.
G&M Inc 001	97.54	99.36	Gravel	Gravel, sandy gravel, light brown (7.5YR6/4), gravel and cobbles, very dense, quartz, quartzite, other metamorphics. At 325 ft fragments of cobbles or boulders.
G&M Inc 001	99.36	100.58	sand, clay and gravel	Silty gravel and sand, silty gravel-silty sands, light brown (7.5YR6/4).
G&M Inc 001	100.58	103.63	Gravel	Gravel, sandy gravel light brown (7.5YR6/4), very dense.
G&M Inc 001	103.63	106.07	sand and clay	Clayey sand, sandy clay, light brown (7.5YR6/4), 20% moderate plasticity fines, 65% to medium sand, 15% to coarse gravel, subrounded to round, moderate iron oxide staining on grains, very dense.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 001	106.07	110.03	sand and clay	Clayey sand, sandy clay. Brown (7.5YR5/4), 20% moderate plasticity fines, 50% fine to coarse sand 30% fine to coarse gravel, iron oxide staining on grains, dense. At 358 ft push cobble.
G&M Inc 001	110.03	111.71	sand and trace gravel	Gravelly sand, gravelly sand, brown (7.5YR5/4). Total depth 366.5 ft. Boring terminated in gravelly sand at 366.25 ft and converted to a monitoring well.
G&M Inc 002	0.00	2.44	sand and clay	Silt and very fine sand, silt to very fine sand, pinkish gray (7.5YR6/2), well sorted.
G&M Inc 002	2.44	6.10	sand, clay and gravel	Silty gravel, silty sandy gravel, light brown (7.5YR6/4), poorly-sorted, 50% angular 1/4 in gravel. At 14 ft, gravel increases to 1 in size but decreases to 30%.
G&M Inc 002	6.10	7.62	sand, clay and gravel	Gravelly sand, silty sands silty gravel, silty very fine to medium sand (60%) and 1/4–1/2 in gravel (40%) light brown (7.5YR6/4), poorly-sorted, angular stringers of very fine sand interbedded.
G&M Inc 002	7.62	9.14	sand, clay and gravel	Silty sand, silty sands, light brown (7.5YR6/4), 20% fines, 70% sand, 10% gravel, (low plasticity fines in gravel at 27 ft coarsening downward sequences).
G&M Inc 002	9.14	12.19	sand, clay and gravel	Silty gravel, silty gravel, brown, (7.5YR4/2), 20% fines, low plasticity, 30% sand, 50% gravel, subrounded, gravel to 1 in probably greater fragments, chert (quartzite, metamorphic, sandstone).
G&M Inc 002	12.19	13.72	sand and trace gravel	Gravelly sand, gravelly sand, brown (7.5YR5/4) 10–15% low plasticity fines, 60% sand, 25–30% coarse gravel, subangular to subrounded, some angular, fine to coarse sand, fine gravel. Gravel consists of SS, sHS, lS, mafics.
G&M Inc 002	13.72	16.76	sand, clay and gravel	Silty sand, silty sands, brown (7.5YR5/4), 20% low plasticity fines, 75% fine to coarse sand, 5% fine gravel, grains subrounded to angular.
G&M Inc 002	16.76	21.34	sand and trace gravel	Gravelly sand, gravelly sand, brown (7.5YR5/4), 5–10% low plasticity fines, fine to coarse sand 75%, 15% fine to coarse gravel (≤2 in), subrounded. Dense to very dense.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 002	21.34	24.38	sand and gravel	Sand gravel, sandy gravel, brown (7.5YR5/4), 5–10% low plasticity fines, 25–30% sand, 65%fine to coarse subrounded to subangular gravel, some iron oxide staining on grains (2.4YR3/4). At 75 ft, color dark reddish brown to dark brown (7.5YR4/4) with combined grains.
G&M Inc 002	24.38	25.91	sand, clay and gravel	Silty sand, silty sands, brown (10YR5/3), 15–20% low to moderate plasticity fines, 60–70% fine to coarse sand, 15–20% fine to coarse gravel, very dense.
G&M Inc 002	25.91	27.43	sand and gravel	Gravel, sandy gravel, brown (10YR5/3), 5% fines, 5% fine to coarse sand, 90% fine to coarse gravel.
G&M Inc 002	27.43	35.05	clay and sand	Clayey, sand, sandy clay, reddish Yellow (5YR6/6), moderate plasticity fines, 55% fine to coarse sand, 20% fine to coarse gravel, Fe oxide staining throughout, partially cemented, very dense, grains round to subangular. At 110 ft sandy clay, decrease in gravel to 10%, fines increase to 35%.
G&M Inc 002	35.05	36.58	clay, sand and gravel	Clayey gravel, sandy clay gravel, reddish brown (5YR5/4), 20% fines, 10% sand, 70% fine to coarse, subrounded to subangular gravel.
G&M Inc 002	36.58	38.10	sand, clay and gravel	Silty sand, silty sands, reddish yellow (7.5YR6/6), 15% low plasticity fines, 70% fine to coarse, round -subangular sand, 15% fine to coarse gravel, very dense, moderate Fe oxide staining on grains, moderately indurated.
G&M Inc 002	38.10	39.62	sand, clay and gravel	Gravelly sand, with increase in gravel to 20%.
G&M Inc 002	39.62	41.15	sand, clay and gravel	Decrease in gravel to 15%, reddish brown (5YR5/4).
G&M Inc 002	41.15	42.67	sand, clay and gravel	Silty gravel, silty gravel, reddish brown (5YR5/4), 20% low plasticity fines, 10–15% fine -coarse sand, 65–70% fine to coarse gravel, Fe oxide staining on grains, round to subangular.
G&M Inc 002	42.67	47.24	sand and trace gravel	Gravelly sand, gravelly sand, light reddish brown (5YR6/4) 5% low plasticity fines, 60% fine to coarse round to subangular sand, 35% fine to coarse gravel, Fe oxide staining on some grains, very dense. At 149 ft sand to 70%.
G&M Inc 002	47.24	48.77	sand and gravel	Sandy gravel, sandy gravel, light reddish brown (5YR6/4), 5–10% low plasticity fines, 40% fine to coarse sand, 50–55% fine to coarse gravel, Fe oxide staining on some grains.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 002	48.77	51.82	sand, clay and trace gravel	Silty sand, silty sands, reddish brown (5YR5/4), 25% low to moderate plasticity fines, 70% fine to medium sand, 5% fine gravel, very dense, at 160.5 gravel to 20%.
G&M Inc 002	51.82	53.34	sand and trace gravel	Gravelly sand, gravelly sand, Gravel to 30%. Fines to 10%.
G&M Inc 002	53.34	54.86	clay, sand and gravel	Clayey gravel, sandy clay gravel, reddish brown (5YR4/4), 10% low plasticity fines, 25% fine to coarse sand, 65% fine to coarse gravel.
G&M Inc 002	54.86	57.61	clay, sand and gravel	Clayey gravel, sandy clay gravel, reddish yellow (5YR6/6), 30% moderate plasticity fines, 15% fine -coarse sand, 50% fine to coarse gravel, round to subrounded, 5% cobbles, Fe oxide staining on grains, dense to very dense.
G&M Inc 002	57.61	60.96	clay, sand and gravel	Silty gravel-sandy gravel, sand to 20%, fines 25%.
G&M Inc 002	60.96	64.01	sand and trace gravel	Gravelly sand, gravelly sand, reddish brown (5YR5/4), 5% low plasticity fines, 70% fine to coarse sand, round to subangular, fine to coarse gravel, very dense, Fe oxide staining on grains. At 208 ft very hard.
G&M Inc 002	64.01	66.60	sand and trace gravel	Gravelly sand, brown (7.5YR4/2), 5–10% fine gravel, 80%, ≤20% coarse gravel to cobbles, very dense, Fe oxide staining on grains.
G&M Inc 002	66.60	69.34	sand and trace gravel	Gravelly sand, gravelly sand, reddish brown (5YR5/4), 10% low plasticity fines, 60% fine to coarse subrounded sand, 30% fine to coarse gravel, Fe oxide staining on grains, very dense.
G&M Inc 002	69.34	71.63	clay, sand and gravel	Clayey gravel, sandy clay gravel, reddish yellow (7.5YR6/6), 25–30% low-moderate plasticity fines, 15% sand, at 231 ft 50–55% fine to coarse gravel, Fe oxide staining on grains.
G&M Inc 002	71.63	74.07	sand and gravel	Sandy gravel, sandy gravel, reddish brown (5YR5/4), 5% low plasticity fines, 15–20% medium coarse sand, 80–75% fine to coarse gravel, Fe oxide staining on grains.
G&M Inc 002	74.07	76.20	sand, clay and trace gravel	Silty sand, silty sands, reddish brown (5YR5/3), 20% low plasticity fines, 70% fine-medium sand, 10% fine gravel, grains subrounded.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 002	76.20	81.38	Gravel	Gravel, sandy gravel-gravel, little or no fines, brown, mixed gravel-quartz, metamorphics, granite, etc. Very hard drilling. Fe oxide staining on some grain. Partially cemented to be so hard.
G&M Inc 002	81.38	84.43	clay and sand	Sandy clay-sandy silt, silt and very fine sand/clay, pinkish gray (5YR7/2), 95% fines, low-moderate plasticity, 5% fine sand, flecks of biotite and other dark minerals, weakly weathered, stiff to hard. Volcanic origin, few gravel, weathered white feldspars.
G&M Inc 002	84.43	88.39	sand, clay and gravel	Sandy gravel, hard to dense, silty gravel, hard very dense. At 283 ft silty gravel, light brown, very dense (7.5YR6/4), 30% low plasticity fines, 20% fine to coarse sand, 50% fine to coarse gravel, very dense, traces of Fe oxide staining on grains.
G&M Inc 002	88.39	91.74	sand and gravel	Gravel, sandy gravel, very dense. At 295 ft silty gravel, silty gravel.
G&M Inc 002	91.74	92.96	sand and clay	Clayey sand, sandy clay, light brown (7.5YR6/4), 25% moderately plasticity fines, stiff, 65% fine coarse sand, 10% fine to coarse gravel, trace Fe oxide staining.
G&M Inc 002	92.96	100.28	sand and gravel	Sandy gravel, sandy gravel, light brown (7.5YR6/4), 20% moderate plasticity fines, 30% fine to medium sand, 50% fine to coarse gravel, medium dense. At 309 ft, very dense, cobbles and boulders. At 315 ft very dense.
G&M Inc 002	100.28	103.63	sand and trace gravel	Gravelly sand, gravelly sand, light brown, 20% fines, 60% fine to coarse sand, 20% fine to coarse gravel, Fe oxide staining on some grains, very dense.
G&M Inc 002	103.63	106.68	sand and trace gravel	Gravelly sand, gravelly sand, very pale brown (10YR7/4).
G&M Inc 002	106.68	109.73	sand, clay and gravel	Silty gravel, silty gravel, light brown, 30% low plasticity fines, 20% fine to coarse sand, 50% fine to coarse gravel with cobbles, Fe oxide staining on grains, medium dense.
G&M Inc 002	109.73	112.78	sand, clay and gravel	Clayey-sandy gravel, sandy clay gravel, light brown, 20–30% moderately plasticity fines, 20–30% fine to medium sand, 40–60% fine to coarse gravel with cobbles. At 365 ft sandy clay gravel, reddish brown (7.5YR6/6), Fe oxide staining, 1 1/2 ft, gravel, hard.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 002	112.78	114.30	sand and trace gravel	Gravelly sand, hard streak, gravelly sand, light reddish brown (5YR6/4), 15% low plasticity fines, 60% very fine to coarse sand, subrounded, 25% fine to coarse gravel, abundant Fe oxide staining, medium dense to dense.
G&M Inc 002	114.30	118.87	sand and clay	Clayey sand, sandy clay, light brown (7.5YR6/4), 25% moderate plasticity clay, 60% fine to coarse sand, 15% fine to coarse gravel, dense, Fe oxide staining abundant. Terminate boring at 390 ft in clayey sand, total depth 390 ft.
G&M Inc 600	0.00	4.57	sand and clay	Silty sand, silty sands, light brown, silty, very fine sand, 5% coarse sand, 10% 1/4 gravel, subangular coarse sand with thin beds, of very fine sand, indurated, poorly sorted (7.5YR6/4). Foam is making percentage of fines (washing through screen).
G&M Inc 600	4.57	10.36	sand and trace gravel	Gravelly sand, gravelly sand, 20% 1/4–1/2 in gravel in medium to coarse sand, subrounded, poorly sorted, light brown (7.5YR6/4).
G&M Inc 600	10.36	13.11	sand and trace gravel	Gravelly sand, gravelly sand, 40% 1/4 in gravel, 5% 1 in gravel, 55% medium to coarse sand, subrounded, poorly sorted.20% 1/4–1/2 in gravel in medium to coarse sand, subrounded, poorly sorted, light brown (7.5YR6/4). At 40 ft surface casing (12 1/4 in diameter) to 39.8.
G&M Inc 600	13.11	15.54	sand and trace gravel	Gravelly sand, gravelly sand, 20% 1 in gravel, 20% 1/4 in gravel, 60% medium-coarse-grained sand, poorly sorted, subrounded. At 47 ft change to down hole bit.
G&M Inc 600	15.54	19.51	sand and trace gravel	Gravelly sand, gravelly sand, 30% 1/4 in gravel, 70% fine to coarse sand, rounded, poorly sorted.
G&M Inc 600	19.51	20.42	sand and trace gravel	Gravelly sand, gravelly sand, 10% 1/4 in gravel, fine to coarse sand 90%.
G&M Inc 600	20.42	22.56	sand and gravel	Gravelly sand, 10% 3/4 in gravel, 30% 1/2 –1/4 in gravel, subrounded, poorly sorted, fine to coarse sand.
G&M Inc 600	22.56	22.56	sand and gravel	Gravelly sand, 20% 1/4 in gravel, increased fine sand (fine to coarse sand 80%) (discharge hose came loose, filled with gravel).
G&M Inc 600	24.38	26.82	sand and gravel	Gravelly sand, 10% 1/4 in gravel, 90% fine to coarse sand, subrounded, poorly sorted, light brown (7.5YR6/4).

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 600	26.82	29.87	sand and gravel	Gravelly sand, 1/4 in gravel, 60% fine to coarse sand, less fine sand, subrounded, poorly sorted. At 92 ft 1/4 in gravel and increased fines.
G&M Inc 600	28.04	29.87	sand and gravel	.
G&M Inc 600	29.87	32.00	sand, clay and gravel	Gravelly sand-silty sands, 20% 1/4 in gravel, 10–20% silt, 60–70% fine to coarse sand, poorly sorted, subrounded.
G&M Inc 600	29.87	32.00	sand, clay and gravel	Gravelly sand/clay, 10% 1/2 in gravel, 30% 1/4 in gravel, 60% medium to coarse sand, subangular, trace of orange sandy clay, brown (7.5YR5/2).
G&M Inc 600	32.00	33.53	sand, clay and gravel	Sandy gravel 50% subangular gravel 1/4 in, 10% orange sandy clay, 40% medium to coarse sand, subangular, trace of orange sandy clay, brown (7.5YR5/2).
G&M Inc 600	33.53	36.58	clay and sand	Sandy gravel, 50% subangular gravel 1/4 in, 10% orange sandy clay, 40% medium to coarse sand. At 113 ft lost, 8 ft of hole overnight. No clay.
G&M Inc 600	36.58	37.80	sand, clay and gravel	Gravelly sand, 40% subrounded 1/4 in gravel, 10% silty very fine sand, 50% fine to coarse sand, poorly sorted.
G&M Inc 600	37.80	40.84	clay and sand	Sandy clay, 10% clay, 40% fine to coarse sand.
G&M Inc 600	40.84	42.67	sand, clay and trace gravel	Silty sands, 5% 1/4 in gravel, 20% silt, 75% fine to medium sand.
G&M Inc 600	42.67	44.20	sand and gravel	Gravelly sand, 40% gravel 1/4 in 60% fine sand to coarse sand.
G&M Inc 600	44.20	45.42	sand, clay and gravel	Sandy clay gravel, 30% 1/2 in, 30%, 1/4 in gravel, coated with sandy clay.
G&M Inc 600	45.42	46.63	sand and clay	Silty sands, silty medium to coarse sand.
G&M Inc 600	46.63	48.77	gravel	Gravelly sand, 20% 1/4 in gravel.
G&M Inc 600	48.77	49.68	sand and gravel	Gravelly sand, 40% 1/4 in gravel, subangular, 60% fine to coarse sand, poorly sorted.
G&M Inc 600	49.68	50.29	sand, clay and gravel	20% gravel, more silty.
G&M Inc 600	50.29	51.82	sand and clay	Silty sands, fine to coarse silty sand.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 600	51.82	52.43	sand and clay	Clay, 10% clay (soft).
G&M Inc 600	52.43	54.56	sand, clay and gravel	Gravelly sand, 20% 1/4 in gravel, subangular.
G&M Inc 600	54.56	57.00	sand, clay and gravel	Gravelly sand, 40% gravel 1/4 in, 5% clay.
G&M Inc 600	57.00	59.44	sand, clay and gravel	Gravelly sand, 40% gravel 1/4 in, 10% clay.
G&M Inc 600	59.44	63.09	sand, clay and gravel	Gravelly sand-silty sands, 40% 1/4 in gravel, 20% silt and clay.
G&M Inc 600	63.09	65.23	sand, clay and gravel	Gravelly sand, 40% 1/4 in gravel, subangular, 1–% clay and silt, 50% fine to coarse sand, poorly sorted.
G&M Inc 600	65.23	66.75	sand, clay and gravel	Gravelly sand/sandy clay, 30% 1/4 in gravel,5% clay, 75% medium to coarse sand.
G&M Inc 600	66.75	68.28	sand and gravel	Gravelly sand, 10% 1/2 in, 20% 1/4 in, no clay.
G&M Inc 600	66.75	68.28	sand and gravel	Gravelly sand, 10% 1/2 in, 20% 1/4 in, no clay.
G&M Inc 600	68.28	69.80	sand and gravel	Gravelly sand/Sandy gravel, 30% 1/2 in, 20% 1/4 in gravel, 50% medium coarse sand.
G&M Inc 600	69.80	71.32	sand, clay and gravel	Gravelly sand, 10% 1/2 in, 20% 1/4 in, gravel 80% fine to coarse sand, silty.
G&M Inc 600	71.32	73.15	sand, clay and gravel	Gravelly sand/sandy clay, 20% 1/4 in gravel, subrounded, 10% sandy clay, 70% fine to coarse sand.
G&M Inc 600	73.15	74.07	sand and clay	Silty sands, very silty, very fine to coarse sand.
G&M Inc 600	74.07	75.29	sand and clay	Gravelly sand/silty sands, 50% coarse sand and 1/4 in gravel 50% silt to fine sand.
G&M Inc 600	75.29	76.20	sand and clay	Silty sands, 20% silt, 80% fine to coarse sand.
G&M Inc 600	76.20	77.42	sand and clay	Gravelly sand, fine to coarse sand, rounded.
G&M Inc 600	77.42	78.33	sand and clay	Sandy gravel, 70% 1/2 in gravel, tough drilling, cobbles (?).
G&M Inc 600	78.33	78.64	sand and clay	Silty sands, silty fine sand.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 600	78.64	80.77	sand and clay	Silty sands, silty fine to coarse sand, subrounded.
G&M Inc 600	80.77	81.99	sand, clay and gravel	Gravelly sand, 40% 1/4 in gravel, 60% silty fine sand.
G&M Inc 600	81.99	82.91	sand and clay	Silty sands, silty fine to coarse sand, 60%.
G&M Inc 600	82.91	85.34	sand and gravel	Gravelly sand, 20% 1/2 in gravel, 20% 1/4 in 60% fine to coarse sand.
G&M Inc 600	85.34	86.26	sand and gravel	Gravelly sand 20% subangular 1/4 in gravel, 80% medium to coarse sand.
G&M Inc 600	86.26	87.48	sand and gravel	Gravelly sand, 40% 1/2 in gravel, 10% sandy clay, 90% fine to coarse sand.
G&M Inc 600	87.48	89.61	sand, clay and gravel	20% 1/4 in gravel, 80% silty fine to coarse sand. No water in pipe after 1 hr at 288 ft. At 291 ft 1 ft cobbles (?).
G&M Inc 600	89.61	91.14	sand, clay and gravel	Silty sands, 20% light brown clayey silt 20% 1/4 in gravel, 40% medium to coarse sand, no water measured due to foam in pipe overnight.
G&M Inc 600	91.14	91.74	sand, clay and gravel	Silt and very fine sand, 30%, 40% light brown clayey silt, gravel and sand, poorly sorted.
G&M Inc 600	91.74	92.35	sand, clay and gravel	Gravelly sand, more sand, less gravel.
G&M Inc 600	92.35	92.81	sand, clay and gravel	Silt and very fine sand, still 30% clayey silt/silty clay, 20%, 1/2 in gravel.
G&M Inc 600	92.81	94.79	sand, clay and gravel	Water level 285.55 ft, 1/18/89. Sandy gravel, rig chatter, top of gravel coming into borehole.
G&M Inc 600	94.79	96.62	sand, clay and trace gravel	Water level 290.73 ft, 12/19/89. At 311 ft, bounce on gravel/cobbles (?). Silty sands 30%, clayey silt and 65% fine to coarse sand, 5% gravel.
G&M Inc 600	96.62	98.45	sand, clay and trace gravel	Silt and very fine sand, 50% light brown, clayey silt, 45% fine to coarse sand, 5% gravel.
G&M Inc 600	98.45	100.89	sand, clay and trace gravel	Silt and very fine sand, 80% light brown clayey silt, 5% gravel 1/4–1/2 in. At 325 ft, water level 311.35 ft, 12/19/89.
G&M Inc 600	100.89	104.24	sand and clay	Silt and very fine sand, 60% clayey silt, 15% gravel 25% sand. At 335 ft water level 309.97 ft, 12/19/89.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 600	104.24	106.38	sand, clay and gravel	Silt and very fine sand-silty sands, 60% silt to very fine sand 15% 1/4–1/2 in gravel, 2% fine to coarse sand. At 345 ft 316.68 ft, 12/19/89.
G&M Inc 600	106.38	107.59	sand and clay	Gravelly sand, very fine sandstone, pale brown (10YR6/3).
G&M Inc 600	107.59	110.03	sand, clay and gravel	Silt and very fine sand, light brown clayey silt, stiff (60%), 1/4–1/2 in gravel (30%) 10% sand. At 355 ft water level 320.54 ft, 12/19/89. At 360 ft very pale brown (10YR7/3).
G&M Inc 600	110.03	112.47	sand and trace gravel	Gravelly sand, gravelly sand, (70%) very fine sandstone, 10% 1/4–1/2 in gravel, 20% medium to coarse sand. At 363 ft water level 302.60 ft, 12/19/89.
G&M Inc 600	112.47	114.30	sand and trace gravel	Same as above (10YR6/3).
G&M Inc 600	114.30	118.57	sand and trace gravel	Water level 323.05 ft, 12/3/90. Add 10 in casing to bottom of well, start drilling 10 in hole.
G&M Inc 600	118.57	119.79	sand and clay	Silty sand, silty sands, very pale brown (10YR7/3), well indurated, fine grain.
G&M Inc 600	119.79	121.92	sand, clay and trace gravel	At 393 ft stringers of small gravel. At 399 ft water level 304.6 ft, 12/4/90.
G&M Inc 600	121.92	123.14	sand and clay	Silty sand, silty sands, at 7:00 (1/24/90) water level ≈302 ft at 400 ft depth.
G&M Inc 600	123.14	126.80	clay, sand and gravel	Gravelly clay, clay, pale brown (10YR6/3), 90% moderate plasticity fines, 10% fine to coarse gravel. At 410 ft water level 309.1 ft, 12/4/90.
G&M Inc 600	126.80	131.06	sand	Sand, gravelly sand, pale brown (10YR6/3), very fine to medium grain, well indurated (almost sandstone), friable, can break with fingers. At 420 ft water level 306.65 ft, 12/5/90.
G&M Inc 600	131.06	133.50	sand	Water level 301.14 ft, 1/30/90. Sand, gravelly sand, pale brown (10YR6/3).
G&M Inc 600	133.50	134.11	sand and clay	Sand, pale brown (10YR6/3) very fine to medium-grained, moderately well indurated, mostly friable, 5–10% soft salt and clay, 1–5% fine to very fine gravel.
G&M Inc 600	134.11	136.25	sand and clay	Very fine sand, gravelly sand, brown (10YR4/3) as above. At 440 ft water level 308.65 ft, 1/31/90.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 600	136.25	139.90	sand and clay	Clayey sand, sandy clay, increase in clay content to 5–25%, otherwise as above. Made less water than sand unit above.
G&M Inc 600	139.90	142.65	Gravel	Gravel, sandy gravel, very fine to medium pebbles (90%), coarse/very coarse pebbles (10%), ≤1 1/2 in diameter, rig chatter, lithic fragments, volcanics quartz, poorly sorted, angular to sub rounded, >50% fine pebble size but ranges very fine to very coarse. At 460 ft water level 303.2 ft, 2/1/90.
G&M Inc 600	142.65	143.26	Gravel	Sandy gravel, increase in coarse pebbles, pebble zone, 1 ft thick at 468 ft.
G&M Inc 600	143.26	145.08	Gravel	Gravel, little or no fines, as above, increase in fine pebbles, better sorted.
G&M Inc 600	145.08	146.30	sand, clay and gravel	Gravelly silt, sandy clay gravel, brown, gravelly, silt, and sand (25%) very fine to fine sand, (25%) silt, (7.5YR5/6), making less water.
G&M Inc 600	146.30	152.10	clay, sand and gravel	Silt, silt and very fine sand. Fine to medium pebble gravel (50%), clay cement. Brown (7.5YR4/3), silt (75%), fine clay (10%), fine sand (15%) tight clay, poor recovery due to lack of water down hole.
G&M Inc 600	152.10	153.01	sand, clay and gravel	Gravelly silt, clay, as above, increase in gravel (fine to coarse), content to 20%, gravel is coarsening with depth. Need heavy foam to lift gravel. At 502 ft water level 415.8 ft, 2/2/90, total depth 5.02 ft.
G&M Inc 601	0.00	1.22	sand and clay	No data.
G&M Inc 601	1.22	3.05	sand and clay	Silty sand, silty sands, pale brown (10YR6/3) 80% well rounded, well graded fine-grained sand and 20% fines moderately weathered.
G&M Inc 601	3.05	7.62	sand and trace gravel	Gravelly sand, gravelly sand, brown (10YR5/3) 50% fine to coarse sand, 40% fine to coarse gravel, 10% fines. Partially cemented sands, fragments well-rounded to subangular quartzite, metamorphic and volcanic rocks. Weak to moderately weathered, at 15 in gravel reduced to <10%, mixed fine to coarse subrounded sands, 10% fines.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 601	7.62	9.14	sand	Sand, well graded sand, dark brown (7.5YR4/4) 90% well graded, well sorted fine sand, 80% quartz and quartzite (well rounded) and 20% other met rocks weakly weathered.
G&M Inc 601	9.14	10.67	sand and trace gravel	Gravelly sand, gravelly sand, dark brown (7.5YR4/4) 75% fine to coarse-grained sand, 20% fine to coarse-grained 5% fines. Well rounded to subrounded. Moderately weathered.
G&M Inc 601	10.67	13.72	sand and clay	Silty sand, silty sands, brown (7.5YR4/4) 70% fine to medium-grained well rounded sand, 30% fines (silty).
G&M Inc 601	13.72	18.59	sand and trace gravel	Gravelly sand, gravelly sand, Grayish brown (10YR5/2) 70% fine to coarse-grained sand and 30% fine to coarse gravel, partially cemented. Weakly weathered fragments, 80% volcanic rocks, 20% metamorphic rocks.
G&M Inc 601	18.59	19.81	sand and trace gravel	Gravelly sand, gravelly sand, dark grayish brown (10YR4/2) 60% medium to coarse-grained sand and 40% fine to coarse gravel partially cemented, moderately weathered. Mostly volcanic rocks.
G&M Inc 601	19.81	22.86	sand, clay and gravel	At 65 ft, 90% medium to coarse-grained sand, 10% fine to coarse gravel fragment, 75% volcanic rocks, 10% quartzite, 10% other metamorphic rocks. At 70 ft, 80% fine to coarse-grained sand, 30% fine to medium-grained sand 10% fines (silty), partially cemented. Moderate weathering.
G&M Inc 601	22.86	24.38	sand and trace gravel	Sand, well graded sand, pale brown (10YR6/3) 90% fine to medium sand, 5% fine gravel, 5% fines. Probably started at 73 ft.
G&M Inc 601	24.38	27.43	sand and clay	Well graded sands. At 80–90% fine to coarse-grained sand, 10% fines (silts).
G&M Inc 601	27.43	30.48	sand, clay and gravel	Gravelly sand, gravelly sand/gravel, little or no fines, brown (10YR/3) 60% fine to coarse-grained, poorly sorted sands, 35% fine to medium gravel, 5% fines (clayey silts), subrounded to angular, partially cemented, weakly weathered. At 95 ft, 70% fine to coarse sand, 20% fine gravel, 10% fines (silty clay), rounded to subangular, partially cemented.
G&M Inc 601	30.48	33.53	sand, clay and trace gravel	Sand, well graded sand, pale brown (10YR6/3) 90% fine to medium-grained sand, 5% fine gravel, 5% fines (clayey silts), weakly weathered, partially cemented. At 105 ft fine to coarse sand, rig chatter on cobbles at 101–102 ft.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 601	33.53	35.05	sand and gravel	At 110 ft, coarse sand fragments 50% volcanic rocks, 40% metamorphic rocks 10% quartz and quartzite.
G&M Inc 601	35.05	36.58	sand and clay	Silt sand, silty sands, brown (10YR5/3) 90% fine to coarse-grained sand, 20% fines (silty), moderately weathered.
G&M Inc 601	36.58	39.62	sand, clay and trace gravel	Sand, gravelly sand, pale brown (10YR6/3) 90% fine to coarse-grained sand, 5% fine gravel 5% fines (clayey silts), weakly weathered. Fragments 70% volcanic, 20% metamorphic rocks, (10%) quartz.
G&M Inc 601	39.62	42.67	sand and gravel	At 130 ft, 95% medium to coarse-grained sand, <5% gravel, >5% fines partially cemented.
G&M Inc 601	42.67	44.20	sand and clay	Rig chatter at 140 ft At 140 ft, 95% medium to coarse-grained sand, 5% silty fines (Fragments, 60% volcanic rocks, 40% metamorphic rocks).
G&M Inc 601	44.20	45.72	sand	Well graded sand, well graded sand, Yellowish brown (10YR5/4) 90% fine gravel, well sorted, well rounded sand, 10% fines and medium-grained sand.
G&M Inc 601	45.72	47.24	sand and trace gravel	Gravelly sand, gravelly sand, brown (10YR5/3) 50% fine to coarse-grained sand, 40% fine to medium gravel, 10% fine.
G&M Inc 601	47.24	50.29	sand and clay	Clayey sand, sandy clay, brown (10YR5/4) 60% fine to coarse-grained sand, 20% silty clays fines, 20% fine to coarse gravel, moderately weathered, poorly sorted, well rounded to subangular.
G&M Inc 601	50.29	51.82	sand, clay and gravel	At 165 ft, clay reduced to 10%angular fragments of gravel (5–10%) rest is fine to coarse-grained sand.
G&M Inc 601	51.82	53.34	sand, clay and gravel	At 170 ft, clay at 10%, subrounded to angular gravel of chert, volcanic angular gravel of chert, volcanic rocks and quartz, at 40%, 50% fine to medium sand.
G&M Inc 601	53.34	54.86	sand and gravel	175 ft, angular, moderately to well weathered fragment of gravel of cherty, silicified volcanic rocks.
G&M Inc 601	54.86	56.39	sand, clay and trace gravel	Sand, gravelly sand, reddish brown (5YR5/4) 85% fine to medium-grained sand, 10% fine to medium gravel 5% silty fines. Rounded to subrounded, weakly weathered.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 601	56.39	59.44	sand, clay and trace gravel	Gravelly sand, brown (7.5YR5/4) 85% fine to coarse-grained sand, 10% clayey silts, 5% fine gravel well rounded to subangular. Fragments 60% volcanic, 20% metamorphic rocks, and 20% quartz, poorly sorted. Rod hop 190 ft, 194 ft.
G&M Inc 601	59.44	64.01	sand and gravel	At 195 ft, subrounded to angular fragments (from cobbles) of cherty volcanic rocks. Fragments 80%, volcanic, 10% metamorphic rocks and 10% quartz.
G&M Inc 601	64.01	67.06	sand and clay	Sand, gravelly sand, brown (10YR5/3) 95% fine to coarse-grained sand, 5% fines (silty), weakly cemented, subrounded to subangular, weakly weathered. Fragments 90% volcanic rocks, 10% quartz and quartzite.
G&M Inc 601	67.06	68.58	clay and sand	At 220 ft, 5% clayey silty fines nearly a well-graded sand.
G&M Inc 601	68.58	70.10	sand and clay	Sand, well graded sand, brown (7.5YR5/4) ≈95% fine to medium-grained, well-graded sand, <5% fines (silty), rounded to subrounded, moderately weathered.
G&M Inc 601	70.10	70.10	sand, clay and gravel	Sand, gravelly sand, light brown (7.5YR6/4) 80% fine to coarse-grained sand, 15% fine gravel, 5% silty fines, partially cemented, moderately weathered. Fragments 90% volcanic rocks, 10% quartz.
G&M Inc 601	70.10	74.68	sand	At 235 ft sand better graded (medium to coarse), only, 5% gravel and <5% fine.
G&M Inc 601	74.68	76.20	sand, clay and gravel	At 245 ft, gravel increased to 75%, fine to medium gravel and 5% fines (silty).
G&M Inc 601	76.20	77.72	sand, clay and gravel	At 250 ft, gravel reduced to <5%, sand mostly fine to medium-grained with <5% fines (silty).
G&M Inc 601	77.72	79.25	sand, clay and gravel	At 255 ft, 80% fine to coarse-grained sand, 15% fine gravel 5% fine (silty) moderately weathered.
G&M Inc 601	79.25	80.77	Gravel	At 260 ft, fine gravel increased to 20%.
G&M Inc 601	80.77	82.30	sand and gravel	At 265 ft, 90% medium to coarse-grained sand and 10% fine gravel.
G&M Inc 601	82.30	83.82	sand and gravel	At 270 ft, 90% fine to coarse-grained sand and 10% fine gravel, subrounded to subangular.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 601	83.82	85.34	sand and gravel	At 275 ft, 80% fine to coarse sand and 20% fine to medium gravel. Fragments 80% volcanic rocks, 10% metamorphic rocks, 10% quartz.
G&M Inc 601	85.34	88.39	sand, clay and trace gravel	At 280 ft, 85% medium to coarse-grained sand, 10% fine gravel, <5% fines (silt), subrounded to angular.
G&M Inc 601	88.39	89.92	sand	Sand, well graded sand, dark yellowish-brown (10%, 4/4) 90% fine to medium well-graded sand, 10% fine and coarse fraction moderately weathered, well rounded to subangular.
G&M Inc 601	89.92	91.44	sand and trace gravel	Gravelly sand, gravelly sand, dark yellowish brown (10YR4/4) 90% fine to coarse, poorly sorted sand and 10% fine to medium gravel. Fragments 60% volcanic, 30% metamorphic rocks, 10% quartz, weakly weathered.
G&M Inc 601	91.44	94.49	sand, clay and trace gravel	At 300 ft, addition of 5% fines (silty). Gravelly sand at 306–307 ft, slow drilling, low penetration rate.
G&M Inc 601	94.49	96.01	sand and trace gravel	Gravelly sand/sandy gravel. At 310 ft, 90% fine to medium-grained sand (minor coarse fraction), includes angular, milky quartz fragment from probable cobbles or coarse gravel, rig chatter at 314–316 ft.
G&M Inc 601	96.01	97.54	sand, clay and gravel	At 315 ft, 70% fine to coarse-grained sand, 20% fine to coarse gravel, 10% fine (silty clay). Fragments 60% volcanic rocks, 30% quartz and quartzite, 10% other metamorphic rocks.
G&M Inc 601	97.54	99.06	sand and gravel	At 325 ft, medium to coarse sand, fine to coarse gravel, 50% to 80% quartz and quartzite, trace fines.
G&M Inc 601	99.06	102.11	sand, clay and trace gravel	At 330 ft, 10% clayey silts in medium to coarse-grained sand and 10–20% fine to medium gravel. Rig chatter at 325 ft.
G&M Inc 601	102.11	103.63	sand and clay	Silty sand, silty sands, brownish yellow (10YR6/6) 80–90% fine to medium-grained, subrounded to angular sand (minor coarse fraction) 10%, clayey silts, partially cemented, weakly weathered. Angular fragments of milky quartz broken from cobbles.
G&M Inc 601	103.63	106.68	sand, clay and trace gravel	Gravelly sand, gravelly sand, dark brown (10YR5/3). At 340 ft, angular chips of 80% quartz, quartzite and chert, 20% other metamorphic and volcanic rocks, 90% medium to coarse sand, 10% clayey silty fines. At 340–341 ft cobbles, slow, hard drilling, cobbles, rig chatter at 344 ft.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 601	106.68	108.20	sand, clay and gravel	At 345 ft, 50% medium to coarse sand, 40% fine to coarse gravel and cobbles, 10% fines (silty). Fragments 80% quartz, quartzite, and cherts, 20% volcanic and metamorphic rocks. Heavy rig chatter at 348 ft Slow hard drilling.
G&M Inc 601	108.20	109.73	sand and gravel	Sandy gravel, sandy gravel/gravelly sand, light yellowish brown (10YR6/4), 70% fine to coarse gravel 30% fine to coarse sand, weakly weathered, subrounded to subangular. Fragments 50% quartz and quartzite, 50% volcanic rocks. Light rig chatter.
G&M Inc 601	109.73	111.25	sand and gravel	Sandy gravel/gravelly sand At 360 ft, 50% fine to coarse gravel, 50% medium to coarse sand continued light rig chatter. Starting to make water at 364 ft.
G&M Inc 601	111.25	112.78	sand and gravel	Sand gravel, sandy gravel. Water level 320.42 ft, 3/30/90. Yellowish brown (10YR5/4) 50–60% fine to coarse gravel and angular chips from cobbles, 40% medium to coarse-grained to sub to angular sands, moderately weathered. Fragments 50% quartz and quartzite, 40% metamorphic rocks, 10% other rocks. Rig chatter from 364 ft.
G&M Inc 601	112.78	115.82	sand and gravel	Sandy gravel. At 370 ft, ≈70% fine to coarse gravel 30% coarse sand, minor fines. Fragments 70% quartzite and quartzite, 20% volcanic rocks, 10% metamorphic rocks, start of large gravel at 370 ft. Heavy rig chatter from 370 ft.
G&M Inc 601	115.82	118.87	sand and gravel	At 380 ft, finer gravel, more rounded, plenty of cobble chips. Cobble/gravel 80%, coarse sand 20%. Fragments 75% quartz and quartzite, 20% volcanic rocks, 5% other metamorphic rocks. At 385 ft water level 320.26 ft, 3/30/90.
G&M Inc 601	118.87	120.40	sand and gravel	At 390 ft, larger, angular gravel and cobble fragments. More quartzite less quartz.
G&M Inc 601	120.40	121.92	sand and gravel	At 395 ft, medium to strong weathering quartz, and quartzite and metamorphic rocks fragments to medium to coarse-grained sand. Rig chatter at 396–420 ft slow drilling quartz/quartzite. Cobbles/gravel.
G&M Inc 601	121.92	122.83	sand and gravel	No samples. Driller note, soft drilling 402–403 ft. From 403 ft, less rig chatter, smoother and faster drilling, some hard spots.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 601	122.83	124.97	sand and trace gravel	Gravelly sand, gravelly sand. Water level 320.57 ft, 3/30/90. Dark yellowish brown (10YR4/4) 90% medium to coarse-grained sand, 10% fine to medium gravel (cobbles. Subrounded to angular, weak to moderately weathered. Fragments 80% quartz and quartzite, 10% metamorphic rocks, 5% other rock. Light rig chatter 406–408 ft, slow drilling.
G&M Inc 601	124.97	126.49	sand and trace gravel	At 410 ft, better graded sand with few fine gravel. Sand is medium to coarse-grained. 90% quartz and quartzite, slow drilling, light rig chatter.
G&M Inc 601	126.49	128.02	sand and trace gravel	At 413–416 ft light to medium rig chatter. At 415 ft, medium to coarse sand and fine gravel, quartz and quartzite (90%). Water level 320.92 ft, 3/29/90. At 420 ft, 90% fine to coarse-grained sand, ≈10% fine gravel, 80% quartz/quartzite, 20% other metamorphic rocks. Total depth 420 ft. Completed drilling 2:45 pm, 3/28/90.
G&M Inc 602	0.00	3.05	sand and trace gravel	Gravelly sand, gravelly sand, dark grayish brown (10YR4/2) 80% coarse sand, 15% fine gravel, 5% fines, sand 80–90% quartzite, 10–20% quartz.
G&M Inc 602	3.05	4.57	sand and trace gravel	Fine increase 20% and sand more well graded.
G&M Inc 602	4.57	7.62	sand and gravel	Reddish gray (5YR5/2) gravel (fine-grained) increase to 30% in medium sand with 10% fines, sand and gravel fragments, 10% volcanic rocks, 50% quartzite and quartz 10% others. Fragment of partially to well cemented, fine to medium grain sands, weakly weathered.
G&M Inc 602	7.62	15.24	sand and trace gravel	Gravelly sand, gravelly sand, dark reddish brown (5YR3/4) 80% medium to coarse-grained sand, 20% fine gravel, not cemented. Fragments, 60% quartzite and quartz 30% volcanic rocks and 10% other rocks.
G&M Inc 602	15.24	16.76	sand and trace gravel	Gravelly sand, gravelly sand, brown (10YR5/3) 85% medium to coarse-grained sand, 15% fine gravel. Fragments 60% metamorphic volcanic rocks, 30% quartzite and quartz 10% others, medium weathered and rounded gravel.
G&M Inc 602	16.76	21.34	sand and trace gravel	Gravelly sand, gravelly sand, reddish brown (5YR5/4) 75% coarse to medium-grained sand and 25% fine-grained gravel, (subrounded). Fragments, 80% meta-volcanic rocks, 20% quartzite and quartz. Partially cemented sands and gravel fragments.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 602	21.34	22.86	sand and trace gravel	Gravelly sand, gravelly sand, reddish brown (5YR5/3) 80% medium to coarse-grained sand and 20% fine gravel. Partially cemented. Fragments, 90% volcanic and meta-volcanic rocks. 10% quartz and quartzite.
G&M Inc 602	22.86	24.38	sand and trace gravel	Gravelly sand, well graded sand, brown (7.5YR5/4) 95% fine to medium-grained, well-graded sand, 5% fine-grained gravel. Fragments 90% volcanic and metamorphic volcanic rocks, 10% quartzite and quartz. Partially cemented, moderately weathered.
G&M Inc 602	24.38	28.96	sand and trace gravel	Gravelly sand, gravelly sand/gravel, little or no fines, brown (7.5YR5/4) 75% fine to coarse sand, 25% fine gravel. Fragments of 70% volcanic and meta-volcanic rocks, 25% quartzite and quartzite and 5% cherty fragments, moderately weathered.
G&M Inc 602	28.96	30.78	sand and trace gravel	Gravelly sand, gravelly sand, brown (7.5YR5/2) 90% fine to medium-grained sand, 5–10% fine gravel, 0–5% fines. Fragments 90% volcanic rocks, 10% quartz and other fragments. Moderately weathered.
G&M Inc 602	30.78	32.61	sand and trace gravel	Gravelly sand, gravelly sand, brown (7.5YR4/2) 80% fine to coarse-grained sand, 15% fine gravel, 5% fines. Fragments 60% volcanic rocks, rocks, 30% quartz and quartzite, 10% other. Partially cemented, moderately weathered.
G&M Inc 602	32.61	36.58	sand and gravel	Gravell sand, gravelly sand, brown (7.5YR4/2) 80% fine to coarse-grained sand, 15% fine gravel, 5% fines. Fragments 60% volcanic rocks, 30% quartz and quartzite, 10% other. Partially cemented, moderately weathered.
G&M Inc 602	36.58	38.10	sand and trace gravel	Gravelly sand, gravelly sand, light brown (7.5YR6/4) 80% fine to coarse-grained sand, 10% fine gravel, 10% fines. Fragments, 50% volcanic and meta-volcanic rocks, 40% quartz, and quartzite, 60% other metamorphic rocks. Partially cemented, moderately weathered.
G&M Inc 602	38.10	41.15	sand and clay	Clayey sand, sandy clay, pale brown (10YR6/3) 80% fine to medium-grained sand, 10% fine gravel, 10% fines. Partially cemented. Fragments 50% quartz and quartzite, 40% volcanic, 10% other rocks. At 130 ft fines decrease to ≈5%.
G&M Inc 602	41.15	42.67	sand, clay and trace gravel	Brown (10YR5/5) 85% fine to coarse-grained sand, 10% fine gravel, (angular to subrounded), 5% fines. Fragments 60% quartz site, 30% volcanic rocks, 10% others. At 140 ft, gravel reduced to 5% and sand is fine to medium-grained.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 602	42.67	45.72	sand and trace gravel	Gravelly sand, gravelly sand. Reddish brown (5YR/3) 75% fine to coarse-grained sands, 25% fine to medium-grained gravelly (rounded to subrounded). Fragments 50% quartzite. 40% volcanic rocks, 10% other metamorphic rocks. Partially cemented, moderately weathered.
G&M Inc 602	45.72	50.29	sand and trace gravel	Gravelly sand, gravelly sand. Reddish brown (5YR5/3) 75% fine to coarse-grained sands, 25% fine to medium-grained gravel (rounded to subrounded). Fragments 50% quartzite, 40% volcanic rocks, 10% other metamorphic rocks. Partially cemented, moderately weathered. At 155 ft, gravel reduced to 15%, sand is fine to medium-grained, 5% fines (clay). At 160 ft, angular to subangular gravel to 25–30%, sands medium to fine-grained.
G&M Inc 602	50.29	51.82	sand and gravel	Sand, well graded sand, brown (7.5YR5/2), 95% fine to medium-grained, well graded sand with ≈5% fines sand garnets, 60–75% quartzite and quartz, 20–30% volcanic, 10% other rocks moderately weathered.
G&M Inc 602	51.82	54.86	sand and trace gravel	Gravelly sand, gravelly sand, light brown (7.5YR6/4) 70% medium to coarse sand, 25% fine to medium subangular gravel 5% fines, weakly weathered. At 175 ft, gravel reduced to 10–15% and fines (clay) increased to 10%, rig chatter at ≈178 ft.
G&M Inc 602	54.86	56.39	sand, clay and gravel	At 180 ft, gravel increased to 25% with 10% (clay) fines. Probable cobbles with gravel, rig chatter.
G&M Inc 602	56.39	59.44	sand and trace gravel	At 185 ft sand and gravel fragment (cobble fragments) are 70% volcanic rocks (some welded and silicified), 25% quartzite and quartz and 5% other rocks, less rig chatter.
G&M Inc 602	59.44	62.48	sand and gravel	At 190 ft, gravel angular to subrounded increases to ≈35% sand partially cemented, sand fine to coarse-grained.
G&M Inc 602	62.48	70.10	sand and trace gravel	Gravelly sand, gravelly sand, pinkish gray (7.5YR6/2) 60% medium to coarse-grained sand, 40% fine to medium-grained gravel, (angular to subrounded). Fragments 60% volcanic rocks and cherty volcanic rocks, 35% quartz and quartzite, 5% other rocks, weakly weathered. At 210 ft, rig chatter, angular, chert, volcanic rocks, fragment 5–10% fines (clay). At 215 ft, gravel reduce to 25% subangular to subrounded fragments. At 225 ft, 80% medium to coarse-grained sand and 15% fine-grained, subangular gravel, 5% fines (clay).

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 602	70.10	73.15	sand, clay and gravel	Gravelly sand, gravelly sand, brown (7.5YR5/4) 70% fine to coarse to-grained sand, 20% fine to coarse-grained gravel, 10% fines (silts). Fragments 50% quartzite and quartz, 40% volcanic rocks, 10% other rocks, moderately weathered.
G&M Inc 602	73.15	74.68	sand, clay and gravel	Gravelly sand, at 240 ft, fine gravel reduced to 10% in medium to coarse-grained sand and 5% fines.
G&M Inc 602	74.68	76.20	sand, clay and trace gravel	At 245 ft, medium to coarse gravel, rounded to angular increases to 40% in medium-grained sand with 10% fines (silts), gravel fragments of volcanic rocks and minor metamorphic rocks.
G&M Inc 602	76.20	77.72	sand and gravel	At 250 ft, fine to medium-grained sand with 10% fine-grained gravel (angular to subangular). Fragments of 50% volcanic rocks, 40% quartzite and quartz, 10% other metamorphic rocks.
G&M Inc 602	77.72	79.25	sand and gravel	At 255 ft, increase in fine to coarse gravel (subangular to subrounded to 30% in medium to coarse-grained sand. Rig chatter at 256 ft.
G&M Inc 602	79.25	80.77	sand and gravel	Gravelly sand, at 260 ft, gravel increase in 40% (subrounded) in coarse-grained sand.
G&M Inc 602	80.77	82.30	sand and gravel	At 265 ft, gravel decrease to 10% (subrounded to angular) in fine to medium-grained sand.
G&M Inc 602	82.30	83.82	sand and gravel	At 270 ft, fine to coarse gravel to 40% in fine to coarse sand and 10% fines.
G&M Inc 602	83.82	86.87	sand and gravel	At 275 ft, gravel reduced to 10% (fine) in medium to coarse sand. At 280 ft gravelly sand.
G&M Inc 602	86.87	88.39	sand and gravel	At 285 ft, 90% medium to coarse-grained sand and <10% fine gravel.
G&M Inc 602	88.39	89.92	sand and gravel	At 290 ft, minor (<10%) fine gravel in medium to coarse-grained sands.
G&M Inc 602	89.92	91.44	sand and gravel	At 295 ft, 20–30% coarse, well-rounded, gravel in fine to medium-grained sand, 10% fines.
G&M Inc 602	91.44	92.96	sand and gravel	At 300 ft, ≈10% fine gravel in fine to coarse sand.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 602	92.96	94.49	sand, clay and gravel	At 305 ft, 20–30% coarse, well-rounded gravel with fine to medium-grained sand and ≈10% fines (silts).
G&M Inc 602	94.49	97.54	sand and clay	Silty sand, silty sands, light brown (7.5YR6/4) 70% fine-grained sand, 30% silty clay, sticky clay, more silt than clay.
G&M Inc 602	97.54	99.06	sand and clay	Water level 295.8 ft, 3/1/80.
G&M Inc 602	99.06	100.58	sand and clay	Silty sand, silty sands, very pale brown (10YR2/3) 80% fine-grained sand, 10% clayey silt fines, 10% coarse sand fragments.
G&M Inc 602	100.58	103.63	sand and clay	Water level 310.17 ft, 3/2/90. At 330 ft, few coarse sand fragments and slightly more clay (rolls out).
G&M Inc 602	103.63	105.16	sand and clay	At 340 ft, 5–10% medium to coarse-grained sand fragments.
G&M Inc 602	105.16	106.68	sand and gravel	At 345 ft (light rig chatter) 10% angular, coarse sand fragments (cobbles).
G&M Inc 602	106.68	108.20	sand, clay and trace gravel	Silty sand, silty sands. Water level 330.1 ft, 3/2/90 light brown (7.5YR6/4) 80% fine-grained sand, 10% coarse-grained sand (rounded to subangular), 10% fine (silt), moderately weathered.
G&M Inc 602	108.20	109.73	sand, clay and gravel	Silty gravel, silty gravel, light yellowish brown (10YR6/4) 70% fine to coarse gravel, 20% fine to medium sands, 10% fines (silts) fragments 70% quartz and quar6zite, 30% other metamorphic rocks, rig chatter.
G&M Inc 602	109.73	111.25	sand and trace gravel	Gravelly sand, gravelly sand, water level 329.8, 3/2/90. Brownish yellow (10YR6/6) 80% fine to coarse sand, 10% fine gravel, 10% fines, moderately weathered. Fragments 40% quartz and quartzite, 60% other metamorphic rocks.
G&M Inc 602	111.25	112.78	sand, clay and gravel	Gravelly sand, gravelly sand, water level 321.17 ft, 3/3/90. Light yellowish brown (10YR6/4) 70% fine to coarse-grained sand, 25% fine to medium-grained gravel and gravel fragments (angular) and 5% fines (silty). Fragments 70% quartz and quartzite, 20% metamorphic rocks, 10% other rocks, moderately weathered, possible cobbles in drilling, rig chatter and drilling slow. At 370 water level 332.55 ft, 3/3/90.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 602	112.78	114.30	sand, clay and gravel	Sandy gravel, sandy gravel, water level 330.3 ft, 3/3/90. Very pale brown (10YR7/4) 75% fine to coarse gravel, 20% medium to coarse sand, percent (silty) fines. Fragments 90% quartz and quartzite 10% other metamorphic rocks, moderately weathered, some cemented fragments (rig chatter, slow hard drilling.
G&M Inc 602	114.30	117.35	sand and gravel	Water level 325.82 ft, 3/3/90. At 375– 60% fine to coarse gravel and medium to coarse sand increases to 40%. At 380 ft, angular fragments from cobbles, rig chatter continues.
G&M Inc 602	117.35	118.87	sand, clay and gravel	Water level 324.1 ft, 3/4/90. At 385 ft, 75% fine to coarse gravel, 20% fine to coarse sands and 5% fines, hard drilling, lots of rig chatter, especially 380–383 ft.
G&M Inc 602	118.87	120.40	sand, clay and gravel	At 390 ft, 80% fine to coarse gravel and cobbles (?), 15% coarse sand, 5% silty fines, quartz and quartzite fragments ≈80%, very hard, slow drilling, lots of rig chatter. Water level 325.2 ft, 3/4/90.
G&M Inc 602	120.40	121.92	sand, clay and gravel	Gravelly, sand, gravelly sand. Water level 324.18 ft, 3/5/90. Light yellowish brown (10YR6/4), 70% medium to coarse-grained sand, 20% fine gravel, ≈10% fines (silty clay). Fragments 60% quartz and quartzite and 40% other metamorphic rocks, moderately weathered.
G&M Inc 602	121.92	124.97	sand, clay and gravel	Water level 327.2 ft, 3/5/90. At 400 ft continued gravelly sand, 60% medium to coarse-grained sand, 30% fine gravel, 10% fines (clayey silts). Fragments 90% quartz and quartzite 10% other metamorphic rocks, hard slow drilling, light rig chatter and rod hop. At 405 ft, 70% medium to coarse sand, 20% fine gravel, 10% fines.
G&M Inc 602	124.97	126.49	sand, clay and trace gravel	Gravelly sand, gravelly sand, water level ≈327.7 ft, 3/5/90. Very pale brown (10YR7/3) 80% medium to coarse-grained sand, 10% fine-grained gravel, 10% fines (silty clay), partially cemented. Fragments 85%, quartz and quartzite, 10% other metamorphic rocks, 5% volcanic, very slow, hard drilling, moderate rig chatter and rod hop, possible drilling of quartz cobbles and gravel. Water level ≈325.0, 3/6/90.
G&M Inc 602	126.49	127.86	sand, clay and gravel	Gravelly sand, gravelly sand, water level ≈328.12, 3/18/90. Pale brown (10YR6/3) 70% medium to coarse-grained sand, 25% fine to coarse gravel, 5% fines (silty clay), weakly weathered. Fragments 90% quartz and quartzite, 10% other metamorphic rocks.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 602	127.86	128.02	sand and trace gravel	Total depth, sand, well graded sand, light brownish gray (10YR6/2) 90% plus fine to medium-grained sand, <5% coarse-grained sand and gravel. <5% fines, well rounded to subrounded, weakly weathered, sand 90% quartz and quartzite, 10% other metamorphic rocks.
G&M Inc 603	0.00	11.89	sand and gravel	No data.
G&M Inc 603	11.89	15.54	sand and trace gravel	Sand, gravelly sand, medium to coarse sand mixed, color, primarily reddish brown (5YR5/4). At 45 ft same with some (30%) fine angular gravel. At 47 ft hard drilling, cobbles 48 ft.
G&M Inc 603	15.54	25.30	sand and trace gravel	Sand, gravelly sand, Coarse sand with some 1/4 in sub-rounded gravel, light brownish gray 2.5YR (6/2). At 55 ft Coarse sand, little fine angular gravel, reddish brown (5YR5/4). At 65 ft little 1/4–1/2 in gravel. At 70 ft increased gravel, subrounded (20%).
G&M Inc 603	25.30	32.00	sand, clay and gravel	Silty gravel, hard drilling, cobbles 1/4–1/2 in gravel, sub-rounded, silty fine to coarse sand, poorly sorted, HNU reading after sitting 30 minutes. At 90 ft fine to coarse sand (40%) 1/4–1/2 in gravel (60%) brown (7.5YR5/2). At 99 ft silty fine to coarse sand 30% 1/4–1/2 in sub-rounded gravel (70%) brown (7.5YR5/2).
G&M Inc 603	32.00	36.88	sand, clay and gravel	sand, silty sands, silty fine to coarse sand (60%), 40% 1/4 in gravel brown (7.5YR5/4). At 109 ft silty fine to coarse sand (70%) 1/8–1/4 in gravel subrounded (30%). At 115 ft some clay.
G&M Inc 603	36.88	39.62	sand, clay and gravel	Clayey sand, sandy clay, silty-clayey fine to coarse sand, 20–30%, 1/4–1/2 in subrounded gravel, brown (7.5YR5/4). At 125 ft harder drilling 60% 1/4–1/2 in gravel.
G&M Inc 603	39.62	51.82	sand, clay and gravel	Sand. gravelly sand, silty fine to coarse sand 30% 1/4–1/2 in subrounded gravel, reddish brown (5YR4/3), at 135 ft trace clay, 1/3–1/2 in gravel (40%). At 145 ft silty fine to coarse sand, 1/4 in gravel, subangular (10%). At 149 ft 30–40% gravel. At 160 ft gravel subrounded, trace clay. At 165 ft 20% gravel.
G&M Inc 603	51.82	53.34	clay, sand and gravel	Clayey gravel, sandy clay gravel, clayey gravel, 1/4–1/2 in subrounded 40% medium to coarse sand, brown (7.5YR5/4).
G&M Inc 603	53.34	54.86	sand and clay	Clayey sand, sandy clay. Clayey fine to coarse sand, 10% 1/4–1/2 in gravel.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 603	54.86	56.39	clay, sand and gravel	Clayey gravel, sandy clay gravel. Clayey gravel 1/4–1/2 in subangular 30–40% fine to coarse sand brown (7.5YR5/4).
G&M Inc 603	56.39	57.91	clay and sand	Clayey, sand, sandy clay. Clayey fine in coarse sand 10–15% 1/4–1/2 in gravel.
G&M Inc 603	57.91	70.10	sand, clay and trace gravel	Silty sand, silty sands. Silty fine to medium sand trace, 5% 1/4 in subrounded gravel, brown. At 195 ft silty medium to coarse sand 40% 1/4–1 in subrounded gravel, hard drilling. At 201 ft silty fine to coarse sand 30% subangular 1/4–3/4 in gravel brown (7.5YR5/4) poorly sorted. At 209 ft 30–40% gravel. At 215 ft silty fine to coarse sand 10% 1/4 in subangular gravel brown (7.5YR5/4). At 225 ft less gravel (<5%), more fines, light brown (7.5YR6/4).
G&M Inc 603	70.10	71.02	sand and trace gravel	Sand, gravelly sand, medium to coarse sand, trace fines, 40–50%, subrounded, 1/4–3/4 in gravel, some lighter colors, mostly brown (7.5YR5/4).
G&M Inc 603	71.02	78.64	sand, clay and gravel	Silt sand, silty sands. Silty fine to coarse sand 40% subrounded, 1/4–3/4 in gravel, (7.5YR6/4) light brown. At 240 ft silty fine to coarse sand trace 1/3–1/4 in gravel, light brown (7.5YR6/4). At 244 ft 20% 1/4–1/2 in gravel subrounded. At 249 ft 10% 1/4–1/2 in gravel subrounded, slight increase in fines, cemented. At 254 ft silty fine to coarse sand 30% 1/4–1/2 in gravel subrounded, light brown (7.5YR6/5).
G&M Inc 603	78.64	80.16	sand, clay and gravel	Sand, gravelly sand, fine to coarse sand, trace silt, 15% 1/8–1/2 in gravel, brown, (7.5YR5/4).
G&M Inc 603	80.16	97.84	sand, clay and gravel	Silt sand, silty sands, silty fine to coarse sand 10% 1/4–1/2 in subangular gravel. At 269 ft 20% gravel, subrounded. At 274 ft same. At 279 ft same. At 285 ft silty sands, silty to coarse sand 20% 1/4–3/4 in gravel subangular, brown (7.5YR5/4). At 291 ft silty sands, silty medium to coarse sand trace 1/4 in gravel, brown (7.5YR5/4). At 295 ft increased gravel to 30–40% subrounded. At 298 ft, gravel 1/4–1/2 in subrounded (30%). At 304 ft 10% gravel. At 309 ft increase fines, only trace gravel. At 314 ft silty sands silty fine sand (40% silt) yellowish light brown (10YR5/3).
G&M Inc 603	97.84	103.33	clay, sand and trace gravel	Silt, silt and very fine sand. Pale brown, sandy silt, trace 1/4 in gravel, (10YR6/3). At 323 ft water at 323.33 ft, 09:01. At 329 ft reddish brown (5YR5/4). At 334 ft trace clay.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 603	103.33	104.55	sand, clay and trace gravel	Silty sand, silty sands, light yellowish brown (10YR6/4) silty sand/sandy silt, trace gravel and siltstone cobbles at 343 ft.
G&M Inc 603	104.55	108.20	sand, clay and gravel	Silt and very fine sand. Cemented silts and fine-grained sandstone, 10–15% coarse sand and gravel, pale brown (10YR6/3) hard drilling. At 351 ft cobbles with some coarse sand, heavy rig chatter. Easier at 354 ft.
G&M Inc 603	108.20	109.73	sand, clay and gravel	Silty sands, silty medium to coarse sand, some subrounded 1/8–1/4 in gravel (20%) and trace of cobble fragments, brown (7.5YR5/4).
G&M Inc 603	109.73	112.47	clay, sand and gravel	Silt, silt and very fine sand, silty with 20% medium to coarse sand and 20% 1/8–1/4 in gravel, some clay light yellowish brown (10YR6/4). Rig chatter at 363 ft At 364 ft sandy silty 30% fine to coarse sand and 10% 1/4–1 in gravel, light yellowish brown (10YR5/3), occasional angular cobble, chips of varying color.
G&M Inc 603	112.47	113.69	sand, clay and gravel	Water level -319.41 ft, 1/17/90. At 370 ft occasional rig chatter, increased gravel 1/8–3/4 in, (40%), gravelly silt, light yellowish brown (10YR5/3).
G&M Inc 603	113.69	118.57	sand, clay and gravel	cobbles, cobbles, some coarse sand and silt (?). Color varies depending on individual cobble. Heavy rig chatter continues. At 379 ft cobbles of various colors, trace of silt and fine to coarse sand, heavy rig chatter, very slow drilling. Water level 316.24 ft, 1/17/90. At 383 ft cobbles with some fine to medium sand and cemented silt, light yellowish brown (10YR6/4).
G&M Inc 603	118.57	121.31	sand, clay and gravel	Water level 375.93 ft, 1/18/90. Using cable tool below 390 coarse sand and gravel, some cobbles and large fragments of indurated silt and sand. Changed to cable tool at 390 ft.
G&M Inc 603	121.31	126.49	sand and gravel	At 401 ft gravelly sand. Medium to coarse sand and some fine gravel, no coarse gravel in cuttings. At 404 ft amount of cuttings in bailer decreasing. At 407 ft gravelly sand, fine to medium sand, 1–2% coarse sand, trace fine gravel, water very muddy, only 2–4 cups of cuttings in a bailer load. At 415 ft water level 322.10 ft, 2/3/90. Total depth 415 ft measured with cuttings bailer.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 604	0.00	7.32	sand, clay and gravel	Silty sand, silty sands, at 4 ft, brown silty sand 30–40%, 1/4–1/2 in gravel (10YR5/3), subrounded gravel. At 14 ft Some cobbles of various color, increase in color, increase in coarse sand. At 19 ft fine to coarse silty sand, trace 1/4 in subangular gravel, brown (10YR5/3).
G&M Inc 604	7.32	8.84	clay, sand and gravel	Silty, silt and very fine sand. Reddish brown sandy silt, 30% fine sand with trace coarse sand and fine gravel (5YR4/3).
G&M Inc 604	8.84	15.24	sand and trace gravel	Gravelly sand, gravelly sand 40% medium to coarse sand, trace gravel to 1/4 in subrounded, cobble chips. At 39 ft increased gravel (20%) and cobble chips. At 45 ft gravelly sand, gravelly sand, brown, (7.5YR5/4) 10% plasticity fines, 25% fine-coarse gravel, 65% fine to coarse sand, Fe oxide staining on grains, abundant.
G&M Inc 604	15.24	21.34	sand and gravel	Sandy gravel, CP, brown (7.5YR5/4), 65% fine to coarse gravel, 30% fine to coarse sand subrounded, Fe oxide staining on grains. At 60 ft fines to 10–15%, 30% fine to coarse sand, 55–60% gravel, Fe oxide staining on some grains. At 68% gravel stringers.
G&M Inc 604	21.34	22.56	sand and trace gravel	Gravelly sand, gravelly sand, brown, (7.5YR5/4) 15% low plasticity fines, 60% fine to coarse sand, 25% fine to coarse gravel.
G&M Inc 604	22.86	27.43	sand and gravel	Sandy gravel, sandy gravel. At 80 ft sandy gravel, reddish brown (5YR4/3).
G&M Inc 604	27.43	30.48	sand, clay and gravel	Silt sand, silty sands, reddish brown (7YR4/3) 20% low-mod plasticity fines, 15% fine, coarse gravel, 65% fine to coarse sand. At 98 ft gravel to 25%.
G&M Inc 604	30.48	31.39	sand and clay	Clayey sand, sandstone, reddish brown (5YR/4) 20% moderate plasticity fines, 70% fines to coarse sand, 10% fine to coarse gravel.
G&M Inc 604	31.39	33.53	sand and gravel	Sandy gravel, sandy gravel, reddish brown (5YR5/4) 15% moderate plasticity fines, 30% fine to coarse sand, 55% fine to coarse gravel.
G&M Inc 604	33.53	35.05	sand and clay	Clayey sand, sandy clay, reddish brown (5YR5/4) 20–25% moderate plasticity fines, 10% gravel, 65–70% sand.
G&M Inc 604	35.05	36.58	Gravel	Gravel Sandy gravel, reddish brown (5YR5/4).

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 604	36.58	39.62	sand, clay and gravel	Silty gravel, silty gravel-sandy gravel, reddish brown, 15% low plasticity fines, 10% fine to coarse sand, 75% fine to coarse sand, 75% fine to coarse gravel, Fe oxide staining on grains, occasional cobbles.
G&M Inc 604	39.62	42.67	sand, clay and gravel	Silty sand to sand, silty sands-gravelly sand, reddish brown, 10–20% low plasticity fines, 60% fine to coarse sand, 20–30% fine to coarse gravel.
G&M Inc 604	42.67	48.77	sand and gravel	Sandy gravel, sandy gravel, reddish brown, 10% low plasticity fines, 30% fine to coarse sand, 60% fine to coarse gravel, Fe oxide staining on some grains occasional cobbles.
G&M Inc 604	48.77	54.86	clay, sand and gravel	Clayey gravel, sandy clay gravel, reddish brown, 20% moderate plasticity fines, 15% fine to coarse sand, 65% gravel and cobbles. At 164 ft hard streak.
G&M Inc 604	54.86	60.96	sand and clay	Clayey sand, sandy clay, brown (7.5YR. 5/4) 20% moderate plasticity fines, 60% fine to coarse sand, 20% gravel and cobbles. At 196 ft cobbles.
G&M Inc 604	60.96	64.01	sand and gravel	Sandy gravel, sandy gravel, brown (7.5YR5/4), 10% low plasticity fines, 30% fine to coarse sand, 60% gravel and cobbles.
G&M Inc 604	64.01	74.68	sand and gravel	Sandy gravel/gravelly sand, gravelly sand-CP, brown (7.5YR5/4), 10–15% low plasticity fines, 40–50% sand, 40–50% gravel and cobbles.
G&M Inc 604	74.68	83.82	sand and gravel	Sandy gravel, sandy gravel, Gravel brown (7.5YR5/4), 10% low plasticity fines, 30% fine to coarse sand, 60% fine to coarse gravel, occasional cobbles.
G&M Inc 604	83.82	88.39	sand and trace gravel	Gravelly sand, gravelly sand, brown (7.5YR5/4), 10% low plasticity fines, 70% sand, 20% gravel and cobbles. At 280 ft gravelly sand.
G&M Inc 604	88.39	91.44	sand and clay	Clayey sand, sandy clay, brown (7.5YR5/4) 20–25% low-moderate plasticity fines, 70–75% fine to medium sand, ≤10% gravel, stringers of cobbles.
G&M Inc 604	91.44	96.01	sand and trace gravel	Sand, gravelly sand, brown (7.5YR5/4) 10% fines, 85% fine to coarse sand, 5% gravel. At 308 ft hard drilling.
G&M Inc 604	96.01	97.54	sand and clay	Clayey sand, sandy clay, brown (7.5YR5/2) 20% moderate plasticity fines, 70% sand, 10% gravel.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 604	97.54	100.58	sand and clay	Clayey sand, sandy clay, with stringers of gravel.
G&M Inc 604	100.58	102.11	sand, clay and gravel	Silty sand, gravelly sand-silty sands, very pale brown (10YR8/3) very fine to medium grain sand, well indurated, friable 30% low plasticity fines, 15% gravel.
G&M Inc 604	102.11	102.72	sand, clay and gravel	Gravelly sand, gravelly sand, brown (10YR5/3) medium to coarse-grained sand with silty clays, 20–30% gravel, deeply weathered.
G&M Inc 604	102.72	105.16	clay, sand and gravel	Clayey gravel, sandy clay gravel, brown (10YR5/3) 10–40% coarse sand, silty clays, 50% well graded gravel, fragments of milky quartz, quartzite and green metamorphic rocks. At 344 ft water level ≈323.16 ft.
G&M Inc 604	105.16	106.68	clay, sand and gravel	Sandy silts, silt and very fine sand, light olive gray (5YR6/2) Static water at 323.16 ft At 347 ft clayey silt, silt and very fine sand, light gray (5YR7/2). Fine-grained clayey silt and minor (<5%), gravelly sands.
G&M Inc 604	106.68	109.73	sand and trace gravel	sand, static water level 322.9 ft, elevation 2,447.05 ft) well graded sands, brown (7.5YR5/4) Fine to medium-grained, well graded sand, 3% cobbles of milky to light gray quartz sands 30% quartz, 60% feldspar, 10% other, weakly weathered, well cemented. At 356 ft introduction of cobbles of reddish brown, quartzite moderately weathered.
G&M Inc 604	109.73	111.56	sand, clay and gravel	Static water level 357.5 ft, elevation 2,412.45 ft. At 360 ft sand cemented and mixed with 3–5% fine to medium-grained clayey gravel of moderately weathered quartzite and metamorphic rocks.
G&M Inc 604	111.56	112.17	sand, clay and gravel	Silty gravel, silty gravel, brown (7.5YR5/4) fine-grained silts and 90% fine gravel, quartzite, quartz and metamorphic and volcanic rocks, weakly weathered.
G&M Inc 604	112.17	114.30	sand and clay	Silty sand, silty sands, brown (7.5YR5/4) medium to coarse-grained sand and fine silt, fragments of quartz, quartzite, weakly weathered, and minor metamorphic rocks.
G&M Inc 604	114.30	115.82	sand and clay	Silty sand, static water level 346.15 ft, elevation 2423.80 ft. Silty sands, brown (7.5YR5/4) fine to medium-grained, well graded sand, 10% quartz fragments/cobbles, well cemented, more silts than before.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 604	115.82	118.87	sand and clay	Silty sand, static water level 374.25 ft, elevation 2,395.70. Silty sands, brown (7.5YR5/4) fine to medium-grained sand with ≈5–15% silts and clays, 50% of sand is milky with quartz fragments, poorly cemented.
G&M Inc 604	118.87	121.31	sand and clay	Silty sand, static water level 319.43 ft, elevation 2,450.52 ft. Silty sands, brown (7.5YR5/4) same as above, except more sand and silt (to 25% partially cemented sands.
G&M Inc 604	121.31	123.44	clay, sand and gravel	Silty clay, clay, light brown (7.5YR6/4) fine silty clay, so ft At 400 ft gravelly clay, clay, light brown (7.5YR6/4) fine-grained clay (soft), ≈10% fine-grained gravel of fragments of quartz and metamorphic rocks.
G&M Inc 604	123.44	124.97	sand and clay	Clayey sand, sandy clay, brown (7.5YR6/4) medium to coarse sand and 10 clay and 1% fine gravel, sand fragments of quartz, quartzite and metamorphic rocks.
G&M Inc 604	124.97	126.49	sand, clay and gravel	Silty gravel, silty gravel, water level ≈367.25 ft, light reddish brown (5YR6/4) fine gravel, 5–10% silts, gravel fragments 60% quartz, 30% quartzite and 10% metamorphic and other rocks. Rig chatter while drilling.
G&M Inc 604	126.49	128.02	sand and trace gravel	Gravelly sand, well graded sand, brown (7.5YR4/4), coarse sand 60%, 40% fine gravel, gravel fragments 50% reddish brown quartzite, 40% quartz,10% other rocks, rig chatter.
G&M Inc 604	128.02	129.84	sand, clay and gravel	Gravelly sand, water level ≈321.47 ft well graded sands, reddish brown (5YR4/4) gravelly sand, 5% silts, 80% coarse sands, 15% gravel, 80% reddish brown quartzite, 15% quartz, other rock deeply weathered, quartzite, moderate weathering on others. Rig chatter and hard drilling (415–427 ft).
G&M Inc 604	129.84	131.06	sand and trace gravel	Gravelly sand, well graded sand, pale brown (10YR6/3) medium to coarse-grained sand, 5–10% fine gravel, fragments quartz, quartzite and metamorphic rocks.
G&M Inc 604	131.06	132.59	sand, clay and gravel	Gravelly sand, water level ≈321.0 ft, well graded sand, light yellowish brown (10YR6/4) 80–85% medium to coarse sand, 10–15% fine gravel, 5% silts, sand and gravel fragments of 20% quartz, 60% quartzite, 20% other metamorphic rocks. Very hard drilling 429–430 ft.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 604	132.59	132.89	sand and trace gravel	Gravelly sand, water level ≈320.9 ft, well graded sand, pale brown (10YR6/3) 80–90% medium to coarser-grained sand partially to uncemented, 10–20% fine to coarse gravel. Fragments, 50% quartz, 30% quartzite, 20% metamorphic rocks. Total depth 436.2 drilling completed 2/20/90
G&M Inc 605	0.00	5.79	sand, clay and gravel	Silty gravel, silty gravel (1/8–1 in), poorly sorted, sub-rounded, light brown.
G&M Inc 605	5.79	13.72	sand, clay and gravel	Silty sands, silty sand and gravel (1/8–1/2 in) poorly sorted, rounded, light brown. At 42 ft gravelly sand, medium to coarse sand, rounded, 30% 1/4–1/2 in angular gravel.
G&M Inc 605	13.72	25.91	sand, clay and gravel	Gravelly sand-sandy gravel, 50% 1/4–1 in gravel, medium to coarse same poorly sorted. At 50%, cemented silty fine to medium sand, 50% 1/4–3/4 in gravel, brown (7.5YR5/2). At 57 ft increase in silt (10%). At 60 ft gravelly sand, medium to coarse sand, rounded, 20% 1/4 in gravel, subrounded, brown (7.5YR5/2). At 71 ft, gravelly sand, 1/4–1/2 in gravel, subrounded (20%) fine to medium sand (80%) brown (7.5YR5/2). At 77 ft gravelly sand, fine to coarse sand, rounded 30–40% 1/4 in gravel, 1/2 in.
G&M Inc 605	25.91	30.48	sand, clay and gravel	Sandy gravel, 1/4–1/2 in gravel, subrounded, 30% silty, fine to coarse sand, poorly sorted. At 88 ft sandy gravel, medium to coarse sand 30% 1/4 in gravel, subrounded 70%, brown (7.5YR5/2).
G&M Inc 605	30.48	33.53	sand, clay and gravel	Silty sands, silty fine to coarse sand, 30% 1/4 in gravel, 1/2 in subrounded, brown (7.5YR5/4). At 104 ft, 1/4–1/2 in gravel, 30% silty fine to coarse sand.
G&M Inc 605	33.53	35.05	sand and clay	Silty sands-gravelly sand, Cemented silt and fine sand (10–20%) 80–90% 1/8–1/2 in gravel, light brown (7.5YR6/4).
G&M Inc 605	35.05	36.58	sand, clay and gravel	Sandy clay gravel, clayey sand gravel, 1/4–3/4 in.
G&M Inc 605	36.58	38.10	sand, clay and gravel	Silty sands, clayey fine to coarse sand, 20–30% 1/4–1/2 in gravel, subangular, brown (7.5YR5/4).
G&M Inc 605	38.10	41.15	sand, clay and gravel	Gravelly sand-sandy gravel, 40–50% 1/4–1/2 in gravel.
G&M Inc 605	41.15	45.72	sand, clay and gravel	Gravelly sand, silty fine to coarse sand, 30% 1/4–1/2 in gravel, subrounded, brown (7.5YR5/4). At 140 ft gravelly sand, medium to coarse sand, subrounded, 20% 1/8–1/4 in gravel, trace of clay, brown (7.5YR5/4).

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 605	45.72	47.24	sand, clay and trace gravel	Silty sands, silty fine to coarse sand, 5% gravel, subangular, light brown (7.5YR6/4).
G&M Inc 605	47.24	48.77	sand and gravel	Sandy gravel, poorly sorted, 1/4–1 in gravel, subangular, 30% medium to coarse sand.
G&M Inc 605	48.77	53.64	sand, clay and gravel	Gravelly sand, silty fine to coarse sand, 40% 1/4–1/2 in gravel, subrounded, brown (7.5,YR5/4). At 165 ft 20% 1/4 in gravel.
G&M Inc 605	53.64	56.08	sand, clay and gravel	Sandy gravel-gravelly sand, clayey gravel, 1/4–1/2 in, 40% fine to coarse sand, subrounded, brown (7.5YR5/4).
G&M Inc 605	56.08	57.91	clay, sand and gravel	Sandy clay, clayey fine to medium sand, 10% 1/4–1/2 in gravel, subrounded.
G&M Inc 605	57.91	60.96	clay, sand and gravel	Sandy clay-gravelly sand, clayey fine to coarse sand, 20% 1/4–1/2 in gravel, subrounded, brown (7.5YR5/4).
G&M Inc 605	60.96	62.18	clay, sand and gravel	Gravelly sand, clayey fine to coarse sand, subangular1/2 in gravel, 30% brown (7.5YR5/4).
G&M Inc 605	62.18	65.23	sand and gravel	Sandy gravel, 1/4–1/2 in subrounded gravel, 40%, medium to coarse sand, brown (7.5YR5/4).
G&M Inc 605	65.23	66.75	sand and clay	Gravelly sand, clayey fine to coarse sand, 10% 1/4 in subangular gravel.
G&M Inc 605	66.75	68.28	sand and clay	Gravelly sand, 30%, 1/4–1/2 in subangular gravel, brown (7.5YR5/4).
G&M Inc 605	68.28	70.10	sand, clay and gravel	Sandy gravel, 1/4–1 in subrounded gravel, 30% clayey sand.
G&M Inc 605	70.10	73.15	sand and gravel	Gravelly sand, medium to coarse sand, 40% 1/4–3/4 in gravel, subrounded, brown (7.5YR5/4).
G&M Inc 605	73.15	74.68	sand, clay and gravel	Gravelly sand-silty sands, silty fine to medium sand, 30% subrounded 1/4–3/4 in gravel, brown (7.5YR5/4).
G&M Inc 605	74.68	76.20	sand and clay	Silty sands, fine to medium sand, silty.
G&M Inc 605	76.20	77.72	sand, clay and gravel	Sandy gravel-silty gravel, 1/4–3/4 in rounded gravel, 30% fine to coarse silty sand, brown (7.5YR5/4).

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 605	77.72	80.47	sand, clay and gravel	Silty sands-gravelly sand, fine to medium sand silty, 30% subrounded gravel.
G&M Inc 605	80.47	82.30	sand and gravel	Gravelly sand, fine to coarse sand, clean 10% 1/4 in gravel, subrounded, brown (7.5YR4/2).
G&M Inc 605	82.30	85.34	sand and gravel	Sandy gravel, medium to coarse sand, 80%, 1/4–1/2 in gravel, subrounded, clean brown (7.5YR4/2).
G&M Inc 605	85.34	86.56	sand, clay and gravel	Silty gravel, silty 1/4–3/4 in gravel, 20% medium to coarse sand, brown (7.5YR4/2).
G&M Inc 605	86.56	88.39	sand, clay and gravel	Gravelly sand, silty fine to coarse sand, 20% 1/4–1/2 in gravel.
G&M Inc 605	88.39	94.49	sand and clay	Silt and very fine sand, 290, brown, slightly clayey silt (10YR5/3).
G&M Inc 605	94.49	97.54	sand and gravel	Silt and very fine sand, 10% 1/4–1/2 in subangular gravel, pale brown (10YR6/3). At 315 ft no gravel. At 320 ft wait for water, no water.
G&M Inc 605	97.54	100.28	sand, clay and gravel	Silt and very fine sand-gravelly sand, brown indurated siltstone to very fine-grained sandstone (10YR5/3). At 325 ft, 20% rounded 1/2–1 in gravel.
G&M Inc 605	100.28	102.11	sand and gravel	At 330 ft water level ≈309.23 ft (15 hrs.) gravelly sand, 40% 1/2 –1 in gravel, rounded to subrounded, (10YR6/2) light brownish gray (299.40 ft).
G&M Inc 605	102.11	114.30	sand and clay	Silty sands, very cemented siltstone to very fine-grained sandstone, 10% coarse sand (10YR6/2) light brownish gray. At 340 ft water level ≈309.42 ft, 2 hr, rising (-305.54). At 350 ft water level ≈313.72 ft, (1 hr), rising (-298.20). At 360 ft water level ≈314.25 ft (4 hr), rising (-310.28). At 361 ft silty sands, slightly indurated silt to very fine sand, 20% 1/4–1 in gravel subangular (10YR6/2). Light brownish gray and light gray (10YR7/2). At 370 ft water level ≈338.05 ft (1 hr), rising (-317.61).

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
G&M Inc 605	114.30	127.10	sand, clay and trace gravel	Silt and very fine sand, Grayish soft clayey silt, slightly sticky, smooth light brownish gray (10YR6/2). At 380 ft water level ≈289.75 ft (15 hrs) (-279.33). At 390 ft water level ≥ 300 ft (1 hr), rising, silt and very fine sand, indurated silt, no clay, brown (10YR5/3). At 396 ft clayey sand, brown clayey silt, indurated. At 400 ft water level ≈382 ft (1.5 hr) (-366.16). At 401 ft clayey sand, indurated clayey silt, brown (10YR5/3), 5% 1/4–1/2 in subangular gravel. At 410 ft water level ≈337.73 ft (after 1 hr) (no gravel) (-332.13). At 412 ft clayey sand, silt, slightly indurated, brown (10YR5/3). At 415 ft 10% medium to coarse sand.
G&M Inc 605	127.10	127.71	sand, clay and trace gravel	Gravelly sand, 417.5 ft slight rig chatter making water.
G&M Inc 605	127.71	129.54	sand	At 420 ft silty sands, 60% medium to coarse sand, brown (10YR5/3), 40% light brownish gray (10YR6/2), slightly indurated. At 420 ft water level ≈317.5 ft (after 17 hrs) (-313.5). At 424 ft heavy rig chatter.
G&M Inc 605	129.54	132.59	sand, clay and gravel	Sandy gravel, 40% angular gravel chips 30% medium to coarse sand, light brown silt, slightly indurated. At 430 ft, gravel (1/4–1/2 in cobbles (?). Angular chips, 20% light brown, slightly indurated silt.
G&M Inc 605	132.59	134.11	sand, clay and gravel	Silty gravel, cobble chips, angular medium to coarse sand sized grains (heavy rig chatter) 10% silt, indurated. At 440 ft water level -319.64 ft (16 hrs), total depth 440 ft.
GSI 304	0.00	0.91	sand, clay and gravel	Fill, sandy gravel with silt, brown.
GSI 304	0.91	3.35	sand, clay and gravel	Sandy gravel with silt, brown with cobbles partially cemented.
GSI 304	3.35	4.11	sand, clay and gravel	Sand with gravel, silt, light brown.
GSI 304	4.11	4.42	sand and gravel	Cemented sandy gravel, light brown.
GSI 304	4.42	4.88	sand, clay and gravel	Gravelly sand with silt, brown.
GSI 304	4.88	6.10	sand, clay and gravel	Sand with silt, gravel, brown.
GSI 304	6.10	6.71	sand, clay and gravel	Sandy gravel with silt, brown.
GSI 304	6.71	8.23	sand, clay and gravel	Sand with gravel, silt, brown. With cobbles.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
GSI 304	8.23	11.28	sand, clay and gravel	Silty sand with gravel, brown.
GSI 304	11.28	15.24	sand, clay and gravel	Sandy gravel with silt, brown.
GSI 304	15.24	16.15	sand, clay and gravel	Sandy gravel with occasional cobbles, silt, brown.
GSI 304	16.15	16.76	sand, clay and gravel	Sand with gravel, silt, light brown.
GSI 304	16.76	17.68	sand, clay and gravel	Gravelly sand with silt, light brown.
GSI 304	17.68	21.95	sand, clay and gravel	Sandy gravel with silt, occasional. Cobbles, light brown.
GSI 304	21.95	23.77	sand, clay and gravel	Gravelly sand with silt, clay, light brown. Cobble zone 77–78.
GSI 304	23.77	24.69	sand, clay and gravel	Gravelly silt with sand, clay, light brown.
GSI 304	24.69	28.35	sand, clay and gravel	Silty gravel with sand, occasional. Cobbles, light brown. Cobble zone 89–90.
GSI 304	28.35	30.48	sand, clay and gravel	Gravel, s/clay, silt, light brown.
GSI 304	30.48	33.83	sand, clay and gravel	Gravel with clay, silt with small clay layers, light brown.
GSI 304	33.83	34.14	clay, sand and gravel	Clayey gravel with sand, light brown.
GSI 304	34.14	35.36	sand, clay and gravel	Sandy gravel with silt, light brown.
GSI 304	35.36	38.10	clay, sand and gravel	Clayey gravel with sand, light brown. Cobble zone 119–120.
GSI 304	38.10	40.23	sand, clay and gravel	Gravelly sand with silt, light brown. With cobbles.
GSI 304	40.23	44.81	sand, clay and gravel	Silty gravel with gravel, occasional. Cobbles, brown/gray. Cobbles zone 142–143.
GSI 304	44.81	45.11	clay, sand and gravel	clay gravel with cobbles, light brown.
GSI 304	45.11	45.72	sand, clay and gravel	Silty gravel with occasional. Cobbles, light brown.
GSI 304	45.72	46.33	sand, clay and gravel	Silty gravel with occasional. Cobbles, light brown.
GSI 304	46.33	49.38	clay, sand and gravel	Clayey gravel with sand, light brown. Cobble zone 156–157. Cobble zone 159–160.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
GSI 304	49.38	51.21	sand, clay and gravel	Silty sand with gravel, brown, clay, light brown. With cobbles.
GSI 304	51.21	60.96	clay, sand and gravel	Clayey gravel with sand, silt, cobbles, light brown. Cobble zone 173–174, cobble zone 176–177, cobble zone 181–182, cobble zone 184–187, cobble zone 194–197.
GSI 304	60.96	65.84	clay, sand and gravel	Clayey gravel with sand, silt, cobbles, light brown. Cobble zone 201–202, cobble zone 204–209.
GSI 304	65.84	66.75	clay, sand and gravel	Clayey sand with gravel, dark brown with cobbles.
GSI 304	66.75	70.10	clay, sand and gravel	Clayey gravel with sand, silt, cobbles, light brown.
GSI 304	70.10	73.15	clay, sand and gravel	Clayey sand with gravel, silt, dark brown. Cobble zone 236–238.
GSI 304	73.15	75.59	clay, sand and gravel	Sandy clay with gravel, cobbles, dark brown. Cobble zone 245–248.
GSI 304	75.59	76.20	sand, clay and gravel	Silty sand with gravel, clay, dark brown.
GSI 304	76.20	80.16	sand, clay and gravel	Silty sand with gravel, clay, dark brown.
GSI 304	80.16	81.69	sand, clay and gravel	Silty with sand, gravel, brown. With cobbles.
GSI 304	81.69	87.78	sand and clay	Clayey sand with silt, gravel, brown.
GSI 304	87.78	88.39	sand and clay	Clayey sand with silt, gravel, brown.
GSI 304	88.39	90.68	clay, sand and gravel	Silty clay with gravel, light brown.
GSI 304	90.68	91.44	clay, sand and gravel	Sandy clay with gravel, light brown white in color.
GSI 304	91.44	92.66	clay, sand and gravel	Sandy clay with gravel, white.
GSI 304	92.66	93.57	sand, clay and gravel	Sandy clay, light brown and light green clay.
GSI 304	93.57	95.10	clay, sand and gravel	Sandy silt with gravel, clay, light green light brown.
GSI 304	95.10	96.62	sand, clay and gravel	Silty sand with gravel, light brown.
GSI 304	96.62	97.38	clay, sand and gravel	Silty clay with gravel, light green.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
GSI 304	97.38	97.84	sand, clay and gravel	Silty sand with gravel, light green.
GSI 304	97.84	98.76	clay, sand and gravel	Sandy silt with gravel, light green.
GSI 304	98.76	99.67	sand, clay and gravel	Silty sand with gravel, clay, light brown.
GSI 304	99.67	100.58	sand, clay and gravel	Clayey silt with gravel, sand, light green.
GSI 304	100.58	102.11	clay, sand and gravel	Sandy silt with gravel, clay, light green light brown.
GSI 304	102.11	103.33	sand, clay and gravel	Silty sand with gravel, clay, light brown with silty clay layers.
GSI 304	103.33	106.68	sand, clay and gravel	Clayey silt with gravel, sand, light green light brown with silty sand and silty clay layers.
GSI 304	106.68	107.14	sand, clay and gravel	Clayey silt with gravel, silt, light, brown and light green.
GSI 304	107.14	108.51	sand, clay and gravel	Silty sand with gravel and small clayey silt layers, white to light brown.
GSI 304	108.51	109.42	clay, sand and gravel	Clayey sand with gravel white.
GSI 304	109.42	111.25	clay, sand and gravel	clay silt with gravel, light brown and light green.
GSI 304	111.25	113.08	sand, clay and gravel	Silty sand with green/ light brown with white clayey silt layers.
GSI 304	113.08	114.60	sand, clay and gravel	clay silt with gravel, light brown and light green.
GSI 304	114.60	115.82	clay, sand and gravel	Sandy silt with gravel, light brown/light green with clay.
GSI 304	115.82	121.92	clay, sand and gravel	Bottom at 380 ft.
GSI 305	0.00	2.74	sand, clay and gravel	Sandy gravel with silt, light brown with cobbles partially cemented with clay.
GSI 305	2.74	3.66	sand, clay and gravel	Gravel sand with silt, brown.
GSI 305	3.66	3.96	sand and gravel	Cemented sand and gravel, light brown.
GSI 305	3.96	5.18	sand, clay and gravel	Sand gravel with silt, brown.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
GSI 305	5.18	7.01	sand, clay and gravel	Sandy gravel with silt, brown.
GSI 305	7.01	9.14	sand, clay and gravel	Sand gravel with silt, brown with cobbles.
GSI 305	9.14	10.97	sand, clay and trace gravel	Gravelly sand with silt, brown.
GSI 305	10.97	15.24	sand, clay and gravel	Sandy gravel with silt, cobbles, brown.
GSI 305	15.24	18.90	sand, clay and gravel	Sandy gravel with silt, cobbles, brown.
GSI 305	18.90	19.81	sand, clay and trace gravel	Gravelly sand with silt, cobbles, brown.
GSI 305	19.81	28.04	sand, clay and gravel	Sandy gravel with silt, cobbles, brown. Large gravel 67–90 cm.
GSI 305	28.04	28.35	clay, sand and gravel	Sandy clay with gravel, light brown.
GSI 305	28.35	28.65	sand, clay and gravel	clay gravel with silt, light brown.
GSI 305	28.65	29.87	sand, clay and gravel	Silty gravel with sand, clay, cobbles, light brown.
GSI 305	29.87	30.48	clay, sand and gravel	Clayey gravel with sand, silt, cobbles, light brown.
GSI 305	30.48	30.94	clay, sand and gravel	Clayey gravel with silt, sand, light brown.
GSI 305	30.94	31.70	sand, clay and gravel	Sandy gravel with silt, cobbles, brown.
GSI 305	31.70	44.81	clay, sand and gravel	Clayey gravel with silt, sand, light brown. Cobble zone 105–109 ft, 117–121 ft, 124–126 ft, 134–139 ft, 133–134 ft.
GSI 305	44.81	45.42	clay, sand and gravel	Clayey sand with gravel, light brown.
GSI 305	45.42	45.72	clay, sand and gravel	Clayey gravel, light brown.
GSI 305	45.72	70.10	clay, sand and gravel	Clayey gravel with sand, silt, cobbles, light brown. Cobble zone 150–164 ft, 168–169 ft, 173–175 ft, 184–189 ft, 196–200 ft. Clayey gravel with sand, silt, cobbles, light brown. Cobble zone 202–204 ft, 214–219 ft, 221–222 ft, 226–232 ft
GSI 305	70.10	71.93	clay, sand and gravel	Clayey sand with silt, gravel, light brown.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
GSI 305	71.93	76.20	clay, sand and gravel	Clayey gravel, sand, silt, cobbles, light brown.
GSI 305	76.20	79.25	clay, sand and gravel	Clayey gravel with sand, silt, cobbles, light brown. Cobble zone 255–257.
GSI 305	79.25	84.12	clay, sand and gravel	Clayey sand with gravel, clay, cobbles light brown. More cobbles.
GSI 305	84.12	84.73	sand and clay	Clayey sand with silt, light brown.
GSI 305	84.73	85.34	clay and sand	Sandy clay, light brown and light green.
GSI 305	85.34	87.17	clay and sand	Clay with sand, gravel, light brown and light green.
GSI 305	87.17	91.44	sand and gravel	Sand and clay, light brown and light green, alternating seams.
GSI 305	91.44	91.74	sand and gravel	Sand and clay, light brown, light green.
GSI 305	91.74	92.81	clay and sand	Sand clay, light brown and light green.
GSI 305	92.81	94.34	clay and sand	Sandy clay, light brown and light green.
GSI 305	94.34	96.01	clay and sand	Sand clay, light green.
GSI 305	96.01	97.54	sand and clay	Silty sand with clay, light brown.
GSI 305	97.54	103.63	sand and clay	Clayey sand with silt, light brown, light green.
GSI 305	103.63	105.16	sand and clay	Clayey sand with silt, light brown, light green.
GSI 305	105.16	106.68	sand and clay	Silty sand with clay, white light brown.
GSI 305	106.68	110.34	sand, clay and gravel	Silty sand with gravel, clay, white light brown with brown silty sand layers.
GSI 305	110.34	112.47	sand and clay	Sandy clay with silt, light green/ light brown.
GSI 305	112.47	114.00	sand and clay	Clayey sand with silt, white light brown.
GSI 305	114.00	115.82	clay and sand	Sandy clay, light green, light brown.
GSI 305	115.82	121.92	clay and sand	Bottom at 380 ft.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
GSI 306	0.00	0.91	sand and trace gravel	Gravelly sand, brown.
GSI 306	0.91	2.29	sand, clay and gravel	Sandy gravel with trace of silt, gravel, brown. Partially cemented, (very dense to m. hard).
GSI 306	2.29	2.59	sand and gravel	Cemented sand and gravel, light brown.
GSI 306	2.59	4.57	sand, clay and trace gravel	Gravelly sand with silt, brown.
GSI 306	4.57	5.49	sand, clay and gravel	Sandy gravel with silt, cobbles, brown.
GSI 306	5.49	6.71	sand, clay and gravel	Silty sand with gravel, clay, brown.
GSI 306	6.71	8.84	sand, clay and gravel	Sand gravel with silt, cobbles, brown.
GSI 306	8.84	10.06	sand, clay and trace gravel	Gravelly sand with silt, brown.
GSI 306	10.06	14.63	sand, clay and trace gravel	Gravelly sand with silt, cobbles, light brown. More cobbles.
GSI 306	14.63	17.68	sand, clay and trace gravel	Gravelly sand with silt, brown.
GSI 306	17.68	20.42	sand, clay and gravel	Sandy gravel with silt, cobbles, brown.
GSI 306	20.42	21.03	sand, clay and gravel	Gravelly sand with silt, brown.
GSI 306	21.03	24.38	sand, clay and gravel	Sandy gravel with silt, cobbles, brown.
GSI 306	24.38	35.66	clay, sand and gravel	Clayey gravel with sand, silt, cobbles, light brown. cobble zone 82–86. cobble zone 89–91. cobble zone 93–97. Occur. Silty clay layers. cobble zone 105–106. cobble zone 108–109. cobble zone 112–114.
GSI 306	35.66	38.40	sand, clay and gravel	Sandy gravel with clay, silt, cobbles light brown. cobble zone 124–126.
GSI 306	38.40	85.34	clay, sand and gravel	Clayey gravel with sand, silt, cobbles, light brown. Cobble zone 160–162 ft, 164–166 ft, 167–170 ft, 172–173 ft, 180–190 ft, 193–195 ft, 196–201 ft, 207–209 ft, 212–215 ft, 220–222 ft. Very frequent cobbles and large gravel 225–245 ft. Cobble zone 248–252 ft, 257–263 ft., 276–278 ft.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
GSI 306	85.34	86.26	sand and clay	Clayey sand with trace gravel. light brown.
GSI 306	86.26	88.39	clay, sand and gravel	Sandy clay with gravel, light brown and light green.
GSI 306	88.39	91.44	clay, sand and gravel	Silty clay with sand, gravel, light brown and light green.
GSI 306	91.44	92.96	clay, sand and gravel	Sandy clay with sand, gravel, light green light brown.
GSI 306	92.96	93.57	clay and sand	Sand clay, light green with white silty clay layers.
GSI 306	93.57	100.58	clay and sand	Silty clay with sand, light green. White with light green sandy clay layers and with light green sandy silt layers.
GSI 306	100.58	105.77	sand, clay and gravel	Silty sand with gravel, light green. White silty clay layers.
GSI 306	105.77	106.07	clay and sand	Silty clay with sand, white.
GSI 306	106.07	106.68	clay and sand	Sandy silt with clay, light brown and light green.
GSI 306	106.68	107.29	clay and sand	Sandy silt with clay, white light green.
GSI 306	107.29	107.75	clay and sand	Silty clay with sand, white.
GSI 306	107.75	110.95	clay and sand	Sandy silt, light brown and light green.
GSI 306	110.95	112.78	sand and clay	Silty sand with clay, brown with white silty clay lenses.
GSI 306	112.78	115.82	clay and sand	Sandy silt with clay, light brown with brown silty clay lenses.
GSI 306	115.82	121.92	clay and sand	Bottom at 380 ft.
IT Corp 500	0.00	2.13	sand	Pale brown (10YR6/3) sand, dry, well graded, subangular.
IT Corp 500	2.13	5.18	sand, clay and gravel	Yellowish brown (10YR5/4) Gravel with sand, moist, well graded, subrounded, trace clay. Contains rhyolite fragments, quartz, feldspar, chert, and minor mafic minerals.
IT Corp 500	5.18	7.01	sand and gravel	Very pale brown (10YR7/3) sand, moist, well graded, subangular. Contains rhyolite fragments and minor mafic minerals.
IT Corp 500	7.01	8.53	Gravel	Very pale brown (10YR7/3) gravel, moist, well graded, subangular. Contains rhyodacite and rhyolite fragments.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
IT Corp 500	8.53	10.06	sand and gravel	Very pale brown (10YR7/3) sand with gravel, dry, well graded sand, subangular, gravel to 1/4 in. Predominantly mineralogy is rhyolite and 5 to 10% quartz.
IT Corp 500	10.06	11.58	Gravel	Very pale brown (10YR8/4) gravel, dry, well graded, sub-angular, gravel less than 1/2 in.
IT Corp 500	11.58	13.11	nonwelded tuff	Pink (5YR7/4) sand, dry, well graded, subangular.
IT Corp 500	13.11	14.63	nonwelded tuff	Pink (5YR7/4) gravel, dry, well graded, subrounded, gravel <1 in. Predominant mineralogy is rhyolite and dacite.
IT Corp 500	14.63	16.15	nonwelded tuff	Pink (5YR7/4) sand, dry, well graded, subangular, trace gravel to 1/4 in diameter.
IT Corp 500	16.15	18.29	nonwelded tuff	Pink (5YR7/4) sandy gravel, dry, well graded.
IT Corp 500	18.29	19.20	nonwelded tuff	Pink (7.5YR7/3) to black (7.5YR2/0) gravel with sand, dry, coarse-grained sand, gravel to 3/4 in, well graded, angular. Grains, consist of dacite and rhyolite.
IT Corp 500	19.20	22.25	sand and gravel	Light brown (7.5YR6/4) sand with gravel, dry, gravel to 1/4 in, well graded, subangular.
IT Corp 500	22.25	23.77	sand and gravel	Light brown (7.5YR6/4) sandy gravel, dry, gravel >1 in diameter, well graded, subangular. Consists of rhyolite and rhyolite tuff fragments. Loss of air to formation, slower drilling.
IT Corp 500	23.77	27.43	nonwelded tuff	Pink (7.5YR7/3) sand, dry, well graded, subangular.
IT Corp 500	27.43	28.35	sand and trace gravel	Gravelly sand. Grains consist of rhyolite, feldspar, quartz, minor mafic minerals, and chert.
IT Corp 500	28.35	30.48	sand and gravel	Gravel with sand, subangular, gravel >1 in diameter.
IT Corp 500	30.48	32.00	sand and gravel	Sandy gravel, subangular, gravel to 1/2 in. Grains consist of dacite and rhyolite.
IT Corp 500	32.00	35.05	sand and gravel	Gravel, dry, subangular, gravel >3/4 in, same sand. Grains consist of rhyolite, tuff, and possibly basalt.
IT Corp 500	35.05	36.58	sand and gravel	Sandy gravel, gravel >1/2 in. Contains rhyolite, feldspar, and quartz.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
IT Corp 500	36.58	37.49	sand and gravel	Gravel with sand, dry, subangular, gravel less than 1/2 in.
IT Corp 500	37.49	39.62	nonwelded tuff	Pink (7.5YR7/3) sand with gravel, dry, subangular, gravel to 1/4 in diameter.
IT Corp 500	39.62	40.54	sand and gravel	Light brown (7YR6/4) gravelly sand, dry, subangular, gravel >1/4 in diameter. Grains consist of rhyolite fragments.
IT Corp 500	40.54	43.59	sand and gravel	Light brown (7.5YR6/4) sandy gravel, dry, subangular, gravel >1 in diameter. Grains consist of rhyolite, dacite, and occasional quartzite and biotite schist.
IT Corp 500	43.59	45.11	nonwelded tuff	Pink (7.5YR7/3) sand, dry, well graded, trace gravel to 1/4 in diameter.
IT Corp 500	45.11	47.24	Gravel	Hard drilling 149 to 151 ft. Pink (7.5YR7/3) gravel, well graded, gravel >3/4 in diameter. Grains predominantly rhyolite, dacite, and occasional quartzite.
IT Corp 500	47.24	48.77	sand and gravel	Brown (7.5YR5/3) gravel with sand, dry, well graded, gravel to 1/2 in diameter. Contains chalcedony filled rhyolite, quartzite, and occasional basalt fragments.
IT Corp 500	48.77	51.21	sand and gravel	Brown (7.5 5/3) sandy gravel, dry, well graded, subangular, gravel to 1/2 in, coarse granted sand. Grains consist of rhyolite, quartzite and basalt.
IT Corp 500	51.21	53.34	sand, clay and gravel	Brown (7.5YR5/4) gravelly sand with silt and clay, dry, well graded, subangular, gravel to 1/2 in diameter.
IT Corp 500	53.34	60.35	sand, clay and gravel	Brown (7.5YR5/4) gravelly sand with silt and clay, dry, well graded, subangular, gravel to 1/2 in diameter. Grains consist of predominantly of rhyolite, and occasional quartzite, quartz, biotite-rich fragments, and basalt fragments.
IT Corp 500	60.35	61.87	nonwelded tuff	Pink (7.5YR7/4) gravelly sand, dry, well graded, subangular, gravel to 1/2 in diameter.
IT Corp 500	61.87	64.01	nonwelded tuff	Pink (7.5YR7/4) gravelly sand, dry, well graded, subangular, gravel to 1/4 in diameter. Grains consists of rhyolite with quartz and feldspar phenocrysts.
IT Corp 500	64.01	64.92	sand, clay and gravel	Brown (7.5YR5/4) gravelly sand, moist, subrounded, gravel to 1/4 in diameter, trace silts and clays.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
IT Corp 500	64.92	67.97	nonwelded tuff	Pink (7.5YR7/3) sandy gravel, dry, subangular, gravel to 1/4 in diameter. Grains consist of rhyolite and dacite, and occasional black glass (obsidian) fragments.
IT Corp 500	67.97	70.10	nonwelded tuff	Pink (7.5YR7/3) sand with gravel, dry, gravel to 3/16 in diameter, medium-grained sand.
IT Corp 500	70.10	71.63	sand and gravel	Brown (7.5YR5/3) gravelly sand, moist, gravel to 1/4 in diameter, coarse-grained sand. Grains predominantly rhyolite and dacite.
IT Corp 500	71.63	74.68	sand and gravel	Light brown (7.5YR6/3) gravelly sand, dry, gravel to 1 in diameter, subangular. Grains consists of rhyolite with quartz phenocrysts.
IT Corp 500	74.68	77.72	sand and gravel	Brown (7.5YR5/3) sandy gravel, moist, coarse-grained sand, gravel to 1/2 in diameter. Grains predominantly rhyolite with minor quartzite, and occasional basalt fragments.
IT Corp 500	77.72	78.64	nonwelded tuff	Pink (7.5YR7/3) gravelly sand, dry, gravel to 1/2 in diameter, coarse-grained sand, subangular.
IT Corp 500	78.64	80.16	nonwelded tuff	Pink (7.5YR7/3) gravelly sand, dry, gravel to 1/2 in diameter. Grains consists of rhyolite, weathered hornblende-bearing dacite, and occasional microcrystalline quartz.
IT Corp 500	80.16	81.69	sand and gravel	Light brown (7.5YR6/4) sand with gravel, moist, subrounded coarse-grained sand, gravel to 3/16 in diameter.
IT Corp 500	81.69	83.21	sand and gravel	Brown (7.5YR5/4) gravel with sand, moist, gravel to 3/4 in diameter. Grains consist of rhyolite and dacite with quartz and feldspar phenocrysts.
IT Corp 500	83.21	84.73	nonwelded tuff	Pink (7.5YR7/3) sand with gravel, moist, subrounded, gravel to 1/4 in diameter.
IT Corp 500	84.73	86.26	sand, clay and gravel	Brown (7.5YR5/4) gravel with silts and clays, moist, subangular, gravel to 1/2 in diameter. Grains consist of rhyolites and dacites, and occasional quartzite fragments.
IT Corp 500	86.26	88.39	sand and gravel	Pale brown (10YR6/3) gravelly sand with clay, moist, subrounded sand grains.
IT Corp 500	88.39	89.92	sand, clay and gravel	Light yellowish brown (10YR6/4) gravelly sand with clay, moist, subangular sand grains.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
IT Corp 500	89.92	90.83	sand	Light gray (10YR7/2) sand, dry, subrounded coarse-grained sand.
IT Corp 500	90.83	90.98	sand and gravel	Very pale brown (10YR7/3) gravelly sand, moist, gravel to 3/16 in diameter, coarse-grained sand, subrounded. Grains consist predominantly of rhyolite and dacite. Total depth 298.56 ft.
IT Corp 501	0.00	4.57	sand and gravel	Dark brown (7.5YR4/4) gravelly sand dry, subrounded gravel >3/4 in diameter. At 10 ft color change to pale brown (10YR6/3) gravel size >11/2 in diameter.
IT Corp 501	4.57	15.24	sand and gravel	color change to light yellowish brown (10YR6/4), sand is very fine to coarse-grained, gravel to 1/2 in diameter.
IT Corp 501	15.24	16.76	sand and gravel	Dark yellowish brown (10YR4/4) sandy gravel, dry subangular to rounded, gravel to 1 in diameter, well graded.
IT Corp 501	16.76	21.34	sand and gravel	Yellowish brown (10YR5/4) gravelly sand, dry, subrounded to rounded, well graded, gravel to 3/4 in diameter.
IT Corp 501	21.34	24.38	sand and gravel	Yellowish brown (10YR5/4) sand with gravel, dry, gravel to 1/2 in diameter.
IT Corp 501	24.38	25.91	sand and gravel	Yellowish brown (10YR) 5/4) gravel with sand, dry, clasts to 11/2 in diameter, well graded.
IT Corp 501	25.91	27.43	sand and gravel	Yellowish brown (10YR5/4) gravelly sand, dry, subangular, gravel to 3/4 in diameter.
IT Corp 501	27.43	31.82	sand and gravel	Yellowish brown (10YR5/4) sandy gravel, dry, subangular to subrounded, gravel to 1 in diameter. At 100 ft slight increase in sand percentage. Total depth 104.4 ft.
Law Eng 101	0.00	0.30	clay, sand and gravel	Silty sands, brown sandy silt with gravel.
Law Eng 101	0.30	2.44	sand, clay and gravel	Silty gravel, Gray-brown silty sandy fine to coarse gravel and cobbles, noncemented.
Law Eng 101	2.44	11.58	sand, clay and gravel	Silty sands, very dense gray-tan silty sand with fine to coarse gravel and occasional cobbles, noncemented with occasional partially cemented layers.
Law Eng 101	11.58	14.33	sand, clay and gravel	Silty sands/silty gravel, very dense gray-tan silty sand and gravel, partially cemented.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Law Eng 101	14.33	15.85	sand, clay and trace gravel	Very dense tan silty sand and scattered gravel, noncemented.
Law Eng 101	15.85	23.77	sand, clay and gravel	Silty sands/silty gravel, very dense gray-tan silty sand and gravel, partially cemented with occasional well cemented layers.
Law Eng 101	24.38	30.48	sand, clay and gravel	Silty sands/silty gravel, very dense gray and brown silty sand and gravel with cobbles, well cemented with a partially cemented layer at 94 ft.
Law Eng 101	30.48	39.62	sand, clay and gravel	Silty sands/silty gravel, very dense gray-tan silty sand and gravel with cobbles, partially cemented by brown argillaceous material.
Law Eng 101	39.62	42.67	sand, clay and gravel	Very dense gray-tan silty sand and gravel with cobbles, well cemented. Boring terminated at 140 ft.
Law Eng 102	0.00	0.91	clay and sand	Silty sands, brown sandy silt, noncemented.
Law Eng 102	0.91	1.83	sand and gravel	Sandy gravel, Gray-brown sandy gravel, noncemented.
Law Eng 102	1.83	5.49	sand, clay and gravel	Silty sands, brown silty fine sand with fine to coarse gravel, noncemented to partially cemented layers.
Law Eng 102	5.49	12.19	sand, clay and gravel	Silty sands/silty gravel, brown silty sandy gravel, partially cemented.
Law Eng 102	12.19	14.33	sand, clay and gravel	Silty sands/silty gravel, brown silty sandy gravel, partially cemented.
Law Eng 102	14.33	18.29	sand, clay and gravel	Silty sands/silty gravel, very dense gray-tan silt and sand with gravel, partially cemented.
Law Eng 102	18.29	24.38	sand, clay and gravel	Silty gravel/Sandy clay gravel, very dense red-brown silty sandy gravel with cobbles, partially cemented by clayey matrix.
Law Eng 102	24.38	28.96	sand, clay and gravel	Silty sands/silty gravel, very dense gray-tan (slight brown) silty sand and gravel with scattered cobbles, noncemented. Boring terminated at 95 ft.
Law Eng 103	0.00	0.76	sand and clay	Silty sands, light gray-brown very fine sand and silt, noncemented.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Law Eng 103	0.76	1.52	clay, sand and gravel	Silty sands, dense brown sandy silt with gravel, noncemented.
Law Eng 103	1.52	3.05	sand, clay and gravel	Silty sands, very dense brown gravel and silty very fine sand, noncemented.
Law Eng 103	3.05	5.49	sand, clay and gravel	Silty gravel, very dense brown-tan sand with gravel and silt,.
Law Eng 103	5.49	7.92	sand, clay and gravel	Silty sands-silty gravel, very dense brown-tan sand with gravel and silt, noncemented.
Law Eng 103	7.92	13.41	sand, clay and gravel	Very dense tan silty sand with gravel, partially cemented.
Law Eng 103	13.41	19.81	sand, clay and gravel	Silty sands-silty gravel, very dense brown silty fine to coarse gravel with fine to coarse sand and trace of clay in partially cemented matrix.
Law Eng 103	19.81	21.95	sand, clay and gravel	Silty sands-silty gravel, very dense brown silty fine to coarse gravel with fine to coarse sand and trace of clay in partially cemented matrix.
Law Eng 103	21.95	24.38	sand, clay and gravel	Silty sands, very dense brown-orange silty gravelly sand within a clayey silt matrix.
Law Eng 103	24.38	30.48	sand, clay and gravel	Silty sands, very dense brown-orange silty gravelly sand within a clayey silt matrix. Boring terminated at 100 ft.
Law Eng 104	0.00	1.52	sand, clay and gravel	Silty sands, brown silt with fine sand and gravel.
Law Eng 104	1.52	2.44	sand, clay and gravel	Silty sands/silty gravel, brown silty sand and gravel, non-cemented.
Law Eng 104	2.44	7.92	sand, clay and gravel	Silty sands/silty gravel, very dense gray-tan silt and gravel with occasional cobble, noncemented to partially cemented.
Law Eng 104	7.92	14.02	sand, clay and gravel	Silty sands, very dense gray-tan silty and sand with fine gravel, noncemented. At 45 ft cobbles encountered.
Law Eng 104	14.02	22.86	sand, clay and gravel	Silty sands, very dense gray-tan silty sand with gravel, partially cemented.
Law Eng 104	22.86	24.38	clay, sand and gravel	Sandy clay, very dense orange-brown fine to coarse sand and gravel in clay (orange) matrix, well cemented.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Law Eng 104	24.38	26.82	clay, sand and gravel	Sandy clay, very dense orange-brown fine to coarse sand and gravel in clay (orange) matrix, well cemented.
Law Eng 104	26.82	47.55	clay, sand and gravel	Sandy clay, very dense orange-brown fine to coarse sand and gravel in clay (orange) matrix, well cemented. At 100 ft greater percent clay matrix. At 120 ft, occurrence of cobbles in some layers. At 140 ft less percent clay matrix. Boring terminated at 156 ft.
Law Eng 105	0.00	1.07	sand and clay	Silty sands, very dense brown silty sand, noncemented.
Law Eng 105	1.07	4.27	sand, clay and gravel	Silty gravel, very dense gray silty sandy gravel with occasional cobbles, noncemented.
Law Eng 105	4.27	7.62	clay, sand and gravel	Silty sands, very dense brown sandy silt with gravel and occasional cobbles, noncemented.
Law Eng 105	7.62	10.36	sand, clay and gravel	Silty gravel, very dense gray-brown silty sandy gravel with cobbles, noncemented to well-cemented.
Law Eng 105	10.36	12.80	sand, clay and gravel	Silty sands, very dense brown silty sand with scattered gravel, partial cementation grading to well-cemented with depth.
Law Eng 105	12.80	15.24	sand, clay and gravel	Silty sands, very dense tan silty sand with gravel, noncemented.
Law Eng 105	15.24	24.38	sand, clay and gravel	Silty sands/silty gravel, very dense gray-tan silty sand and gravel, scattered cobbles, partially cemented.
Law Eng 105	24.38	27.43	sand, clay and gravel	Silty sands/silty gravel, very dense dark gray-brown silty sand and gravel, noncemented.
Law Eng 105	27.43	30.18	sand and clay	Silty sands, very dense gray-tan silty sand, well cemented. Boring terminated at 99 ft.
Law Eng 106	0.00	0.91	clay, sand and trace gravel	Silty sands, dense brown sandy silt with scattered gravel and cobbles, noncemented.
Law Eng 106	0.91	2.13	sand, clay and gravel	Silty gravel, dense brown silty sandy gravel with cobbles, noncemented.
Law Eng 106	2.13	7.32	sand, clay and gravel	Silty sands, very dense gray-tan silty sand with fine gravel, partially cemented.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Law Eng 106	7.32	11.58	sand, clay and gravel	Silty gravel, very dense gray-tan silty sandy gravel with cobbles, noncemented.
Law Eng 106	11.58	18.29	sand, clay and gravel	Silty sands, very dense brown silty sand with gravel and occasional cobbles, noncemented.
Law Eng 106	18.29	24.38	sand, clay and trace gravel	Silty sands, very dense gray-tan silty sand with scattered gravel and occasional cobbles, well cemented.
Law Eng 106	24.38	27.43	sand, clay and trace gravel	Silty sands, very dense gray-tan silty sand with scattered gravel and occasional cobbles, well cemented.
Law Eng 106	27.43	42.06	sand, clay and gravel	Silty sands/silty gravel, very dense tan to brown silty sand and gravel, partially cemented.
Law Eng 106	42.06	48.77	sand and gravel	Silty sands/silty gravel, very dense tan to brown sand and gravel, noncemented. Boring terminated at 160 ft.
Law Eng 107	0.00	1.22	clay and sand	Silty sands, firm brown sandy silt, noncemented.
Law Eng 107	1.22	2.44	sand, clay and gravel	Silty gravel, dense brown silty sandy gravel, noncemented.
Law Eng 107	2.44	6.10	sand, clay and gravel	Silty sands, very dense brown silty sand and gravel scattered cobbles, partially cemented.
Law Eng 107	6.10	8.23	sand, clay and gravel	Silty gravel/gravel, little or no fines, very dense gray-brown and tan silty sandy gravel with cobbles, noncemented to partially cemented.
Law Eng 107	8.23	20.73	sand, clay and gravel	Silty sands/silty gravel, very dense brown and tan silty sand and gravel, scattered cobbles, noncemented.
Law Eng 107	20.73	22.71	sand, clay and gravel	Silty sands/silty gravel, very dense tan silty sand and fine gravel, well cemented. Boring terminated at 74.5 ft,.
Law Eng 301	0.00	3.05	sand, clay and gravel	Brown silty sandy gravel and cobbles, noncemented. Remarks, rock fragments (sand, gravel, cobbles, and boulders) are of intermediate (andesitic or dioritic), felsic (rhyolitic), and, mafic (basaltic) compositions.
Law Eng 301	3.05	6.10	sand, clay and gravel	Brown silty sand with gravel, noncemented.
Law Eng 301	6.10	9.14	sand, clay and gravel	Brown silty sandy gravel and cobbles, noncemented.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Law Eng 301	9.14	35.05	clay, sand and gravel	Brown sandy silt and silty sandy gravel with cobbles, noncemented.
Law Eng 301	35.05	48.77	sand, clay and gravel	Brown silty sand with gravel. Becomes finer with depth. Partially to well-cemented with noncemented zones.
Law Eng 301	48.77	62.48	sand, clay and gravel	Alternating brown silty sandy gravel with cobbles and brown sandy clayey silt. At 180 ft partially to well-cemented.
Law Eng 301	62.48	67.06	sand, clay and gravel	Brown sandy clayey silt, well cemented.
Law Eng 301	67.06	79.25	sand, clay and gravel	Brown silty sandy gravel with cobbles. At 240 ft partially to well-cemented.
Law Eng 301	79.25	91.44	sand, clay and gravel	Alternating brown sandy clayey silt and brown silty sandy gravel. At 280 ft partially to well-cemented.
Law Eng 301	91.44	97.54	sand, clay and gravel	Light brown and tan sandy clayey silt with coarse sand and gravel, well cemented.
Law Eng 301	97.54	103.63	sand, clay and gravel	Color becomes yellow-brown below 325 ft.
Law Eng 301	103.63	112.78	sand, clay and gravel	Red and brown clayey silty with coarse sand and gravel, well cemented. Remarks, rock fragments (sand and gravel) below ≈340 ft are dominantly schistose and of metamorphic origin.
Law Eng 301	112.78	117.35	clay and sand	Brown clayey silt with coarse sand, well cemented. Bottomed at 385 ft.
Law Eng 302	0.00	12.19	sand, clay and gravel	Brown silty clayey sandy gravel with cobbles. Remarks, rock fragments (sand, gravel, cobbles, and boulders) are of intermediate (andesitic or dioritic), felsic (rhyolitic), and, mafic (basaltic) composition.
Law Eng 302	12.19	27.43	clay, sand and gravel	Brown sandy silt with gravel and occasional cobbles.
Law Eng 302	27.43	39.62	sand, clay and gravel	Brown clayey silty sand with gravel and cobbles.
Law Eng 302	39.62	48.77	sand, clay and gravel	Brown sandy gravel with cobbles and a trace of silty clay.
Law Eng 302	48.77	60.96	clay, sand and gravel	Brown sandy silt with clay and gravel, occasional cobbles.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Law Eng 302	60.96	77.72	sand and gravel	Light brown sandy coarse gravel and cobbles with boulders.
Law Eng 302	77.72	85.34	sand, clay and gravel	Light brown clayey silty sand with gravel and occasional cobbles.
Law Eng 302	85.34	97.54	sand, clay and gravel	Brown coarse sandy gravel with cobbles and boulders in a clayey silty fine sand matrix.
Law Eng 302	97.54	108.20	sand, clay and gravel	Brown coarse sandy gravel with cobbles and boulders in a clayey silty fine sand matrix. Bottomed at 355 ft.
Law Eng 303	0.00	10.67	sand, clay and gravel	Brown silty clayey sand and gravel with occasional cobbles. Remarks, rock fragments (sand, gravel, cobbles, and boulders) are of intermediate (andesitic or dioritic), felsic (rhyolitic), and mafic (basaltic) composition.
Law Eng 303	10.67	13.72	sand, clay and gravel	Brown sandy gravel with trace of silty clay.
Law Eng 303	13.72	25.91	sand, clay and gravel	Brown clayey silty sand and gravel with cobbles.
Law Eng 303	25.91	33.53	sand, clay and gravel	Brown sandy gravel and cobbles with trace silty clay.
Law Eng 303	33.53	45.72	sand, clay and gravel	Brown silty sand and gravel with trace clay and cobbles.
Law Eng 303	45.72	54.86	sand, clay and gravel	Brown to red sandy clayey silt with gravel and occasional cobbles.
Law Eng 303	54.86	79.25	sand, clay and gravel	Light brown clayey silty sand and gravel with cobbles and occasional boulders.
Law Eng 303	79.25	94.49	sand, clay and gravel	Brown to red sandy clayey silt with coarse sand and gravel.
Law Eng 303	94.49	97.54	sand, clay and gravel	Yellow to light brown silty clay with coarse sand and gravel.
Law Eng 303	97.54	106.68	sand, clay and gravel	Yellow to light brown silty clay with coarse sand and gravel. Bottomed at 350 ft.
Law Eng Trench 10–1	0.00	0.61	sand and clay	Silty sands, loose light brown calcareous silty sand and sand silt with roots.
Law Eng Trench 10–1	0.61	3.35	sand, clay and gravel	Gravel, little or no fines, dense and very dense brown silty gravelly sand and sandy gravel. Loosely cemented to uncemented, some calcareous cementation. Generally massive.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Law Eng Trench 10–1	3.35	5.49	clay, sand and gravel	Silty sands, very hard light brown sandy silt and silty sand with sandy gravel lenses. Moderately-well to well cemented with discontinuous inrock-likein caliche zones throughout. Remarks, Grain size.
Law Eng Trench 10–1	5.49	8.53	sand, clay and gravel	Sand with silty sands, dense silty gravelly sand, loosely cemented to uncemented. Some calcareous zones and dark, manganese-stained lenses. Remarks, grain size.
Law Eng Trench 10–1	5.49	8.53	sand, clay and gravel	Sand with silty sands, dense silty gravelly sand, loosely cemented to uncemented. Some calcareous zones and dark, manganese-stained lenses. Remarks, Grain size.
Law Eng Trench 10–1	8.53	9.45	sand and clay	Silty sands, hard light brown sandy silt and silty sand, loosely cemented.
Law Eng Trench 10–1	9.45	12.19	sand, clay and gravel	Sand with silty sands/silty gravel, dense brown and gray gravelly silty sand with some cobbles. Predominately uncemented. Some manganese-staining. Remarks, Grain size.
Law Eng Trench 10–1	12.19	12.80	sand, clay and gravel	Sand with silty sands/silty gravel, dense brown and gray silty sandy gravel and gravelly sand with frequent cross-bedded silty sand lenses. Loosely to moderately well cemented. Manganese staining.
Law Eng Trench 10–1	12.80	18.29	sand, clay and gravel	Sand with silty sands/gravel, little or no fines, very dense brown silty sand and gravel with cobbles alternating with layers and lenses of loose to dense silty sand, thick to thin bedded, loosely cemented. Remarks, grain size. Bottom of trench 10 at 60 ft, south Wall. Remarks, Grain size.
Law Eng Trench 22–1N	0.00	0.61	sand, clay and gravel	Silty sands, loose light brown calcareous silty sand and gravel, not cemented, root zone.
Law Eng Trench 22–1N	0.61	3.96	sand, clay and gravel	Gravel, little or no fines, dense brown silty sandy gravel and cobbles with some cross-bedded silty sand lenses. Loosely cemented to uncemented, some calcareous zones.
Law Eng Trench 22–1N	3.96	7.77	clay, sand and gravel	Silty sands, very hard light brown, sandy silt and silty sand with gravel and cobble lenses. Moderately well cemented with some calcareous zones in the upper part. Grain size.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Law Eng Trench 22–1N	7.77	11.43	sand, clay and gravel	Gravel, little or no fines, very dense brown sandy gravel and cobbles with cross-bedded silty sand and sandy gravel lenses. Moderately well to loosely cemented. Frequent occurrences of manganese-stained lenses.
Law Eng Trench 22–1N	11.43	12.19	sand, clay and gravel	Contact is a distinct and very irregular unconformity.
Law Eng Trench 22–1N	12.19	16.00	clay, sand and gravel	Silty gravel/silty sands, alternating layers and lenses of gravel and cobbles in a very hard light brown sandy silt and silty sand matrix and very dense sandy gravel and gravelly cobbles. Moderately-well and well-cemented intervals predominate, loosely-cemented and uncemented in some cross-bedded sand lenses. Bottom of Trench, North Side.
Law Eng Trench 22–2S	0.00	0.61	sand and clay	Silty sands, inloosein light brown calcareous silty sand and sandy silt. Remarks, grain size.
Law Eng Trench 22–2S	0.61	2.29	sand and clay	Gravel, little or no fines, loose to dense brown and gray sandy gravel and cobbles, occasional lenses or zone is calcareous, loosely-cemented to uncemented.
Law Eng Trench 22–2S	2.29	8.99	clay, sand and gravel	Silty sands, very hard light brown gravelly sandy silt and silty sand with sandy gravel and cobble lenses and layers. Silt and sand matrix is massively bedded and moderately well cemented. Remarks, Grain size.
Law Eng Trench 22–2S	8.99	11.73	sand, clay and gravel	Gravel, little or no fines, very dense gray-brown silty sandy gravel, cobbles, and boulders. Thick to thin bedded and cross-bedded manganese-strained lenses dispersed throughout. Moderately well cemented to uncemented. Remarks, Grain size.
Law Eng Trench 22–2S	11.73	12.19	sand, clay and gravel	Distinct and highly irregular unconformable contact.
Law Eng Trench 22–2S	12.19	15.39	clay, sand and gravel	Silty sands, very hard light brown gravelly sandy silt with cobbles. Massive to thickly bedded, moderately-well cemented. Remarks, grain size.
Law Eng Trench 22–2S	15.39	17.37	sand, clay and gravel	Silty sands/silty gravel, dense and very dense brown silty gravelly sand with cobbles and thin silty sand lenses. Medium to thin bedded cross beds in fine lenses. Moderately well cemented. Bottom of Trench, south side, 57 ft Remarks, grain size.
Law Eng Trench 22–3W	0.00	0.61	sand and clay	Silty sands, loose light brown calcareous silty sand and sandy silt, roots.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Law Eng Trench 22–3W	0.61	1.98	sand, clay and gravel	Gravel, little or no fines, dense brown sandy gravel and cobbles with some silty sand and sandy gravel lenses. Massive bedding except in fine-grained, thin to medium bedded lenses. At 6.5 ft loosely to uncemented. Some calcareous zones.
Law Eng Trench 22–3W	1.98	6.71	clay, sand and gravel	Silty sands, very hard light brown gravelly sandy silt and silty sand with frequent layers of gravel and cobbles in a sand/silt matrix. Massive to medium bedded in gravel/cobble lenses. Moderately well cemented to loosely cemented in upper 2 ft.
Law Eng Trench 22–3W	6.71	10.36	sand, clay and gravel	Silty gravel, very dense brown silty sandy gravel and cobbles, generally massive except in silty sand and sandy gravel. Lenses which are thin and cross-bedded, moderately well cemented. More fines here than in this layer in other walls. At 34 ft distinct and irregular unconformable contact.
Law Eng Trench 22–3W	10.36	10.67	sand, clay and gravel	Silty sands/silty gravel, very hard light brown sand, gravel and cobbles in silt-sand matrix. Moderately well cemented. Bottom of Trench, west side.
Law Eng W-2	0.00	6.10	sand, clay and gravel	Brown clayey silty sand and gravel, occasional cobbles. Remarks, rock fragments (sand, gravel, cobbles, and boulders) are of intermediate (andesitic or dioritic), felsic (rhyolitic), and mafic (basaltic) composition.
Law Eng W-2	6.10	10.67	sand and gravel	Brown sandy fine to coarse gravel with cobbles.
Law Eng W-2	10.67	18.29	sand, clay and gravel	Brown clayey silty sand with gravel and cobbles.
Law Eng W-2	18.29	39.62	sand, clay and gravel	Brown clayey silty sand with gravel and cobbles.
Law Eng W-2	39.62	45.72	clay, sand and gravel	Brown sandy silt with clay and gravel with occasional cobbles.
Law Eng W-2	45.72	57.91	sand, clay and gravel	Brown sandy gravel with trace silty clay, and occasional cobbles.
Law Eng W-2	57.91	80.77	sand and gravel	Brown sandy coarse gravel with cobbles and boulders. Remarks, rock fragments below ≈210 ft react with 0.10 molar HCl acid, calcite believed to be disseminated within or adhering to the silicic rock fragments.
Law Eng W-2	80.77	86.87	sand, clay and gravel	Light brown to tan clayey silty sand with gravel, cobbles, and some boulders.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Law Eng W-2	86.87	97.54	sand, clay and gravel	Brown coarse sandy gravel with cobbles and boulders in a light brown to tan clayey silty fine sand matrix.
Law Eng W-2	97.54	111.25	sand, clay and gravel	Brown coarse sandy gravel with cobbles and boulders in a light brown to tan clayey silty fine sand matrix. Bottomed at 365 ft.
Mark Group 308	0.00	12.19	sand, clay and gravel	No data. 40 ft of surface casing previously installed (12 1/4 in diameter) elevation of measuring point is top of casing. Height of measuring point above land surface is 1.54 ft.
Mark Group 308	12.19	16.15	sand and gravel	Coarse sand with minor gravel, moderately well graded, reddish brown, subrounded to subangular grains.
Mark Group 308	16.15	22.25	sand and gravel	Coarse sand with 15% cobbles, well graded, reddish brown, subrounded to subangular, some angular, rig chatter.
Mark Group 308	22.25	25.30	sand and gravel	Fine to coarse sand with minor gravel, well graded, reddish brown subrounded to angular, rig chatter.
Mark Group 308	25.30	28.35	sand and trace gravel	Gravelly sand, well graded, reddish brown, minor cobble, subrounded to angular.
Mark Group 308	28.35	31.39	sand	Fine to medium sand, well graded, reddish brown subrounded to angular, rig chatter.
Mark Group 308	31.39	34.14	sand, clay and trace gravel	Gravelly sand with silt, well graded, reddish brown, subrounded to angular.
Mark Group 308	34.14	35.97	sand, clay and trace gravel	(Resume drilling starting depth 110 ft).
Mark Group 308	35.97	39.01	sand	Fine to medium sand, reddish brown, subangular, some larger/coarser sand, no gravel.
Mark Group 308	39.01	43.28	sand and trace gravel	Fine to medium sand with trace gravel, reddish, brown, gravel is angular, 1/2 in diameter.
Mark Group 308	43.28	45.72	sand	Gravelly fine to medium sand, reddish brown, angular to subangular, ≈10–20% gravel 1/4–1/2 in diameter.
Mark Group 308	45.72	49.38	sand	Gravelly fine to medium sand, reddish brown, angular-subangular, some coarse sand (≈ 1%), ≈10–20% gravel 1/4–1/2 in diameter.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 308	49.38	51.82	sand and gravel	Sandy gravel, sand fine-medium subangular, gravel medium-coarse 1/4–3/4 in diameter, reddish brown (166 ft, rig chatter).
Mark Group 308	51.82	54.86	sand and gravel	Sand gravel, sand fine-medium subangular, gravel medium-coarse 1/4–3/4 in diameter, reddish brown.
Mark Group 308	54.86	57.91	sand and trace gravel	Gravelly sand, sand mainly fine-grained to very fine-grained, 10% 1/4 diameter (>1/2 in 1%), brown.
Mark Group 308	57.91	60.96	sand and gravel	Sand gravel, angular to subangular, sand very fine to coarse (40% fine, 10% coarse, 50% fine-medium), gravel is fine-medium grain, brown.
Mark Group 308	60.96	64.01	sand, clay and trace gravel	Gravelly sand, well graded, very fine to medium sand, gravel fine-medium grain, ≈10–20% to 1/4 in diameter, few clay balls present, reddish brown.
Mark Group 308	64.01	67.06	sand and trace gravel	Fine to medium sand, very little gravel, reddish brown.
Mark Group 308	67.06	70.10	sand and trace gravel	Fine to medium sand, very little gravel (<1%), probably residual material, reddish brown.
Mark Group 308	70.10	73.15	sand and trace gravel	Gravelly sand, sand well graded, very fine-medium angular-subangular, reddish brown.
Mark Group 308	73.15	76.20	sand and gravel	Sandy gravel, well graded, sand fine-medium grain, gravel fine to coarse grain, 1/8–3/4 in average diameter, reddish brown.
Mark Group 308	76.20	79.25	sand and trace gravel	Gravelly sand, sand medium to fine-grained, mainly fine-grained, (60%), 30% gravel 1/4–1/2 in diameter, reddish brown.
Mark Group 308	79.25	82.30	sand and trace gravel	Gravelly sand, sand medium to fine-grained, mainly fine-grained, ≈20–30% gravel 1/4–1/2 in diameter, reddish brown, few clay balls present.
Mark Group 308	82.30	85.34	sand and trace gravel	Gravelly sand, sand medium to fine-grained, mainly fine-grained, ≈20–30% gravel 1/8–1/4 in diameter, reddish brown.
Mark Group 308	85.34	88.39	sand, clay and gravel	Gravelly clayey sand, sand, very fine-medium grain, mainly fine-grained, some clay balls present after washing, gravel fine-grained, 1/8 in diameter reddish brown.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 308	88.39	89.92	sand and clay	Sandy clay, sand, very fine to coarse (≈30–45%), clay appears to be a silty clay, grayish brown.
Mark Group 308	89.92	92.66	sand, clay and trace gravel	290–295 sandy clay with some gravel, sand is very fine, gravel 1/7 in diameter, grayish brown. Static water level at 303.04 ft Starting depth 319 ft Total depth drilled 338 ft.
Mark Group 309	0.00	18.29	sand, clay and trace gravel	No data to 60 ft of surface casing previously installed (12 1/4 in diameter). Elevation unknown. Measuring point is top of casing. Height of measuring point above land surface is 0.95 ft.
Mark Group 309	18.29	18.90	sand, clay and trace gravel	At 60 ft begin drilling.
Mark Group 309	18.90	21.95	sand and gravel	Sandy gravel, brown, poorly graded, well rounded to subangular.
Mark Group 309	21.95	24.38	sand and gravel	Sandy gravel, brown, moderately graded, subrounded to subangular.
Mark Group 309	24.38	27.43	sand and gravel	Sandy gravel, brown, well graded, minor cobble.
Mark Group 309	27.43	30.48	sand and gravel	Sandy gravel, brown, well graded, gravel ≤1/2 in, subrounded to subangular.
Mark Group 309	30.48	36.12	sand and clay	Silty sand, brown, well graded, coarse-grained.
Mark Group 309	36.12	39.62	sand and clay	Silty sand, brown, well graded, coarse-grained.
Mark Group 309	39.62	45.72	sand and gravel	Sandy gravel, brown, moderately graded, subrounded to subangular.
Mark Group 309	45.72	48.77	sand, clay and trace gravel	Silty sand, brown, well graded, coarse-grained with minor gravel.
Mark Group 309	48.77	54.86	sand and gravel	Sandy gravel, brown, moderately graded, subrounded to subangular.
Mark Group 309	54.86	57.91	sand and gravel	Sandy gravel, brown, well graded, subrounded to subangular.
Mark Group 309	57.91	60.96	sand and gravel	Sandy gravel, brown, well graded, subangular to angular.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 309	60.96	64.01	sand and gravel	Sandy gravel, brown, well graded, subangular to subangular.
Mark Group 309	64.01	67.06	sand and trace gravel	Gravelly sand, brown, well graded, subangular to subrounded.
Mark Group 309	67.06	70.10	sand and gravel	sand, brown, well graded, fine to medium-grained with minor gravel.
Mark Group 309	70.10	73.15	sand and trace gravel	Gravelly sand, brown, well graded, subangular to subrounded.
Mark Group 309	73.15	76.20	sand and trace gravel	Same as above.
Mark Group 309	76.20	82.30	sand and trace gravel	Gravelly sand, brown, well graded, subrounded to subangular.
Mark Group 309	82.30	85.34	sand and trace gravel	Gravelly sand, brown, well graded, decreasing gravel, subrounded to subangular.
Mark Group 309	85.34	88.39	clay and sand	Sandy silt, light brown, mod. Graded, subrounded to subangular. Slow drilling.
Mark Group 309	88.39	91.44	clay and sand	Sandy silt, as above with decreasing sand. Very slow drilling, insticky in.
Mark Group 309	91.44	93.27	sand and clay	Silty sand, light brown, well graded, very fine to fine-grained with minor medium-grained sand. Static water level 309.5 ft.
Mark Group 309	93.27	94.49	sand and clay	Started drilling from 312.9 ft, on 10–07/88. Lithology same as previous interval. Total depth drilled 328 ft (7/12/88).
Mark Group 310	0.00	9.14	sand and clay	No sample 0–30 ft used only air, no foam, no return out of discharge line. Installed 40 ft of surface casing (8 in diameter) for drilling 8 in diameter pilot hole. Drilling depths are from land surface.
Mark Group 310	9.14	12.19	sand and gravel	Light brown gravelly sand, sand well graded, fine to coarse grain, gravel fine to coarse.
Mark Group 310	12.19	15.24	sand and gravel	(no return from discharge line after setting surface casing).
Mark Group 310	15.24	18.29	sand and gravel	Light brown gravelly sand, well graded, sand fine to coarse, predominantly medium-grained, gravel coarse-grained.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 310	18.29	21.34	sand and trace gravel	Brownish sand with some gravel, well graded, sand fine-medium-grained, gravel fine-grained 1/8–1/4 in diameter.
Mark Group 310	21.34	24.38	sand, clay and gravel	Brown gravelly sand, well graded, sand fine-medium grain, gravel fine-medium-grained, mainly medium-grained 1/4 in diameter.
Mark Group 310	24.38	27.43	sand and gravel	Brownish sandy gravel, well graded, sand fine to coarse-grained, gravel medium-grained, 1/2 in diameter.
Mark Group 310	27.43	30.48	sand and gravel	Brown sandy gravel, well graded, sand fine to coarse-grained, mainly medium-grained, gravel medium-grained.
Mark Group 310	30.48	33.53	sand and gravel	Brown sandy gravel, well graded, sand fine to coarse-grained, mainly medium-grained, gravel fine to coarse, mainly coarse-grained >1/2 in diameter.
Mark Group 310	33.53	36.58	sand and gravel	110 ft, brown gravelly sand, well graded, sand fine to medium-grained, gravel is fine to coarse-grained.
Mark Group 310	36.58	39.62	sand	Brownish gravelly sand, sand fine to medium-grained, mainly medium-grained.
Mark Group 310	39.62	42.67	sand and gravel	Brownish gravelly sand, well graced, sand fine to coarse-grained, mainly medium-grained, gravel medium to coarse-grained 1/4–3/4 in diameter.
Mark Group 310	42.67	45.72	sand and gravel	Brown sandy gravel, well graded, sand fine-grained, gravel medium to coarse-grained, mainly coarse-grained 1/2 in diameter.
Mark Group 310	45.72	51.82	sand and gravel	Brown sandy gravel, well graded, sand fine-medium-grained, gravel medium-grained 1/4–1/2 in diameter.
Mark Group 310	51.82	54.86	sand and gravel	Brown sand with gravel, well graded, sand fine to coarse, mainly medium-grained, gravel medium-grained 1/4–1/2 in diameter.
Mark Group 310	54.86	60.96	sand, clay and gravel	Brown sandy gravel, well graded, sand medium-grained, gravel medium to coarse-grained 1/4–1/2 in diameter.
Mark Group 310	60.96	64.01	sand and gravel	Brownish sandy gravel, well graded, sand fine to medium-grained, mainly medium-grained, gravel medium-grained, 1/2 in diameter.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 310	64.01	67.06	sand and trace gravel	Brownish sand with some gravel, well graded, sand fine to coarse-grained, gravel medium-grained 1/8–1/4 in diameter.
Mark Group 310	67.06	70.10	sand, clay and gravel	Brown gravel with some sand, gravel well graded, fine to coarse, mainly coarse-grained, 1/2 in diameter.
Mark Group 310	70.10	73.76	sand and gravel	Brownish sandy gravel, well graded, angular to subangular, sand well graded and fine to medium-grained, gravel graded from fine to medium 1/8–1/2 in diameter.
Mark Group 310	73.76	76.20	sand and gravel	Brownish sandy gravel, well graded, sand well graded fine to coarse-grained, gravel medium to coarse 1/8–3/4 in diameter.
Mark Group 310	76.20	79.25	sand, clay and gravel	Brown gravelly sand, sand well graded, fine to coarse-grained, gravel medium-grained, 1/4–1/2 in diameter.
Mark Group 310	79.25	82.30	sand and gravel	Brownish gravelly sand, well graded, sand fine-grained to coarse-grained, gravel coarse-grained >1/2 in diameter.
Mark Group 310	82.30	86.11	clay and sand	Grayish brown, sandy clay with some silt, sand fine-grained.
Mark Group 310	86.11	88.39	clay and sand	Static water level 282.5 ft.
Mark Group 310	88.39	91.44	sand and clay	At 290 ft grayish silty clayey sand, sand fine-grained. Starting depth 290 ft At 300 ft, grayish silty clay with some sand, sand is fine-grained.
Mark Group 310	91.44	92.20	sand and clay	Total Depth drilled, 302.5 ft.
Mark Group 311	0.00	3.05	sand and clay	Installing 40 ft, of 121/4 in diameter surface casing. Drilling depth from land surface. Measuring point will be top of casing. Height of casing above land surface is 1.58 ft.
Mark Group 311	3.05	6.10	sand and gravel	Brown, sandy gravel, poorly consolidated, medium to coarse-grained sand, coarse-grained gravel, 3/4 in diameter.
Mark Group 311	6.10	9.14	sand and gravel	Brown, sandy gravel, medium to coarse sand, coarse gravel, 3/4 in diameter.
Mark Group 311	9.14	12.19	sand and gravel	Brown, sandy gravel, well graded, sand fine to coarse-grained, coarse gravel.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 311	12.19	15.24	sand and gravel	No cuttings return from surface casing installation.
Mark Group 311	15.24	18.29	sand and gravel	Brown, sandy gravel, well graded, sand fine to coarse-grained, gravel fine to medium-grained, 1/8–1/2 in diameter.
Mark Group 311	18.29	21.34	sand and trace gravel	Reddish-brown, red gravelly sand, well graded, sand fine to coarse-grained, subangular, gravel fine to medium-grained, mainly medium-grained, 1/8–1/4 in diameter.
Mark Group 311	21.34	24.38	sand and trace gravel	Reddish-brown, gravelly sand, same as previous interval.
Mark Group 311	24.38	27.43	sand and gravel	Brown, sandy gravel, well graded, sand fine to coarse-grained, gravel medium-grained 1/8 in diameter.
Mark Group 311	27.43	30.48	sand and gravel	Brownish gravelly sand, well graded, sand fine to coarse, gravel medium-grained, 1/4–1/2 in diameter.
Mark Group 311	30.48	33.53	sand, clay and gravel	Brown, sandy gravel with little clay, sand very fine to medium-grained, gravel medium-grained, 1/8–1/4 in diameter.
Mark Group 311	33.53	36.58	sand, clay and gravel	Brown, sandy gravel with some clay, well graded, clay is a silty clay, sand very fine to medium-grained, gravel fine to medium mainly medium-grained, 1/8–1/2 in diameter.
Mark Group 311	36.58	39.62	sand, clay and gravel	Brown, sandy gravel with some silty clay, well graded, sand very fine to medium-grained, gravel medium-grained.
Mark Group 311	39.62	42.67	sand and gravel	Brown, gravelly sand, well graded, sand very fine to medium mainly fine-grained, gravel medium to coarse-grained.
Mark Group 311	42.67	45.72	sand, clay and gravel	Brown, gravelly sand with some silt, sand very fine to medium-grained, gravel fine to coarse, 1/8–1 in diameter.
Mark Group 311	45.72	48.77	sand, clay and gravel	Brown, gravelly sand with some clayey silt, sand very fine to medium mainly fine-grained, gravel medium-grained, 1/8–1/4 in diameter.
Mark Group 311	48.77	51.82	sand, clay and gravel	Same as 150–foot interval.
Mark Group 311	51.82	54.86	sand, clay and gravel	Brownish, gravelly sand with clayey silt, well graded, sand very fine to medium gravel fine to medium mainly medium 1/8–1/4 in diameter.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 311	54.86	57.91	sand, clay and gravel	Brownish, clayey gravelly sand, well graded, clay is a silty clay, sand very fine to medium mainly fine-grained, gravel fine to medium predominantly 1/8–1/4 in diameter.
Mark Group 311	57.91	60.96	sand and gravel	Brown, sandy gravel, well graded, sand fine to coarse, mainly medium gravel fine to medium 1/6–1/4 in diameter.
Mark Group 311	60.96	64.01	sand and gravel	Brown, sandy gravel, well graded, sand medium to coarse-grained, gravel medium to coarse, 1/6–3/4 in diameter, mainly 1/2 –3/4 in diameter.
Mark Group 311	64.01	67.06	sand, clay and gravel	Brown, sandy gravel with some silty clay, sand medium to coarse-grained, gravel fine to medium-grained, 1/16–1/4 in diameter.
Mark Group 311	67.06	70.10	sand, clay and gravel	Reddish-brown, gravel with some sand and silty clay, gravel well graded, angular to subangular, 1/16–1/2 in diameter.
Mark Group 311	70.10	73.15	sand and gravel	Brown, sandy gravel, well graded, sand fine to medium-grained, gravel medium to coarse, 1/8–1/2 in diameter.
Mark Group 311	73.15	76.20	sand, clay and gravel	Brown, sandy gravel with some silty clay, well graded, sand is fine to coarse, gravel fine to coarse, 1/16–3/4 in diameter.
Mark Group 311	76.20	79.25	sand and gravel	Reddish brown, sand with gravel, sand is fine to coarse-grained, gravel medium-grained 1/8–1/4 in diameter, no clay.
Mark Group 311	79.25	82.30	sand and gravel	Brown, sandy gravel, well graded, sand fine to coarse-grained, gravel fine to medium-grained, 1/8–1/2 in diameter.
Mark Group 311	82.30	85.34	sand and gravel	Brown sand with some gravel, sand fine to coarse-grained, angular-subangular, gravel medium-grained, ≈1/4 in diameter.
Mark Group 311	85.34	88.39	sand, clay and gravel	Brown, gravelly sand with some clayey silt, sand fine to coarse-grained, mainly fine-medium-grained, gravel medium-grained, ≈1/4 in diameter.
Mark Group 311	88.39	91.44	sand, clay and gravel	Same as previous interval.
Mark Group 311	91.44	92.35	sand and clay	Grayish-brown, sand with silt, fine-grained.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 311	92.35	94.49	sand and clay	Start of drilling from 303 ft, no water in borehole, drill down 5 ft. Static water level 304.4 ft.
Mark Group 311	94.49	97.54	sand	Reddish-brown, sand, sand medium-grained, subangular to subrounded.
Mark Group 311	97.54	100.58	sand, clay and trace gravel	Reddish-brown, sand with some silt and little gravel, sand medium-grained, subangular to subrounded, silt cemented. Rig on stand by to monitor water level. At 330 greenish-brown, silt with some medium sand and fine gravel, silt well cemented. Total depth drilled 330 ft.
Mark Group 312	0.00	12.19	sand, clay and trace gravel	40 ft of surface casing previously installed (12 1/4 in diameter). Elevation measuring point is top of casing. Height of measuring point above land surface is 1.0 ft.
Mark Group 312	13.72	15.24	sand and gravel	At 45 ft sandy gravel, well graded, very little fines, clasts predominantly volcanic tuffs and quartz.
Mark Group 312	15.24	18.29	sand and gravel	Sandy gravel, well graded.
Mark Group 312	18.29	21.34	sand and trace gravel	Medium grain sand with 10% gravel, poorly graded, gravel angular to subangular.
Mark Group 312	21.34	24.38	sand, clay and gravel	Medium-coarse-grained gravelly sand, gravel primarily quartz (20%) and volcanic tuff, undifferentiated, some finer-grained silt present (<5%).
Mark Group 312	24.38	27.43	sand and gravel	Medium-fine sandy gravel, gravel fragments 1 in diameter, volcanics (tuffs, basalt) metaquartzite.
Mark Group 312	27.43	28.65	sand, clay and trace gravel	Gravelly sand, reddish brown, fine-medium sand, some silt washed away when dispersing foam, gravel 1/4–1/2 in diameter.
Mark Group 312	28.65	30.48	sand, clay and trace gravel	Same, ≈3 ft fill at bottom.
Mark Group 312	30.48	33.53	sand and gravel	Gravelly fine-medium sand, gravel coarser 1/4–3/4 in, well graded, brownish.
Mark Group 312	33.53	36.27	sand and gravel	Medium sand to sandy gravel, sand poorly graded, gravel 1/34–1/2 in diameter.
Mark Group 312	36.27	36.58	sand	Medium gravelly sand, well graded.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 312	36.58	39.62	sand and trace gravel	Medium-coarse gravelly sand, well graded, sand fine-medium mainly medium grain, many fines suspended in foam.
Mark Group 312	39.62	42.67	sand and trace gravel	Medium-coarse gravelly sand, well graded.
Mark Group 312	42.67	45.72	sand and trace gravel	Medium-coarse gravelly sand, fewer large cobbles and gravel, predominantly volcanic clasts.
Mark Group 312	45.72	48.77	sand and trace gravel	Medium-coarse gravelly sand, angular to subangular grains, gravel 1/4–1/2 in diameter, few gravel at 1/2 in diameter (153 ft hole staying open better).
Mark Group 312	48.77	51.82	sand and trace gravel	Medium-coarse gravelly sand, similar to 150 ft. Gravelly sand, brown, sand fine-medium some coarse, ≈30% gravel 1/4 in diameter.
Mark Group 312	51.82	54.86	sand, clay and trace gravel	Gravelly silty sand, gravel 1/4–3/4 in diameter (≈10%), silt to silty clay (≈20%), 170 ft rig on cobble, hard drilling. At 177 cannot penetrate nearly as fast.
Mark Group 312	54.86	57.91	sand, clay and trace gravel	Gravelly silt clayey sand, less silt (≈5%), 10–15% gravel 1/4–1/2 in diameter, sand predominantly medium-coarse, well graded.
Mark Group 312	57.91	60.96	sand, clay and trace gravel	Gravelly silty clayey sand, 20–30% silty clay, fine gravel 1/4–1/2 in diameter, less clay. At 193 ft hung tool on bottom.
Mark Group 312	60.96	64.01	sand, clay and gravel	Medium-coarse silty sand with some gravel, mostly sand (80%), gravel 1/4–1/2 in (5–10%), clay (10–15%).
Mark Group 312	64.01	67.06	sand and clay	Medium-coarse clayey sand, subangular to subrounded sand.
Mark Group 312	67.06	70.10	sand and gravel	Fine to medium gravel sand, gravel 1/4–1/2 in diameter, some clay present (<5%), gravel 10–15%.
Mark Group 312	70.10	73.15	sand, clay and gravel	Fine to medium-grained gravelly sand, medium gravel, no clay/silt present.
Mark Group 312	73.15	76.20	sand and gravel	Fine to medium-grained gravelly sand, fine gravel (<1/4 in).
Mark Group 312	76.20	79.25	sand and trace gravel	Fine-grained, some fine gravel (<5%).

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 312	79.25	82.30	sand and trace gravel	Fine to medium sand with some gravel (<5%), mainly fine-grained sand, brown.
Mark Group 312	82.30	85.34	sand and trace gravel	Gravelly sand, well graded, sand fine-medium-grained, gravel 1/8–1/4 in diameter (≈20%), brown.
Mark Group 312	85.34	87.17	sand and trace gravel	Static water level 284.5 ft (corrected). Temporary Total depth for water level measure, 1.5 ft fill (blew hole, ≈6 in fill).
Mark Group 312	87.17	88.39	sand and trace gravel	Started drilling 286 ft. At 290 ft gravelly sand well graded, sand fine-medium mainly fine-grained, gravel 1/8 in diameter, angular-subangular.
Mark Group 312	90.22	91.44	sand and trace gravel	At 296 ft, (stopped to monitor water level).
Mark Group 312	91.44	93.27	sand and trace gravel	Gravelly sand, brown (similar to 290 ft) Total depth drilled 306 ft.
Mark Group 312A	0.00	3.05	sand, clay and gravel	slightly moist, medium dense, red brown, fine sand, some silt, little gravel.
Mark Group 312A	3.05	6.10	sand, clay and gravel	slightly moist, medium dense, red brown, gravel, some sand, little silt.
Mark Group 312A	6.10	12.19	sand, clay and gravel	Dry, medium dense, red brown, mf sand, little silt and gravel.
Mark Group 312A	12.19	18.29	sand, clay and gravel	Dry, medium dense, light brown, mf gravel, some cmf sand, little silt.
Mark Group 312A	18.29	23.77	sand, clay and gravel	Moist, medium dense, light red brown, mf gravel and cmf sand, some silt.
Mark Group 312A	23.77	24.23	sand, clay and gravel	Dense.
Mark Group 312A	24.23	24.69	sand, clay and gravel	Dry, dense, brown, cmf gravel, little sand and silt.
Mark Group 312A	24.69	25.15	sand, clay and gravel	Dry, dense, brown, mf gravel, some sand, little silt.
Mark Group 312A	25.15	30.48	sand, clay and gravel	slightly moist, dense, light brown, gravel, some sand, little silt.
Mark Group 312A	30.48	30.94	sand, clay and gravel	Dry, dense, light brown, cmf gravel, some mf sand, little silt.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 312A	30.94	31.39	sand, clay and gravel	Dry, dense, light brown, cmf gravel, some mf sand, little silt.
Mark Group 312A	31.39	36.58	sand, clay and gravel	slightly moist, medium dense, light brown, sand, some gravel, little silt.
Mark Group 312A	36.58	39.62	sand, clay and gravel	slightly moist, medium dense, light brown, gravel, some sand, little silt.
Mark Group 312A	39.62	48.16	sand, clay and gravel	slightly moist, medium dense, brown, gravel, some sand, little silt.
Mark Group 312A	48.16	48.62	sand, clay and gravel	Dense.
Mark Group 312A	48.62	49.07	sand, clay and gravel	Dense.
Mark Group 312A	49.07	54.86	sand, clay and gravel	slightly moist, dense, brown, gravel, little sand and silt.
Mark Group 312A	54.86	60.96	sand, clay and gravel	Wet, very dense, brown, gravel, little sand.
Mark Group 312A	60.96	61.42	sand, clay and gravel	Wet, dense, brown, mf gravel, some cmf sand, little silt and clay.
Mark Group 312A	61.42	67.06	sand and gravel	Wet, dense, brown, mf gravel, some cmf sand.
Mark Group 312A	67.06	73.15	sand, clay and gravel	Wet, medium dense, brown, cmf gravel, some cmf sand, little silt.
Mark Group 312A	73.15	79.25	sand and gravel	Wet, medium dense, brown, cmf gravel, some cmf sand.
Mark Group 312A	79.25	85.04	sand and gravel	Wet, medium dense, brown, cmf gravel, some cmf sand.
Mark Group 312A	85.04	85.50	sand and gravel	Wet, medium dense, brown, cmf sand, come cmf gravel.
Mark Group 312A	85.50	91.44	sand and gravel	Wet, medium dense, brown, cmf sand, come cmf gravel.
Mark Group 312A	91.44	91.90	sand, clay and gravel	Wet, medium dense, brown, silt and sand, little clay and gravel.
Mark Group 313	0.00	3.05	sand and trace gravel	Installing 40 ft of surface casing (12 1/4 in diameter). Drilling depth from land surface. Elevation/Measuring point will be top of casing. Height of casing above land surface is 1.64 ft.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 313	3.05	9.14	sand and gravel	At 10 ft, medium to fine-grained sandy gravel, 10–15% coarse gravel, 1 in diameter, brown.
Mark Group 313	9.14	15.24	sand and trace gravel	At 30 ft, fine-medium-grained sand, very little gravel, probably remnants in discharge line. At 35 ft (secure surface casing).
Mark Group 313	15.24	18.29	sand and gravel	Fine to coarse-grained sand, no gravel, coarse grains ≈1/8 in (≈10%).
Mark Group 313	18.29	24.38	sand and gravel	Very fine to coarse sandy gravel, 30% gravel ≈1/2 in, 1/4 in diameter.
Mark Group 313	24.38	27.43	sand and gravel	Medium-coarse sandy gravel.
Mark Group 313	27.43	30.48	sand and gravel	Brownish fine-medium-grained sandy gravel, gravel 3/4 in diameter 10%, 1/2 in diameter 30%. Subangular, some subrounded.
Mark Group 313	30.48	33.53	sand and gravel	Brownish fine-medium-grained, sandy gravel, gravel >3/4 in diameter 15%.
Mark Group 313	33.53	36.58	sand and gravel	Brownish black, medium to fine sandy gravel, gravel avg. <1/2 in diameter, very fine sand and some clay present.
Mark Group 313	36.58	39.62	sand and gravel	Brownish fine-medium sandy, medium-coarse gravel. At 122 ft some hole instability.
Mark Group 313	39.62	42.67	sand, clay and gravel	Reddish brown, clayey sandy gravel, <5–10% clay, gravel ≈1/2 in diameter.
Mark Group 313	42.67	45.72	sand and gravel	Medium-grained gravelly sand, brownish, no clay present, similar to above. At 143 (hammer/heard jamming on drill pipe) (After letting hole sit 1 day, ≈3 ft of fill in bottom. Top at 138 ft).
Mark Group 313	45.72	48.77	sand and gravel	Brownish-red gravelly sand, sand medium to fine-grained, subangular, gravel medium-grained ≈1/2 in diameter 10%.
Mark Group 313	48.77	51.82	sand and gravel	Brownish-black (volcanic) gravelly sand, sand medium to fine-grained, subangular, some gravel ≈1/2 in diameter, largest percent gravel 1/81/4 in diameter, total gravel 5%.
Mark Group 313	51.82	54.86	sand and gravel	Brownish-red sandy gravel, gravel, 1/4–1/2 in diameter, well graded, sand fine to medium-grained.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 313	54.86	57.91	sand, clay and gravel	Brownish clayey sandy gravel, 12% brown silty clay balls in cuttings, sand fine to coarse, gravel angular-subangular1/2 in diameter.
Mark Group 313	57.91	60.96	sand	Brownish gravelly sand, sand very fine to fine ≈70% gravel large 1 in diameter no clay present.
Mark Group 313	60.96	67.06	sand, clay and gravel	Brownish gravelly sand with some clay balls present <5%, sand is fine-medium-grained, gravel 1/4–1/2 in diameter.
Mark Group 313	67.06	70.10	sand	Brownish gravelly sand, no clay present, sand well-graded fine to coarse, predominantly coarse, gravel ≈10–20%, diameter 1/4–1/2 in.
Mark Group 313	70.10	73.15	sand, clay and gravel	Brownish clayey sandy gravel, clay is silty clay ≈20%, sand very fine-medium gravel 60% medium to coarse, avg. diameter 1/4–1/2 in.
Mark Group 313	73.15	76.20	sand	Brownish gravelly sand, some clay present <5%, coarse sand but graded fine to coarse, gravel 1/2 in diameter.
Mark Group 313	76.20	79.25	sand and gravel	Brownish-red sandy gravel, some clay present 60% gravel 1/2 –3/4 in diameter.
Mark Group 313	79.25	82.30	sand and gravel	Brownish gravelly sand, gravel fine 1/8–1/4 in diameter, mainly fine to coarse sand, angular to subangular.
Mark Group 313	82.30	85.34	sand and gravel	Brown sandy gravel, sand fine to medium gravel 1/4–1/2 in diameter, medium to coarse.
Mark Group 313	85.34	88.39	sand, clay and gravel	Static water level at 287.20 ft. At 290 ft brownish clayey gravelly sand, sand medium to coarse-grained, angular to subangular, gravel fine to medium-grained, 1/8 in diameter, clayey is silty clay, ≈10–20%.
Mark Group 313	88.39	91.44	sand, clay and gravel	Brownish gravelly clayey sand, clay is silty clay ≈30%, gravel medium-grained 1/2 in diameter 10%, sand well-graded fine to coarse 60%, fine-grained sand bound in clay. Depth of hole 303.2 ft.
Mark Group 313	91.44	94.49	sand, clay and gravel	At 307 ft 8/23/88 drill to Total depth.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 313	94.49	97.54	sand, clay and gravel	Brownish sandy clayey gravel, sand very fine-fine bound in the clay ≈10%, clayey material is gritty with very fine-grained sand and silt 40% gravel is 1/2 in diameter. At 320 ft reddish brownish medium to coarse-grained sand, few clay ball present probably residual. Total Depth drilled 320 ft.
Mark Group 314	0.00	14.63	sand, clay and gravel	40 ft of surface casing previously installed (12 1/4 in diameter) Elevation/Measuring point is top of casing. Height of measuring point above land surface is 1.16 ft.
Mark Group 314	14.63	18.29	sand and gravel	Brown sand with some gravel, fine to medium-grained, well graded.
Mark Group 314	18.29	21.34	sand and gravel	Brown, fine to coarse sand with some gravel, well graded, gravel ≈1/4 in diameter, angular to subangular.
Mark Group 314	21.34	24.38	sand and gravel	Brown, gravelly sand, well graded, sand fine to coarse-grained, gravel 1/8–1/4 in diameter, predominantly 1/8 in diameter.
Mark Group 314	24.38	27.43	sand and gravel	Brown, gravelly sand, well graded, sand fine to coarse, mainly fine-grained gravel 1/8–1/4 in diameter, predominantly 1/8 in diameter.
Mark Group 314	27.43	30.48	sand and gravel	Brownish, gravelly sand, well graded, sand same as above, gravel 1/8–1/2 in diameter.
Mark Group 314	30.48	33.53	sand and clay	Brown, fine to medium-grained sand with some clay present, no gravel observed. At 106 ft rig down trying to get foam to dissipate.
Mark Group 314	33.53	36.58	sand, clay and gravel	Brown, gravelly sand, well graded, sand very fine to medium-grained, gravel 1/8–1/2 in diameter, mainly 1/2 in diameter, some clay present.
Mark Group 314	36.58	39.62	sand, clay and gravel	Brownish red, sandy gravel with some clay, well graded, sand is very fine to medium-grained, gravel fine to coarse, 1/8–3/4 in diameter, mainly 1/4 in diameter.
Mark Group 314	39.62	42.67	sand and clay	Brownish red, gravelly sand with some clay, sand is very fine to medium-grained, gravel medium-grained.
Mark Group 314	42.67	45.72	sand, clay and gravel	Brown sand with gravel and some clay, well graded, sand very fine to medium-grained, gravel is fine to medium 1/8–1/4 in diameter.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 314	45.72	48.77	sand, clay and gravel	Brown, very sand gravel with some clay, well graded, sand very fine to medium gravel fine to medium 1/8–1/4 in diameter, mainly 1/4 in diameter.
Mark Group 314	48.77	51.82	sand and gravel	Brown sand with some fine gravel, sand well graded, very fine to medium-grained.
Mark Group 314	51.82	54.86	sand, clay and gravel	Brown, clayey sandy gravel, well graded, sand very fine to fine-grained, gravel fine to coarse, 1/16–1/2 in diameter.
Mark Group 314	54.86	57.91	sand, clay and gravel	Brown, clayey sandy gravel, well graded, sand very fine to fine-grained, gravel fine to coarse, 1/16–1/2 in diameter.
Mark Group 314	57.91	60.96	sand and gravel	Brown, sandy gravel, well graded, angular to subangular, gravel clasts up to 1/4 in diameter.
Mark Group 314	60.96	64.01	sand, clay and gravel	Brown, silty-sandy gravel, well graded, angular to subangular, gravel clasts ≤1/2 in diameter.
Mark Group 314	64.01	67.06	sand and gravel	Brown, gravelly sand, well graded, angular to subrounded, gravel clasts ≤1/4 in diameter.
Mark Group 314	67.06	70.10	sand and gravel	Same as above with gravel clasts ≤1/2 in diameter.
Mark Group 314	70.10	73.15	sand and gravel	Brown, gravelly sand, well graded, angular to subrounded, gravel clasts ≤1/2 in diameter.
Mark Group 314	73.15	76.20	sand, clay and gravel	Brown, coarse-grained silty sand, well graded, angular to subrounded.
Mark Group 314	76.20	79.25	sand and gravel	Brown, coarse-grained sand with minor gravel, well graded.
Mark Group 314	79.25	82.30	sand and gravel	Same as above.
Mark Group 314	82.30	85.34	sand, clay and gravel	Brown silty sand, well graded, coarse to fine-grained.
Mark Group 314	85.34	88.39	sand, clay and gravel	Light brown, silty sand, well graded, coarse to fine-grained, subangular to subrounded.
Mark Group 314	88.39	91.44	sand and clay	Silty sand, light brown, well graded, coarse to fine-grained, subangular to subrounded.
Mark Group 314	91.44	94.49	sand and clay	Same as above. Static water level at 302.29 ft.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 314	94.49	97.54	sand, clay and gravel	Brown, silt, very fine sand with some gravel, well graded, sand is very fine to coarse-grained, gravel is fine to medium-grained.
Mark Group 314	97.54	100.58	sand, clay and gravel	Circulating foam. Similar to above interval. At 326 ft stopped circulating.
Mark Group 314	100.58	102.41	sand, clay and gravel	Brown, silty sand with some gravel, well graded, sand very fine to coarse-grained, gravel fine to medium-grained. Total depth drilled 336 ft.
Mark Group 315	0.00	3.05	sand, clay and gravel	40 ft of surface casing previously installed (121/4 in diameter). Elevation unknown. Measuring point is top of casing. Height of measuring point above land surface is 1.84 ft.
Mark Group 315	3.05	6.10	sand and gravel	Brownish red, well graded gravel, very little fines, washing out with fines, gravel diameter 3/4–1 in, angular to subangular.
Mark Group 315	6.10	9.14	sand and trace gravel	Reddish brown, gravelly sand, well graded, fine-medium-grained subangular sand, gravel ≈1/2 in diameter well graded.
Mark Group 315	9.14	11.89	sand and trace gravel	Reddish brown gravelly sand, sand well graded fine to coarse, mainly coarse-grained subangular, gravel ≈1/4–1/2 in diameter gravel (≈20–30%).
Mark Group 315	11.89	12.19	sand and trace gravel	Depth of hole 39 ft drilled 0–39 ft surface casing installed. Starting depth 39 ft. At 40 ft reddish brown sandy gravel, well graded, sand medium to fine, gravel (≈20%) 1/8–1/4 in diameter.
Mark Group 315	12.19	18.29	sand and gravel	Reddish brown sandy gravel, well graded, sand medium to fine-grained, gravel (≈20%) 1/8–1/4 in diameter.
Mark Group 315	18.29	21.34	sand and trace gravel	Brown well graded sand with some gravel, sand very fine-medium-grained, mainly fine-grained, gravel (<10%) medium-grained 1/8 in diameter.
Mark Group 315	21.34	24.38	sand and trace gravel	Reddish brown gravelly sand, sand well graded fine-medium-grained, gravel ≈1/4 in diameter (20%).
Mark Group 315	24.38	27.43	sand and trace gravel	Brownish medium to fine sand with very little gravel, predominant grain size fine sand (≈60%). At 86 ft (hole staying open, not caving when adding drill pipe).

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 315	27.43	30.48	sand and trace gravel	Brownish, medium to fine sand with some gravel, and medium to fine, well graded, predominantly fine, gravel 1/4 in diameter (<10%).
Mark Group 315	30.48	33.53	sand, clay and gravel	Brownish very-fine sand with silty gravel, gravel 1/2 –3/4 in diameter, mainly 1/2 in diameter (≈20%), some silty/clay balls present.
Mark Group 315	33.53	36.58	sand and trace gravel	Reddish brown fine-medium sand with some gravel 1/2 –1 in diameter (≈10%).
Mark Group 315	36.58	39.62	sand, clay and gravel	Reddish brown very fine-medium clayey sand with gravel, clay balls are silty with sand, very fine-grained gravel (≈10–20%) 1/2 in diameter.
Mark Group 315	39.62	42.67	sand and trace gravel	Reddish brown fine to coarse sand with some gravel, gravel 1/8–1/4 in diameter, some clay present.
Mark Group 315	42.67	45.72	sand, clay and trace gravel	Brownish sand, some clay present, little gravel, sand well graded very fine-medium mainly fine-grained, gravel fine <1/8 in diameter (<10%).
Mark Group 315	45.72	48.77	sand, clay and gravel	Grayish brown silty gravel with some sand, gravel 1/8 in diameter, silty material gritty with very fine sand rolled into balls.
Mark Group 315	48.77	51.82	sand, clay and gravel	Grayish brown clayey gravel with some sand, gravel well graded 1/8–1/2 in diameter, clay is silty clay with fine sand rolled into balls.
Mark Group 315	51.82	54.86	sand and gravel	Reddish brown sandy gravel, well graded, sand fine-medium no clay, gravel 1/8–1/2 in diameter, predominantly 1/2 in.
Mark Group 315	54.86	57.91	sand, clay and gravel	Brownish sand clayey gravel, well graded sand, very fine to medium clay is silty clay with sand rolled into balls, gravel 1/8–1/2 in diameter (50%).
Mark Group 315	57.91	60.96	sand and trace gravel	Reddish brown gravelly sand, well graded, sand angular to subangular, fine-medium-grained, gravel 1/8–1/4 in diameter (≈15%), little clay present.
Mark Group 315	60.96	64.01	sand, clay and gravel	Brownish sandy clayey gravel, well graded, sand very fine-medium gravel 1/8–1/2 in, 1/4 in predominant.
Mark Group 315	64.01	67.06	sand	Brownish medium-coarse sand, angular to subangular, (lots of rig chatter, grinding up cobbles) no clay.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 315	67.06	70.10	sand, clay and gravel	Brownish sandy gravel with some clay, well graded, sand fine-medium clay-reddish very little silt (<10%), gravel medium-coarse 1/8–2/4 in diameter.
Mark Group 315	70.10	73.15	sand, clay and gravel	Reddish brown sandy gravel with some clay, sand medium-grained, gravel angular 1/8–3/4 in diameter, clay <5%.
Mark Group 315	73.15	76.20	sand and clay	Brownish gravelly sand with some clay, sand very fine-medium-grained, 60% fine-grained, gravel 1/8–1/4 in diameter, some clay (<5%).
Mark Group 315	76.20	79.25	sand and clay	Brownish gravelly sand with some clay, sand fine to coarse, gravel fine-medium 1/8–1/4 in diameter (≈20%), clay ≈10%.
Mark Group 315	79.25	82.30	sand and trace gravel	Brownish sand with trace gravel, sand very fine-medium grain, predominantly fine-grained, <10% fine gravel ≈1/8 in diameter.
Mark Group 315	82.30	85.34	sand, clay and gravel	Brownish sand with trace gravel, sand fine to coarse, mainly medium-grained, no trace of clay-silt.
Mark Group 315	85.34	88.39	sand and trace gravel	Brownish sand with trace gravel, sand fine to coarse, mainly medium (60%), gravel 1/8 in diameter.
Mark Group 315	88.39	91.44	sand	Brownish sand with few gravel, medium coarse sand.
Mark Group 315	91.44	93.57	sand and trace gravel	Brownish sand with little gravel present.
Mark Group 315	93.57	94.49	sand and trace gravel	307 depth of hole. Drilling down to 321.6 ft Static water level 305.63 ft.
Mark Group 315	94.49	97.84	sand, clay and gravel	No return 0707 foam at surface. brown gravelly sand with some clay, sand fine to coarse, mainly medium-grained, gravel 1/8–1/4 in diameter (10–20%), clay-silty clay <5%.
Mark Group 315	97.84	100.58	sand, clay and gravel	At 320 ft, brown gravelly sand with some clay, sand fine to coarse, mainly medium-grained, gravel 1/8–1/4 in diameter (10–20%), clay is silty clay (<5%), similar to 310 ft. 321.5 ft, depth of hole, bottom of screen.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 315	100.58	103.63	clay, sand and trace gravel	At 330 ft, light grayish brown sandy silt with some gravel, sand well graded fine to medium-grained, gravel <10% 1/8–1/4 in diameter, silt is strongly cemented and is very hard drilling. At 340 ft, Gray brown sandy silt, sand is fine to medium-grained, mainly fine-grained, strongly cemented, similar to 330 ft, total depth drilled 340 ft.
Mark Group 316	0.00	12.19	clay, sand and trace gravel	No data. 40 ft of surface casing previously installed (121/4 in diameter). Elevation/Measuring point is top of casing. Height of measuring point above land surface is 0.86 ft.
Mark Group 316	12.19	15.24	sand and trace gravel	(42.41 to 50 ft) Coarse sand with gravel, well graded, reddish brown, some cobbles, rounded to subrounded.
Mark Group 316	15.24	18.29	sand and trace gravel	Medium to coarse sand with 10% gravel, no cobbles, moderately graded.
Mark Group 316	18.29	21.34	sand and gravel	Sandy gravel with 2% cobbles, well rounded to subrounded, well graded.
Mark Group 316	21.34	24.38	sand and gravel	Fine to coarse sandy gravel with 15% cobbles well rounded, well graded.
Mark Group 316	24.38	27.43	sand and gravel	Fine to coarse sand with 5% gravel, well graded, reddish-brown.
Mark Group 316	27.43	33.53	sand and gravel	Sandy gravel with small cobbles, well graded, well rounded gravel and cobbles, reddish brown. At 108 ft (ran out of water, fill truck).
Mark Group 316	33.53	36.58	sand and trace gravel	Medium to coarse sand with 15% gravel, subrounded to subangular, well graded, brown.
Mark Group 316	36.58	39.62	sand and trace gravel	Medium to coarse sand with 10% gravel, subrounded to subangular, well graded, brown.
Mark Group 316	39.62	45.72	sand, clay and gravel	Sandy gravel with minor silt, subrounded to subangular, well graded, brown, rig chatter.
Mark Group 316	45.72	48.77	sand and trace gravel	Gravelly sand, subrounded to subangular, well graded, brown.
Mark Group 316	48.77	51.82	sand, clay and gravel	Sandy gravel with balled clay, well graded, subrounded to subangular, brown. At 168 ft (smooth drilling).

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 316	51.82	58.52	sand and trace gravel	Medium to coarse gravelly sand, moderately graded, subrounded to subangular, brown. At 184 ft (2140 start drilling again). At 186 ft same as above.
Mark Group 316	58.52	62.18	sand, clay and gravel	Gravelly sand with silt and minor clay, subrounded to subangular, well graded, brown. Rig chatter 188–193 ft.
Mark Group 316	62.18	64.77	sand and trace gravel	Gravelly sand, moderately graded, subrounded to subangular, brown.
Mark Group 316	64.77	70.71	sand, clay and gravel	Sandy gravel, well graded, subrounded to subangular, brown. At 228 ft same as above with minor silt. Rig chatter at 231 ft.
Mark Group 316	70.71	76.81	sand and trace gravel	Gravelly sand, well graded, subrounded to subangular, brown. At 240 ft same as above. At 246 ft smooth drilling, slow.
Mark Group 316	76.81	79.86	sand, clay and trace gravel	Silty sand with 10% gravel, minor clay, brown.
Mark Group 316	79.86	83.06	sand, clay and trace gravel	Silty sand, increasing silt, 5% gravel, minor clay, brown.
Mark Group 316	83.06	85.34	sand, clay and trace gravel	Silty sand, decreasing silt, 5% gravel, minor clay, brown.
Mark Group 316	85.34	88.39	clay and sand	Clayey sandy silt, brown. At 284 ft 0001 blow hole with foam to clean and condition hole. Static water level at 289.51 ft.
Mark Group 316	88.39	94.49	clay and sand	Sandy silt, brown, plastic. At 296.5 ft sandy gravelly silt, brown, plastic, rig chatter. At 302 ft clayey silt, brown, plastic (smooth drilling) Total depth drilled 310 ft.
Mark Group 317	0.00	3.05	clay and sand	No data. Installing 40 ft of surface casing (121/4 in diameter) Drilling depths from land surface. Measuring point will be top of casing. Height of casing above land surface is 1.65 ft.
Mark Group 317	3.05	6.10	sand and gravel	Light brown, sandy gravel, well graded, sand fine to coarse-grained, gravel 1/2 –1 in diameter.
Mark Group 317	6.10	9.14	sand and gravel	Light brown, sandy gravel, well graded (similar to above sample) 22 ft, installing second section of 12 in casing.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 317	9.14	15.24	sand and gravel	Brown, gravelly sand, well graded, sand fine to coarse-grained, subangular to subrounded, gravel medium to coarse-grained, 1/8–3/4 in diameter.
Mark Group 317	15.24	18.29	sand, clay and gravel	Brown gravelly sand, well graded, sand fine to coarse-grained, gravel fine to coarse-grained.
Mark Group 317	18.29	21.34	sand and gravel	Brown sand with gravel, well graded, sand fine to coarse-grained (mainly coarse-grained), gravel fine to coarse-grained, 1/8–1/2 diameter.
Mark Group 317	21.34	24.38	sand and gravel	Brown, sandy gravel, sand fine to medium-grained, gravel fine to coarse, mainly medium-grained 1/4 in diameter.
Mark Group 317	24.38	27.43	sand, clay and gravel	Brown, gravelly sand with some silt, sand fine to coarse-grained, gravel fine to coarse-grained, 1/8–1/2 in diameter.
Mark Group 317	27.43	30.48	sand, clay and gravel	Brown, gravelly sand with some silt, sand very fine to coarse-grained (mainly fine-grained), gravel fine to coarse, mainly medium-grained, 1/8–1/2 in diameter, some 1 in diameter.
Mark Group 317	30.48	33.53	sand, clay and gravel	Brown, gravelly sand with some silt, sand well graded, fine to coarse-grained, gravel fine to coarse-grained (mainly medium).
Mark Group 317	33.53	36.58	sand and gravel	Brown, gravelly sand, well graded, sand very fine to coarse-grained (mainly medium-grained) gravel fine to medium-grained, ≈1 in diameter.
Mark Group 317	36.58	39.62	sand and gravel	Brown, gravelly sand, well graded, same as above interval except gravel medium-grained, 1/4 in diameter.
Mark Group 317	39.62	42.67	sand, clay and gravel	Brown, sand with some silt and gravel, well graded, sand very fine to coarse-grained, gravel fine to medium 1/8–1/4 in diameter.
Mark Group 317	42.67	45.72	sand, clay and gravel	Brown, gravelly sand with some silt, well graded, sand very fine to coarse, gravel medium-grained, 1/8–1/2 in diameter.
Mark Group 317	45.72	48.77	sand, clay and gravel	Brown, gravelly sand with some silt.
Mark Group 317	48.77	51.82	sand, clay and gravel	Brown, sandy gravel with some silt, well graded, sand very fine to coarse-grained (mainly medium-grained), gravel fine to medium-grained, 1/16–1/4 in diameter.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 317	51.82	54.86	sand, clay and gravel	Brown, silty sand with gravel, well graded, sand very fine to coarse-grained, gravel fine to coarse (mainly medium-grained), 1/8–1/4 in diameter.
Mark Group 317	54.86	57.91	sand, clay and gravel	Same as previous interval.
Mark Group 317	57.91	60.96	sand, clay and gravel	Brown, gravelly sand with some silt, well graded, sand very fine to coarse, mainly fine sand, gravel fine to medium-grained.
Mark Group 317	60.96	64.01	sand, clay and gravel	Brown, gravelly sand with some silt, sand fine to medium-grained, gravel fine to medium-grained, 1/16–1/4 in diameter.
Mark Group 317	64.01	67.06	sand, clay and gravel	Same as previous interval except fine to coarse-grained, cuttings 1/8–1/2 in diameter.
Mark Group 317	67.06	70.10	sand, clay and gravel	Hnu readings, 37 ppm inside casing, 0.0 ppm work zone, 22 ppm inside drill pipe.
Mark Group 317	70.10	73.15	sand and clay	Brown sand with trace of silt, fine to medium-grained.
Mark Group 317	73.15	76.20	sand, clay and gravel	Brown, silty sand with gravel, sand medium to very fine-grained, gravel fine to medium 1/16–1/4 in diameter.
Mark Group 317	76.20	79.25	sand, clay and gravel	Brown, sandy gravel with trace silt, well graded, gravel fine to coarse-grained, mainly 1/4–3/4 in diameter, and fine to medium-grained.
Mark Group 317	79.25	82.30	sand, clay and gravel	Brown, sandy gravel with trace silt, well graded, gravel fine to coarse (mainly medium), 1/8–1/2 in diameter, sand fine to coarse-grained.
Mark Group 317	82.30	85.34	sand and gravel	Brown, sandy gravel, well graded, gravel fine to medium-grained, 1/8–1/2 in diameter, sand fine to coarse-grained.
Mark Group 317	85.34	88.39	sand and gravel	Brownish-red, sand with gravel, sand very fine to coarse-grained, gravel fine-grained, 1/16–1/8 in diameter.
Mark Group 317	88.39	91.44	sand, clay and gravel	Brown, silty sand with some gravel, sand very fine to medium (mainly fine), gravel fine to medium.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 317	91.44	97.54	sand, clay and trace gravel	Brown silty sand with some gravel, sand very fine to medium (mainly fine-grained), gravel fine-grained with few medium-grained gravel. Static water level at 306.42 ft, 307 ft from top of 12 in. Stand by to monitor water levels. Drilled 310.4–320.4 ft. At 320 ft greenish-brown, sandy silt, well cemented. 1023 stopped circulating foam. Rig on standby to monitor water level.
Mark Group 317	97.54	100.58	sand, clay and trace gravel	Started drilling from 320 ft.
Mark Group 317	100.58	103.63	clay and sand	Greenish-brown sandy silt, very fine-grained sand, well cemented. At 340 ft greenish-brown, sandy silt, sand is very fine to fine-grained, silt well cemented, stopped circulating air/foam, started tripping pipe. Total depth drilled 340 ft.
Mark Group 400	0.00	2.44	sand, clay and gravel	Artificial fill, fine-grained sand with silt and gravel, gap-graded, slightly moist, brown with paper fragments.
Mark Group 400	2.44	2.59	sand and clay	Very fine-grained sand with trace silt, poorly graded, slightly moist, brown.
Mark Group 400	2.59	6.71	sand and gravel	Coarse, sandy gravel with trace fine-medium sand well graded, brown, dry, weakly cemented, very dense.
Mark Group 400	6.71	8.23	sand and trace gravel	Very fine-grained sand with some medium-coarse sand and gravel, poorly graded, brown, slightly moist.
Mark Group 400	8.23	14.02	sand and trace gravel	Fine-grained sand with some medium-coarse sand and gravel, well graded, light brown, dry, no cementation very dense. Undisturbed sample penetrated 6 in (36–39.5 ft) First bulk sample met with refusal, second bulk sample successful at 39.5–41 ft.
Mark Group 400	14.02	23.47	sand and gravel	Bottom of interval not yet encountered. Fine to medium-grained sand with some coarse sand and gravel, well graded, slightly moist, reddish-brown. Slight cohesiveness to finer materials. Obtained bulk sample at 58 ft. Not enough recovery-will resample tomorrow. Bottom of hole At 58 ft on 4/5/88. Very fine-grained sand with some medium-coarse sand and gravel (to 2 in), well graded reddish-brown, slightly moist, no cementation, very dense, slight cohesiveness in finer materials.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 400	23.47	27.43	sand, clay and trace gravel	Gravelly, fine to coarse sand with some silt and trace cobbles (4 in) well graded, reddish-brown, slightly moist, weak concentration, very dense, slight cohesiveness in finer materials. Considerable rhyolite in gravel and cobble size. At 86 ft same as above, but color change to brown (not as red), also, ash flow tuff constituents seen in gravel-sized materials.
Mark Group 400	27.43	28.35	sand and gravel	Coarser materials, fewer fines, gravelly, medium sand with trace cobbles, well graded, brown, slightly moist.
Mark Group 400	28.35	31.39	sand, clay and gravel	(bottom of interval not yet encountered). Gravelly sand with some silt and trace cobbles (4 in diameter), well graded, brown, slightly moist, weak concentration, very dense. Bottom of hole At 100 ft on 4/7/88. Gravelly sand with trace cobbles, well graded, brown, slightly moist, weak cementation, very dense.
Mark Group 400	31.39	35.05	sand and gravel	Gravel sand with cobbles, well graded, dry, grayish-brown.
Mark Group 400	35.05	41.45	sand, clay and trace gravel	Very fine to coarse sand with some silt and trace gravel and cobbles, well graded, brown, slightly moist, weak cementation (slight cohesiveness in finer materials).
Mark Group 400	41.45	46.94	sand and trace gravel	(bottom of interval not yet encountered) very fine to medium sand with some coarse sand and trace gravel and cobbles, well graded, brown, slightly moist, weak cementation. Bulk sample, 61 blows per 10 in with air hammer, undisturbed sample, 63 blows per 6 in. Bottom of hole At 138 ft on 4/8/88. Started drilling from 138 ft. Sand with some gravel and cobbles, well graded, brown, dry, weak cementation.
Mark Group 400	46.94	48.77	sand, clay and gravel	Very fine to medium sand with silt and gravel, poorly graded, brown, slightly moist, weak cementation, very dense, not friable. Bulk sample, drove 18 in, 88 blows with air hammer undisturbed, drove 12 in.
Mark Group 400	48.77	50.60	sand and gravel	Gravel sand with cobble (4 ft), well graded, grayish-brown, dry.
Mark Group 400	50.60	51.21	sand and gravel	Fine to medium sand with coarse sand and gravel, poorly graded, slightly moist, brown (similar to 154–160 ft interval).
Mark Group 400	51.21	53.04	sand and trace gravel	Gravelly sand with cobble (4 in), well graded, grayish-brown, dry.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 400	53.04	53.64	sand and gravel	Fine to medium sand with coarse sand and gravel, poorly graded, slightly moist, brown (similar to 154–160 ft interval).
Mark Group 400	53.64	55.17	sand, clay and gravel	Very fine to coarse sand with gravel and trace clay, well graded, brown, slightly moist, weak cementation, very dense. Bulk sample, drove 10 in, 92 blows with air. Refusal at 181 ft less clay.
Mark Group 400	55.17	57.30	sand, clay and gravel	No more clay observed.
Mark Group 400	58.06	62.48	sand and gravel	Fine to medium sand with gravel and cobble, well graded, brown, slightly moist, weak cementation, moderately friable. At 195 ft rode on cobble for ≈15 seconds. Bulk sample, drove sampler 12 in, 124 blows with air hammer, undisturbed sample, refusal.
Mark Group 400	62.48	62.79	sand and trace gravel	Gravelly sand with trace cobble, poorly graded, grayish-brown, dry.
Mark Group 400	62.79	63.70	sand and gravel	Fine to medium sand with gravel and cobble, well graded, brown, slightly moist.
Mark Group 400	63.70	63.86	sand, clay and gravel	Trace of clay, color change to reddish-brown.
Mark Group 400	63.86	65.84	sand and trace gravel	Gravelly, fine to medium sand with cobbles, well graded, grayish-brown, dry. At 212 ft color change to brown, sat on large cobble for ≈11/2 minutes. At 213.5 ft color change to grayish-brown. At 216 ft, bottom of interval not yet encountered. Fine to medium sand with gravel, well graded, brown, slightly moist, no cementation, dense. Bulk sample, drove 12 in, 81 blows with air hammer. Bottom of hole 218 ft on 4/9/88.
Mark Group 400	65.84	66.75	sand and gravel	Attempted undisturbed sample at 219 ft, then started drilling at 218 ft. Fine to medium sand with trace gravel, well graded, brown, slightly moist, no cementation, medium dense (estimate) undisturbed sample, Refusal after 2 in.
Mark Group 400	66.75	69.49	sand, clay and gravel	Fine to medium sand with gravel, coarse sand, trace clay and cobbles, well graded, brown, slightly moist, weak cementation, very dense. At 221 ft clay gone, drier.
Mark Group 400	69.49	70.71	sand, clay and trace gravel	Gravelly sand with some cobbles, well graded, brown dry, no cementation, casing driving harder in this interval.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 400	70.71	74.37	sand and gravel	Fine to medium sand with gravel and trace cobbles, poorly graded (gap-graded), brown, slightly moist, no cementation, slight cohesion in finer sands. Bulk sample, refusal at 8 in, drove 8 in with 79 blows by air hammer.
Mark Group 400	74.37	77.11	sand and gravel	Fine sand with gravel, poorly graded, brown, slightly moist, slight cohesiveness in fines. Grades to trace amounts of gravel.
Mark Group 400	77.11	77.42	sand and gravel	Gravelly sand with cobble, poorly graded, brown, dry.
Mark Group 400	77.42	78.33	sand and gravel	Fine sand with gravel, poorly graded, brown, slightly moist, slight cohesiveness in fines. Grades to trace amounts of gravel.
Mark Group 400	78.33	80.16	sand and gravel	Sandy gravel with cobbles (4 in), well graded, brown, slight moist, no cementation, very dense.
Mark Group 400	80.16	80.77	sand and trace gravel	Fine to medium sand with trace gravel, poorly graded, brown, slightly moist, slight cohesion.
Mark Group 400	80.77	81.69	sand and gravel	Sandy gravel with cobble, well graded, brown, dry, no cementation.
Mark Group 400	81.69	83.82	sand, clay and gravel	Fine to medium sand with some gravel and trace cobble (3 in), poorly graded, brown, slightly moist, no cementation, slight cohesion in fine sands. At 275 ft sand with gravel and trace silt moderately well graded, brown, slightly moist. At 278 ft moister bulk sample, drove 14.5 in, 56 blows with air hammer. Bottom of hole at 278 ft on 4/11/88. Started with undisturbed sample at 279 ft and drilled from 273 ft. Adequate recovery for 1 brass ring. At 275 ft, bottom of interval not yet encountered. Sand with gravel, well graded, brown, moist (at 280 ft) no cementation. At 283 ft water table, wet. After hole set open for 1 hour, water level (measured with M-scope) at 283.2 ft. Bottom of hole at 288 ft on 4/12/88. Bulk sample, 18 ft in 94 blows with air hammer. Depth to water 283.5 ft from surface. Undisturbed sample at 289 ft, recovered 2 rings (12 in). Stared drilling at 288 ft.
Mark Group 400	83.82	89.61	sand and gravel	Sand with gravel, well graded, brown, saturated, no cementation, dense. Bulk sample, 18 in 32 blows with air hammer. Undisturbed sample, full recovery (18 in).
Mark Group 400	89.61	90.92	sand and clay	Silty, very fine-grained sand, poorly graded, (max. particle size coarse sand), slight plasticity, brown, saturated, no cementation, dense. Sand heaved up sampler 9 in. Bulk sample, 10 in with 9 blows.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 400	90.92	91.07	clay and sand	Very fine-grained sandy silt with some clay, (max. particle size medium-sand, <5%), very stiff, low plasticity, light brown, moist, no cementation, contains small roots and red staining near root inclusions. At 298.8 ft, (bottom of interval not yet encountered). Very fine-grained sandy silt, poorly graded, brown, saturated, no cementation. Grades to thicker material with large gravel at 303 ft depth. Bottom of hole at 303 ft on 4/13/88. Bulk sample at 303 ft, 12 in recovery, easy penetration.
Mark Group 400	92.35	92.96	sand and trace gravel	Started drilling at 303 ft depth. Fine to medium sand with trace gravel (to 3 in diameter), poorly graded, brown, saturated, no cementation, loose (not dense). Bulk sample at 308 ft, recovered 18 in.
Mark Group 400	92.96	96.93	clay and sand	Very fine sandy silt with some clay, (max. particle size medium sand, <5%), low dry strength, medium stiff, none to medium plasticity (varies throughout, moist, light brown, no cementation, contains black, organic layered staining. Bulk sample at 313 ft, recovered 14 in. Undisturbed sample at 315 ft, recovered 18 in.
Mark Group 400	96.93	97.84	sand and clay	Bulk sample at 318 ft, 123 in recovery showed gradational change from fines to sands. Fine to medium sand with trace silt, poorly graded, brown, saturated, no cementation, loose. Grades from fine materials to coarser materials with trace gravel at 320 ft. At 3 21 ft (bottom of interval not yet encountered) clayey silt with some sand, low dry strength, medium stiff, medium plasticity, light grayish-brown, moist, no cementation with organic materials (possible rootlets). Bulk sample at 323 ft, 12 in recover. Bottom of hole at 323 ft on 4/14/88.
Mark Group 400	99.67	100.58	sand and clay	Started drilling from 323 ft. No water in hole at beginning of day. Silty sand, poorly graded, light brown, slightly moist, no cementation, dense, no plasticity. This (≈1/4 in thick) medium-grained sand layers throughout. Bulk sample at 328 ft, recovered 12 in.
Mark Group 400	100.58	103.02	sand, clay and trace gravel	Fine to medium-grained sand with trace silt, poorly graded, reddish brown, slightly moist, subrounded grains, no cementation. Contains thin layers (4 in or less) of gray silty clay with minor organic materials and subrounded quartz pebbles (large sand-pea size gravel size). Bulk sample at 333 ft, recovered 8 in. Undisturbed sample at 334 ft, recovered 14 in.
Mark Group 400	103.02	105.16	clay and sand	Started drilling from 343 ft. Water in the hole could not be measured because drill stem was in hole. Fine sandy silt, low dry strength, no plasticity, light brown, slightly moist, firm, blocky fracture, no cementation.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 400	105.16	105.77	sand, clay and gravel	Sand with gravel, well graded, brown, saturated, no cementation. At 347 ft (bottom of interval not yet encountered) silty sand, poorly graded (max. particle size fine sand), very low dry strength, no plasticity, light brown, slightly moist, no cementation. Bulk sample at 348 ft, recovered 12 in. Bottom of hole at 348 ft on 4/18/88.
Mark Group 400	106.98	107.90	clay and sand	Started drilling from 348 ft. Sandy silt (maximum particle size fine sand), very low dry strength, no plasticity, light brown, moist, dense, no cementation.
Mark Group 400	107.90	108.20	sand, clay and trace gravel	Fine to medium sand with trace silt, gravel and cobble (≈5%), poorly graded, brown, saturated, subangular grains, loose, no cementation. Undisturbed sample at 353 ft, 18 in recovery. Bulk sample at 355 ft, 12 in recovery.
Mark Group 400	108.20	10.82	sand, clay and trace gravel	(same as 351–354 ft).
Mark Group 400	108.36	109.73	clay, sand and trace gravel	Silty sand with trace gravel and cobble, poorly graded, brown, saturated, loose, no cementation. Contains blocks and thin, non-continuous lenses of sandy silt (as in 347–354 ft interval) Inner casing dropped into hole 355–358 ft. Welded temporary safety bar onto casing to hold it up. Bulk sample at 358 ft, 12 in recovery, 360 ft casing driving harder.
Mark Group 400	109.73	111.56	sand, clay and trace gravel	Fine-grained sand with some silt and trace medium to coarse sand and cobble (≈15%) (cobble to ≈6 ft diameter), poorly graded (gap graded), brown, saturated, loose, no cementation. Bulk sample 363 ft, 12 in recovery. At 366 ft, bottom of interval not yet encountered. Gravelly sand with cobbles, well graded, brown, saturated (producing water). Bottom of hole at 368 ft on 4/19/88. Water level 328.3 ft below ground surface. Bulk sample at 368 ft, 14 in recovery. Started drilling at 368 ft.
Mark Group 400	112.17	112.32	sand, clay and gravel	Fine-grained sand with silt and cobbles (≈3 to 4 in diameter), very poorly graded (gap graded) brown, saturated, loose, non-stratified, no cementation.
Mark Group 400	112.32	114.00	sand and gravel	Very fine to fine-grained sand with trace medium sand and gravel, very poorly graded, brown, wet, moderately dense, non-stratified, no cementation. Contains white, coarse-grained sand-sized inclusions, possibly a quartz altered to clay, that breaks across the grains. At 370 ft trace gravel and cobbles. Bulk sample at 373 ft, 18 in recovery. Undisturbed sample at 375 ft, 14 in recovery ≈4 in slough.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 400	114.00	116.13	sand and gravel	Gravelly sand with cobble, very well graded, brown, saturated (good water producer), loose, no cementation (water everywhere while drilling). Bulk sample at 378 ft, 7 in recovery. Rig chatter at 381 ft.
Mark Group 400	116.13	117.04	sand and gravel	Sandy gravel with cobble, well graded, brown, saturated, dense, no cementation. Bulk sample at 383 ft, 12 in recovery. Bottom of hole at 383 ft on 4/20/88. Static water level at 329 ft from surface. Started drilling from 383 ft, casing driving very hard, considerable rig chatter.
Mark Group 400	117.04	126.80	sand and gravel	Cobble, large gravel, well graded, colors depend on individual grains, primarily quartz (white) and some feldspathic minerals, saturated. Bulk sample at 388 ft, drove in 5 in, recovered 2 cobbles and 3 large gravel. Continued drilling without casing the hole. Did not sample, refusal in sampling the same materials. Rig chatter continuing. At 411 ft color change in water, lighter, fewer fines. Hole is producing more water.
Mark Group 400	126.80	128.02	sand and gravel	Very fine-medium sand, poorly graded, white to grayish white (primarily quartz), saturated, moderately well cemented. Either thin layer or 4 ft diameter boulder.
Mark Group 400	128.02	134.11	sand and gravel	Cobble gravel with boulders, light brown with other colors depending on individual grains, saturated. Thin zones of either sandstone layer (as in 416–420 ft interval) or sandstone boulder through this zone.
Mark Group 400	134.11	138.38	sand and trace gravel	Fine to medium sand with trace coarse sand and pea-size gravel, poorly graded, white to grayish white (primarily quartz), saturated, moderately cemented.
Mark Group 400	138.38	140.21	sand	Medium sand, very poorly graded, brown, saturated, rounded grains, no cementation.
Mark Group 400	140.21	140.82	sand and clay	Very fine-medium sane with trace silt, moderately well graded, brown, saturated, weak cementation with some moderate cementation in gravel-size-masses. Bulk sample at 460 ft, recovered 12 in.
Mark Group 400	141.43	143.26	sand	Very fine-medium sand, poorly graded, white to grayish white (primarily quartz grains with quartz Cementation), saturated, moderately well cemented.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 400	143.26	160.32	sand and trace gravel	Very fine-medium sand, poorly graded, brown cementation with multi-colored grains (primarily brown), saturated, weak cementation with some moderate cementation in gravel-size masses. at 482 ft with coarse sand-size quartz. At 505 ft, same as above with gravel-size quartz. At 526 ft, (bottom of interval not yet encountered). Cobble gravel with trace sand, well graded, color dependent upon individual grains and with brown sand, no cementation. Total depth of boring at 537 ft.
Mark Group 401	0.00	1.83	sand and trace gravel	Fine medium sand with trace gravel, poorly graded, light brown, slightly moist, no cementation, contains organic material (roots).
Mark Group 401	1.83	4.57	sand and gravel	Sandy gravel with trace cobble, poorly graded, grayish brown, dry, no cementation, contains roots to ≈10 ft depth.
Mark Group 401	4.57	8.84	sand and trace gravel	Fine to medium sand with trace coarse sand and gravel (≈5 %), poorly graded, light brown, dry, no cementation. Bulk sample at 18 ft, recovered 13 in 46 blows with air hammer. Blow counts given per 6 in interval. At 27 ft more gravel (gravelly sand).
Mark Group 401	8.84	9.14	sand	Fine to medium sand, very poorly graded, black and brown grains, dry, no cementation.
Mark Group 401	9.14	10.67	sand and gravel	Sandy gravel with cobble, well graded, grayish brown, dry, no cementation.
Mark Group 401	10.67	13.72	sand and gravel	Fine gravelly sand with trace cobble, well graded, light brown, dry, moderately dense, no cementation, 39–40 ft cobble/gravel layer. Undisturbed sample at 38 ft, recovered 18 in, 123 blows with air hammer.
Mark Group 401	13.72	20.73	sand and gravel	Sand with fine gravel (≈30%) and trace cobble (≈5%, (4 ft), well graded, reddish brown, slightly moist, moderately dense, no cementation, slight cohesion in finer sands. Bulk sample at 58 ft, drove 12 in 89 blows with air burner. At 62 ft more gravel and cobble.
Mark Group 401	20.73	21.34	sand and gravel	Sandy gravel with cobble (≈30%/50%/20% sand/gravel/cobble), well graded, reddish brown, dry.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 401	21.34	22.25	sand, clay and gravel	Find-medium sand with gravel (≈20%) and trace cobble, poorly graded, light brown, slightly moist, no cementation. At 73 ft fine-medium sandy gravel with trace silt and cobble, well graded, brown, slightly moist (in fine sands), no cementation. Sat on large cobble for 3/4 minutes at 73 ft. Bulk sample at 78 ft, refusal at 9 in penetration. Bottom of hole at 78 ft on 5/3/88.
Mark Group 401	22.25	24.08	sand, clay and gravel	Started drilling from 78 ft, undisturbed sample at 79 ft, recovered 5 in. Refusal thereafter.
Mark Group 401	24.08	31.70	sand, clay and gravel	Sandy gravel with small to large cobbles and trace silt, well graded, ≈30/50/20% sand/gravel/cobble, brown, slightly moist, no cementation, slight cohesiveness in finer sands. Casing driving hard through cobbles. Bulk sample at 98 ft, Refusal after 71/2 in 105 blows with air hammer.
Mark Group 401	31.70	37.19	sand, clay and gravel	At 104 ft casing driving easier. Fine, medium sand with gravel (≈30%) and trace cobble and clay, well graded, reddish brown, moist, weak cementation. At 113 ft color change to brown, more gravel, slightly moist. At 118 ft color change to reddish-brown undisturbed sample at 118 ft, drove 12 in 182 blows with air hammer.
Mark Group 401	37.19	41.15	sand and gravel	Sandy gravel with cobble, well graded, brown, dry, no cementation. At 127 ft slightly moist. At 133 ft color change, light brown (134–135 ft cobble/gravel).
Mark Group 401	41.15	45.11	sand and clay	Gravelly medium-coarse sand with trace clay, well graded, reddish brown, slightly moist, weak cementation. Bulk sample at 138 ft, Refusal after 8 in 74 blows with air hammer.
Mark Group 401	45.11	45.72	sand and trace gravel	Gravelly sand with trace cobble, well graded, reddish brown slightly moist.
Mark Group 401	45.72	46.33	sand and gravel	Sandy gravel with cobble, well graded, brown, dry. At 152 ft gravelly medium-coarse sand with clay, well graded, reddish brown, slightly moist, weak cementation. Bottom of hole at 158 ft on 5/4/88. Started drilling from 158 ft. Bulk sample at 158 ft, refusal after 10 in, 137 blow with air hammer.
Mark Group 401	46.33	49.99	sand, clay and gravel	Gravel medium-coarse sand with clay (≈20%) and cobble, well graded, reddish brown, slightly moist, weak cementation.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 401	49.99	52.12	sand	Gravelly fine-medium sand, well graded, brown, slightly moist, no cementation. At 170 ft trace clay.
Mark Group 401	52.12	53.34	sand and gravel	Sandy gravel with trace clay (≈5%) well graded, brown, slightly moist.
Mark Group 401	53.34	53.64	sand and gravel	Fine to medium sand with gravel and trace clay, poorly graded, brown, slightly moist.
Mark Group 401	53.64	55.17	sand and clay	Gravelly fine-medium sand with trace clay, well graded, light brown, dry, no cementation. Bulk sample at 178 ft, refusal at 6 in, 58 blows with air hammer.
Mark Group 401	55.17	57.91	sand and gravel	Sandy gravel with trace cobble (≥4 in), well graded, brown, slightly moist.
Mark Group 401	57.91	58.52	sand and gravel	cobble gravel with sand, well-graded, light brown, slightly moist.
Mark Group 401	58.52	59.44	sand and gravel	Sandy gravel with trace cobble (≥4 in), well graded, brown, slightly moist.
Mark Group 401	59.44	60.05	sand and trace gravel	Fine to medium sand with trace gravel and cobble (≈15% total) poorly graded, brown, slightly moist (≈5 in). Bulk sample at 198 ft, refusal after 71/2 in, 125 blows with air hammer.
Mark Group 401	60.05	62.18	sand, clay and gravel	Sandy gravel with trace clay (≈15%), well graded, brown, slightly moist, none to weak cementation, very dense.
Mark Group 401	62.18	62.48	sand and clay	Fine to medium sand with trace clay and gravel, poorly graded, brown, moist, cohesive.
Mark Group 401	62.48	64.62	sand and gravel	Sandy gravel with cobble, well graded, brown, slightly moist.
Mark Group 401	64.62	64.92	sand and trace gravel	Gravelly sand with trace cobble, well graded, brown, slightly moist.
Mark Group 401	64.92	66.14	sand and gravel	Sandy gravel with cobble, well graded, brown, slightly moist.
Mark Group 401	66.14	66.45	sand and trace gravel	Gravelly sand, bulk sample at 218 ft, refusal after 6 in, 79 blows with air hammer.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 401	66.45	68.88	sand and gravel	Sandy gravel with cobble (cobble in sample 4 in), well graded brown, slightly moist. Rig chatter 221–226 ft.
Mark Group 401	68.88	69.80	sand and trace gravel	Fine to medium sand with trace gravel and cobble, poorly graded, brown, moist.
Mark Group 401	69.80	70.41	sand, clay and gravel	Sand with gravel and trace clay and cobble, well graded, brown, moist. Rig chatter 231–233 ft.
Mark Group 401	70.41	72.24	sand and gravel	Fine to medium sandy gravel with cobble (6 in), gap-graded, brown, moist.
Mark Group 401	72.24	72.54	sand, clay and trace gravel	Gravelly sand with trace clay and cobble, poorly graded (gap graded), brown, moist. Bulk sample at 238 ft, refusal after 31/2 in. Drove 59 blows with air hammer, bouncing off bottom.
Mark Group 401	72.54	72.85	sand and gravel	Gravel with sand and trace cobble, well graded, brown, moist, no cementation. Bottom of hole at 238 ft On 5/5/88.
Mark Group 401	72.85	75.29	sand and gravel	Started drilling from 238 ft depth. Sand with gravel and cobble, well graded brown moist. Grades to cobble.
Mark Group 401	75.29	78.33	sand, clay and trace gravel	Gravelly sand with trace cobble (≈5%) well graded, brown, very moist. At 257 ft, fine to medium sand with trace coarse gravel (≈10%), poorly graded, brown, very moist, none to weak cementation. Bottom of hole at 258 ft on 5/6/88.
Mark Group 401	78.33	78.94	sand and trace gravel	Fine to medium sand with trace coarse gravel (≈10%), poorly graded, brown, very moist, none to weak cementation.
Mark Group 401	78.33	78.94	sand, clay and trace gravel	Started drilling from 258 ft. Bulk sample at 258 ft, recovered ≈4 in. Lost sample from sampler shoe. Undisturbed sample at 259 ft, recovered 9 in.
Mark Group 401	78.94	82.91	sand and trace gravel	Fine-coarse sand with trace gravel, well graded, brown, very moist, weak cementation. Casting driving very easily. Bulk sample at 268 ft, recovered ≈5 in.
Mark Group 401	82.91	83.52	sand, clay and trace gravel	Very fine-grained sand with clay and trace gravel, poorly graded, brown, very moist, weak cementation.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 401	83.52	86.87	clay and sand	Silt with very fine sand and clay, low dry strength, slight plasticity, greenish light brown, very moist, stiff. At 276.5 ft more very fine-grained sand (sandy silt), trace clay. Undisturbed sample at 277 ft, recovered 12 in. Bulk sample at 278 ft, recovered 15 in. At 281 ft with some clay, less sand (as at 274 ft). Bulk sample at 283 ft, recovered 15 in. At 285 ft silty fine-grained sand with trace clay, medium dry strength, slight plasticity, greenish-light brown, wet, stiff, some weak cementation in gravel-size masses. Cuttings plugging up outlet. Stopped drilling to clean out the outlet. Bulk sample at 288 ft, recovered 9 in (sampler wet on outside). Undisturbed sample at 289 ft, recovered 15 in. Bottom of hole at 288 ft, on 5/7/88.
Mark Group 401	86.87	89.92	clay and sand	Depth to water level 286.96 ft. Started drilling from 288 ft silty fine-grained sand with trace clay moderate dry strength, slight plasticity, greenish-light brown, wet, stiff, some weak cementation in gravel-size masses. Saturated at 287 ft. Bulk sample at 293 ft, recovered 12 in. Undisturbed sample at 294 ft, recovered 12 in. At 295 ft silty clay, high dry strength, no plasticity, grayish light brown, saturated, moderately strong cementation, blocky fracture, strongly calcareous with shell inclusions. Bulk sample at 298 ft, recovered 5 in. Bulk sample at 303 ft, recovered 3 in, 307 ft color change to brown, not calcareous. Bulk sample at 308 ft, recovered 11/2 in. Ran small split barrel down hole and recovered 7 more in. Bottom of hole at 308 ft on 5/9/88.
Mark Group 401	89.92	94.79	clay and sand	Depth to water level 302.9 ft. Started drilling from 308 ft (drove 6 in casing from 298 ft. Silty clay, high dry strength, no plasticity, brown, saturated, moderately strong cementation, blocky fracture.
Mark Group 401	94.79	95.55	sand and clay	Very fine-grained sand with silt, very poorly graded, light brown, saturated, strong cementation, platy cleavage. Bulk sample at 313 ft, recovered 12 in. Undisturbed sample at 314 ft, recovered 15 in.
Mark Group 401	95.55	98.15	clay and sand	Silt with clay and some fine-grained sand, (25% sand), very low dry strength, no plasticity, greenish-light brown, saturated, soft with gravel-sized moderately cemented messes. Bulk sample at 318 ft, recovered 10 in. Bulk sample at 323 ft, recovered 5 in.
Mark Group 401	98.15	99.36	sand and clay	Very fine-grained sand with silt, very poorly graded, light brown, saturated, strong cementation, platy cleavage, mildly reactive with acid (326–327 ft casing driving harder).

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 401	99.36	101.50	clay and sand	Bulk sample at 328 ft, recovered 14 in with 2 ft diameter-split barrel, no recovery on large sampler. Clay with trace very fine sand and silt, low dry strength, moderately stiff, no plasticity, tan, saturated (but appears moist) homogeneous, strong reaction with acid. Bottom of hole at 333 ft on 5/10/88.
Mark Group 401	101.50	102.11	clay and sand	Started drilling from 33 ft, depth to water 328.35 ft. Bulk sample at 333 ft, recovered 12 in. Undisturbed sample at 334 ft, recovered 14 in. clayey silt, medium dry strength, no plasticity, tan, saturated, soft with white, fine to coarse gravel-size cemented masses, no reaction to acid.
Mark Group 401	102.11	102.72	sand and clay	Silty sand, poorly graded, light brown, saturated, moderately well cemented (difficulty driving casing). Bulk sample at 338 ft, recovered 11 in.
Mark Group 401	102.72	103.94	clay and sand	Silt with some very fine sand (≈25%), low dry strength, no plasticity, light brown, wet, very stiff, weak cementation with white coarse-sand size inclusions of silt-sized particles, moderately reactive with acid. Bulk sample at 343 ft, recovered 71/2 in.
Mark Group 401	103.94	105.46	sand and clay	Silty sand, poorly grade, moderate dry strength, light brown, saturated, moderately well cemented, platy fracture, medium dry strength (casing driving hard through consolidated material). Bulk sample at 348 ft, recovered 6 in.
Mark Group 401	105.46	107.90	sand	Fine-grained sand with trace coarse and sand (≈5%), poorly graded, brown, saturated, strong cementation, medium dry strength, strong reaction with acid, Casing driving extremely hard. Producing water from this interval. Bulk sample 353.5 ft, recovered 6 in. 354 ft, looser material, weak cementation, more silt. Bottom of hole at 358 ft on 5/11/88.
Mark Group 401	107.90	109.42	sand and clay	Depth to water 320.2 ft. Started drilling from 358 ft. Bulk sample at 358 ft, recovered 3 in. Silty fine-grained sand with trace coarse sand (≈5%), poorly graded, brown, saturated, strong cementation, medium dry strength strong reaction with acid.
Mark Group 401	109.42	110.95	sand and clay	Fine to medium sand with some silt and trace coarse sand, poorly graded, brown, saturated, weak cementation, weak dry strength, reaction with acid, trace black organic material. Bulk sample at 363 ft, recovered 11/2 in.
Mark Group 401	110.95	112.17	sand and trace gravel	Gravelly sand, well graded, brown, saturated, weak cementation. Bulk sample at 368 ft, recovered 13 in.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 401	112.17	112.78	sand, clay and trace gravel	Fine to medium sand with trace silt and coarse sand, poorly graded, brown, saturated, no cementation.
Mark Group 401	112.78	114.30	sand and gravel	Gravelly sand with cobbles (4 in), ≈40% gravel, 40% sand, 20% cobble, well graded, brown, saturated, no cementation. Undisturbed sample at 373 ft, recovered 14 in. Bulk sample at 274 ft, recovered 10 in. At 374 ft cobble gravel with some sand (≈25%) well graded, brown and colors of individual grains, saturated, no cementation, maximum grain size 4 in. Bulk sample at 378 ft, recovered 4 in. Considerable rig chatter 380 ft, large cobbles. Stopped to hose off radiator, rig too hot at 390 ft. Bottom of hole at 399 ft on 5/12/88.
Mark Group 401	114.30	128.02	sand and gravel	Started drilling from 399 ft. Cobble gravel with trace sand, well graded, brown and colors of individual grains, saturated, no cementation, cobbles >5 in diameter. Producing water. Considerable rig chatter throughout. Total depth of boring at 420 ft.
Mark Group 402	0.00	1.52	sand and gravel	Sand with gravel, moderate yellowish to brown, sand is fine grain with fine gravel, subrounded. Sand 90% gravel 10%, slightly moist, 0–8 ft, sample is gap graded.
Mark Group 402	1.52	2.13	sand and gravel	Sand and gravel is about 50/50, gravel fine to medium pale yellowish-brown, variable rock types.
Mark Group 402	2.13	3.66	sand and gravel	Sand and gravel is about 50/50, gravel angular to subangular, light gray to gray.
Mark Group 402	3.66	4.57	sand and gravel	Less gravel (<20%).
Mark Group 402	4.57	6.71	sand and gravel	Sand with gravel same as above. Bulk sample at 22 ft met with refusal. No sample recovered probably due to cobbles and gravel.
Mark Group 402	7.62	12.34	sand and gravel	Bulk sample at 25 ft met with refusal, recovered only cobble-sized rocks. Sand with gravel, moderate yellowish-brown to gray-brown, sand is fine to medium with gravel to cobble-size (20–25%). Zone, gravel content 30%, 33–34 ft sand content higher mostly fine grain with silt 38–40.5 ft. Bottom of hole at 40.5 ft. Started drilling at 40.5 ft. Bulk sample at 43.5 ft, drove 14 in with 450 blows, recovered 7 in. Most of sand lost from sample. Description of recovered sample as follows, Fine gravel with trace coarse sand (9%) and coarse gravel (13%), poorly graded gravel is angular to subangular, composed mainly of igneous rocks, color is moderate yellowish-brown.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 402	12.50	19.57	sand, clay and gravel	Sand gravel with trace silt, sand 33%, gravel 62%, fines 5%, well graded, light brown to moderate yellowish-brown, damp. Bulk sample at 63.5 ft. Drove 7 in with 174 blows,.
Mark Group 402	19.57	22.86	sand and gravel	Sand fine to medium 80%, gravel fine 20%. At 75% gravelly sand with sand fraction about 75%, gravel <25%, damp.
Mark Group 402	22.86	37.64	sand and gravel	Bulk sample at 83 ft, met with refusal, unable to hold sample in bulk sampler. Bottom of hole at 83.5 ft on 5/7/88. Started drilling from 83.5 ft (open hole drilling) Gravel and sand, ≈50/50, gravel is fine, and mostly angular to subangular, clast.
Mark Group 402	37.64	43.74	sand, clay and gravel	Start at depth of 1 24.8 ft Undisturbed sample at 124.8 ft, drove 81/2in with 450 blows. Sand with gravel, well graded overall, sand with highest percent in the coarse sand range. Gravel mostly fine, subangular average size is 1/8–1/4 in, minor silt with clay, color is moderate yellowish-brown, sample is slightly damp.
Mark Group 402	43.74	49.83	sand, clay and gravel	Bulk sample at 143.5 ft, drove 4 in with 300 blows. Net with refusal after 4 in. Sandy gravel with chips of boulder-size rocks composed mostly of igneous materials, well graded, reddish brown and light gray. Zone of thin reddish-brown clayey lenses 145–146 ft. Boulders with minor sand and silt 156–158 ft. At 162–163.5 ft, sand and fine gravel, minor clay. Boring abandoned due to drilling problems. Total depth of boring 163.5 ft.
Mark Group 402B	0.00	11.43	sand and gravel	Top of hole (ground level). Sand and gravel, sand is well graded, gravel size is unknown as drill cuttings are pulverized by action of under reamer and down hole hammer. Boring abandoned due to drilling problems. Total depth of boring 37.5 ft.
Mark Group 402C	0.00	1.83	sand, clay and trace gravel	Gravelly sand with trace silt, well graded, light brown, slightly moist, no cementation, contains roots.
Mark Group 402C	1.83	7.62	sand and gravel	Very fine-grained sand with some medium to coarse sand and gravel, well graded, light brown, dry, no cementation.
Mark Group 402C	7.62	8.84	sand and gravel	Sandy gravel with trace cobble, well graded, grayish-brown, dry, no cementation.
Mark Group 402C	8.84	9.14	sand, clay and trace gravel	Gravelly sand with trace silt, well graded, light brown, dry, no cementation.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 402C	9.14	10.06	sand, clay and gravel	Sandy gravel with trace cobble, well graded, grayish-brown, dry, no cementation. At 33 ft, gravelly sand with trace silt, well graded, light brown, dry, no cementation. Bottom of hole at 40 ft.
Mark Group 402C	12.19	16.76	sand and gravel	Starting drilling from 40 ft. Sand and fine gravel, sand 80%, well graded and slightly damp, color is pale yellowish-brown. At 48–55 ft same as above, but sand about 70%, gravel composed of angular to subangular rock.
Mark Group 402C	16.76	21.34	sand and gravel	Gravel and sand, gravel about 60% well graded, mostly medium to coarse, slightly damp, color is moderate yellowish-brown.
Mark Group 402C	21.34	22.86	sand and gravel	Sand and gravel, sand 70%, large coarse fraction but well graded, gravel 30% is fine.
Mark Group 402C	22.86	24.38	sand and gravel	Gravel and sand, gravel 80% is fine, sand 20%, color is pale yellowish-brown.
Mark Group 402C	24.38	29.26	sand, clay and gravel	Bulk sample at 80 ft, down 9 in with 150 blows. Sandy gravel with trace of silt, 40% sand, 55% gravel, and 5% fines, well graded, gravel is fine with rocks that are mostly subangular, color is pale yellowish-brown.
Mark Group 402C	29.26	30.48	sand and gravel	Sand 80%, gravel 20%, gravel is fine.
Mark Group 402C	30.48	34.14	sand and gravel	sand and gravel about 50/50, same as 80–96 ft interval.
Mark Group 402C	34.14	35.05	sand, clay and trace gravel	Zone of sand and silt, very little gravel.
Mark Group 402C	35.05	36.58	sand and gravel	Sand and gravel 50/50. Bottom of hole at 120 on 5/16/88.
Mark Group 402C	36.58	39.01	sand and gravel	Started drilling from 120 ft, gravel and sand, sand mostly coarse to medium 40% gravel mostly fine 60%, color is pale yellowish brown. At 127–128 ft same except sand about 50% gravel 50%, color is light brown).
Mark Group 402C	39.01	42.06	sand and gravel	Same except gravel is about 40%, coarse to medium sand is 60%.
Mark Group 402C	42.06	42.67	sand and gravel	Sand 80% with gravel 20%, light brown, slightly damp.
Mark Group 402C	42.67	44.50	sand and gravel	Sand and gravel, about 50/50 sand is well graded, gravel is fine.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 402C	44.50	47.85	sand and gravel	Gravel and sand with gravel about 60–70%, sand 40–30%, zone very hard and cemented gravel is multicolored with various igneous rock types and sand is well graded, color is pale yellowish brown.
Mark Group 402C	47.85	48.77	sand and gravel	Sand and gravel, sand 60% gravel 40%, color light brown and slightly damp.
Mark Group 402C	48.77	50.90	sand, clay and gravel	Bulk sample at 160 ft, drove 7.2 in with 300 blows undisturbed sample 160.6 ft, drove 4.8 in with 280 blow. Sandy gravel with trace of silt and clay, subrounded rocks, sand 41% is well graded. Sample contains about 6% silt and clay and 53% gravel.
Mark Group 402C	50.90	52.12	sand and gravel	Gravel and sand about 50/50, gravel is fine and well graded, multi colored rocks.
Mark Group 402C	52.12	53.04	sand and gravel	Sand 60%, gravel 40%, sand is coarse to fine, 173–174 ft hard zone, cemented gravel.
Mark Group 402C	53.04	54.86	sand and gravel	sand 70%, fine gravel 30%, 178–180 ft same, but largest gravel is about 3/4 in diameter. Bottom of hole at 180 ft on 5/17/88.
Mark Group 402C	53.04	60.96	sand and gravel	Started drilling from 180 ft. Bulk sample at 180 ft, drove 5 in with 150 blows. Sample contains, Gravel with trace of sand (14%) poorly graded, gravel 80%, sand fine to medium 20%, gravel subrounded, light gray. Sand fraction may have been lost. Sand 70% and fine gravel 30%, sand is well graded, and gravel is angular to subrounded, color is moderate brown and slightly damp. At 190–199 ft sand 80%, gravel 20%, well graded. At 198 ft minor red clay. At 199–200 ft gravel fraction increased to about 30%. Undisturbed sample at 200 ft, drove 9/5 in with 150 blows. Bulk sample at 200.8 ft, drove 6 in with 150 blows.
Mark Group 402C	60.96	61.33	sand and gravel	Gravel with sand (28%) and trace of clay (8%) well graded.
Mark Group 402C	61.33	67.06	sand and gravel	Gravel (60–70%) and sand (40–30% gravel as above, sand well graded with larger coarse fraction, no clay seen. Color is a pale yellowish brown. 208–213 ft as above, zone is hard with abundant basalt chips. Bottom of hole at 220 ft on 5/18/88.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 402C	67.06	69.49	sand, clay and gravel	Started drilling from 220 ft. Bulk sample at 220 ft, drove 7 in with 150 blows. Sand with gravel (22%) and trace of silt (10%), light brown color, damp. 225–228 ft same as above but drier.
Mark Group 402C	69.49	70.71	sand and gravel	Fine gravel 70%, sand 30%, more cemented than before.
Mark Group 402C	70.71	71.32	sand and gravel	Sand 60%, gravel 40%.
Mark Group 402C	71.32	73.15	sand and gravel	Sand and gravel in about equal proportions.
Mark Group 402C	73.15	79.25	sand, clay and gravel	Bulk sample at 240 ft, drove 5 in with 150 blows. Bulk sample at 240.4 ft, Refusal after 5 in. At 240 ft sandy gravel with trace of silt and clay, well graded, at 240.4 ft sand 35%, gravel 60%, fines 5%. Sand 75% coarse to fine, well graded and fine gravel 25%, light brown in color, slightly damp. 255–260 ft caved material was the same as above. Formation caved in (will have to set 6 in casing). End of Drilling at 255 ft on 5/19/88. Bottom of hole and 260 ft on 5/19/88.
Mark Group 402C	79.25	82.84	sand, clay and gravel	Started drilling from 260 ft. Bulk sample at 260 ft, drove 12 in with 150 blows. Gravelly sand with trace of silt, 40% gravel, 52% sand, 8% fines, well graded, slightly moist, minor silt content, gravel with up to golf ball size rocks. Bottom of hole at 271.8 ft, on 5/26/88. Note, 6 in casing set to 260 ft.
Mark Group 402C	82.84	84.73	sand, clay and gravel	Started drilling from 271.8 ft. Bulk sample at 271 ft, drove 8 in with 150 blows undisturbed sample at 271.7 ft, drove 5 in with 150 blows. Sandy gravel with trace of silt, 45% sand, 50% gravel, 5% fines, well graded, light brown, slightly damp, gravel is fine, subrounded.
Mark Group 402C	84.73	86.26	sand, clay and gravel	Bulk sample at 278 ft, drove 1.5 ft. Sand with gravel and trace silt, poorly graded (60% sand, 28% gravel, 6% fines), sample is damp (not wet), color is moderate brown. Bottom of hole at 283 ft on 5/27/88.
Mark Group 402C	86.26	87.48	sand, clay and gravel	Depth to water 282.2 ft. Started drilling from 283 ft, gravelly sand with trace silt, well graded (36% gravel, 56% sand, 8% fines) Bulk sample at 283 ft, drove 10 in with 150 blows. Undisturbed sample at 283.8 ft, drove 12 in with 150 blows.
Mark Group 402C	87.48	87.72	sand and clay	Thin zone of clayey silty sand, light brown color. Bulk sample at 288 ft, drove 11 in.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 402C	87.72	89.31	sand, clay and gravel	Clayey sand with silt and gravel, poorly graded (39% fines, 51% sand, 10% gravel) Open hole drilling. Bottom of hole at 293 ft on 5/28/88. Attached air hammer above sampler. Unable to note blow counts as system is extremely rapid. Depth to water 283.3 ft, water level measurement taken at 07:05. Bulk sample at 293 ft, drove 6 in with 20 blows. Undisturbed sample at 293.5 ft, drove 12 in with 56 blows. At 293 ft, silt, highly cemented, very friable, crumbles easily, thinly bedded, slightly damp (sweats in plastic bag) pale yellowish brown color. Note, Driller attempted to drive casing deeper than 289.5 ft but met with refusal. Bottom of hole at 293 ft on 6/1/88.
Mark Group 402C	89.31	90.22	sand, clay and gravel	Started drilling from 293 ft. Note, bottom of casing at 286.6 ft Open hole drilling. Same silt becoming more sandy 295–296 ft.
Mark Group 402C	90.22	93.88	sand and clay	Bulk sample at 298 ft, recovered 5 in with 50 blows. Silty, fine grain sand, weak, breaks easily, indistinct bedding, wet, light brown color. At 302 ft streaks of gravelly sand. Bulk sample at 303 ft, recovered 5 in with 72 blows. 303–308 ft sample, silty sand, poorly graded, soft, pale yellowish brown in color. Bulk sample was dry to only damp. Bulk sample at 308 ft, drove 12 in with 100 blows. At 308 ft clayey silty very-fine-grained sand, poorly graded, very silty damp with vertical tubes filled with kaolinite clay. Bottom of hole at 309 ft on 6/2/88.
Mark Group 402C	94.18	95.10	sand and clay	Depth to water ≈292.8 ft. Started drilling from 309 ft. Note, Used down hole hammer mounted above sampler. clayey, silty fine-grained sandstone cemented with clay into while calcareous layer both firm and brittle. Bulk sample at 312 ft, drove 4 in with 130 blows. Undisturbed sample at 312.3 ft, drove 8.5 in with 150 blows.
Mark Group 402C	96.01	96.01	sand and clay	Same as above, except white layers are thing and interlayer with sandy, clayey silt.
Mark Group 402C	96.01	97.23	sand and clay	Same but softer containing more clay.
Mark Group 402C	97.23	98.15	sand and clay	Bulk sample at 319 ft, drove 5 in. Clayey sand, fine grain, hard to brittle, clay cement, light olive gray.
Mark Group 402C	98.15	99.06	sand and clay	Same but more clay Bulk sample at 324 ft, drove 4 in. At 325 ft, same, sand very fine grain, as above, light gray to light olive gray. Bulk sample at 329 ft,. Bulk sample at 324 ft, recovered 4 in. Undisturbed sample at 324 ft. Bottom of hole at 334 ft on 6/3/88.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 402C	99.06	102.57	sand and clay	Depth to water 296.55 ft. Start open hole drilling from 334 ft. Sand, very fine grain, as before.
Mark Group 402C	102.57	102.87	clay, sand and limestone	Silt, white, very hard but brittle.
Mark Group 402C	102.87	103.33	clay and sand	Clayey silt, light brown with very fine sand.
Mark Group 402C	103.33	103.54	clay and sand	Bulk sample at 339 ft, drove 4.5 in with 230 blows. Clayey silt, pale yellowish brown, soft to moderately hard.
Mark Group 402C	103.54	104.39	clay, sand and limestone	Silt, white, hard, limey (341–342.5 same with color change to light brown).
Mark Group 402C	104.39	104.85	clay and sand	Clayey, light olive gray. Bulk sample at 344 ft, drove in 76 blows.
Mark Group 402C	104.85	108.81	sand and clay	Silty fine-medium sand, well graded. Bulk sample at 349 ft, drove 5 in 180 blows.
Mark Group 402C	108.81	109.12	clay and sand	Bulk sample at 354 ft, drove 7 in 200 blows. Undisturbed sample at 354.6 ft, drove 12 in 80 blows. light brown silt, moderately hard and brittle.
Mark Group 402C	109.12	109.42	clay and sand	Clayey silt with thin layers of lime, white and hard.
Mark Group 402C	109.42	109.58	sand	Bulk sample at 359 ft, drove 8.5 in 180 blows. Sand, fine to medium grain, light olive brown. Bottom of hole at 359 ft, on 6/4/88.
Mark Group 402C	109.58	109.73	sand and clay	Depth to water 307.9 ft, drove casing from 340 ft, drove hard. Started drilling from 359 ft, silty, very fine-medium sand, poorly graded, light, brown, saturated, moderate cementation.
Mark Group 402C	109.73	111.86	clay and sand	Clayey silt with trace fine sand, tan, saturated (but only appears moist in noncemented portions) no dry strength, no plasticity, soft with white coarse sand to gravel size altered grains that break across the grain. Bulk sample at 364 ft, recovered 12 in. At 367 ft very fine sandy silt with trace clay maximum particle size medium sand, low dry strength, no plasticity, brown, saturated, weak cementation to moderate cementation in gravel size pieces. Starting to produce water. Bulk sample at 369 ft, recovered 15 in. Bulk sample at 374 ft, recovered 10 in. Bottom of hole at 374 ft on 6/6/88.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 402C	111.86	115.98	clay and sand	Depth to water 319.9 ft, started drilling from 374 ft, very fine sandy silt clay, low plasticity, no dry strength, brown, saturated, weak cementation to moderate cementation in gravel sized pieces, 378–378.5 ft stronger cementation.
Mark Group 402C	115.98	116.74	clay and sand	Bulk/Undisturbed sample at 379 ft, recovered 18 in (3 rings), middle ring sent in for undisturbed.
Mark Group 402C	116.74	117.35	clay and sand	Bulk sample at 384 ft, recovered 10 in. Very fine sandy silt, maximum particle size medium sand, low dry strength, no plasticity, brown, saturated, platy fracture, moderate cementation, weak reaction with acid.
Mark Group 402C	117.35	117.65	clay and sand	Silt fine to medium sand, well graded, brown, saturated, no cementation.
Mark Group 402C	117.77	120.09	clay and sand	Very fine sandy silt, maximum particle size medium sand, very low dry strength, no plasticity, brown, saturated, platy fracture, moderate cementation, very weak reaction with acid. Bulk sample at 389 ft, recovered 9 in.
Mark Group 402C	120.09	121.77	sand and clay	Silty fine-medium sand, well graded, brown, saturated, some weak cementation in gravel-sized masses (<10% by volume), no reaction with acid. Bulk sample at 394 ft, recovered 13 in. Bulk/Undisturbed sample at 399 ft, recovered 11 in. At 399.5 ft silty fine-medium sand with trace gravel, well graded, brown, saturated, no cementation. Bottom of hole at 399 ft, on 6/7/88.
Mark Group 402C	121.77	124.36	sand, clay and gravel	Depth to water 322.7 ft. Started drilling from 399 ft, silty, fine-medium sand with trace coarse sand and gravel (to 1 in diameter), well graded, brown, saturated, no cementation. Bulk sample at 404 ft, recovered 12 in. Grades to coarser materials.
Mark Group 402C	124.36	130.76	sand, clay and gravel	Bulk sample at 409 ft, recovered 9 in 2 tries. Cobble gravel with trace sand and silt, well graded, brown with colors of individual grains, saturated, no cementation. Rig chatter at 427–420 ft. At 429 ft gravel with trace fine sand, silt, and cobble, poorly graded (gap graded), brown, saturated, no cementation. At 434 ft more sand (fine-medium) less silt. Rig chatter at 435 ft, cobbles. Hole caving above drill stem. Total depth of boring at 436 ft.
Mark Group 403	0.00	3.96	sand and trace gravel	Gravelly, fine-medium sand with trace cobble, well graded, brown, dry, contains roots, no cementation. At 4 ft, slightly moist. At 8 ft, no more roots, color change to brown.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 403	3.96	5.18	sand, clay and trace gravel	Sand with trace travel, silt and cobble, well graded, light brown, dry, no cementation. At 15 ft same with color change to brown, slightly moist.
Mark Group 403	5.18	5.49	sand and trace gravel	Fine to medium sand with trace gravel and cobble (≈25% G&C), gap graded, brown, slightly moist.
Mark Group 403	5.49	8.84	sand, clay and gravel	Bulk sample at 18 ft, recovered 11 in 2 attempts. Gravelly sand with trace cobble and silt, well graded, light brown, dry, no cementation 20 ft, slightly moist at 20 ft.
Mark Group 403	8.84	10.06	sand, clay and gravel	Very fine to fine sand with gravel and trace silt, gap graded, light brown, dry, no cementation.
Mark Group 403	10.06	13.11	sand, clay and trace gravel	Gravelly sand with trace cobble and silt, well graded, light brown, dry, no cementation. Bulk sample at 38 ft, recovered 15 in.
Mark Group 403	13.11	13.72	sand and gravel	Sandy gravel, well graded, light brown, dry, no cementation.
Mark Group 403	13.72	14.63	sand and gravel	Gravelly sand (≈60% sand, 40% gravel) with trace cobble, well graded, light brown, dry, no cementation.
Mark Group 403	14.63	15.54	sand and gravel	Sandy gravel, well graded, light brown, dry, no cementation.
Mark Group 403	15.54	16.76	sand, clay and trace gravel	Gravelly sand with trace cobble (≈60% sand, 40% gravel), well graded, light brown, dry, no cementation.
Mark Group 403	16.76	20.73	sand, clay and gravel	Sand with some gravel (≈20%) and trace silt, well graded, brown, slightly moist, no cementation. Bulk/undisturbed sample at 58 ft, recovered 18 in. At 65 ft same with more gravel and trace cobble.
Mark Group 403	20.73	27.13	sand and trace gravel	Gravelly sand with trace cobble, well graded, brown, dry, no cementation. Bulk/undisturbed sample at 78 ft, recovered 14 in. At 80 ft same, slightly moist. Rig chatter 82–82.5 ft, large cobbles.
Mark Group 403	27.13	27.74	sand and gravel	Sandy gravel with some cobble, well graded, (≈35% sand, 45% gravel, 20% cobble) brown, dry, no cementation.
Mark Group 403	27.74	28.96	sand, clay and trace gravel	Gravelly sand with trace cobble sand clay, well graded, reddish-brown, slightly moist, no cementation.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 403	28.96	29.26	sand, clay and gravel	Sandy gravel with some cobble, well graded, grayish-brown, dry, no cementation. At 96 ft sand with some gravel and trace silt (clay and cobble, well graded, reddish-brown, slightly moist, no cementation. Bulk sample at 98 ft, recovered 12 in. Bottom of hole at 98 ft on 6/22/88.
Mark Group 403	29.26	32.00	sand, clay and gravel	Started Drilling from 98 ft, sand with trace gravel, clay, and cobble, well graded, reddish brown, slightly moist, not cementation. at 101 ft same with color change to brown, dry.
Mark Group 403	32.00	38.10	sand, clay and gravel	Sand with gravel and trace clay and cobble, well graded, reddish brown, slightly moist, no cementation. Bulk/ undisturbed sample at 118 ft, recovered 24 in.
Mark Group 403	38.10	43.89	sand, clay and gravel	Sandy gravel with trace cobble and clay, well graded, brown, dry, no cementation. At 125–127 ft rig chatter. At 129–131 ft rig chatter. At 133 ft, same but slightly moist. At 135–138 ft, rig chatter. Bulk sample at 138 ft, recovered 9 in.
Mark Group 403	43.89	44.50	sand and gravel	Gravelly sand with cobble (gravel 30 30/sand 50/ cobble 20), well graded, brown, slightly moist, no cementation.
Mark Group 403	44.50	46.94	sand, clay and gravel	Sand with gravel and trace silt and cobble, well graded, brown slightly moist, no cementation. At 154 ft sandy gravel with cobble and trace clay, well graded, reddish brown, slightly moist, no cementation. Bottom of hole at 158 ft on 6/23/88.
Mark Group 403	46.94	55.47	sand, clay and gravel	Started drilling from 158 ft, sandy gravel with some cobble and trace clay, well graded, reddish, brown slightly moist, no cementation, very dense, moderately cohesive due to clay. At 163 ft same but not as much clay. At 172 ft. More clay (20%), color change to brown. Bulk sample at 178 ft, recovered 13 in.
Mark Group 403	55.47	57.61	sand and trace gravel	Fine to medium sand with some coarse sand and gravel and trace cobble, well graded, slightly moist, brown, no cementation.
Mark Group 403	57.61	58.83	sand, clay and trace gravel	Gravelly sand with some clay (≈15%), well graded, brown, slightly moist, rig chatter throughout this strata.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 403	58.83	59.44	sand, clay and gravel	Fine to medium sand with gravel, gap graded, brown, dry, no cementation. At 195 ft. Sandy gravel with cobble and clay, well graded, brown, slightly moist, no cementation. Caving stopped driving down at 195 ft. Bulk/undisturbed sample at 199 ft, recovered 18 in. Bottom of hole at 199 ft on 6/24/88.
Mark Group 403	60.66	62.18	sand, clay and gravel	Started drilling from 199 ft, sandy gravel with cobble and trace clay (≈10%) well graded, brown, slightly moist, no cementation. At 210 ft rig chatter casing driving hard for all 20 ft.
Mark Group 403	62.18	62.94	sand, clay and gravel	Sandy gravel with cobble and trace clay (30%/40/20%/10%), well graded, black, slightly moist.
Mark Group 403	62.94	63.40	sand and gravel	Cobble gravel with trace sand, well graded, slightly moist, rig chatter throughout.
Mark Group 403	63.40	65.23	sand and gravel	Sand with gravel (≈20%) and clay (≈15%), well graded, brown, slightly moist, no cementation.
Mark Group 403	65.23	68.58	sand, clay and gravel	Sandy gravel with clay and trace cobble, well graded, reddish brown, slightly moist, no cementation. Bulk sample at 218 ft, recovered 9 in.
Mark Group 403	68.58	69.49	sand and trace gravel	Gravelly sand with cobble (≈20%), well graded, brown, slightly moist, no cementation.
Mark Group 403	69.49	71.63	sand, clay and gravel	Sand with gravel (≈20%) and trace clay (≈15%), well graded, reddish brown, slightly moist, no cementation.
Mark Group 403	71.63	73.15	sand, clay and gravel	Gravelly sand with cobble and trace clay, well graded, brown, slightly moist, no cementation. Bulk/undisturbed sample at 238 ft, recovered 18 in.
Mark Group 403	73.15	77.72	sand, clay and gravel	Sand with gravel and clay (≈20%) and trace cobble, well graded brown, slightly moist, no cementation. Casing driving very slowly, but continues to go down. At 255 ft, fine to medium sand with some silt and trace gravel (≈15%) and cobble (≈5%), well graded, brown, slightly moist, no cementation. Bottom of hole at 258 ft, on 6/25/88.
Mark Group 403	77.72	84.73	sand, clay and gravel	Started drilling from 258 ft. Bulk sample at 258 ft, recovered 9 in. Fine to medium sand with some silt and trace gravel (≈15%) and cobble (≈5%), well graded, brown, slightly moist, no cementation.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 403	84.73	85.04	sand	Bulk/Undisturbed sample at 379 ft, recovered 16 in. Fine to medium sand, poorly graded, brown, slightly moist, no cementation.
Mark Group 403	85.04	85.19	sand and gravel	Sand with gravel, well graded, brown, moist, no cementation.
Mark Group 403	85.19	85.95	sand and gravel	Fine to medium sand with gravel, very poorly graded, brown, slightly moist, no cementation.
Mark Group 403	85.95	86.41	sand and clay	Clayey sand, poorly graded, brown, moist, no cementation. Bulk sample at 282 ft, recovered 16 in.
Mark Group 403	86.41	87.17	clay and sand	Silt with trace clay and very fine sand, maximum particle size medium sand, no plastic thread, brown, slightly moist, soft, no cementation.
Mark Group 403	87.17	87.78	clay and sand	Clayey very fine sand, weak plastic thread, brown, wet, medium stiff, no cementation. Bulk sample at 288 ft, recovered 9 in.
Mark Group 403	87.78	90.22	sand, clay and trace gravel	Gravelly sand with silt, well graded, brown, slightly moist, no cementation. Bulk sample at 293 ft, recovered 8 in.
Mark Group 403	90.22	91.14	sand, clay and gravel	Clayey sand with silt, well graded, very low, dry strength, weak and soft plastic thread (very slight plasticity), brown, wet, firm, no cementation. Bulk sample at 298 ft, recovered 10 in. Bulk sample at 299 ft, recovered 11 in. At 299 ft fine-grained sandy clay, maximum particle size fine gravel, medium plasticity, brown, wet, no cementation. Bottom of hole at 298 ft on 6/27/88.
Mark Group 403	91.14	92.51	clay, sand and trace gravel	Fine-grained sandy clay, maximum particle size fine gravel, medium dry strength, moderate plasticity, brown, wet stiff with some moderate cementation in large gravel-size masses.
Mark Group 403	92.51	92.66	sand, clay and gravel	Sand with gravel and trace silt, well graded, brown saturated, no cementation. At 304 ft, fine-grained sandy silt with gravel (≈30%), low dry strength, low plasticity, brown, saturated. Bulk sample at 303 ft, recovered 14 in. Undisturbed sample at 304 ft, recovered 18 in. Bottom of hole at 303 ft, on 6/28/88. Depth to water measured at 300.9 ft from ground surface. Depth of water 300.92 ft. Started drilling from 303 ft.
Mark Group 403	92.66	93.27	clay, sand and gravel	Fine-grained sandy silt with gravel (≈30%), low dry strength, low plasticity, brown, saturated.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 403	93.27	94.03	sand, clay and gravel	Sand with gravel and trace clay, well graded, brown, saturated, occasional strong cementation in coarse gravel-sized masses. Bulk sample at 308 ft, recovered 10 in.
Mark Group 403	94.03	94.49	clay, sand and gravel	Fine-grained sandy silt with trace clay, maximum particle size fine gravel (<3%), low dry strength, no plasticity, brown, moist, no cementation.
Mark Group 403	94.49	96.62	sand and clay	Sand with trace silt (≈15%) and gravel (≈10%), well graded, brown, saturated, loose, no cementation. Bulk sample at 314 ft, recovered 3 in, may have lost part of fines. At 317 ft silty, fine-grained sand, poorly graded, light brown, saturated, moderate cementation. Bottom of hole at 319 ft on 6/29/88.
Mark Group 403	96.62	97.38	sand and clay	Depth to water 310.5 ft. Started drilling from 319 ft. Silty, fine-grained sand, poorly graded, light brown, saturated, moderate cementation, medium dry strength with very minor (localized) reactions to acid. Bulk/undisturbed sample at 319 ft, recovered 13 in.
Mark Group 403	97.23	102.72	clay and sand	Fine-grained sandy silt, maximum particle size medium sand, medium dry strength, no plasticity, light brown, saturated, alternating thin layers of firm with no cementation and hard with moderate cementation and platy fracture. Bulk sample at 324 ft, recovered 11 in. Bulk sample at 329 ft, recovered 18 in. Bulk sample at 334 ft, recovered 11 in. At 335 ft contains trace quartz gravel (≈5%).
Mark Group 403	102.72	103.63	clay and sand	Silt with trace fine sand and clay, maximum particle size medium sand, low to medium dry strength, no plasticity, light brown, saturated, no cementation but with grace grave-sized moderately cemented masses. Bulk sample at 339 ft, recovered 15 in.
Mark Group 403	103.63	104.55	clay and sand	Very fine-grained sandy silt, maximum particle size medium sand, medium dry strength, no plasticity, light brown, saturated, moderately strong cementation.
Mark Group 403	104.55	105.77	clay and sand	Silt with trace fine sand and clay, maximum particle size medium sand, low-medium dry strength, no plasticity, light brown, saturated, no cementation with gravel-sized moderately cemented masses, very mild reaction with acid. Undisturbed sample at 344 ft, recovered 16 in. Bulk sample at 346 ft, recovered 18 in. At 347 ft silty fine-grained sand, poorly graded, light brown, saturated, moderate-strong cementation. Bottom of hole at 349 ft on 6/30/88.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 403	106.38	106.68	clay and sand	Depth to water 318.72 ft. Started drilling from 349 ft, sand fine to medium grain, weakly cemented. Bulk sample B403–29–349, recovered 13 in.
Mark Group 403	106.71	107.90	sand and gravel	Sand well graded, fine to medium weakly cemented, observed several white quartz pebbles, hit some clay at 353–354 ft. Bulk sample B403–30–354, recovered 15 in.
Mark Group 403	107.90	108.81	sand	Sand fine grain, light moderate brown color, weakly cemented.
Mark Group 403	108.81	110.95	sand	Sand, fine grain as above with medium to coarse quartz and igneous type rock, sand. Zone from 357–358 ft contains multi-colored igneous gravel. Zone from 358–359 ft, sand with medium quartz grains.
Mark Group 403	110.95	111.71	sand and clay	Silty-sandy light brown clay damp but not moist, dense material. Bulk sample B403–31–359, recovered 18 in. Bulk sample B403–32–364, recovered 12 in.
Mark Group 403	111.40	112.47	sand and clay	Very fine-grained sand, weakly cemented, clayey with minor fine to medium grain sand.
Mark Group 403	112.47	112.99	sand and clay	Bulk sample B403–33–369. Silty clay, light brown, minor sand, dense.
Mark Group 403	112.99	114.00	clay	clay, light olive gray, dry to only slightly damp, no silt or sand seen. At 374 ft silty clayey sand. undisturbed U403–34–374, recovered 18 in. Bulk B403–34–374, recovered 9 in. Bottom of hole at 374 ft on 7/1/88.
Mark Group 403	114.00	114.91	sand, clay and trace gravel	Depth to water 319.24 ft. Started drilling from 374 ft, silty clayey sand with trace gravel and sand, maximum particle size fine gravel, slight plasticity, light brown, saturated with trace organic material.
Mark Group 403	114.91	115.21	sand, clay and trace gravel	Silty sand with trace gravel, poorly graded, light brown, saturated with trace organic material.
Mark Group 403	115.21	117.04	clay and sand	Bulk sample at 379 ft, recovered 18 in. silty clay with trace fine sand, maximum particle size medium sand, no plasticity to medium plasticity when wet, light brown, saturated (but appears moist) with trace organic materials, low dry strength, swells with water addition. Bulk/undisturbed sample at 384 ft, recovered 18 in. Bulk sample at 386 ft, recovered 18 in.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 403	117.04	119.18	sand and clay	Silty fine-medium sand with trace clay, poorly graded brown, saturated, no cementation. Bulk sample at 389 ft, recovered 16 in. At 391 ft silty clay with trace fine sand, low dry strength, low plasticity, brown, saturated with gravel-sized masses of high dry strength. Bulk sample at 394 ft, recovered 18 in. Bottom of hole at 394 ft on 7/6/88.
Mark Group 403	119.18	125.12	clay and sand	Depth to water 320.59 ft. Started drilling from 394 ft, silty clay with trace fine sand, low dry strength with gravel-sized masses of high dry strength, low plasticity, brown, saturated. At 397–398 ft same with trace fine to coarse gravel, ≈10%. At 398 ft same as above at 391 without gravel with medium plasticity and weak reaction with acid. Bulk sample at 399 ft, recovered 18 in. Bulk/undisturbed sample at 404 ft, recovered 18 in. Bulk sample at 406 ft, recovered 18 in. At 404.5 ft color changed to light brown, less sand. Bulk sample at 409 ft, recovered 18 in.
Mark Group 403	125.12	126.19	clay, sand and gravel	Gravelly clay, gap graded, maximum particle size coarse gravel, medium dry strength, medium plasticity, light brown, saturated, no cementation. Bulk sample at 414 ft, recovered 18 in.
Mark Group 403	126.19	127.10	sand, clay and gravel	Sandy clayey silt, maximum particle size coarse sand (<2%), low dry strength with large gravel sized masses of high dry strength clay, no plasticity, brown, saturated, no cementation. At 417 ft, gravelly sand with trace silt, well graded, brown saturated, no cementation. Producing water. Bulk sample at 419 ft, recovered 10 in. Bottom of hole at 419 ft on 7/7/88. Depth to water 323.35 ft.
Mark Group 403	127.10	131.06	sand, clay and gravel	Started drilling from 419 ft, gravelly sand with trace silt, clay and cobbles, well graded, brown, with colors of individual grains, saturated (producing water), no cementation. Bulk sample at 424 ft, recovered ≈10 in. sample not representative, fines and sands washed out. At 425 ft same as above with less fines. At 425–426 ft rig chatter.
Mark Group 403	131.06	132.59	sand and gravel	Sandy gravel with cobble (large cobble), (≈30% sand/50% gravel/20% cobble), well graded, brown, with colors of individual grains, saturated, no cementation (rig chatter throughout).
Mark Group 403	132.59	133.50	sand and gravel	Gravelly sand with cobble and trace fines (≈15% fines, well graded, light brown, saturated, no cementation. Casing would not drive beyond 436 ft.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 403	133.50	137.77	sand and gravel	Cobble gravel with sand (30% cobble/50% gravel/20% sand) well graded, brown with colors of individual grains, saturated, no cementation. Large cobbles throughout this zone, colors of cuttings change depending upon the individual cobble/boulder, considerable rig chatter.
Mark Group 403	137.77	139.60	sand, clay and trace gravel	Gravelly sand with trace silt (≈10%) and cobble, well graded, light brown, saturated, no cementation.
Mark Group 403	139.60	140.21	Gravel	Boulder, purple quartzite.
Mark Group 403	140.21	142.04	sand and gravel	Cobble gravel with trace sand, well graded, brown with colors of individual grains, saturated, no cementation.
Mark Group 403	142.04	150.27	sand and gravel	Gravelly sand with cobble (30/50/20), well graded, light brown with colors of individual grains, saturated, no cementation.
Mark Group 403	150.27	156.67	sand and gravel	Sandy gravel, well graded, light brown with colors of individual grains, saturated, no cementation. At 495 ft same as above.
Mark Group 403	156.67	159.41	sand and trace gravel	Gravelly sand with trace cobble, well graded, light brown with colors of individual grains, saturated, no cementation. At 523 ft sandy gravel with trace of cobbles and occasional boulders, well graded, brown with colors of individual grains, saturated, no cementation.
Mark Group 403	159.41	174.65	sand and gravel	Started drilling from 562 ft, sandy gravel with trace of cobbles and occasional boulders, well graded, brown with colors of individual grains, saturated, no cementation.
Mark Group 403	163.07	164.29	sand and gravel	Rig chatter (large cobbles).
Mark Group 403	165.20	167.34	sand and gravel	Rig chatter (large cobbles). Bottom of hole at 562 ft on 7/8/88.
Mark Group 403	174.65	179.83	sand and gravel	Cobble gravel with trace sand, well graded, colors of individual grains, saturated, no cementation. At 573–578 ft rig chatter.
Mark Group 403	179.83	180.75	sand, clay and gravel	Sandy gravel with trace silt (5%), well graded, light brown with colors of individual grains, saturated, no cementation.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Mark Group 403	180.75	181.36	sand, clay and gravel	Considerable rig chatter.
Mark Group 403	181.36	190.80	sand, clay and gravel	Cobble gravel with trace sand, well graded, colors of individual grains, saturated, no cementation. At 601 ft same with trace silt. At 612–614 ft considerable rig chatter. At 626 f t. Cobble gravel with boulders and trace sand (5%) well graded, colors of individual grains, saturated, no cementation. Considerable rig chatter from 626 ft on down. Considerable rig chatter from 626 ft on down (especially at 637 ft). Total depth of boring at 658 ft.
Perc Est AFCA1	0.00	0.49	sand and trace gravel	Sand, fine, moist, windblown, and occasional volcanic gravel and cobbles embedded in sand, moderate yellowish brown (10YR5/4). Gravel and cobbles commonly coated with calcite.
Perc Est AFCA1	0.49	0.61	sand and gravel	Boulders and cobbles mixed with sand, dry.
Perc Est AFCA1	0.61	0.70	sand and gravel	Pavement of cobbles and boulders.
Perc Est AFCA1	0.70	0.91	sand and trace gravel	Sand and gravel, mostly sand, gravel as large as 4 cm, roots around cobbles, fewer roots at 0.9 meter, grayish orange pink (5YR7/2).
Perc Est AFCA1	0.91	1.40	sand and trace gravel	Sand with few stones, fine, powdery, very dry. Cored 1.07–2.59 m, recovered 33 cm of sample.
Perc Est AFCA1	1.40	3.11	clay and sand	Silt with fine sand, partly cemented, occasional fine gravel and coarse sand, pinkish gray (5YR8/1). Cored 2.59–3.20 m, recovered 52 cm.
Perc Est AFCA1	3.11	4.08	clay and sand	Silt with fine sand, partly cemented, dry very pale orange (10YR8/2). Cored 3.20–4.11 m, recovered 88 cm.
Perc Est AFCA1	4.08	5.03	clay, sand and trace gravel	Silt with fine sand, compacted, dry, very pale orange (10YR8/2). Roots with oxidization rings are throughout core. Many dark colored pebbles embedded in sandy silt. Bottom 15 cm has more sand. Overall look is like marl. Cored 4.11–5.03 m, recovered 92 cm.
Perc Est AFCA1	5.03	5.35	sand and clay	Sand, medium to fine-grained, dry 5.03–5.18 m, very pale orange (10YR8/2). Grades-fine sand and silt 5.18–5.33 m. Silt is dense and cemented with fossilized roots-almost a siltstone. Cored 5.03–5.58 m, recovered 30 cm.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFCA1	5.35	6.55	clay and sand	Silt with fine sand, dense and partly cemented, almost a siltstone, very pale orange (10YR8/2). Sample is mottled with grayish green sandy silt and contains many nearly vertical streaks of yellow orange oxidation with fossilized roots. Calcite nodules are present and seem to have formed around old root traces or in small 26 burrows. Cored 5.58–6.55 m, recovered 97 cm.
Perc Est AFCA1	6.55	7.16	clay and sand	Silt with fine sand, dense and partly cemented, almost a siltstone, very pale orange (10YR8/2). There are fewer zones of oxidation and fossilized roots. Cored 6.55–7.16 m, recovered 61 cm.
Perc Est AFCA1	7.16	8.23	clay and sand	Silt with fine sand, dense and partly cemented 7.16–8.23 m, almost a siltstone, very pale orange (10YR8/2). There are only occasional zones of oxidation. Black pebbles at 8.23 m. Cored 7.16–8.69 m, recovered 1.52 m.
Perc Est AFCA1	8.23	8.30	sand and gravel	Sand and gravel, gravel as large as 6.3 mm, loose and dry.
Perc Est AFCA1	8.30	8.69	sand	Sand, coarse, loose and slightly damp. Sand is mottled gray, brown, black and pink.
Perc Est AFCA1	8.69	9.14	sand and gravel	Sand and gravel with gravel a dark red volcanic rock, cemented. Cored 8.69–9.14 m, recovered 30 cm. Cored again and collected 15 cm of sample, called it 8.99–9.14 m.
Perc Est AFCA1	9.14	10.21	sand and gravel	No core, drilled hard 9.14–9.60 m, easy 9.60–9.75 m, hard again 9.75–10.21 m.
Perc Est AFCA1	10.21	10.68	clay, sand and trace gravel	Silt with sand, minor gravel, dry and partly cemented. No fossilized roots, oxidation, or calcite nodules observed. Cored 10.21–11.73 m, recovered 42 cm.
Perc Est AFCA1	10.68	11.89	sand and gravel	Sand and gravel with some cobbles, coarse sand, dry and loose. Stones commonly quartzite and carbonate. Cored 11.73–12.65 m, recovered 15 cm.
Perc Est AFCA1	11.89	13.20	sand	Sand, coarse, well sorted for entire core. Individual grains are gray, brown, pink and black. Cored 12.65–13.26 m, recovered 53 cm.
Perc Est AFCA1	13.20	14.20	sand	Sand, fine-coarse. Cored 13.26–14.20 m, recovered 64 cm.
Perc Est AFCA1	14.20	14.51	sand	Sand, coarse, well sorted, gravelly at 14.48 m. Cored 14.20–14.941 m, recovered 30 cm. End of hole.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFCA2	0.00	0.34	clay, sand and trace gravel	Silt with fine sand and some gravel, numerous roots, moist, dark yellowish brown (10YR4/2). Sandy silt is wind-blown.
Perc Est AFCA2	0.34	0.88	sand, clay and gravel	Sand and gravel, gravel as large as 61 cm, mostly volcanic, one large stone of obsidian, some roots, loose, and damp but not as moist as overlying sandy silt, grayish orange pink (5YR7/2).
Perc Est AFCA2	0.88	1.22	clay, sand and trace gravel	Silt with minor gravel, some clay and roots, minor oxidation, damp, grayish orange pink (5YR7/2). Cored 1.07–1.98 m, recovered 61 cm.
Perc Est AFCA2	1.22	1.68	sand and trace gravel	Sand, medium to fine, well sorted, minor gravel, loose, an occasional root, damp, grayish orange pink (5YR7/2).
Perc Est AFCA2	1.68	2.13	sand and clay	Sand with silt, no roots or oxidation observed, moist, grayish orange pink (5YR7/2). Cored 1.98–2.59 m, recovered 61 cm.
Perc Est AFCA2	2.13	2.59	clay and sand	Silt with sand, pea-size gravel at 2.56 m, moist yet readily falls apart, grayish orange pink (5YR7/2).
Perc Est AFCA2	2.59	2.96	sand and gravel	Sand and gravel, stones 6 mm, damp, grayish orange pink (5YR7/2). Cored 2.59–3.44 m, recovered 37 cm. Driller noted gravel at 3.35 m.
Perc Est AFCA2	2.96	3.65	sand and clay	Sand with silt, no roots or oxidation, loose and damp, grayish orange pink (5YR7/2). Cored 3.44–4.11 m, recovered 67 cm.
Perc Est AFCA2	3.65	4.11	clay and sand	Silt with fine sand, partly cemented, mottled with oxidation and manganese nodules, moist, grayish orange pink (5YR7/2).
Perc Est AFCA2	4.11	4.72	sand and trace gravel	Sand, fine-medium gravelly 4.57–4.72 m, moist, light brown (5YR5/4). Cored 4.11–5.64 m, recovered 152 cm.
Perc Est AFCA2	4.72	5.18	sand and trace gravel	Sand, medium to coarse, an occasional pebble, streaks of bright yellow orange oxidation, moist, grayish orange (10YR7/4).
Perc Est AFCA2	5.18	5.64	sand	Sand, fine, well sorted, moist, grayish orange (10YR7/4).
Perc Est AFCA2	5.64	6.04	sand	Sand, medium-coarse, no pebbles, well sorted, moist, grayish orange (10YR5/4). Cored 5.64–7.16 m, recovered 152 cm.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFCA2	6.04	7.16	clay and sand	Silt with fine sand, streaks of bright yellow orange oxidation, very pale orange (10YR8/2).
Perc Est AFCA2	7.16	8.08	clay, sand and trace gravel	Silt with fine sand, an occasional pebble, partly cemented, vertical traces of faintly oxidized zones, some relic root hairs and traces of light gray calcite along old root traces, moist, very pale orange (10YR8/2). Cored 7.16–8.08 m, recovered 91 cm.
Perc Est AFCA2	8.08	8.23	clay and sand	Silt with fine sand (similar to preceding core), moist, very pale orange (10YR8/2). Cored 8.08–8.78 m, recovered 70 cm.
Perc Est AFCA2	8.23	8.78	sand and trace gravel	Sand, fine to medium an occasional pebble, moist, yellowish gray (5Y7/2).
Perc Est AFCA2	8.78	9.24	sand and trace gravel	Sand, fine-medium gravelly 9.02–9.24 m, moist, yellowish gray (5Y7/2). Cored 8.78–10.21 m, recovered 137 cm.
Perc Est AFCA2	9.24	10.15	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 5 cm and more abundant near 10.06 m, moist, pale red (10YR6/2).
Perc Est AFCA2	10.15	10.52	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 4 cm, thin layers of moisture, pale red (10R6/2). Cored 10.21–11. 13 m, recovered 31 cm, sediment at bottom of shoe on core was cemented and hard.
Perc Est AFCA2	10.52	11.58	sand and trace gravel	Sand, fine-medium with an occasional pebble, well sorted, damp, moderate yellowish brown (10YR5/4). Cored from 11, 13–11.73 m, recovered 60 cm.
Perc Est AFCA2	11.58	11.73	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 4 cm, moist, pale red (10R5/2).
Perc Est AFCA2	11.73	12.03	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 3 cm, thin zones of moisture between drier sediments, pale red (10R5/2). Cored 11.73–12.65 m, recovered 30 cm. Last meter was in sand and gravel. Drilling difficult.
Perc Est AFCA3	0.00	0.40	sand and clay	Sand, fine with silt, numerous roots, moist, pale yellowish brown (10YR6/2).
Perc Est AFCA3	0.40	1.00	sand, clay and trace gravel	Sand, fine with silt, pebbles common near 0.98 meter, numerous roots and drier than at surface, grayish orange pink (5YR7/2).

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFCA3	1.00	1.16	sand, clay and trace gravel	Sand and silt with pebbly gravel, loose and much less moisture than near surface, grayish orange pink (5YR7/2). Cored 1.07–1.98 m, recovered 76 cm.
Perc Est AFCA3	1.16	1.83	sand	Sand, medium to fine, well sorted with only an occasional root, more moisture than at 1. 16 m, grayish orange pink (5YR7/2).
Perc Est AFCA3	1.83	2.56	sand and clay	Sand and silt, well sorted, minor amount of coarse sand, moist, partly cemented with web-like secondary calcite and root hairs at 2.29 m, grayish orange pink (5YR7/2). Cored 1.98–2.59 m, recovered 58 cm.
Perc Est AFCA3	2.56	3.11	sand, clay and trace gravel	Sand, medium-coarse, and fine gravel, some silt, occasional roots, moist, pale yellowish brown (10YR6/2). Gravel well sorted and reddish. Cored 2.59–4.11 recover 143 cm.
Perc Est AFCA3	3.11	4.02	sand, clay and gravel	Sand and gravel with some silt, gravel as large as 3 cm, partly cemented, several roots with oxidation around roots, damp, pale yellowish brown (10YR6/2).
Perc Est AFCA3	4.02	4.42	sand, clay and trace gravel	Sand and silt with few pebbles, no roots, moist, moderate yellowish brown (10YR5/4). Cored 4.11–5.64 m, recovered 122 cm.
Perc Est AFCA3	4.42	4.57	sand and trace gravel	Sand, fine to medium well sorted with thin layers of coarse sand and pebbles, moist, grayish orange pink (5YR7/2).
Perc Est AFCA3	4.57	5.33	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 5 cm, moist, grayish orange pink (5YR7/2).
Perc Est AFCA3	5.33	5.79	sand and trace gravel	Sand, medium to coarse, and gravel, gravel as large as 1 cm, moist, grayish orange pink (5YR7/2). Cored 5.64–6.55 m, recovered 76 cm.
Perc Est AFCA3	5.79	6.40	sand	Sand, fine to medium well sorted, no roots or oxidation, moist, grayish orange pink (5YR7/2).
Perc Est AFCA3	6.40	7.07	sand and trace gravel	Sand, medium-coarse, well sorted, occasional pebble, no roots or oxidation, moist, grayish orange pink (5YR7/2). Cored 6.55–7.16 m, recovered 61 cm.
Perc Est AFCA3	7.07	7.16	sand and clay	Silt and fine sand with rust colored blobs (weathering around pebbles?), compact, some calcite webbing, moist, grayish orange pink (5YR7/2).

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFCA3	7.16	8.08	clay, sand and trace gravel	Silt and fine sand, occasional dark red to black pebbles, some staining of grayish yellow (5Y8/4) that may be relic oxidation, calcite nodules, partly cemented, moist, yellowish gray (5YR7/2). Higher content of fine sand 7.17–7.47 m. Cored 7.16 to 8.08 m, recovered 91 cm.
Perc Est AFCA3	8.08	8.66	sand, clay and gravel	Sand and gravel with silt, gravel as large as 5 cm, moist, grayish orange pink (5YR7/2). Cored 8.08–8.69 m, recovered 58 cm.
Perc Est AFCA3	8.66	8.84	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 3 cm, loose, moist, grayish orange pink (5YR7/2). Cored 8.69–10.21 m, recovered 122 cm.
Perc Est AFCA3	8.84	9.14	sand	Sand, medium well sorted, moist, grayish orange pink (5YR7/2).
Perc Est AFCA3	9.14	9.75	sand and clay	Silt with fine sand, compacted and partly cemented, occasional calcite nodule, moist, grayish red (10R4/2).
Perc Est AFCA3	9.75	9.91	sand	Sand, fine to coarse, moist, grayish red (10R4/2).
Perc Est AFCA3	9.91	10.82	sand and clay	Sand, fine, and silt with vertical calcite stringers, moist, grayish red (10R4/2). Cored 10.21–11.73 m, recovered 152 cm.
Perc Est AFCA3	10.82	11.13	sand and clay	Sand, fine with silt and minor clay, moist, grayish red (10R4/2).
Perc Est AFCA3	11.13	11.73	sand and clay	Sand, fine with silt, vertical calcite stringers, moist, grayish red (10R4/2).
Perc Est AFCA3	11.73	13.26	sand, clay and trace gravel	Sand, fine, alternates with 15–cm thick layers of silt and fine sand, occasional pebbles, moist, grayish red (10R4/2). Cored 11.73–13.26 m, recovered 153 cm.
Perc Est AFCA3	13.26	13.44	clay, sand and limestone	Marl (?) with clay and silt, smears, gravel at 13.41–13.44 m, gravel as large as 3 cm, moist, very pale orange (10YR8/2). Cored 13.26–14.48 m, recovered 122 cm.
Perc Est AFCA3	13.44	13.62	sand	Sand, medium to coarse, well sorted, moist, dusky red (10R3/2). Sand grains are red and black.
Perc Est AFCA3	13.62	14.48	sand	Sand, fine to medium well sorted, one large white calcite nodule, moist, grayish orange pink (5YR7/2). End of hole.

Appendix 1. Compilation of borehole and aquifer data.—Continued

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Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFCA4	0.00	0.94	sand, clay and trace gravel	Sand, fine with silt and gravel, gravel as large as 1 cm, numerous roots in uppermost 60 cm, moist, moderate yellow brown (10YR5/4). Cored 0.0–1.07 m, recovered 94 cm.
Perc Est AFCA4	0.94	1.37	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 6 mm, occasional roots, moist. Cored 1.07–1.98 m, recovered 79 cm.
Perc Est AFCA4	1.37	1.68	sand and trace gravel	Sand, medium to coarse, minor gravel, occasional roots, moist.
Perc Est AFCA4	1.68	1.86	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 3 cm, occasional roots, moist.
Perc Est AFCA4	1.86	2.13	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 3 cm, occasional roots, moist. Cored 1.98–2.59 m, recovered 61 cm.
Perc Est AFCA4	2.13	2.29	sand	Sand, medium to coarse, well sorted, occasional roots, moist.
Perc Est AFCA4	2.29	2.59	clay and sand	Silt with fine sand, numerous whitish root hairs and some decomposing woody roots, moist, moderate brown (5YR5/4).
Perc Est AFCA4	2.59	2.74	sand	Sand, very fine, uniform, possibly wind blown, no roots, moist. Cored 2.59–4 m, 11 m, recovered 1.37 m.
Perc Est AFCA4	2.74	3.90	sand	Sand, medium to coarse, larger grains reddish black, moist.
Perc Est AFCA4	3.90	3.96	sand and clay	Sand, fine, well sorted, layered with 6–12 mm thick yellowish green silt and clay, moist.
Perc Est AFCA4	3.96	4.87	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 1 cm, less gravel 4.42–4.72 m, no roots, moist. Cored 4.11–4.94, recovered 76 cm.
Perc Est AFCA4	4.87	5.18	sand and trace gravel	Sand, fine with some gravel, gravel as large as 2 cm, moist. Cored 4.94–5.64, recovered 70 cm.
Perc Est AFCA4	5.18	5.64	sand and trace gravel	Sand, coarse, well sorted, occasional gravel to 3 cm, moist.
Perc Est AFCA4	5.64	6.49	sand and trace gravel	Sand, coarse, well sorted, occasional gravel, gravel as large as 1 cm, no roots, moist. Cored 5.64–6.55 m, recovered 85 cm.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFCA4	6.49	6.86	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 5 cm, moist. Cored 6.55–7.16 m, recovered 61 cm.
Perc Est AFCA4	6.86	7.16	clay and sand	Silt with fine sand, partly cemented, streaks of dark red oxidation, no calcite or fossil roots observed, moist, moderate brown (5YR5/4).
Perc Est AFCA4	7.16	7.86	clay and sand	Silt with sand, and gravel, poorly sorted, gravel as large as 3 cm, moist. Cored 7.16–8.02 m, recovered 86 cm.
Perc Est AFCA4	7.86	8.01	clay and sand	Silt with fine sand and no gravel, lacey white calcite, moist, moderate brown (5YR5/4).
Perc Est AFCA4	8.01	8.23	clay, sand and trace gravel	Silt with very fine sand, occasional pebble <3 mm, moderate brown (5YR5/4), Cored 8.01–8.68 m, recovered 67 cm.
Perc Est AFCA4	8.23	8.44	clay, sand and limestone	Silt with very fine sand, well sorted, pale yellowish brown (10YR6/2), layered with thin beds of medium gray (N6) calcite (freshwater limestone?) and one 5 cm thick layer of very light gray (N8) calcite.
Perc Est AFCA4	8.44	8.68	clay, sand and trace gravel	Silt with very fine sand, an occasional pebble as large as 3 mm, loose, zones of dark reddish brown oxidation, calcite stringers follow relic root traces, pale yellowish brown (10YR6/2).
Perc Est AFCA4	8.68	9.60	clay and sand	Silt with very fine sand, thin layers of cemented siltstone, pale yellowish brown (10YR6/2). Cored 8.68–9.60 m, recovered 92 cm.
Perc Est AFCA4	9.60	9.85	clay and sand	Silt with very fine sand, thin layers of cemented siltstone, pale yellowish brown (10YR6/2) with minor yellowish oxidation streaks. Cored 9.60–9.85 m, recovered 25 cm. Stopped coring because could not penetrate cemented interval with core barrel.
Perc Est AFCA4	9.85	10.06	clay and sand	Drilled slowly to 10.06 m, drilling through something hard. Decided to stop drilling and move to another location. End of hole.
Perc Est AFCA5	0.00	0.91	sand and clay	Sand, fine and silt, windblown, roots numerous to 0.46 meter, less common below, dry uppermost 6 cm, moist below, moderate yellow brown (10YR5/4). Cored 0.0–1.07 m, recovered everything except what was in shoe at end of core barrel.
Perc Est AFCA5	0.91	1.07	sand and gravel	Sand and gravel, gravel as large as 4 cm, damp.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFCA5	1.07	1.40	sand, clay and trace gravel	Sand with silt and gravel, gravel decreases toward bottom, no roots observed, considerably drier than above. Cored 1.07–2.59 m, recovered 33 cm.
Perc Est AFCA5	1.40	3.02	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 1 cm, some roots, calcite veins in upper foot, moist. Cored 2.59–3.51 m, recovered 49 cm.
Perc Est AFCA5	3.02	3.08	clay and sand	Silt with clay in layers <6 mm thick, very pale orange (10YR8/2).
Perc Est AFCA5	3.08	3.90	sand and trace gravel	Sand, coarse, and gravel, no roots, no calcite, loose, moist. Cored 4.11–5.00 m, recovered 89 cm.
Perc Est AFCA5	3.90	4.27	sand and trace gravel	Sand, coarse, and gravel, no roots, no calcite, loose, moist. Cored 4.11–5.00 m, recovered 89 cm.
Perc Est AFCA5	4.27	5.00	sand and clay	Sand, fine to medium with thin layers of cemented silt, some veins of dark reddish oxidation near bottom of interval.
Perc Est AFCA5	5.00	5.64	sand, clay and trace gravel	Sand, fine with silt and an occasional pebble, calcite veins prevalent 5.33–5.64 m, streaks of dark reddish brown oxidation. Cored 5.00–5.64 m, recovered 64 cm.
Perc Est AFCA5	5.64	5.82	sand and trace gravel	Sand, coarse, and gravel, gravel <6 mm, no noticeable calcite or oxidation, moist. Cored 6.64–7.16 m, recovered 131 cm.
Perc Est AFCA5	5.82	6.85	sand and clay	Sand, fine with silt, also thin layers of silt, abundant calcite veins, moist.
Perc Est AFCA5	6.85	6.95	clay and sand	Silt with clay, moist, highly mottled-grayish orange, bright yellow orange, and dark reddish brown.
Perc Est AFCA5	6.95	7.22	clay and sand	Silt with clay, highly mottled, similar to silt 6.85–6.95 m. Cored 7.16–8.69 m, recovered 143 cm.
Perc Est AFCA5	7.22	7.47	sand	Sand, medium well sorted, abundant oxidation, moist.
Perc Est AFCA5	7.47	8.38	sand	Sand, medium well sorted, minor oxidation and occasional large calcite nodule, moist.
Perc Est AFCA5	8.38	8.66	sand	Sand, medium well sorted, loose, wet to touch.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFCA5	8.66	8.99	sand	Sand, medium well sorted, loose, wet-touch. Cored 8.69–9.75 m, recovered 104 cm.
Perc Est AFCA5	8.99	9.14	clay and sand	Silt, wet to touch, yellowish gray (5Y7/2).
Perc Est AFCA5	9.14	9.72	clay, sand and limestone	Silt, yellowish gray (5Y7/2), transitioning into mottled yellow gray and gray marl (?), wet.
Perc Est AFCA5	9.72	10.06	clay and sand	Drilled into hard material, suspect material is a cemented siltstone or marl. End of hole.
Perc Est AFPL1	0.00	0.06	sand and clay	Sand, fine with silt and abundant organic matter, moist, moderate yellowish brown (10YR5/4). Cored 0.0–0.94 meter, recovered 94 cm.
Perc Est AFPL1	0.06	0.73	sand, clay and trace gravel	Sand, fine with silt and an occasional pebble, fewer roots than at surface, drier, grayish orange (10YR5/4).
Perc Est AFPL1	0.73	0.94	sand, clay and trace gravel	Sand, fine to coarse with silt and pebbles, pebbles more common than above, pale yellowish brown (10YR6/2).
Perc Est AFPL1	0.94	1.37	sand, clay and trace gravel	Drilled because too hard to core, cobble was in way of coring.
Perc Est AFPL1	1.37	1.98	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 4 cm, no roots or oxidation observed, moderate yellowish brown (10YR5/4). Cored 1.37–1.98 m, recovered 61 cm.
Perc Est AFPL1	1.98	2.53	sand and clay	Silt with fine sand, no roots, slightly cemented, moist, pale yellowish brown (10YR6/2). Short oxidized staining along fractures or old root traces. Calcite veins present throughout silt. Cored 1.98–2.59 m, recovered 61 cm.
Perc Est AFPL1	2.53	2.59	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 2 cm, no roots, loose, moist.
Perc Est AFPL1	2.59	3.29	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 5 cm, stones often rounded, no roots, moist, pale yellowish brown (10YR6/2). Cored 2.59–3.51 m, recovered 70 cm.
Perc Est AFPL1	3.29	3.66	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 3 cm, no roots, moist, pale yellowish brown (10YR6/2). Cored 3.5 1–4.11 m, recovered 49 cm.
Perc Est AFPL1	3.66	3.93	clay, sand and trace gravel	Silt with fine sand and occasional pebble, no roots, moist, moderate yellowish brown (10YR5/4). Several veins and nodules of calcite, faint oxidation.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFPL1	3.93	4.00	clay, sand and trace gravel	Silt with sand and gravel, stones as large as 3 cm, no roots, moist.
Perc Est AFPL1	4.00	4.94	clay, sand and trace gravel	Silt and fine to medium sand, poorly sorted, occasional gravel near top of interval, no roots, moist, moderate yellowish brown (10YR5/4). Cored 4.11–5.03 m, recovered 82 cm.
Perc Est AFPL1	4.94	5.64	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 5 cm common. Rusty-red stain around stones below 5.49 m, moist, moderate yellowish brown (10YR5/4). Cored 5.03–5.64 m, recovered 61 cm.
Perc Est AFPL1	5.64	5.72	sand and trace gravel	Sand, coarse, and gravel, similar-previous core, moderate yellowish brown (10YR5/4). Cored 5.64–6.46 m, recovered 82 cm.
Perc Est AFPL1	5.72	6.46	sand, clay and trace gravel	Sand, fine and silt, occasional gravel as large as 1 cm, moderate yellowish brown (10YR5/4). Calcite nodules and veins common, no roots, moist, some oxidation.
Perc Est AFPL1	6.46	6.71	sand and clay	Sand, fine, and silt, numerous calcite nodules, moist, moderate yellowish brown (10YR5/4). Cored 6.46–7.16 m, recovered 70 cm.
Perc Est AFPL1	6.71	6.92	sand and trace gravel	Sand, medium to coarse, and gravel, gravel as large as 1 cm, moist, moderate yellowish brown (10YR5/4).
Perc Est AFPL1	6.92	7.16	sand	Sand, fine, uniform, moist, moderate yellowish brown (10YR5/4).
Perc Est AFPL1	7.16	8.02	clay, sand and trace gravel	Silt and fine sand with occasional pebble, numerous calcite nodules and thin calcified layers, moist, grayish orange pink (5YR7/2). Cored 7.16–8.08 m, recovered 92 cm.
Perc Est AFPL1	8.02	8.08	sand and clay	Sand, fine, and silt, no noticeable calcite nodules, moist, moderate yellowish brown (10YR5/4).
Perc Est AFPL1	8.08	8.69	sand, clay and trace gravel	Sand, fine, occasional gravel as large as 1 cm, numerous calcite nodules and veins, thin layers of partly cemented silt, moist, moderate yellowish brown (10YR5/4). Cored 8.08–8.69 m, recovered 61 cm.
Perc Est AFPL1	8.69	8.81	sand	Sand, fine, several calcite nodules and veins, moist, moderate yellowish brown (10YR5/4). Cored 8.69–9.57 m, recovered 88 cm.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFPL1	8.81	9.11	clay, sand and trace gravel	Silt and fine sand, occasional pebble, grayish orange pink (5YR7/2), thin layers of mottled moderate yellowish brown (10YR5/4) to light gray (N7) siltstone (cemented).
Perc Est AFPL1	9.11	9.57	sand and trace gravel	Sand, fine, occasional gravel as large as 1 cm, loose, numerous calcite nodules and veins, moist, moderate yellowish brown (10YR5/4).
Perc Est AFPL2	0.00	0.24	sand and clay	Sand, fine, and silt, abundant organic matter and numerous roots, loose, moist, dark yellowish brown (10YR4/2).
Perc Est AFPL2	0.24	0.91	sand and clay	Sand, fine, and silt, occasional gravel, gravel as large as 1 cm, decreased organic matter and fewer roots, loose, moist, moderate yellowish brown (10YR5/4.
Perc Est AFPL2	0.91	1.01	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 3 cm, partly cemented, no roots observed, grayish orange pink (5YR7/2). Cored 0.0–1.0 meter, recovered 1 meter. Encountered cemented interval at 1 meter.
Perc Est AFPL2	1.01	1.13	sand and gravel	Drilled without core through a 7–cm layer of cemented materials.
Perc Est AFPL2	1.13	1.22	sand and trace gravel	Sand, coarse, and gravel, moist, color grades from grayish orange pink (5YR7/2) -dark yellowish brown (10YR4/2). Cored 1.13–1.98 m, recovered 85 cm.
Perc Est AFPL2	1.22	1.37	sand and trace gravel	Sand, coarse, and gravel, partly cemented, no roots observed, moist, grayish orange pink (5YR7/2).
Perc Est AFPL2	1.37	1.52	sand and trace gravel	Sand, coarse, and gravel, no roots observed, moist, moderate brown (5YR4/4).
Perc Est AFPL2	1.52	1.98	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 5 cm, no roots observed, moist, vertical wispy veins of a white mineral, moderate yellowish brown (5YR7/2). Cored 1.98–2.59 m, recovered 56 cm.
Perc Est AFPL2	1.98	2.07	sand, clay and gravel	Sand and gravel, some silt, cemented, moist, grayish orange pink (5YR7/2).
Perc Est AFPL2	2.07	2.23	sand and trace gravel	Sand, coarse, and gravel, little cementation, loose, pale yellowish brown (10YR6/2).

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFPL2	2.23	2.53	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 6 cm, numerous black pebbles and coarse sand, little cementation, loose, some roots present, pale yellowish brown (10YR6/2).
Perc Est AFPL2	2.59	2.83	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 5 cm, mostly volcanic, white mineral nodules within sand and gravel, whitish coating on larger stones. Cored 2.59–2.83 m, recovered 24 cm. Stopped coring because gravel too large.
Perc Est AFPL2	2.83	3.72	sand and gravel	Drilled to get past large gravel and cobbles.
Perc Est AFPL2	3.72	3.81	sand and gravel	Attempted core but cobble in way. Collected only 9 cm at end of core barrel. Sand, coarse, and gravel, gravel as large as 4 cm, moist, pale yellowish brown. Drilled to 4.11 m.
Perc Est AFPL2	4.11	4.57	sand and clay	Sand, medium well sorted, moist, moderate brown (5YR4/4). Sand grades first to fine sand then to silty fine sand with depth. Cored 4.11–4.94 m, recovered 83 cm.
Perc Est AFPL2	4.57	4.94	sand and clay	Sand, fine and silt, well sorted, moderate yellowish brown (5YR5/4). Several vertical veins of a white mineral extend through interval.
Perc Est AFPL2	4.94	5.61	sand, clay and trace gravel	Sand, fine and silt, occasional gravel as large as 6 mm, moist, moderate yellowish brown (10YR5/4). Several vertical veins of a white mineral along with a few small lenses measuring about 6 mm thick by 2 cm long. Cored 4.94–5.64 m, recovered 67 cm.
Perc Est AFPL2	5.64	6.49	sand, clay and trace gravel	Sand, fine, and silt, occasional gravel as large as 3 cm, gravel more common near bottom of interval, moist, moderate yellowish brown (10YR5/4). Several vertical white veins <I millimeter thick. Few thin intervals of cemented siltstone. Cored 5.64–6.55 m, recovered 85 cm.
Perc Est AFPL2	6.55	6.71	sand and clay	Sand, fine and silt, minor whitish mineral, little cementation, moist, moderate yellowish brown (10YR5/4). Cored 6.5 5–7.16 m, recovered 61 cm.
Perc Est AFPL2	6.71	6.86	sand, clay and trace gravel	Sand, medium and gravel, moist.
Perc Est AFPL2	6.86	7.16	sand and trace gravel	Sand, fine, moderate yellowish brown (10YR5/4). Grades to coarse sand and gravel at 7.16 m, no observed mineral veins or nodules, moist.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFPL2	7.16	7.32	sand and trace gravel	Sand, coarse and fine gravel. Cored 7.16–7.99 m, recovered 82 cm.
Perc Est AFPL2	7.32	7.99	sand, clay and trace gravel	Sand, fine, and silt, occasional gravel as large as 2 cm, moist, moderate yellowish brown (10YR5/4). A cylindrical vein of a white mineral (calcite?) measured <1 cm in diameter and was more than 3 cm long (old root trace?).
Perc Est AFPL2	7.99	8.23	sand, clay and trace gravel	Sand, fine, and silt, occasional gravel as large as 1cm, loose, some white mineral veins, moist, moderate yellowish brown (10YR5/4). Cored 7.99–8.69 m, recovered 70 cm.
Perc Est AFPL2	8.23	8.38	sand, clay and trace gravel	Sand, medium and gravel, gravel as large as 3 cm, no mineral veins, moist, moderate yellowish brown (10YR5/4).
Perc Est AFPL2	8.38	8.69	sand, clay and trace gravel	Sand, fine, grading to sand and gravel, gravel as large as 1 cm, loose, occasional white nodules in fine sand, moist, moderate yellowish brown (10YR5/4).
Perc Est AFPL2	8.69	8.72	sand, clay and trace gravel	Sand, fine, and silt, occasional pebble, white mineral (calcite?) laced through core, moist, moderate yellowish brown (10YR5/4). Cored 8.69–9.51 m, recovered 79 cm.
Perc Est AFPL2	8.72	9.14	sand and trace gravel	Sand, coarse, and gravel, gravel as large as 2.5 cm, thin layer of white mineral at 9.14 m, moist.
Perc Est AFPL2	9.14	9.48	sand, clay and trace gravel	Sand, fine, occasional gravel as large as 1cm, white mineral faced through core, moist, moderate yellowish brown (10YR5/4).
Perc Est AFPL2	9.51	10.21	sand, clay and trace gravel	Sand, fine, and silt, occasional pebble, some minor yellow orange oxidation near top, numerous thin weakly cemented layers, white mineral laced through core, moderate yellowish brown (10YR5/4). Cored 9.51–10.21 m, recovered 70 cm.
Perc Est AFPL2	10.21	10.52	sand	Sand, fine, well sorted, no white minerals, moist, moderate yellowish brown (10YR5/4). Cored 10.21–11.06 m, recovered 85 cm.
Perc Est AFPL2	10.52	10.82	sand, clay and trace gravel	Sand and gravel, some silt, gravel as large as 1cm, moist, occasional bleb of white mineral.
Perc Est AFPL2	10.82	10.97	sand, clay and trace gravel	Sand, fine, and silt, occasional pebble, considerable calcite (?) and thin lenses of cemented sandstone, moist, grayish orange pink (5YR7/2).

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFPL2	10.97	11.06	sand, clay and trace gravel	Sand, fine, and silt, occasional pebble, minor white mineral (calcite?), moist, moderate yellowish brown (10YR5/4).
Perc Est AFPL2	11.06	11.73	sand, clay and trace gravel	Sand, fine, and silt, occasional gravel, damp, thin layers of cemented sandstone, moderate yellowish brown (10YR5/4). Cored 11.06–11.73 m, recovered 67 cm.
Perc Est AFPL2	11.73	11.86	sand, clay and trace gravel	Siltstone, occasional small pebble, highly cemented, occasional veins of a whitish mineral, dry to damp, moderate yellowish brown (10YR5/4). Cored 11.73–12.65 m, recovered 89 cm.
Perc Est AFPL2	11.86	12.34	sand and gravel	Sand and gravel, Gravel as large as 1cm, thin layers of a light gray mineral, moist, moderate brown (5YR4/4).
Perc Est AFPL2	12.34	12.62	sand and clay	Sand, fine, and silt, weakly cemented, numerous veins and blebs of a whitish mineral, moist, moderate yellowish brown (10YR5/4).
Perc Est AFPL2	12.65	12.95	sand, clay and trace gravel	Sand, fine, and silt, occasional pebble and bleb of whitish mineral, moist, moderate yellowish brown (10YR5/4). At 42.5, two thin layers of siltstone, cemented, occasional pebble, very pale orange (10YR8/2). Cored 12.65–13.26 m, recovered 61 cm.
Perc Est AFPL2	12.95	13.26	sand	Sand, very fine, well sorted, occasional small pebble and coarse sand, moist, light brown (5YR6/4).
Perc Est AFPL2	13.26	13.50	sand	Sand, very fine, well sorted, occasional vertical vein of whitish mineral, moist, very pale orange (10YR8/2). Cored 12.95–14.14 m, recovered 88 cm.
Perc Est AFPL2	13.50	13.78	nonwelded tuff	Volcanic ash, very fine sand, well sorted and uniform, loose, moist, very light gray (N8). Ash identified as Lava Creek B with an age of 0.64 Ma (Andrei Sarna-Wojcicki, U.S. Geological Survey, Menlo Park, written commun., 2002).
Perc Est AFPL2	13.78	14.02	sand	Sand, very fine, 1 cm thick layers of cemented sand, moist, pale yellowish brown (10YR6/2).
Perc Est AFPL2	14.02	14.14	sand	Sand, very fine, occasional bleb of whitish mineral, loose, moist, pale yellowish brown (10YR6/2).
Perc Est AFPL2	14.14	14.63	sand	Sand, fine, well sorted, occasional bleb of whitish mineral, loose, moist, pale yellowish brown (10YR6/2). Cored 14.14–14.81 m, recovered 67 cm.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perc Est AFPL2	14.63	14.81	sand	Sand, fine, well sorted, occasional bleb of whitish mineral, loose, moist, very pale orange (10YR8/2).
Perc Est AFPL2	14.81	15.12	sand and trace gravel	Sand, fine, well sorted, occasional pebble, occasional bleb of whitish mineral, loose, moist, very pale orange (10YR8/2). Cored 14.81–15.73 m, recovered 92 cm.
Perc Est AFPL2	15.12	15.42	sand and trace gravel	Sand, fine, well sorted, occasional pebble, occasional cemented zone, moist, grayish yellow (5Y8/4) with oxidized yellowish orange streaks.
Perc Est AFPL2	15.42	15.73	sand and trace gravel	Sand, fine to coarse, and gravel, gravel as large as 6 mm, occasional vertical vein and bleb of whitish mineral, yellowish gray (5Y7/2).
Perc Est AFPL2	15.73	15.94	sand, clay and trace gravel	Sand, fine, and silt, occasional pebble, occasional bleb of whitish mineral, oxidized streaks, moist, grayish yellow (5Y8/4). Cored 15.73–16.56 m, recovered 83 cm.
Perc Est AFPL2	15.94	16.40	sand and trace gravel	Sand, medium with numerous pebbles, moist, occasional bleb of whitish mineral, occasional cemented layer.
Perk Est. ARAS1	0.00	0.76	sand and trace gravel	Sand, coarse, and gravel, loose, gravel as large as 4 cm, gravel mostly volcanic with some quartzite and dolomite, no roots, saturated 0.46–0.76 meter. Information from hand dug pit near drill rig.
Perk Est. ARAS1	0.76	1.98	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 1.07–1.98 m, recovered 91 cm.
Perk Est. ARAS1	1.98	2.59	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 1.98–2.59 m, recovered 61 cm.
Perk Est. ARAS1	2.59	3.51	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, wet. Perched water. Cored 2.59–3.51 m, recovered 92 cm.
Perk Est. ARAS1	3.51	4.11	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 3.51–4.11 m, recovered 60 cm.
Perk Est. ARAS1	4.11	5.09	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 4.11–5.09 m, recovered 98 cm.
Perk Est. ARAS1	5.09	5.64	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 5.09–5.64 m, recovered 55 cm.
Perk Est. ARAS1	5.64	6.40	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 5.64–6.55 m, recovered 76 cm.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perk Est. ARAS1	6.40	7.00	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 6.55–7.22 m, recovered 45 cm.
Perk Est. ARAS1	7.00	8.14	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 7.22–8.14 m, recovered 92 cm.
Perk Est. ARAS1	8.14	8.69	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 8.14–8.69 m, recovered 55 cm.
Perk Est. ARAS1	8.69	9.60	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 8.69–9.60 m, recovered 91 cm.
Perk Est. ARAS1	9.60	10.21	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 9.60–10.21 m, recovered 61 cm.
Perk Est. ARAS1	10.21	11.09	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 10.21–11.13 m, recovered 88 cm.
Perk Est. ARAS1	11.09	11.73	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored from 11. 13–11.73 m, recovered 60 cm.
Perk Est. ARAS1	11.73	12.65	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 11.73–12.65 m, recovered 92 cm.
Perk Est. ARAS1	13.26	14.17	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 13.26–14.17 m, recovered 91 cm.
Perk Est. ARAS1	14.17	14.78	sand, clay and gravel	Sand and gravel, some silt, moderately sorted, moist. Cored 14.17–14.78 m, recovered 61 cm. End of hole.
Perk Est. ARRB1	0.00	0.76	sand and gravel	Sand and gravel, loose, no roots, some streaks of oxidation, wet.
Perk Est. ARRB1	0.76	1.52	sand and gravel	Sand and gravel, gravel mostly volcanic with some quartzite and dolomite, loose. Cored 1.07–1.98 m, recovered 46 cm. Large stone wedged at end of shoe on core barrel.
Perk Est. ARRB1	1.52	2.32	sand, clay and gravel	Sand and gravel poorly sorted with clay and silt, gravel as large as 7.5 cm, wet, pale yellowish brown (10YR6/2). Cored 1.98–2.59 m, recovered 34 cm.
Perk Est. ARRB1	2.32	3.17	sand, clay and gravel	Sand and gravel poorly sorted with clay and silt, wet, pale yellowish brown (10YR6/2). Cored 2.59–3.47 m, recovered 58 cm.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perk Est. ARRB1	3.17	4.11	sand, clay and gravel	Sand and gravel poorly sorted with clay and silt, gravel >5 cm, wet, pale yellowish brown (10YR6/2). Cored 3.47–4.11 m, recovered 64 cm.
Perk Est. ARRB1	4.11	4.89	sand, clay and gravel	Sand and gravel poorly sorted with clay and silt, gravel >7.5 cm, compact yet not cemented, moist, multicolored. In middle of core (at about 4.57 m), a large quartzite stone, same size as the 7.5 cm diameter core barrel except the edges had been rounded to fit tightly in barrel. 467 Cored 4.11–5.03 m, recovered 76 cm.
Perk Est. ARRB1	4.89	5.61	sand, clay and gravel	Sand and gravel poorly sorted with clay and silt, gravel highly weathered, moist, multicolored. Cored 5.03–5.61 m, recovered 58 cm.
Perk Est. ARRB1	5.61	6.40	sand, clay and gravel	Sand and gravel poorly sorted with clay and silt, compact yet not cemented, gravel highly weathered, moist, light brown (5YR5/6). Stopped coring because shoe grinding on large stone. Bottom of shoe had a 3–cm thick piece of freshly broken basalt. Cored 5.61–6.40 m, recovered 79 cm.
Perk Est. ARRB1	6.40	7.13	sand, clay and gravel	Sand and gravel poorly sorted with silt and minor clay, gravel moderately weathered, moist, light brown (5YR5/6). Matching piece of freshly broken basalt at 6.40 m. Cored 6.40–7.16 m, recovered 73 cm.
Perk Est. ARRB1	7.13	8.08	sand, clay and gravel	Sand and gravel poorly sorted with silt and minor clay, gravel moderately weathered, moist but drier and warmer than above, light brown (5YR5/6). Cored 7.16–8.08 m, recovered 92 cm.
Perk Est. ARRB1	8.08	8.69	sand, clay and gravel	Sand and gravel poorly sorted with clay and silt, damp and warm, light brown (5YR5/6). Cored 8.08–8.69 m, recovered 61 cm.
Perk Est. ARRB1	8.69	9.60	sand, clay and gravel	Sand and gravel poorly sorted with clay and silt, damp and warm, light brown (5YR5/6). Cored 8.69–9.60 m, recovered 0.91 cm.
Perk Est. ARRB1	9.60	10.21	sand, clay and gravel	Sand and gravel poorly sorted with clay and silt, wetter than above, light brown (5YR5/6). Cored 9.60–10.21 m, recovered 61 cm.
Perk Est. ARRB1	10.21	10.91	sand, clay and gravel	Sand and gravel poorly sorted with clay and silt, gravel moderately weathered, moist, light brown (5YR5/6). Cored 10.21–10.91 m, recovered 70 cm. Stopped on a boulder-could not continue coring. Drilled through boulder with inner bit.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Perk Est. ARRB1	10.91	11.73	sand, clay and gravel	Sand and gravel poorly sorted with silt and minor clay, gravel as large as 7.5 cm and moderately weathered, damp, light brown (5YR5/6). Cored 11.13–11.73 m, recovered 60 cm.
Perk Est. ARRB1	11.73	12.65	sand, clay and gravel	Sand and gravel poorly sorted with silt and minor clay, gravel as large as 7.5 cm, gravel mostly volcanic with occasional quartzite and moderately weathered, crumbly, damp, light brown (5YR5/6). Cored 11.73–12.65 m, recovered 92 cm.
Perk Est. ARRB1	12.65	13.26	sand, clay and gravel	Sand and gravel poorly sorted with silt and minor clay, gravel as large as 7.5 cm, gravel mostly volcanic with occasional quartzite and moderately weathered, damp, light brown (5YR5/6). Cored 12.65–13.26 m, recovered 61 cm.
Perk Est. ARRB1	13.26	14.17	sand, clay and gravel	Sand and gravel poorly sorted with silt and minor clay, gravel as large as 7.5 cm, loose, damp, light brown (5YR5/6). Color fades gradually-a pale yellowish brown (10YR6/2) at 14 m with more silt below. Cored 13.26–14.17 m, recovered 91 cm.
Perk Est. ARRB1	14.17	14.78	sand, clay and gravel	Sand and gravel poorly sorted with silt and minor clay, gravel >7.5 cm, loose, damp, pale yellow brown (10YR6/2). Cored 14.17–14.78 m, recovered 61 cm. End of hole.
Site Well 1961	0.00	0.61	clay and sand	Sandy loam.
Site Well 1961	0.61	10.06	sand and gravel	Boulders sand and large gravel.
Site Well 1961	10.06	13.72	sand and gravel	Small gravel and sand.
Site Well 1961	13.72	40.84	sand and gravel	Boulders, large gravel and brown sand clay.
Site Well 1961	40.84	44.81	Gravel	Boulders.
Site Well 1961	44.81	45.11	clay	Brown clay.
Site Well 1961	45.11	47.55	Gravel	Boulders and large gravel.
Site Well 1961	47.55	49.07	clay	Brown clay shale.
Site Well 1961	49.07	71.63	clay and gravel	Boulders, sandy red and orange clay streaks. Cored 181–206.5 ft, recovered ≈1.5 ft core.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
Site Well 1961	71.63	80.77	Gravel	Boulders and large gravel.
Site Well 1961	80.77	92.05	clay	Brown clay. Cored 275–280 ft recovered 5 ft core.
Site Well 1961	92.05	93.88	clay	White bentonitic clay.
Site Well 1961	93.88	98.15	clay	Brown bentonitic clay.
Site Well 1961	98.15	107.90	clay	Multicolored boulders with yellow clay.
Site Well 1961	107.90	108.81	clay	White bentonitic clay.
Site Well 1961	108.81	115.21	clay and gravel	Brown bentonitic clay, small gravel.
Site Well 1961	115.21	117.04	clay	Greenish brown clay.
Site Well 1961	117.04	123.75	clay and gravel	White bentonitic clay and boulders.
Site Well 1961	123.75	129.54	clay	Brown clay.
Site Well 1961	129.54	132.89	clay and gravel	Quartzite.
Site Well 1961	132.89	135.64	clay and gravel	Reddish clay, some boulders.
Site Well 1961	135.64	142.34	Gravel	Hard boulders (garnet dolomite quartz).
Site Well 1961	142.34	143.87	clay	Red clay.
Site Well 1961	143.87	148.74	Gravel	Boulders, large and small water gravel.
Site Well 1961	148.74	161.24	clay and gravel	Reddish brown clay, shale and boulders.
Site Well 1961	161.24	163.98	clay	Brown bentonitic clay.
Site Well 1961	163.98	168.55	Gravel	Boulders.
Site Well 1961	168.55	170.99	Gravel	Small water gravel.
Site Well 1961	170.99	172.52	clay and gravel	Small gravel and streaks of yellow clay.
Site Well 1961	172.52	175.26	sand	Hard compacted sand.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
US Ecology MW-315A	0.00	4.57	sand, clay and gravel	Dry, medium dense, brown, sand, some gravel, little silt.
US Ecology MW-315A	4.57	13.72	sand, clay and gravel	Dry, medium dense, light red brown, mf sand, some cmf gravel, little silt.
US Ecology MW-315A	13.72	18.29	sand, clay and gravel	Dry, medium dense, red brown, cmf sand, some mf gravel, little silt.
US Ecology MW-315A	18.29	23.77	sand, clay and gravel	slightly moist, medium dense, red brown, cm gravel, some sand, little silt.
US Ecology MW-315A	23.77	24.23	sand, clay and gravel	Dry, medium dense, brown, cmf gravel, some sand, little silt.
US Ecology MW-315A	24.23	29.87	sand, clay and gravel	Dry, medium dense, brown, cmf gravel, some sand, little silt.
US Ecology MW-315A	29.87	30.33	sand and gravel	Dry, dense, brown, cmf gravel, some sand.
US Ecology MW-315A	30.33	30.78	sand, clay and gravel	Dry, dense, brown, cmf gravel, some cmf sand, little silt.
US Ecology MW-315A	30.78	36.58	sand, clay and gravel	Moist, medium dense, brown, mf gravel, some cmf sand, little silt.
US Ecology MW-315A	36.58	44.20	sand, clay and gravel	Moist, medium dense, red brown, gravel, some sand, little silt.
US Ecology MW-315A	44.20	48.16	sand, clay and gravel	Moist, medium dense, dark brown, gravel, some sand, little silt.
US Ecology MW-315A	48.16	48.62	sand, clay and gravel	Moist, dense, brown, cmf gravel, some sand, little silt.
US Ecology MW-315A	48.62	49.07	sand, clay and gravel	Moist, dense, brown, cmf gravel, some sand, little silt.
US Ecology MW-315A	49.07	54.86	sand, clay and gravel	Moist, dense, brown, cmf gravel, some sand, little silt.
US Ecology MW-315A	54.86	60.05	sand, clay and gravel	Wet, medium dense, brown, gravel, some sand, little silt.
US Ecology MW-315A	60.05	60.50	sand, clay and gravel	Wet, dense, brown, cmf gravel, little sand and clay, medium plasticity.
US Ecology MW-315A	60.50	67.06	sand, clay and gravel	Wet, dense, brown, cm gravel, some clay.
US Ecology MW-315A	67.06	73.15	sand, clay and gravel	Wet, dense, brown, cm gravel, some clay.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
US Ecology MW-315A	73.15	79.25	sand and gravel	Wet, medium dense, brown, gravel, some cmf sand.
US Ecology MW-315A	79.25	85.34	sand and gravel	Wet, medium dense, brown, gravel, some cmf sand.
US Ecology MW-315A	85.34	91.44	sand and gravel	Wet, medium dense, brown, cmf gravel, some cm sand.
US Ecology MW-315A	91.44	91.90	sand and gravel	Wet, medium dense, brown, cmf gravel, some cm sand.
US Ecology MW-315A	91.90	97.54	sand, clay and gravel	Wet, medium dense, brown, sand, some gravel and silt.
US Ecology MW-315A	97.54	97.99	sand, clay and gravel	Wet, medium dense, brown, cmf sand, some silt, little gravel.
US Ecology MW-323	0.00	5.79	sand, clay and gravel	Dry, medium dense, light red brown, sand, some silt, little mf gravel.
US Ecology MW-323	5.79	6.40	sand, clay and gravel	Dry, medium dense, red brown, medium sand, some mf silt, little mf gravel.
US Ecology MW-323	6.40	12.04	sand, clay and gravel	Dry, medium dense, red brown, medium sand, some silt, little mf gravel.
US Ecology MW-323	12.04	12.50	sand, clay and gravel	Dry, medium dense, brown, medium sand, some mf silt and mf gravel.
US Ecology MW-323	12.50	18.29	sand, clay and gravel	Dry, medium dense, brown, medium sand, some mf silt and mf gravel.
US Ecology MW-323	18.29	18.75	sand, clay and gravel	Medium dense, brown, sand, some mf gravel, little silt.
US Ecology MW-323	18.75	24.38	sand, clay and gravel	Medium dense, dark brown, sand, some fmc gravel, little silt.
US Ecology MW-323	24.38	24.84	sand, clay and gravel	Medium dense, dark brown, sand, some fmc gravel, little silt.
US Ecology MW-323	30.48	31.09	sand and gravel	Red brown, gravel, some sand.
US Ecology MW-323	31.09	35.81	sand and gravel	Red brown, gravel, some sand.
US Ecology MW-323	35.81	36.27	sand, clay and gravel	Dense, brown, cmf gravel, some sand, little silt.
US Ecology MW-323	36.27	36.73	sand, clay and gravel	Dense, brown, cmf gravel, some sand, little silt.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
US Ecology MW-323	36.73	42.21	sand and gravel	Moist, medium dense, brown, sand, some mf gravel.
US Ecology MW-323	42.21	42.67	sand, clay and gravel	Wet, medium dense, brown, cmf gravel, some sand, little silt.
US Ecology MW-323	42.67	48.16	sand and gravel	Moist, medium dense, red brown, mf gravel, some coarse sand.
US Ecology MW-323	48.16	48.62	sand and gravel	Medium dense, red brown, cmf gravel, some sand.
US Ecology MW-323	48.62	54.41	sand and gravel	Moist, medium dense, red brown, mf sand, some fm gravel.
US Ecology MW-323	54.41	54.86	sand and gravel	Wet, dense, brown, cm gravel, some coarse sand.
US Ecology MW-323	54.86	55.32	sand and gravel	Wet, medium dense, brown, cm gravel, some coarse sand.
US Ecology MW-323	55.32	59.44	sand, clay and gravel	Wet, medium dense, brown, cm gravel, some sand, little clay.
US Ecology MW-323	59.44	59.89	sand, clay and gravel	Wet, medium dense, brown, gravel, some sand, little silt and clay.
US Ecology MW-323	59.89	66.60	sand, clay and gravel	Wet, medium dense, brown, gravel, some sand, little silt and clay.
US Ecology MW-323	66.60	67.06	sand, clay and gravel	Wet, medium dense, brown, mf gravel, some sand, little silt and clay.
US Ecology MW-323	67.06	72.54	sand, clay and gravel	Wet, brown, cmf sand, some medium gravel and silt.
US Ecology MW-323	72.54	73.00	sand, clay and gravel	Wet, medium dense, brown, cmf sand, some medium gravel and silt.
US Ecology MW-323	73.00	78.79	sand, clay and gravel	Wet, medium dense, brown, cmf sand, some medium gravel and silt.
US Ecology MW-323	78.79	79.25	sand, clay and gravel	Wet, medium dense, brown, cmf gravel, some cmf sand, little silt.
US Ecology MW-323	79.25	79.71	sand, clay and gravel	Wet, medium dense, brown, cmf gravel, some cmf sand, little silt.
US Ecology MW-323	79.71	80.16	sand, clay and gravel	Wet, medium dense, brown, cmf gravel, some cmf sand, little silt.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
US Ecology MW-323	80.16	84.73	sand, clay and gravel	Wet, brown, cm gravel, some mf sand, little clay, trace silt.
US Ecology MW-323	84.73	85.19	sand, clay and gravel	Wet, medium dense, brown, cmf gravel, some sand, little silt.
US Ecology MW-323	85.19	87.78	sand, clay and gravel	.
US Ecology MW-323	87.78	87.93	sand, clay and gravel	Wet, dense, brown, sand, some fine gravel and silt.
US Ecology MW-323	87.93	88.09	sand, clay and gravel	Wet, dense, brown, cm gravel, some cm sand, little silt.
US Ecology MW-323	88.09	88.24	sand, clay and gravel	Wet, dense, brown, cm gravel, some cm sand, little silt.
US Ecology MW-323	88.24	90.53	sand, clay and gravel	.
US Ecology MW-323	90.53	90.98	sand, clay and gravel	Wet, medium dense, brown, silt, some clay, little sand and gravel.
USGS MR3	0.00	123.44	sand and gravel	Basin fill (coarse gravel, sand, boulders).
USGS No 1	0.00	0.60	clay and sand	Silt. Probably wind-blow dust.
USGS No 1	0.60	1.50	sand and gravel	Coarse gravel with some silt.
USGS No 1	1.50	9.10	Gravel	Coarse gravel with some boulders.
USGS No 1	9.10	13.70	Gravel	Fine gravel with large boulders. Boulder bed at 13.7 meters.
USGS No 1	13.70	30.50	Gravel	Coarse gravel with some boulders and sand.
USGS No 1	30.50	31.00	Gravel	Boulders in coarse ravel.
USGS No 1	31.00	32.60	clay and gravel	Bouldery clay.
USGS No 1	32.60	35.60	clay and gravel	Bouldery clay, about half clay.
USGS No 1	35.60	44.80	sand, clay and trace gravel	Small gravel with brown sandy clay.
USGS No 1	44.80	45.10	sand, clay and trace gravel	Boulders in brown sandy clay.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
USGS No 1	45.10	47.80	sand, clay and trace gravel	Boulders with some clay.
USGS No 1	47.80	49.00	clay and gravel	Boulders and gravel in orange clay.
USGS No 1	49.00	52.10	clay	Orange clay.
USGS No 1	52.10	55.10	clay	Reddish-orange clay.
USGS No 1	55.10	60.60	clay	Cored in bentonitic red and orange clay. No core recovery.
USGS No 1	60.60	61.50	clay	Cored. No core recovered. brown clay from bit.
USGS No 1	61.50	62.80	clay	Cored. No core recovered. Considerable brown clay from bit.
USGS No 1	62.80	71.60	clay, sand and gravel	Clayey gravel with boulders, brown clay, and small gravel at 71.6 meters.
USGS No 1	71.60	78.60	sand, clay and gravel	Fine clayey gravel. Pinkish clay.
USGS No 1	78.60	80.80	Gravel	Gravel and boulders with but little clay.
USGS No 1	80.80	83.50	clay and gravel	Brown and yellow clay with some gravel.
USGS No 1	83.50	85.30	clay	Cored, recovered 1.8 meters of light brown clay.
USGS No 1	85.30	92.00	clay and gravel	Brown clay with occasional boulders.
USGS No 1	92.00	93.90	clay	White and brown bentonitic clay with layers of bright-yellow clay.
USGS No 1	93.90	98.50	clay and gravel	Brown swelling clay with some gravel. Mostly clay 80.8–98.1 m.
USGS No 1	98.50	98.80	clay, sand and gravel	Boulders in brown sandy clay.
USGS No 1	98.80	99.40	clay	yellow clay.
USGS No 1	99.40	103.60	Gravel	Boulders but with little clay. Possible water zone.
USGS No 1	103.60	106.40	clay and limestone	White to brown clay. White argillaceous carbonate rock altered to clay.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
USGS No 1	106.40	108.50	limestone	White carbonate rock. Largely altered to clay 108.2–108.5 m.
USGS No 1	108.50	112.10	clay and gravel	Bouldery brown clay.
USGS No 1	112.10	112.80	clay and gravel	White clay, brown clay, and small gravel.
USGS No 1	112.80	117.00	clay, sand and gravel	Dark volcanic boulders with brown bentonitic sandy-clay.
USGS No 1	117.00	123.70	clay and limestone	White carbonate rock somewhat altered to clay.
USGS No 1	123.70	129.50	clay and gravel	Greenish-brown clay, some boulders.
USGS No 1	129.50	132.60	clay and limestone	White carbonate rock and white clay.
USGS No 1	132.60	135.60	clay and gravel	Boulders in red clay.
USGS No 1	135.60	142.30	Gravel	Hard boulders with gravel in dark-red clay. Volcanic rocks.
USGS No 1	142.30	144.50	clay and gravel	Boulders and clay. Red clay at 143.9 meters.
USGS No 1	144.50	148.70	clay and gravel	A variety of boulders with but little clay. A possible source of water.
USGS No 1	148.70	153.00	Gravel	Hard boulders in brown and red sandy clay.
USGS No 1	153.00	161.20	clay, sand and trace gravel	Pinkish-brown clay with sand and occasional boulders.
USGS No 1	161.20	166.10	clay and gravel	Boulders in pink and light-brown clay. Some silicic rock.
USGS No 1	166.10	168.50	clay and gravel	Boulders in clay. Some rounded gravel.
USGS No 1	168.50	172.80	clay and gravel	Boulders in brown clay. Yellow clay and small gravel at 171.0 meters.
USGS No 1	172.80	175.00	dolomite/limestone	Light gray metamorphic rocks. Large boulders or possibly basement rock.
USGS UZB-1	2.29	2.90	sand, clay and gravel	Cored, mixture of gravel and sand with some clay reddish brown.
USGS UZB-1	5.33	5.94	sand, clay and gravel	Cored, mixture of gravel and sand with some clay reddish brown.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
USGS UZB-1	8.63	9.24	sand, clay and gravel	Cored, mixture of gravel and sand with some clay reddish brown.
USGS UZB-1	11.40	12.01	sand, clay and gravel	Cored, mixture of gravel and sand with some clay reddish brown.
USGS UZB-1	14.72	15.33	sand, clay and gravel	Cored, mixture of gravel and sand with some clay reddish brown.
USGS UZB-1	17.53	18.14	sand, clay and gravel	Cored, mixture of gravel and sand with some clay reddish brown.
USGS UZB-1	20.57	21.18	sand, clay and gravel	Cored, mixture of gravel and sand with some clay reddish brown.
USGS UZB-1	21.34	24.38	sand, clay and gravel	No core below 70 ft sand silt and gravel angular chips from drill cuttings.
USGS UZB-1	24.38	48.25	sand and gravel	Sand and gravel, few fines, higher moisture content than above 80 ft.
USGS UZB-2	0.00	0.30	sand, clay and trace gravel	Gravelly silts.
USGS UZB-2	0.30	3.05	sand and gravel	Cemented gravel sands.
USGS UZB-2	3.05	4.88	sand and trace gravel	Gravelly sands.
USGS UZB-2	4.88	7.62	sand, clay and gravel	Silty sandy gravel.
USGS UZB-2	7.62	9.14	sand and clay	Silty sand.
USGS UZB-2	9.14	10.67	sand and gravel	Sandy gravel.
USGS UZB-2	10.67	11.28	sand and trace gravel	Gravelly sand.
USGS UZB-2	11.28	11.58	Gravel	Gravel.
USGS UZB-2	11.89	12.50	sand and gravel	Sand gravel.
USGS UZB-2	12.50	15.24	sand, clay and gravel	Silty gravel.
USGS UZB-2	15.24	16.76	clay, sand and gravel	Sandy silty gravel.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
USGS UZB-2	16.76	18.90	sand and trace gravel	Gravelly sand.
USGS UZB-2	18.90	19.81	sand and gravel	Sandy gravel.
USGS UZB-2	19.81	21.34	Gravel	Gravel.
USGS UZB-2	21.34	21.95	sand and gravel	Sandy gravel.
USGS UZB-2	21.95	22.56	sand, clay and gravel	Silty gravel.
USGS UZB-2	22.56	23.47	Gravel	Gravel.
USGS UZB-2	23.47	24.38	clay, sand and gravel	Sandy silty gravel.
USGS UZB-2	24.38	24.99	sand and gravel	Sandy gravel.
USGS UZB-2	24.99	25.91	Gravel	Gravel.
USGS UZB-2	25.91	26.21	sand, clay and gravel	Silty gravel.
USGS UZB-2	26.21	26.82	sand, clay and gravel	Silty sandy gravel.
USGS UZB-2	26.82	28.35	sand, clay and gravel	Silty gravel.
USGS UZB-2	28.35	29.26	sand, clay and gravel	Silty sandy gravel.
USGS UZB-2	29.26	30.48	sand and gravel	Sandy gravel.
USGS UZB-2	30.48	31.70	sand, clay and gravel	Silty gravel.
USGS UZB-2	31.70	32.31	sand and clay	Silty sand.
USGS UZB-2	32.31	33.53	sand, clay and gravel	Silty gravel.
USGS UZB-2	33.53	35.05	sand and trace gravel	Gravelly sand.
USGS UZB-2	35.05	39.32	sand, clay and gravel	Clayey sandy gravel.
USGS UZB-2	39.32	40.54	sand and gravel	Sandy gravel.
USGS UZB-2	40.54	40.84	Gravel	Gravel.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
USGS UZB-2	40.84	41.45	clay, sand and gravel	Clayey gravel.
USGS UZB-2	41.45	42.67	clay, sand and gravel	Clayey gravelly sand.
USGS UZB-2	42.67	43.59	sand and gravel	Sandy gravel.
USGS UZB-2	43.59	57.91	sand, clay and gravel	Clayey sandy gravel.
USGS UZB-2	57.91	58.22	sand, clay and gravel	Silty gravel.
USGS UZB-2	58.22	60.96	sand, clay and gravel	Clayey sandy gravel.
USGS UZB-2	60.96	61.87	Gravel	Gravel.
USGS UZB-2	61.87	63.70	sand and trace gravel	Gravelly sand.
USGS UZB-2	63.70	72.24	sand, clay and trace gravel	Sandy clayey gravel.
USGS UZB-2	72.24	79.25	sand and gravel	Sandy gravel.
USGS UZB-2	79.25	81.99	clay, sand and gravel	Sandy silty gravel.
USGS UZB-2	81.99	83.82	sand	Sand.
USGS UZB-2	83.82	85.34	clay and sand	Silt.
USGS UZB-2	85.34	86.56	clay and sand	Sandy silt.
USGS UZB-2	86.56	87.48	clay and sand	Clayey sandy silt.
USGS UZB-2	87.48	98.15	sand, clay and trace gravel	Gravelly silt.
USGS UZB-2	98.15	100.58	sand, clay and gravel	Silty gravel.
USGS UZB-2	100.58	104.24	clay	Clay.
USGS UZB-2	104.24	106.68	clay, sand and gravel	Clayey gravel.
USGS UZB-2	106.68	107.90	sand, clay and gravel	Silty gravel.
USGS UZB-2	107.90	111.25	clay, sand and gravel	Clayey gravel.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
USGS UZB-2	111.25	113.39	sand, clay and gravel	Silty gravel.
USGS UZB-2	113.39	114.60	Gravel	Gravel. Note: Casing broke at 200 ft below land surface, casing was no retrieved, total length of casing left in ground was 100 ft, from 200–300 ft below land surface.
USGS UZB-3	0.00	0.61	clay and sand	Sandy silt.
USGS UZB-3	0.61	3.05	sand, clay and gravel	Silty sandy gravel.
USGS UZB-3	3.05	4.27	sand and trace gravel	Gravelly sands.
USGS UZB-3	4.27	4.88	sand and clay	Sand and silt.
USGS UZB-3	4.88	6.71	sand, clay and gravel	Silty sandy gravel.
USGS UZB-3	6.71	7.32	clay and sand	Sandy silt.
USGS UZB-3	7.32	10.67	sand and gravel	Sandy gravel.
USGS UZB-3	10.67	10.97	sand, clay and gravel	Silty sandy gravel.
USGS UZB-3	10.97	12.80	sand and gravel	Sandy gravel.
USGS UZB-3	12.80	13.41	clay, sand and gravel	Sandy silt with gravel.
USGS UZB-3	13.41	14.94	sand and clay	Silty sand.
USGS UZB-3	14.94	18.90	sand, clay and gravel	Silty sandy gravel.
USGS UZB-3	18.90	19.51	sand and clay	Silty sand.
USGS UZB-3	19.51	22.56	sand, clay and gravel	Silty sandy gravel.
USGS UZB-3	22.56	23.16	sand, clay and gravel	Gravel with silt and sand.
USGS UZB-3	23.16	25.60	sand and gravel	coarse sand and gravel.
USGS UZB-3	25.60	30.78	sand, clay and gravel	Silty sand and gravel.
USGS UZB-3	30.78	33.53	sand and gravel	Sandy gravel (damp).
USGS UZB-3	33.53	56.69	sand, clay and gravel	Silty sandy gravel beds.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Top (m)	Bottom (m)	Simplified lithology	Driller's description
USGS UZB-3	56.69	60.96	clay, sand and gravel	Silt, sand and clay with gravel.
USGS UZB-3	60.96	65.84	sand, clay and gravel	Silty sandy gravel.
USGS UZB-3	65.84	67.06	sand and gravel	Sandy gravel.
USGS UZB-3	67.06	67.67	sand, clay and gravel	Silty sandy gravel.
USGS UZB-3	67.67	69.80	sand and gravel	Sandy gravel.
USGS UZB-3	69.80	70.10	sand, clay and trace gravel	Sand and gravel with clay.
USGS UZB-3	70.10	71.93	sand and gravel	Sand gravel.
USGS UZB-3	71.93	72.54	sand and gravel	Sand and gravel.
USGS UZB-3	72.54	73.15	sand, clay and gravel	Silty sandy gravel.
USGS UZB-3	73.15	84.12	sand, clay and gravel	Silty sand and gravel.
USGS UZB-3	84.12	87.17	sand and clay	Silty sand with clay.
USGS UZB-3	87.17	88.70	sand, clay and gravel	Silty sand with gravel.
USGS UZB-3	88.70	91.44	sand and clay	Silty sand with clay.
USGS UZB-3	91.44	93.88	clay, sand and gravel	Silt, sand and gravel.
USGS UZB-3	93.88	97.23	sand, clay and gravel	Silty sandy gravel.
USGS UZB-3	97.23	98.45	sand and clay	Silty sand.
USGS UZB-3	98.45	104.55	clay and sand	Sandy silt.
USGS UZB-3	104.55	105.16	sand, clay and gravel	Silt with sand and gravel.
USGS UZB-3	105.16	109.12	sand and gravel	Sandy gravel.
USGS UZB-3	109.12	111.86	sand, clay and gravel	Silty gravel with boulders.
USGS UZB-3	111.86	114.30	sand, clay and gravel	Silty gravel.

Appendix 1. Compilation of borehole and aquifer data.—Continued

[cm, centimeter; m, meter; in, inch; ft, feet; %, percent; ppm, parts per million; ≈, approximately equal to; >, greater than]

Bore	Water depth (ft)	Total depth (ft)	Water depth (m)	Total depth (m)
AquAeTer MW-318	285	300	86.80	91.44
AquAeTer MW-319	290	318	88.45	96.93
AquAeter MW-325	362	389	110.40	118.57
AquAeTer MW-326	360	372	109.60	113.39
AquAeTer MW-327	338	360	103.10	109.73
G&M Inc 001	341	366	103.94	111.63
G&M Inc 002	356	390	108.51	118.87
G&M Inc 600	307	502	93.45	153.01
G&M Inc 601	325	420	98.99	128.02
G&M Inc 602	328	415	100.07	126.49
G&M Inc 603	322	415	98.13	126.49
G&M Inc 604	322	436	98.15	132.95
G&M Inc 605	320	442	97.43	134.66
GSI 304	288	380	87.78	115.82
GSI 305	283	380	86.26	115.82
GSI 306	300	380	91.44	115.82
Mark Group 308	303	338	92.48	103.02
Mark Group 309	309	340	94.34	103.63
Mark Group 310	282	302	86.11	92.20
Mark Group 311	304	330	92.78	100.58
Mark Group 312	284	305	86.72	92.96
Mark Group 312A	285	301	87.02	91.90
Mark Group 313	287	320	87.54	97.54
Mark Group 314	302	336	92.14	102.41
Mark Group 315	306	340	93.16	103.63
Mark Group 316	290	310	88.24	94.49
Mark Group 317	306	340	93.40	103.63
Mark Group 400	283	537	86.32	163.68
Mark Group 401	287	420	87.48	128.02
Mark Group 402C	282	436	86.01	132.89
Mark Group 403	301	658	91.71	200.56
Perk Est. ARAS1	46	153	14.17	46.49
Perk Est. ARRB1	49	159	14.80	48.50
Site Well 1961	315	575	96.01	175.26
USGS MR3	369	405	112.47	123.44
USGS No 1	326	574	99.36	175.00
USGS UZB-1	145	158	44.20	48.25
USGS UZB-2	358	376	108.98	114.66
USGS UZB-3	361	375	110.03	114.45

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