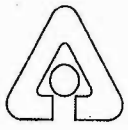
ANL/ER-36096

Final Work Plan: Phase I Expedited Site Characterization for Agenda, Kansas

Environmental Research Division

Argonne National Laboratory



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ANL/ER-36096

Final Work Plan: Phase I Expedited Site Characterization for Agenda, Kansas

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Notation

AMSL	above mean sea level
BGL	below ground level
CCC	Commodity Credit Corporation
CDBG	Community Development Block Grant
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CI	comprehensive investigation
CLP	Contract Laboratory Program
DOE	U.S. Department of Energy
ECPT	electronic cone penetrometer
EPA	U.S. Environmental Protection Agency
ESC	Expedited Site Characterization
ft	foot (feet)
gal	gallon(s)
in.	inch(es)
KDHE	Kansas Department of Health and Environment
KGS	Kansas Geological Survey
MCL	maximum contaminant level
µg/kg	microgram(s) per kilogram
mg/L	milligram(s) per liter
µg/L	microgram(s) per liter
mi	mile(s)
PA	preliminary assessment
PCB	polychlorinated biphenyl
ppb	part(s) per billion
ppm	part(s) per million
PVC	polyvinyl chloride
PWS	public water supply
RI	remedial investigation
SA	site assessment
USDA	U.S. Department of Agriculture
VOC	volatile organic compound

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1 Introduction

The Commodity Credit Corporation (CCC) of the U.S. Department of Agriculture (USDA) has entered into an interagency agreement with the U.S. Department of Energy (DOE) under which Argonne National Laboratory, a multidisciplinary research center operated by the University of Chicago for DOE, provides technical assistance to the CCC/USDA with hazardous waste site characterization and remediation. In particular, Argonne will apply its Expedited Site Characterization (ESC) approach to satisfy the requirements of a remedial investigation (RI) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at sites in Kansas where carbon tetrachloride has been found in water at concentrations above the maximum contaminant level of 5 micrograms per liter (µg/L) promulgated by the U.S. Environmental Protection Agency (EPA). Carbon tetrachloride, a former component in a commercial grain fumigant, is the primary contaminant of concern at sites where the CCC/USDA formerly operated grain storage facilities in Kansas.

The CCC/USDA operated a grain storage facility in Agenda, Kansas, in the 1950s and 1960s. Commercial grain fumigants based on carbon tetrachloride were in general use by both the CCC/USDA and the commercial grain storage industry during this period, and they were probably used at the CCC/USDA facility in Agenda. In 1987, carbon tetrachloride was found at a concentration above the MCL in one of Agenda's public water supply wells by the Kansas Department of Health and Environment (KDHE 1992). Subsequent investigations led by the KDHE identified carbon tetrachloride in both of Agenda's public water supply wells and in groundwater at the former site of the CCC/USDA grain storage facility (PRC 1994a,c, 1995). Because this contamination might be linked to historical use of grain fumigants containing carbon tetrachloride at the former CCC/USDA facility in Agenda, the CCC/USDA will conduct an RI to establish the source and extent of the carbon tetrachloride contamination at Agenda and to determine whether the contamination requires remedial action.

The CCC/USDA has scheduled the ESC investigation of its former facility in Agenda for 1996. The investigation will be divided into two phases. This *Work Plan* outlines the scope of and provides technical guidance for the initial phase of the investigation. In addition to this *Work Plan*, Argonne has issued a *Master Work Plan* (Argonne 1994) that describes the general scope of ESC

investigations at all former CCC/USDA sites in Kansas and provides guidance for them. The *Master Work Plan* contains the material common to ESC investigations at all sites. Both documents must be consulted for the complete details of the plans for Phase I work at the former CCC/USDA site in Agenda.

2 Background Information and Previous Studies

2.1 Site Features and History

2.1.1 Area Description

Agenda, Kansas, is located in southeastern Republic County (Figure 2.1) on State Highway 148, approximately 18 mi southeast of Belleville, the Republic County seat, and approximately 70 mi north of Salina. The city is an agriculture-based residential community with a population of approximately 100. The most prominent businesses in the city are the grain elevator, which is currently owned and operated by United Grain, Inc., and Boettcher Enterprises, a bulk storage and distribution facility for fertilizers and other agricultural chemicals (Figure 2.2). Both are located on the west side of the city along East Railroad Street. During the 1950s and 1960s, the community also had a CCC/USDA grain storage facility, which was located to the north of the grain elevator (Figure 2.2). The CCC/USDA grain storage program was discontinued in the late 1960s and early 1970s. The remaining CCC/USDA facilities are now operated by United Grain, Inc.

Other businesses in Agenda include a service station, an automotive repair shop (Dale's Repair), and a cafe. In addition, the Kyle Railroad has a line that runs through the west side of the city. The tracks are leased from the Mid-States Port Authority (KDR 1995). The United Grain and Boettcher Enterprises facilities are also located on property leased from the Mid-States Port Authority (KDR 1995). The land surrounding the city is primarily cultivated or used as pasture (KDHE 1992).

Agenda has a public water supply system that was constructed in 1955 (Anderson 1996). Presently the system has two public water supply (PWS) wells, designated PWS 1 and PWS 2, located in the south-central portion of town (Figure 2.2). Both PWS wells are in use. The system also has a 10,000-gal underground reservoir and a 2,500-gal tank, located inside the PWS 1 well house, that is used to pressurize the system (Anderson 1996). An air stripper treatment system was installed west of the PWS 1 well house in 1994 to remove volatile organic compound (VOC) contamination present in the well water before it enters the distribution system (Bean 1993).

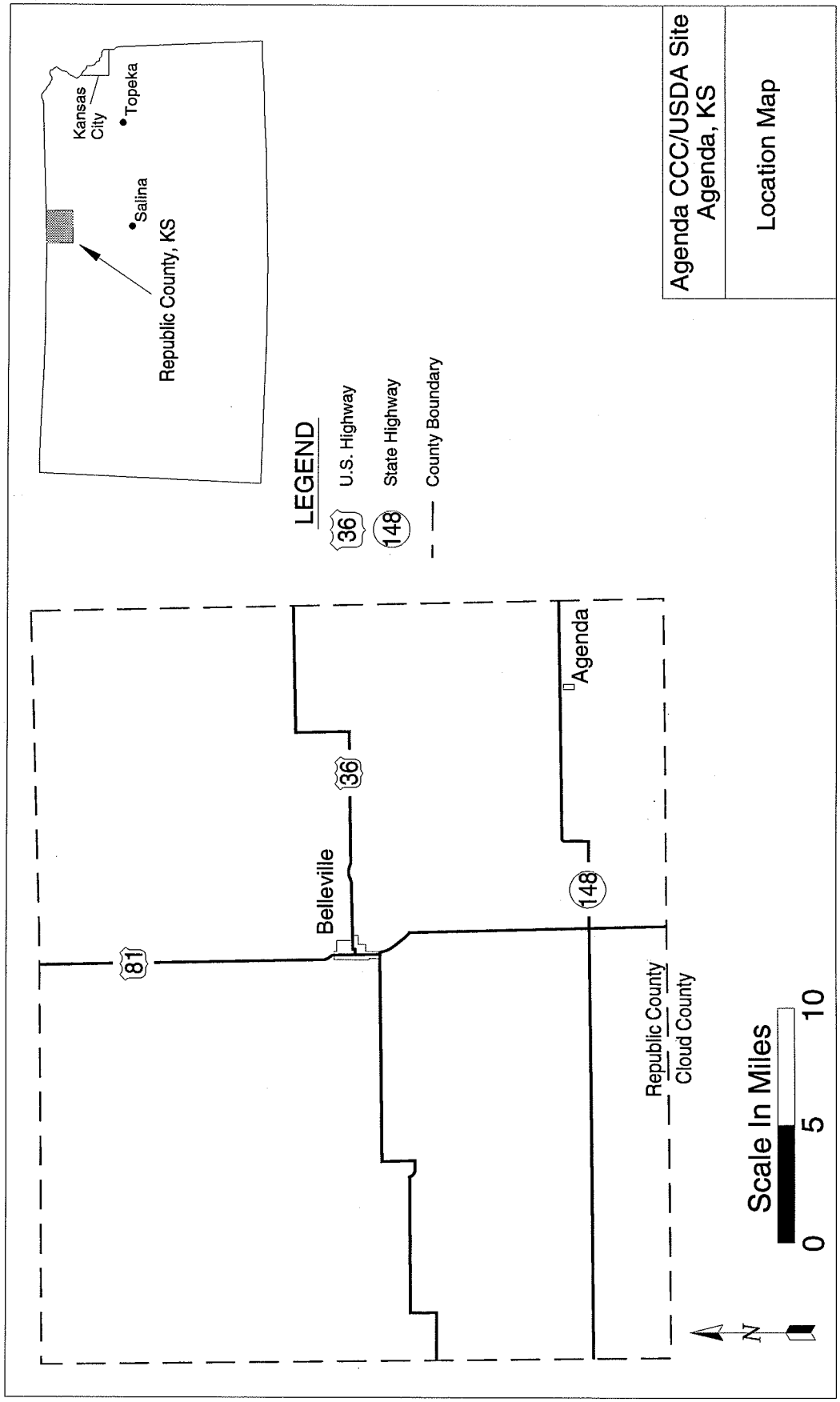


FIGURE 2.1 Map Showing Location of Republic County and the City of Agenda, Kansas

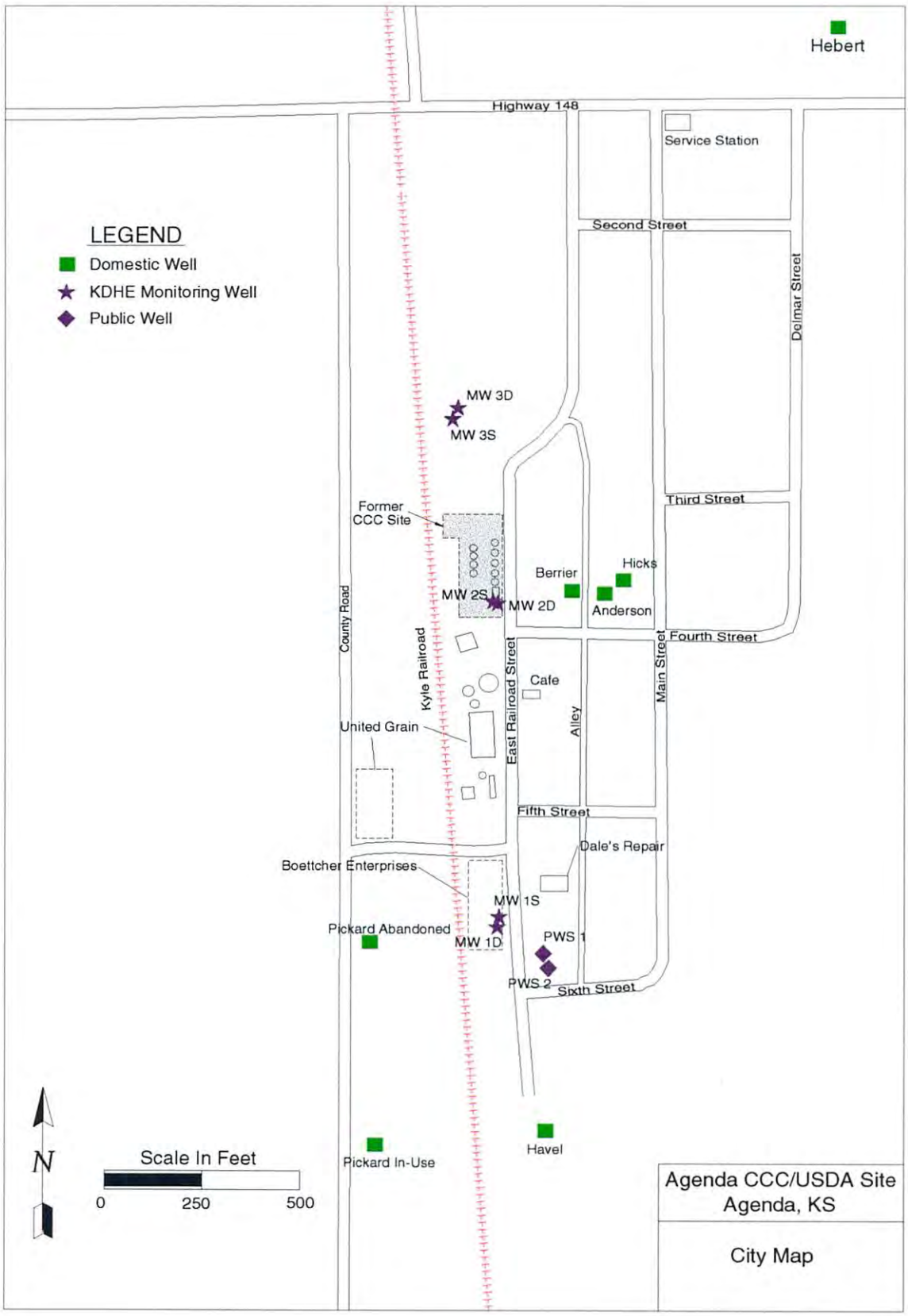


FIGURE 2.2 Map of Agenda, Kansas, Showing the Former CCC/USDA Site and the Approximate Locations of PWS Wells, Domestic Wells, and KDHE Monitoring Wells

The majority of Agenda's residents receive their water via the public water supply system. Interviews with the mayor and the city manager indicated that only the Berrier and Pickard residences (Figure 2.2) use domestic wells for drinking water (Anderson 1996; Kopsa 1996). Several other residences in the city reportedly use domestic wells only for watering lawns and gardens (Anderson 1996). Residents outside the city limits obtain their water either from domestic wells or from the Republic County Rural Water District 2 (KDHE 1992).

Well PWS 1 was installed in 1955 to a depth of 128 ft (PRC 1994c). Reported problems with development of the well required the depth of the well to be reduced (Stover 1994a). Currently, the total depth is measured at 80 ft. PWS 2, installed in 1983 to a depth of 140 ft, is located about 100 ft south of PWS 1 (KDHE 1983). The driller's log for PWS 2 is in Appendix A. No driller's log is available for PWS 1.

2.1.2 Site History

The first indication of VOC groundwater contamination at Agenda came from routine screening of the public water supply by the KDHE. Although sampling by the KDHE on September 9, 1986, had shown both PWS 1 and PWS 2 to be free of VOC contamination, sampling of PWS 1 on June 2, 1987, indicated the presence of carbon tetrachloride (also known as tetrachloromethane) at a concentration of 6.0 micrograms per liter (µg/L).[1] PWS 2 was not sampled. Resampling of PWS 1 on July 14, 1987, confirmed the presence of carbon tetrachloride at a concentration of 2.7 µg/L. Sampling of PWS 1 and PWS 2 on January 18, 1989, revealed carbon tetrachloride in both wells at approximately 2 µg/L. Because carbon tetrachloride is a suspected carcinogen with an EPA-promulgated maximum contaminant level (MCL) of 5 µg/L, monitoring of the Agenda PWS wells was initiated.

In March 1992, the KDHE completed a preliminary assessment (PA) of the Agenda PWS site, designated as EPA Site KSD984997528 (KDHE 1992). Sampling performed on November 13, 1991, included the two PWS wells, five domestic wells (Hebert, Hicks, Berrier, Havel, and an abandoned well north the Pickard residence, Figure 2.2), and one sample from the municipal distribution system (collected at Dale's Repair). All of the samples were analyzed for VOCs and nitrates. Samples from four of the wells were also analyzed for pesticides and herbicides. Carbon tetrachloride was found above the MCL (5 µg/L) in PWS 1. Nitrate was

[1] All analytical data referenced in this document are presented as reported in the original source document. Argonne cannot attest to the accuracy of the analytical results, because adequate quality assurance/quality control information is not generally available for the data.

detected at levels exceeding the MCL of 10 milligrams per liter (mg/L) in the nearby Havel and Hicks wells. The herbicide Atrazine was detected at levels exceeding the MCL (3 µg/L) in the nearby Havel well and the abandoned Pickard domestic well. (Analytical results for groundwater samples collected during this and subsequent investigations are discussed in detail in Section 2.2.2.) On the basis of the results from the PA, the KDHE recommended that PWS 1 should be used only as a standby drinking water source, and that when it was used, the water should be blended with water from PWS 2 prior to distribution. The KDHE further recommended that the Agenda public water supply site be identified to the EPA for possible remediation of the carbon tetrachloride contamination.

Quarterly monitoring of the PWS wells continued throughout 1992 and early 1993. Although it fluctuated, a general increase in the level of carbon tetrachloride contamination was observed in both PWS wells. Samples collected on March 3, 1993, indicated carbon tetrachloride contamination in PWS 1 at 15.4 µg/L and in PWS 2 at 8.3 µg/L, leaving Agenda without an uncontaminated water source. Use of PWS 1 as a municipal water source was discontinued. In April 1993, the KDHE prepared a Request for Proposal to vendors for construction of an air stripper system to remove VOCs from the well water prior to distribution (Stover 1994a). A contract was subsequently awarded to Hazleton Environmental for the air stripper system.

In November 1993, a site assessment (SA) of the Agenda public water supply was conducted by PRC Environmental Management, Inc., for the KDHE (PRC 1994a). The purpose of the SA was to collect and review all available information about the site and to make a recommendation regarding the need for additional work (PRC 1994a). The SA included a review of files from the KDHE Bureau of Environmental Remediation, the KDHE Bureau of Water, and the Kansas Geological Survey (KGS), conducted on October 6-13, 1993. During a site reconnaissance conducted on November 2, 1993, groundwater samples were collected from the two PWS wells, the Berrier domestic well, and an in-use well at the Pickard residence (about 500 ft south of the previously sampled abandoned well north of the Pickard residence). A duplicate sample was also collected from PWS 1. Samples were submitted for VOC, nitrate, pesticide, and herbicide analyses. Carbon tetrachloride was found above the MCL of 5 µg/L in both PWS wells. Nitrates were above the MCL of 10 mg/L in both domestic wells. The herbicide Atrazine was detected in the sample from the PWS 1 well above the MCL of 3 µg/L but was not detected in the duplicate sample. A comprehensive investigation (CI) of the site was recommended by PRC.

In early 1994, the KDHE ordered the CI of the Agenda public water supply site to identify potential sources of the contamination and to delineate its extent; a *Scope of Work* for the CI was issued in April 1994 (Stover 1994b). PRC conducted the CI of the Agenda site for the KDHE. In June 1994, three soil gas samples were collected for carbon tetrachloride analysis at each of two locations (C-9 and C-13, Figure 2.3). Carbon tetrachloride was not detected in any of the soil gas samples at a reported detection limit of 1 part per billion (ppb). PRC then collected eight subsurface soil samples for carbon tetrachloride analysis at locations around the former CCC/USDA storage site and the United Grain facility (Figure 2.3). Carbon tetrachloride was not detected in any of the soil samples at a reported detection limit of 0.10 micrograms per kilogram (µg/kg). Three attempts were also made to collect a shallow groundwater sample with a Geoprobe®, but none was successful. These locations are also shown in Figure 2.3.

Surface and subsurface soil samples were also collected for analysis of nitrate and a suite of 11 pesticides and herbicides (Atrazine, Ametryn, Atraton, Prometon, Prometryne, Propazine, Simetryne, Simazine, Terbuthylazine, Terbutryne, and Cyanazine). Figure 2.4 shows the locations of soil samples analyzed for nitrate and the detected concentrations. (Also included in Figure 2.4, and discussed below, are the locations and concentrations of soil sample A and soil sample B collected by the KDHE in February 1995 for nitrate analysis.) Figure 2.5 shows the locations of soil samples collected for pesticide/herbicide analysis and the detected concentrations of Atrazine, the primary pesticide/herbicide contaminant detected in conjunction with the CI and previous investigations.

Surface soil, subsurface soil, and soil gas samples were collected on June 9-13, 1994, to determine locations for monitoring wells. On June 14-21, 1994, six monitoring wells were installed, three in a shallow water-saturated sand and three in a deeper water-saturated sandstone (Figure 2.2). A hollow-stem-auger drilling rig was used to drill the boreholes for the three shallow wells (MW 1S, MW 2S, and MW 3S); a mud rotary drilling rig was used for the three deeper wells (MW 1D, MW 2D, and MW 3D). Lithologic logs for the six boreholes were completed, and the boreholes for MW 1D and MW 2D were geophysically logged by using a natural-gamma-ray scintillometer tool. Copies of the lithologic and geophysical logs for these boreholes are in Appendix A. Table 2.1 provides the well specifications for the six monitoring wells, the two PWS wells, and the domestic wells within the city.

During the period June 20-22, 1994, PRC collected groundwater samples from four of the monitoring wells (MW 1S, MW 1D, MW 2S, and MW 2D), the two PWS wells, and six

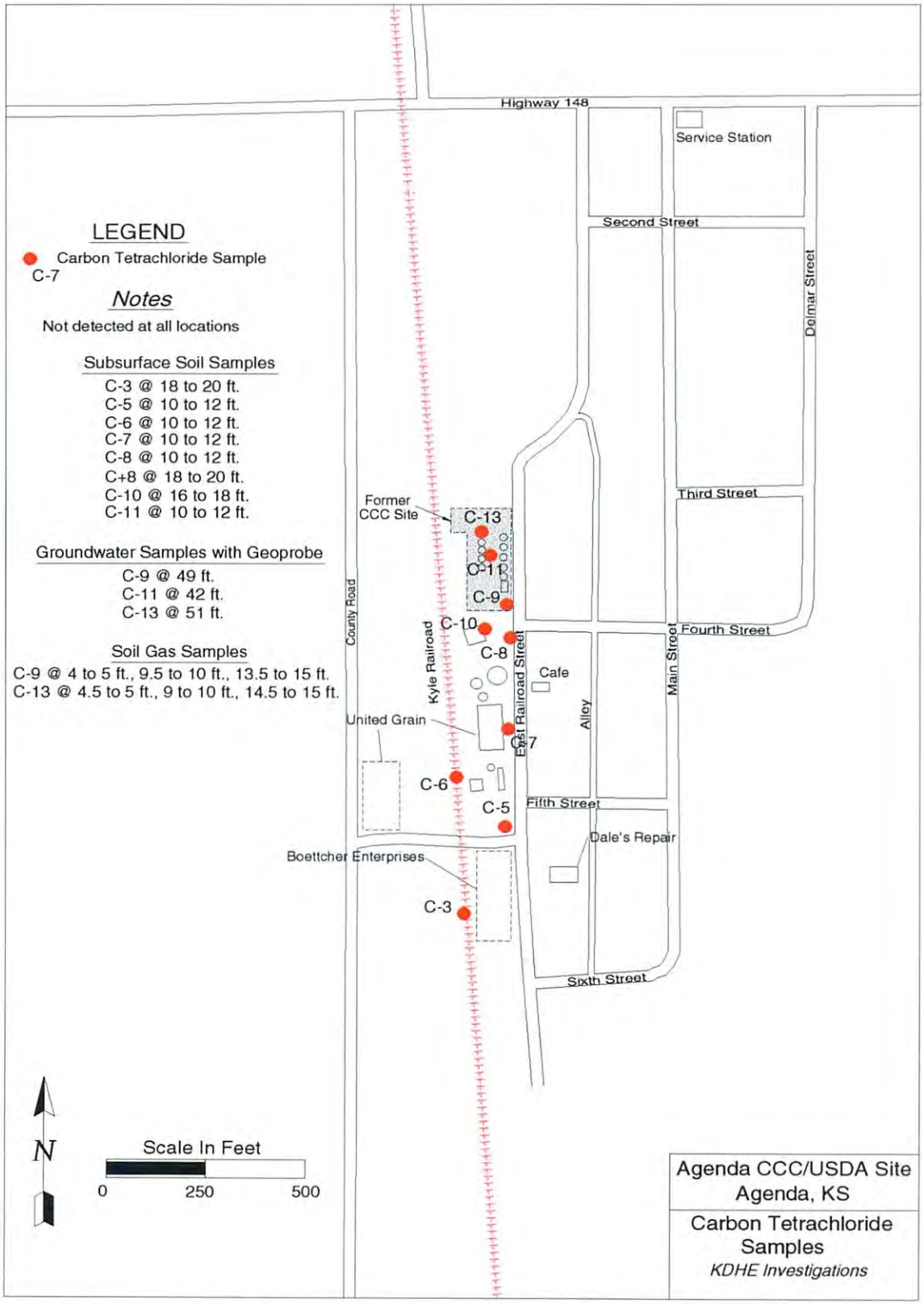


FIGURE 2.3 Locations of Soil Gas, Subsurface Soil, and Geoprobe Groundwater Samples Collected for Carbon Tetrachloride Analysis during KDHE Investigations at Agenda, Kansas

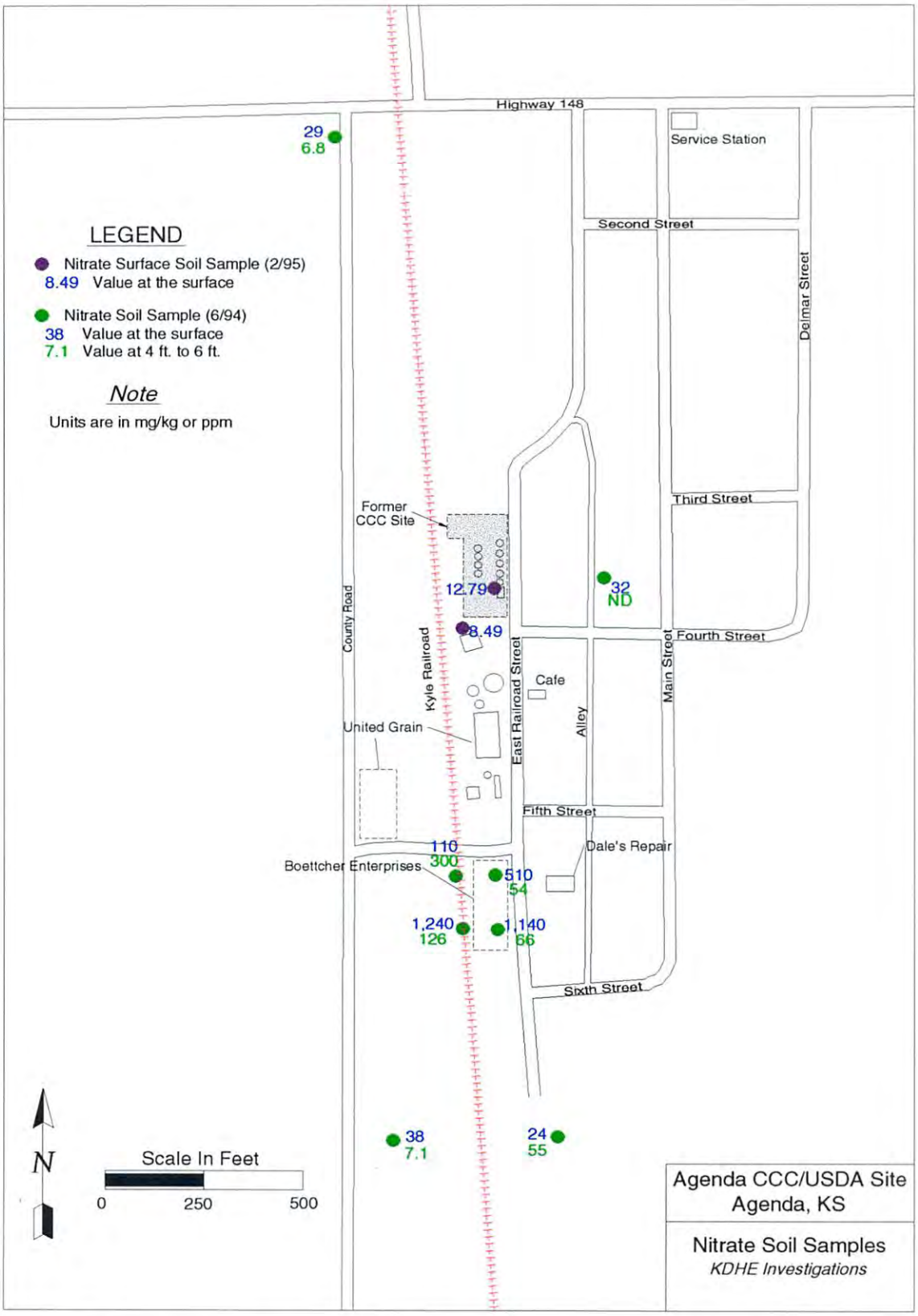


FIGURE 2.4 Locations of and Analytical Results for Soil Samples Analyzed for Nitrate in the KDHE Investigations at Agenda, Kansas

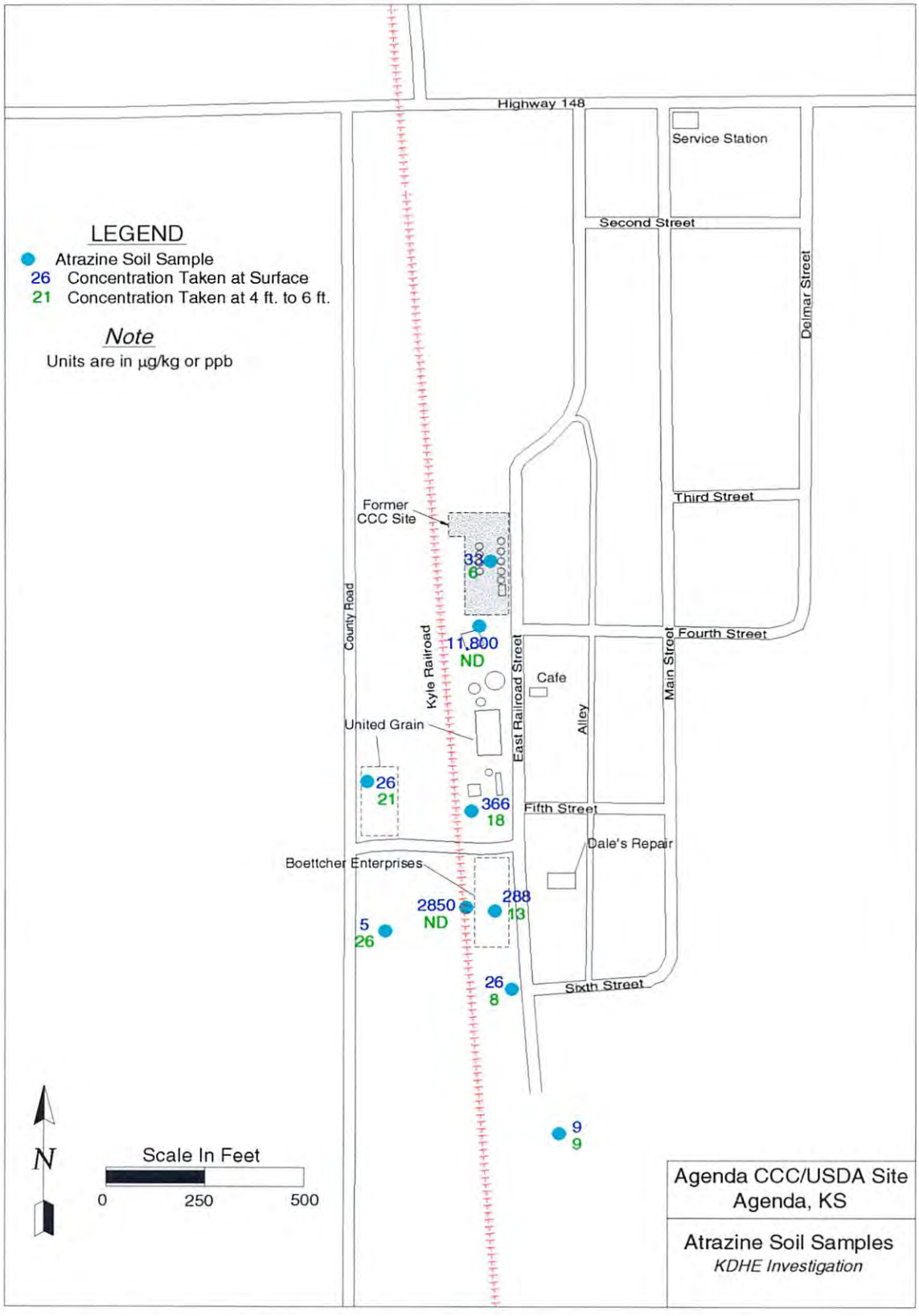


FIGURE 2.5 Locations of and Analytical Results for Soil Samples Analyzed for Atrazine in the KDHE Investigations at Agenda, Kansas

TABLE 2.1 Specifications and Groundwater Elevations for PWS Wells, Domestic Wells, and Monitoring Wells in Agenda, Kansas

Well	Type of Casing	Elevation (ft AMSL) Ground	Elevation (ft AMSL) Top of Casing	Completed Depth (ft BGL)	Elevation (ft AMSL) Bottom	Elevation (ft AMSL) Screened Interval	Groundwater Elevation (ft AMSL) on Date Shown 06/06/94	06/20-22/94	07/22/94	11/22/94	02/07/95
KDHE Monitoring Wells											
MW 1S	2-in. PVC[a]	1411.25	1414.11	54	1357	1357-1367	NA[b]	1373.27	1373.26	1374.11	1372.41
MW 1D	4-in. PVC	1410.92	1414.01	140	1271	1271-1281	NA	1362.21	1366.56	1367.51	1365.41
MW 2S	5-in. PVC	1412.42	1412.14	59	1353	1353-1363	NA	1373.87	1375.18	1375.14	1374.14
MW 2D	5-in. PVC	1412.53	1412.31	139	1274	1274-1284	NA	1367.84	1368.69	1369.81	1366.51
MW 3S	2-in. PVC	1396.89	1399.68	48	1349	1349-1359	NA	1376.66	1376.26	1375.38	1375.28
MW 3D	4-in. PVC	1396.78	1399.64	114	1283	1283-1293	NA	NA	1367.04	1366.54	1366.54
Public Wells											
PWS 1	Unknown	1415.56	1417.03	79	1337	Unknown	1367.23	1367.23	NR[c]	NR	NR
PWS 2	5-in. PVC	1416.17	1417.60	140[d]	1276	1276-1316	1334.17[e]	1335.17[e]	NR	NR	NR
Domestic Wells											
Havel	Unknown	1413.99	1408.64	62	1352	Unknown	1372.04	1371.86	NR	NR	NR
Hicks	6-in. steel	1413.73	1413.91	66	1348	Unknown	1374.13	1374.39	NR	NR	NR
Pickard (abandoned)	5-in. steel	1396.78	1396.88	43	1354	Unknown	1373.18	1373.18	NR	NR	NR
Hebert	5-in. steel	1420.43	1414.33	62	1359	Unknown	1378.13	1378.11	NR	NR	NR

[a] PVC, polyvinyl chlroide.

[b] NA, not available; monitoring well not yet installed.

[c] NR, groundwater elevation not recorded; groundwater elevation was recorded in monitoring wells only.

[d] Constructed well depth obtained from well installation record.

[e] Depth to water questionable. Measured with PWS well pressure gauge, not water level indicator.

Source: PRC (1994c).

domestic wells (Anderson, Berrier, Pickard in-use, Pickard abandoned, Havel, and Hicks). A duplicate sample was also collected from PWS 1. Subsequently, on July 22, 1994, samples were collected from the remaining two monitoring wells (MW 3S and MW 3D), and a second sample was obtained from the Berrier well. Carbon tetrachloride was detected in the PWS 1 sample at 12 µg/L and in the PWS 1 duplicate sample at 13 µg/L. Carbon tetrachloride was not detected above the reported detection limit of 1.2 µg/L in PWS 2, in any of the domestic wells, or in any of the recently completed monitoring wells. The KDHE considered the analytical results from the monitoring well samples questionable because of incomplete well development, according to KDHE protocol, prior to collection of the samples (PRC 1994c). The absence of carbon tetrachloride in PWS 2, which had previously exhibited carbon tetrachloride concentrations up to 10.4 µg/L (in a sample collected on January 25, 1993), could not be explained (PRC 1994c).

An interim report prepared by PRC in September 1994 discussed the field work performed during the CI, summarized the results of the CI, and provided recommendations for additional characterization activities at the site. The interim CI report was revised on December 22, 1994 (PRC 1994c), on the basis of KDHE comments (Stover 1994c). Additional characterization activities recommended included resampling of the monitoring wells after further development, continued monitoring of groundwater levels in the existing monitoring wells, and installation of an additional deep monitoring well off-line from the three existing deep monitoring wells to determine the direction of groundwater flow in the deeper sandstone horizon.

Following completion of the CI field activities in the summer of 1994, the KDHE conducted two sampling events, in November 1994 and in February 1995 (Stover 1995). On November 22, 1994, the KDHE measured water levels and total depths in the six monitoring wells, purged the monitoring wells, and collected samples from the six monitoring wells and the two PWS wells. All water samples were analyzed by the KDHE's laboratory for VOCs and nitrate. Sampling activities by KDHE on February 7, 1995, duplicated the November 22, 1994, activities. Groundwater elevation data recorded for the six monitoring wells, the two PWS wells, and the four private wells listed in Table 2.1 are consistent from June 1994 through February 1995, suggesting that groundwater flow is generally south-southeast in the shallow sand (PRC 1994c). Although the groundwater elevation data for the three deep monitoring wells are similar from June 1994 through February 1995, groundwater flow in the deeper sandstone horizon could not be determined because of the linear arrangement of the three monitoring wells (PRC 1994c).

The February 7, 1995, sampling by the KDHE included collection of a composite water sample from PWS 1 and PWS 2 for analysis of organochlorine pesticides/herbicides. None of

these were detected (at a reported detection limit of 0.3 µg/L for Atrazine). Two surface soil samples were also collected for nitrate analysis (at locations and concentrations shown in Figure 2.4) as an indicator of past releases of nitrogen fertilizer solution. Sample A was collected west of the first grain bin, located north of monitoring wells MW 2S and MW 2D. Sample B was collected at the northwest corner of the building southwest of monitoring wells MW 2S and MW 2D. Soil sampling for nitrate analysis, performed in June 1994 in conjunction with the CI, did not include this area, concentrating instead in the area of a known 1988 nitrate release on the Boettcher Enterprise site. The analytical results, 8.49 mg/kg for sample A and 12.79 mg/kg in sample B, indicate that nitrate fertilizer solution has not been spilled in these areas of the former CCC/USDA grain storage site (PRC 1995).

In April 1995, PRC prepared an addendum to the CI report that summarized the KDHE sampling activities on November 22, 1994, and February 7, 1995 (PRC 1995). The report discussed the potential sources of the carbon tetrachloride, nitrate, and Atrazine contamination (Section 2.1.3) and made recommendations for obtaining an uncontaminated water supply for Agenda (Section 2.2.3).

2.1.3 Potential Contaminant Sources

The three primary contaminants of concern at Agenda are carbon tetrachloride, nitrates, and Atrazine. Figure 2.6 shows the maximum carbon tetrachloride, nitrate, and Atrazine concentrations detected in Agenda public, domestic, and monitoring wells since 1987. Well depths and corresponding elevations are also provided where available.

Grain storage facilities commonly used grain fumigants based on carbon tetrachloride to preserve grain until the federal government banned its use as a grain fumigant in 1985. North and west of the two PWS wells, across East Railroad Street, is the active grain elevator presently operated by United Grain, Inc. Between 1973 and 1992, the grain elevator was operated by Agenda Elevator Company, Inc., and between 1964 and 1973 it was operated by Cooperative Service Association. Though no documentation was found, a grain elevator business is known to have been operating at this location for many years previously (Kopsa 1996). At the north end of the United Grain facility are 9 round metal grain bins and 2 rectangular wooden grain bins. These bins were once part of the CCC/USDA grain storage facility, which in the 1950s and 1960s

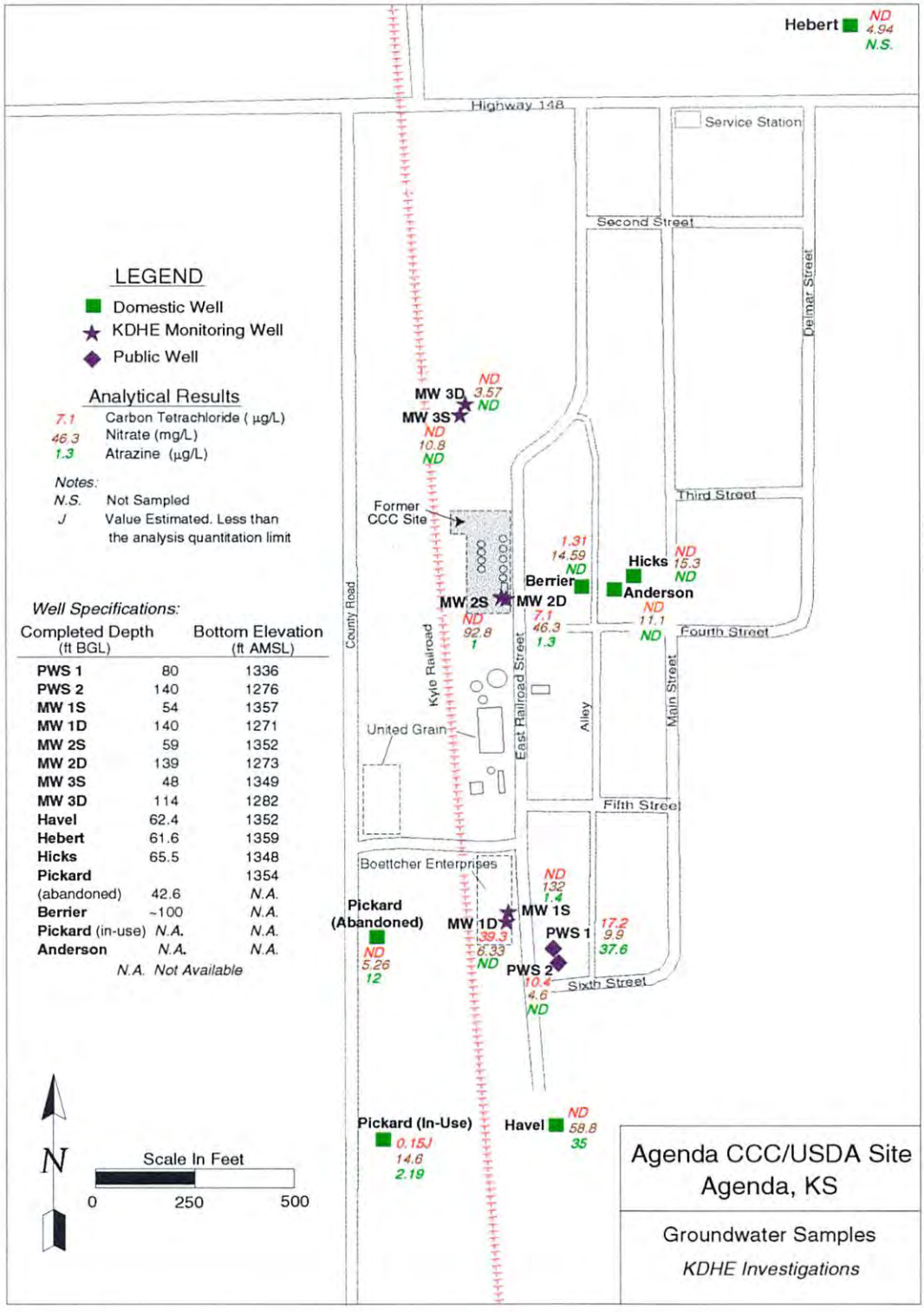


FIGURE 2.6 Maximum Concentrations of Carbon Tetrachloride, Nitrate, and Atrazine Detected in Agenda, Kansas, Wells Since 1987

consisted of 9 metal bins and 11 wooden grain bins (USDA 1962). The former CCC/USDA grain storage bins are now owned and used by United Grain.

Although carbon tetrachloride was not detected in soil and soil gas samples collected at the former CCC/USDA site or elsewhere, carbon tetrachloride was found in groundwater from MW 1D and MW 2D. The highest carbon tetrachloride concentration found to date in the groundwater at Agenda is 39.3 µg/L from MW 1D, which is located at the south end of the property leased by Boettcher Enterprises (Figure 2.6). The maximum concentration detected in MW 2D, located at the southeast corner of the former CCC/USDA grain storage facility, is 7.1 µg/L (Figure 2.6).

United Grain handles pesticides/herbicides, fertilizers, and other agricultural chemicals in addition to grain (KDHE 1992, PRC 1994c). A large white building located southwest of the former CCC/USDA grain storage facility was used to store containers of pesticides and herbicides. Historically, a high-pressure overhead water line at that location was used to fill and clean fertilizer and pesticide/herbicide applicator tanks. As Figure 2.5 shows, the highest Atrazine concentration detected in soil samples collected to date (11,800 µg/kg) was found at this location. Other bulk storage locations include the small parcel of land directly west of the active grain elevator, where trailer-type anhydrous ammonia tanks are stored. Immediately west of the PWS wells across East Railroad Street is the parcel of land leased by Boettcher Enterprises. On this property are two permanent upright tanks of nitrogen fertilizer solution, one permanent tank of anhydrous ammonia, and several trailer-type anhydrous ammonia tanks. On June 14, 1988, 3,000 gal of 28% nitrogen solution were released from a tank located next to the railroad tracks (KDHE 1988), approximately 50 ft west of MW 1S. This is the only documented release at the investigation site; the KDHE did not require submittal of documentation about releases that might have occurred prior to May 1, 1986 (PRC 1994a). Following the 1988 release, saturated soil was removed along the east side of the railroad tracks, encompassing an area 4 ft wide, 225 ft long, and 3 ft deep; saturated soil from the west side of the tracks was also removed (PRC 1994c). Nonetheless, the highest nitrate concentration detected in groundwater samples collected to date was 132 mg/L at MW 1S.

The second highest nitrate concentration in groundwater (92.8 mg/L at MW 2S) was near the location of the aforementioned applicator tank filling area. However, surface soil sampling performed by the KDHE in 1995 (sample A at 8.49 mg/kg and sample B at 12.79 mg/kg, as shown in Figure 2.4) discounted a nitrate release to surface soils in this area (PRC 1995). Leaking septic tanks may be contributing to the nitrate contamination detected in the vicinity of MW 2S and MW 2D (within the former CCC/USDA grain storage site) and the nearby Anderson, Berrier, and

Hicks domestic wells. The Agenda sewage system was constructed in 1971 (Splichal 1995). Household septic systems in use prior to that date might have corroded over time, contributing to the nitrate contamination in both the shallow sand aquifer and the deeper sandstone aquifer in that area.

The bulk storage/distribution facilities of United Grain and Boettcher Enterprises service the extensive agricultural lands surrounding Agenda. Routine use or spillage of fertilizers and herbicides by individual farming operations may also be contributing to the detected nitrate and Atrazine contamination. This is most evident in the widespread nitrate contamination in the area. In a surface soil sample and a subsurface soil sample collected near the corner of County Road and State Highway 148, the nitrate concentrations were 29 mg/kg and 6.8 mg/kg, respectively (Figure 2.4). Nitrate was also found in the private Hebert well, located north of Agenda at the corner of State Highway 148 and Delmar Street, at 4.94 mg/L (Figure 2.6). Soil and groundwater samples for Atrazine analysis have not been collected at locations outside the investigation site. Therefore, the sampling performed to date has not clearly demonstrated whether the Atrazine in the soil and groundwater in proximity to the bulk storage/use locations of United Grain and Boettcher Enterprises (i.e., samples collected at the Pickard abandoned well [5 to 26 µg/kg in soil; 12 µg/L in groundwater], the Pickard residence [2.19 µg/L in groundwater], and the Havel residence [9 µg/kg in soil; 35 µg/L in groundwater], resulted exclusively from migration away from those bulk storage/use locations.

2.2 Previous Investigations

2.2.1 Previous Reports

Technical data on the VOC contamination in groundwater at Agenda were obtained primarily from four written reports. The PA report was produced for the Region VII EPA by the KDHE (KDHE 1992). The subsequent reports prepared by PRC Environmental Management, Inc., for the KDHE described the SA (PRC 1994a) and the CI (PRC 1994c). An addendum to the CI report was also prepared by PRC for the KDHE (PRC 1995).

2.2.2 Data Collection

The EPA's involvement with Agenda's public water supply developed as a result of routine sampling performed by the KDHE in 1987. Beginning in 1991, a series of investigations has focused on confirming the groundwater contamination and delineating its sources and extent. Carbon tetrachloride, nitrate, and Atrazine are the three primary contaminants of concern. Table 2.2 is a compilation of the analytical data for carbon tetrachloride and chloroform (a potential degradation product of carbon tetrachloride) in groundwater, obtained from numerous sampling events since 1986. The history of carbon tetrachloride contamination in the PWS wells is also presented graphically in Figure 2.7. Analytical results for nitrate and Atrazine in groundwater samples are in Table 2.3 and Table 2.4, respectively. The following is a chronological review of the groundwater sampling episodes that have contributed to the existing technical database. All analytical data are reported as given in the original source document. Argonne cannot attest to the accuracy of these analytical results, because adequate quality assuarance/quality control information was not available. The sampling episodes were as follows:

- *September 1986.* Routine monitoring of the Agenda municipal water supply by the KDHE on September 9, 1986, indicated PWS 1 and PWS 2 to be free of VOC contamination.

- *June and July 1987.* Sampling of PWS 1 conducted on June 2 by the KDHE indicated the presence of carbon tetrachloride contamination at 6 μg/L, above the MCL of 5 μg/L. Resampling of PWS 1 on July 14 confirmed the presence of carbon tetrachloride, but at the lower concentration of 2.7 μg/L. According to records available for this ESC, PWS 2 was not sampled.

- *January 1989.* Sampling on January 18 by the KDHE indicated the presence of carbon tetrachloride in PWS 1 at 2.1 μg/L and in PWS 2 at 2 μg/L.

- *July 1989.* Resampling of PWS 1 on July 19 revealed carbon tetrachloride contamination at 3.7 μg/L.

- *January 1991.* Nitrate was detected in PWS 1 at 9.9 mg/L (i.e., at the MCL of 10 mg/L).

TABLE 2.2 Analytical Data for Carbon Tetrachloride and Chloroform for PWS Wells, Domestic Wells, and Monitoring Wells from KDHE Investigations (MCL for carbon tetrachloride is 5 µg/L; MCL for chloroform is 100 µg/L.)

Date	Sampling Event	Well	Concentration (µg/L) Carbon Tetrachloride	Chloroform
09/09/86	KDHE monitoring of public water supply	PWS 1	ND[a]	NR[b]
		PWS 2	ND	NR
06/02/87	KDHE monitoring of public water supply	PWS 1	***6.0***[c]	NR
07/14/87	KDHE monitoring of public water supply	PWS 1	2.7	NR
01/18/89	KDHE monitoring of public water supply	PWS 1	2.1	NR
		PWS 2	2.0	NR
07/19/89	KDHE monitoring of public water supply	PWS 1	3.7	NR
02/04/91	KDHE monitoring of public water supply	PWS 1	4.5	NR
		PWS 2	3.9	NR
05/10/91	KDHE monitoring of public water supply	PWS 1	*6.3*	NR
		PWS 2	4.6	NR
08/19/91	KDHE monitoring of public water supply	PWS 1	***10.6***	NR
		PWS 2	2.8	NR
10/30/91	KDHE monitoring of public water supply	PWS 1	***15.4***	NR
		PWS 2	2.5	NR
11/13/91	KDHE sampling for the PA	Berrier	< 0.7	NR
		Havel	< 0.7	NR
		Hebert (formerly Harvey)	< 0.7	< 0.5
		Hicks	< 0.7	< 0.5
		Pickard (abandoned)	< 0.7	< 0.5
		PWS 1	***7.1***	6.6[d]
		PWS 2	2.5	< 0.5
		PWS distribution	2.4	NR
01/07/92	KDHE monitoring of public water supply	PWS 1	***10.2***	NR
		PWS 2	***5.9***	NR

TABLE 2.2 (Cont.)

Date	Sampling Event	Well	Concentration (µg/L) Carbon Tetrachloride	Chloroform
04/17/92	KDHE monitoring of public water supply	PWS 1	***14.2***	NR
		PWS 2	***6.4***	NR
07/06/92	KDHE monitoring of public water supply	PWS 1	***8.5***	NR
		PWS 2	***6.2***	NR
10/06/92	KDHE monitoring of public water supply	PWS 1	***12.1***	NR
		PWS 2	***8.1***	NR
01/25/93	KDHE monitoring of public water supply	PWS 1	***17.2***	NR
		PWS 2	***10.4***	NR
03/05/93	KDHE monitoring of public water supply	PWS 1	***15.4***	ND
		PWS 2	***8.3***	
04/07/93	KDHE monitoring of public water supply	PWS distribution	***6.3***	0.5[d]
11/02/93	PRC sampling for the SA	Berrier	1.3	< 1
		Pickard (in use)	0.2 J[e]	< 1
		PWS 1	***14.0***	< 1
		PWS 1 (duplicate)	2.6	< 1
		PWS 2	***7.4***	< 1
06/20/94	PRC sampling for the CI	Anderson	< 1.2	< 0.5
		Berrier	< 1.2	< 0.5
		Pickard (in use)	< 1.2	< 0.5
		PWS 1	***12.0***	35.0[d]
		PWS 1 (duplicate)	***13.0***	26.0[d]
		PWS 2	< 1.2	6.1[d]
06/21/94	PRC sampling for the CI	Havel	< 1.2	< 0.5
		Hicks	< 1.2	< 0.5
06/22/94	PRC sampling for the CI	Pickard (abandoned)	< 1.2	< 0.5
		MW 1S	< 1.2	< 0.5
		MW 1D	< 1.2	< 0.5
		MW 2S	< 1.2	< 0.5
		MW 2S (duplicate)	< 1.2	< 0.5
		MW 2D	< 1.2	< 0.5
07/22/94	PRC sampling for the CI	MW 3S	< 1.2	< 0.5
		MW 3D	< 1.2	< 0.5
		Berrier (resample)	< 1.2	< 0.5

TABLE 2.2 (Cont.)

Date	Sampling Event	Well	Concentration (µg/L) Carbon Tetrachloride	Concentration (µg/L) Chloroform
11/22/94	KDHE sampling after the CI	PWS 1	***14.3***	29.2[d]
		PWS 2	***5.0***	< 0.5
		MW 1S	< 0.7	< 0.5
		MW 1D	***13.0***	1.5
		MW 2S	< 0.7	< 0.5
		MW 2D	1.8	< 0.5
		MW 3S	< 0.7	< 0.5
		MW 3D	< 0.7	< 0.5
02/07/95	KDHE sampling after the CI	PWS 1	***15.0***	1.5[d]
		PWS 2	1.9	3.8[d]
		MW 1S	< 0.7	< 0.5
		MW 1D	***39.3***	1.3
		MW 1D (duplicate)	***38.7***	1.2
		MW 2S	< 0.7	< 0.5
		MW 2D	***7.1***	0.5
		MW 3S	< 0.7	< 0.5
		MW 3D	< 0.7	< 0.5
06/22/95	KDHE monitoring of public water supply	PWS 1	1.5	36.3[d]
		PWS 2	1.7	5.8[d]

[a] ND, compound not detected; detection limit was not reported in information available for Argonne's ESC.

[b] NR, concentration not reported in information available for Argonne's ESC.

[c] Values exceeding the MCL are in ***bold italic*** type.

[d] The presence of other trihalomethane compounds indicates that the chloroform levels are primarily due to chlorination of the public water supply.

[e] Qualifier J indicates an estimated concentration, greater than zero but less than the quantitation limit for the analysis.

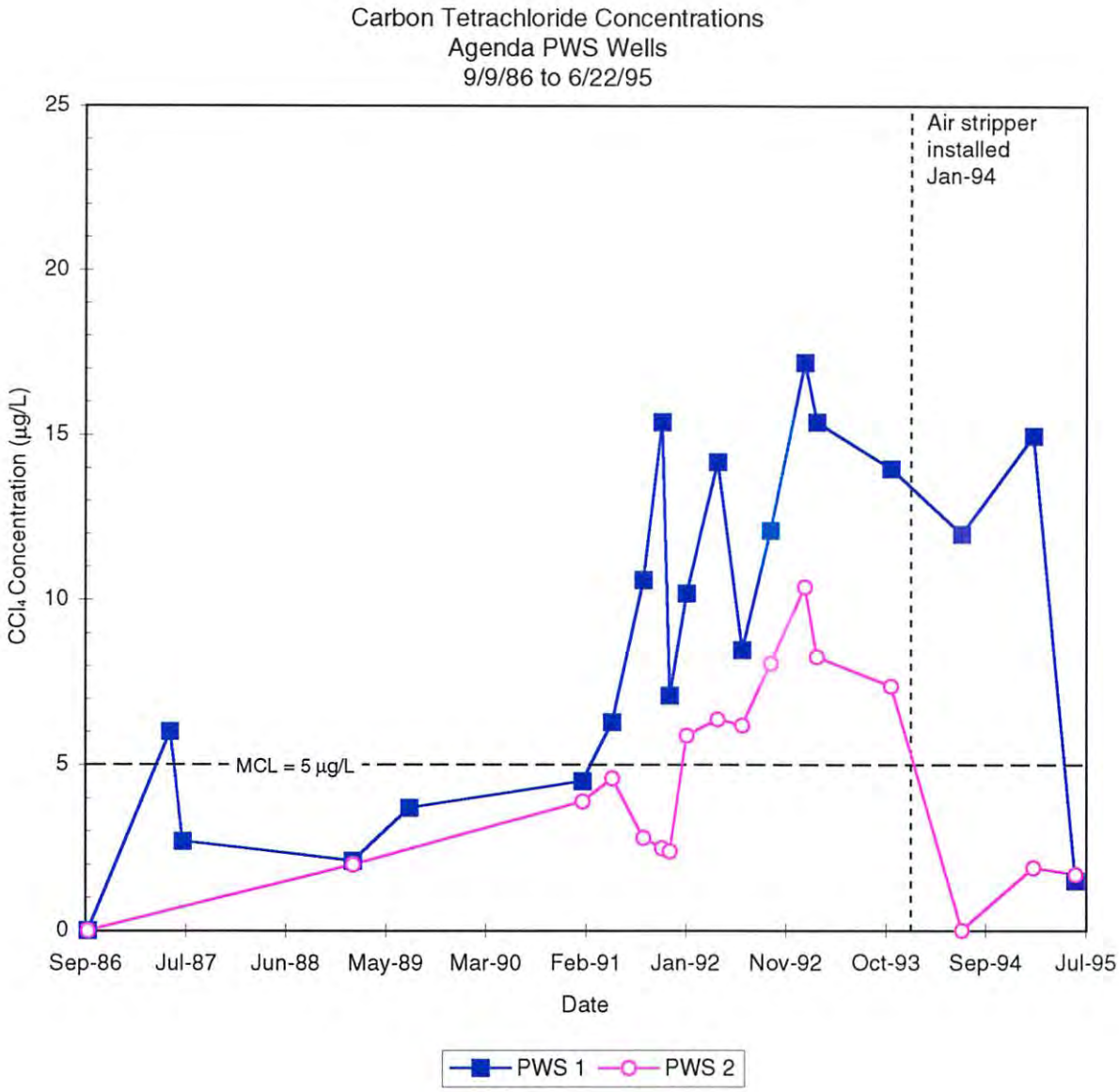


FIGURE 2.7 History of Carbon Tetrachloride Contamination in Agenda's PWS Wells, September 9, 1986, to June 22, 1995

TABLE 2.3 Analytical Data for Nitrates for PWS Wells, Domestic Wells, and Monitoring Wells from KDHE Investigations (MCL for nitrate is 10 mg/L.)

Date	Sampling Event	Well	Nitrate (mg/L)
01/17/91	KDHE monitoring of public water supply	PWS 1	9.9
09/30/91	KDHE monitoring of public water supply	PWS 1	5.9
11/13/91	KDHE sampling for the PA	Berrier	6.94
		Havel	***58.8***[a]
		Hebert (formerly Harvey)	4.94
		Hicks	***15.3***
		Pickard (abandoned)	2.68
		PWS 1	6.01
		PWS 2	3.64
		PWS distribution	3.58
04/29/92	KDHE monitoring of public water supply	PWS 1	5.17
03/05/93	KDHE monitoring of public water supply	PWS 1	5.54
		PWS 2	4.32
03/17/93	KDHE monitoring of public water supply	PWS 1	3.95
11/02/93	PRC sampling for the SA	Berrier	***14.59***
		Pickard (in use)	***12.26***
		PWS 1	6.62
		PWS 1 (duplicate)	6.49
		PWS 2	3.46
06/20/94	PRC sampling for the CI	Anderson	***11.1***
		Berrier	***10.9***
		Pickard (in use)	***14.6***
		PWS 1	5.84
		PWS 1 (duplicate)	3.87
		PWS 2	3.86
06/21/94	PRC sampling for the CI	Havel	1.22
		Hicks	***11.1***
06/22/94	PRC sampling for the CI	Pickard (abandoned)	5.26
		MW 1S	***132.0***
		MW 1D	1.74
		MW 2S	***85.9***
		MW 2S (duplicate)	***92.8***
		MW 2D	***46.3***

TABLE 2.3 (Cont.)

Date	Sampling Event	Well	Nitrate (mg/L)
07/22/94	PRC sampling for the CI	MW 3S	5.05
		MW 3D	3.57
11/22/94	KDHE sampling after the CI	PWS 1	3.2
		PWS 2	3.89
		MW 1S	***71.5***
		MW 1D	4.34
		MW 2S	***60.5***
		MW 2D	***34.5***
		MW 3S	9.38
		MW 3D	2.36
02/07/95	KDHE sampling after the CI	PWS 1	4.81
		PWS 2	4.6
		MW 1S	***60.24***
		MW 1D	6.33
		MW 2S	***58.31***
		MW 2D	***20.86***
		MW 3S	***10.8***
		MW 3D	2.23

[a] Values exceeding the MCL are in ***bold italic*** type.

TABLE 2.4 Analytical Data for Atrazine for PWS Wells, Domestic Wells, and Monitoring Wells from KDHE Investigations (MCL for Atrazine is 3 µg/L.)

Date	Sampling Event	Well	Atrazine (µg/L)
11/13/91	KDHE monitoring of public water supply	Havel	***35.0***[a]
		Pickard (abandoned)	***12.0***
		PWS 1	< 1.2
		PWS 2	< 1.2
4/29/92	KDHE sampling for the PA	PWS 1	ND[b]
11/2/93	PRC sampling for the SA	Berrier	< 25
		Pickard (in use)	< 25
		PWS 1	***37.6***[c]
		PWS 1 (duplicate)	< 25
		PWS 2	< 25
6/20/94	PRC sampling for the CI	Anderson	< 1
		Berrier	< 1
		Pickard (in use)	2.19
		PWS 1	< 1
		PWS 1 (duplicate)	< 1
		PWS 2	< 1
6/21/94	PRC sampling for the CI	Havel	1.44
		Hicks	< 1
6/22/94	PRC sampling for the CI	Pickard (abandoned)	< 1
		MW 1S	1.4
		MW 1D	< 1
		MW 2S	1.0
		MW 2S (duplicate)	1.0
		MW 2D	1.3
7/22/94	PRC sampling for the CI	MW 3D	< 1
		MW 3S	< 1
2/7/95	KDHE sampling after the CI	PWS distribution	< 0.3

[a] Values exceeding the MCL are in ***bold italic*** type.

[b] ND, compound not detected; detection limit was not reported in information available for Argonne's ESC.

[c] Concentration may result in part from coelution of Propazine in the gas chromatograph column.

- *February 1991.* In samples collected on February 4, carbon tetrachloride was measured at a concentration of 4.5 µg/L in a sample from PWS 1 and at 3.9 µg/L in a sample from PWS 2. Quarterly sampling of the Agenda municipal wells was instituted to monitor the VOC contamination.

- *May 1991.* Quarterly sampling of PWS 1 and PWS 2 on May 10 revealed carbon tetrachloride concentrations of 6.3 µg/L and 4.6 µg/L, respectively.

- *August 1991.* Quarterly sampling of PWS 1 and PWS 2 on August 19 revealed carbon tetrachloride concentrations of 10.6 µg/L and 2.8 µg/L, respectively.

- *September 1991.* Nitrate was measured in PWS 1 at 5.9 mg/L.

- *October 1991.* Quarterly sampling of PWS 1 and PWS 2 on October 30 revealed carbon tetrachloride concentrations of 15.4 µg/L and 2.5 µg/L, respectively.

- *November 1991.* Sampling performed on November 13 for the PA, completed by the KDHE in March 1992, included the two PWS wells, five domestic wells (Hebert, Hicks, Berrier, Havel, and an abandoned well north of the Pickard residence), and one sample from the municipal distribution system (collected at Dale's Repair). All the samples were analyzed for VOCs and nitrates. In addition, the two PWS wells and the Havel and abandoned Pickard domestic wells were analyzed for 24 chlorinated pesticides/herbicides and polychlorinated biphenyls (PCBs). Carbon tetrachloride was detected in PWS 1 at 7.1 µg/L, in PWS 2 at 2.5 µg/L, and in the distribution system sample collected at Dale's Repair at 2.4 µg/L. Other VOCs detected in the PWS 1 sample included chloroform (at 6.6 µg/L), bromodichloromethane (at 3.9 µg/L), and dibromo-chloromethane (at 2.9 µg/L), typical by-products of the chlorinating process prior to distribution. Nitrate was present in all sampled wells; the highest concentrations were 58.8 mg/L at the Havel well (located about 400 ft south of the two PWS wells) and 15.3 mg/L at the Hicks well (located about 900 ft north of the two PWS wells). The herbicide Atrazine was not detected in the two PWS wells but was detected at 35.0 µg/L in the Havel well and at 12.0 µg/L in the abandoned Pickard well (located about 500 ft southwest of

the two PWS wells). Metolachlor and Metribuzin were also detected in the Havel well at 5.63 µg/L and 1.04 µg/L, respectively. On the basis of the results of the PA, the KDHE recommended that PWS 1 should only be used as a standby source and that when it was used, the water should be blended with water from PWS 2 prior to distribution.

- *January 1992.* Quarterly sampling of PWS 1 and PWS 2 on January 7 revealed carbon tetrachloride concentrations of 10.2 µg/L and 5.9 µg/L, respectively.

- *April 1992.* Quarterly sampling of PWS 1 and PWS 2 on April 17 revealed carbon tetrachloride concentrations of 14.2 µg/L and 6.4 µg/L, respectively. A sample collected on April 29 from PWS 1 showed nitrate contamination at 5.17 mg/L; pesticide/herbicide contamination was not detected in the sample.

- *July 1992.* Quarterly sampling of PWS 1 and PWS 2 on July 6 revealed carbon tetrachloride concentrations of 8.5 µg/L and 6.2 µg/L, respectively.

- *October 1992.* Quarterly sampling of PWS 1 and PWS 2 on October 6 revealed carbon tetrachloride concentrations of 12.1 µg/L and 8.1 µg/L, respectively.

- *January 1993.* Quarterly sampling of PWS 1 and PWS 2 on January 25 revealed carbon tetrachloride concentrations of 17.2 µg/L and 10.4 µg/L, respectively.

- *March 1993.* Quarterly sampling of PWS 1 and PWS 2 on March 5 revealed carbon tetrachloride concentrations of 15.4 µg/L and 8.3 µg/L, respectively. Nitrate was detected in PWS 1 and PWS 2 at 5.54 mg/L and 4.32 mg/L, respectively. Nitrate was measured in PWS 1 at 3.95 mg/L in a sample collected on March 17. Use of PWS 1 as a municipal water source was terminated because of the high carbon tetrachloride contamination.

- *April 1993.* A sample collected from the Agenda municipal distribution system on April 7 revealed the presence of carbon tetrachloride at 6.3 µg/L. Other

VOCs detected included chloroform at 0.5 µg/L, bromodichloromethane at 2.5 µg/L, dibromochloromethane at 2.8 µg/L, bromoform at 1.5 µg/L, and tetrachloroethene at 0.5 µg/L.

- *November 1993.* On November 2, 1993, in conjunction with the SA performed by PRC for KDHE, four groundwater samples were collected from the two PWS wells, the Berrier domestic well, and a well in use at the Pickard residence. A duplicate sample was also collected at PWS 1. Samples for VOC and pesticide/herbicide analyses were analyzed by PRC in a mobile laboratory at the site. Samples for nitrate analysis were shipped to an off-site laboratory. Carbon tetrachloride was detected in the PWS 1 sample at 14.0 µg/L and in the duplicate sample from PWS 1 at 2.62 µg/L. PRC attributed the difference to (1) differing amounts of suspended sediments in the sample and its duplicate or (2) more thorough purging of the well when the second, duplicate sample was collected (PRC 1994a). Carbon tetrachloride was also detected in the sample from PWS 2 at 7.4 µg/L, in the Berrier well sample at 1.31 µg/L, and in the Pickard in-use well sample at an estimated concentration of 0.15 µg/L. An abbreviated, modified version of EPA Method 507 was used to analyze samples for the following pesticides/herbicides: Trifluralin, Atrazine, Propazine, Alachlor, Metribuzin, Metolachlor, and Parathion. Atrazine and Propazine were detected in the sample from PWS 1 at 37.6 µg/L and 38.3 µg/L, respectively. These chemicals coelute on the gas chromatograph analytical column, and the result may be due to the presence of Atrazine, Propazine, or a combination of the two (PRC 1994a). Neither contaminant was found in the duplicate sample; the discrepancy was attributed to the aforementioned rationales for the difference in carbon tetrachloride results (PRC 1994a). Parathion and Metribuzin were detected in the PWS 1 sample at estimated concentrations of 0.8 µg/L and 0.2 µg/L, respectively. Alachlor was detected in the duplicate sample from PWS 1 at an estimated concentration of 1.67 µg/L. Pesticides/ herbicides were not detected in the samples from PWS 2 or the two private well samples, but this result might be attributed to the high reported detection limits for the on-site analytical method (e.g., 25 µg/L for Atrazine versus the MCL of 3 µg/L). Nitrate was found in all samples, with the highest concentrations in the Berrier well sample (14.59 mg/L) and in the Pickard in-use well sample (12.26 mg/L).

- *June and July 1994.* On June 20-22, groundwater sampling performed by PRC in conjunction with the CI included the collection of samples from the two PWS wells, four of the six monitoring wells (MW 1S, MW 1D, MW 2S, and MW 2D), and six private wells (Anderson, Berrier, Havel, Hicks, Pickard in-use, and Pickard abandoned). Duplicate samples were collected from PWS 1 and MW 2S. On July 22, groundwater samples were collected from MW 3S and MW 3D. All samples were analyzed for VOCs, nitrate, and 11 pesticides/ herbicides (Atrazine, Ametryn, Atraton, Prometon, Prometryne, Propazine, Simetryne, Simazine, Terbuthylazine, Terbutryne, and Cyanazine). On July 22, the Berrier well was also resampled, with analysis for VOCs only. Carbon tetrachloride was detected in the PWS 1 sample at 12 µg/L and in the PWS 1 duplicate sample at 13 µg/L. Carbon tetrachloride was not detected above the reported detection limit of 1.2 µg/L in PWS 2, in any of the private wells, or in any of the recently completed monitoring wells. Chloroform and bromo-dichloromethane, typical by-products of chlorination, were also detected in the samples from PWS 1 and PWS 2. Nitrate was detected in all groundwater samples, with the highest concentration in shallow well MW 1S, located on the Boettcher Enterprise site near the location of the 1988 release of nitrogen fertilizer solution. The second highest nitrate concentration was detected in shallow well MW 2S, located in the southeast corner of the former CCC/USDA grain storage site (near the former fertilizer spray tank filling/ cleaning operation and the potential abandoned, leaking septic tanks). Of note is the difference in nitrate contamination within the deeper wells at these two locations. Nitrate was detected in the shallow-well samples from MW 1S at 132 mg/L and in the deeper-well sample from MW 1D at 1.74 mg/L, whereas nitrate was detected in the shallow-well sample from MW 2S at 85.9 mg/L (92.8 mg/L in the duplicate sample) and in the deeper-well sample from MW 2D at 46.3 mg/L. The location of the highest nitrate contamination measured within the deeper wells is potentially upgradient of the location of highest nitrate contamination within the shallow zone (PRC 1994c). Nitrate contamination in both PWS wells was less than 4 mg/L. Atrazine was detected at five locations: the Pickard in-use well at 2.19 µg/L, the Havel well at 1.44 µg/L, monitoring well MW 1S at 1.4 µg/L, monitoring well MW 2S at 1.0 µg/L, and monitoring well MW 2D at 1.3 µg/L. Terbutryne was detected in MW 3S at 1.5 µg/L and in MW 3D at 1.2 µg/L. Analysis for the pesticide/herbicide compounds Alochlor, Metribuzin, and Parathion, which

were detected at trace concentrations in samples collected on November 2, 1993, for the SA, was not conducted.

- *November 1994.* On November 22, the KDHE performed follow-up sampling to PRC's CI. Groundwater samples were collected from the two PWS wells and the six monitoring wells for VOC and nitrate analyses. Carbon tetrachloride was detected in PWS 1 at 14.3 µg/L, PWS 2 at 5.0 µg/L, MW 1D at 13.0 µg/L, and MW 2D at 1.8 µg/L. The nitrate contamination pattern exhibited in the June 1994 sampling for the CI was repeated. Nitrate contamination was detected in all wells sampled. The nitrate concentrations in MW 1S and MW 1D were 71.5 mg/L and 4.34 mg/L, respectively. The nitrate concentrations in MW 2S and MW 2D were 60.5 mg/L and 34.5 mg/L, respectively. Nitrate concentrations in both PWS wells were less than 4 mg/L.

- *February 1995.* On February 7, the KDHE performed additional follow-up sampling to PRC's CI. Groundwater samples were collected from the two PWS wells and the six monitoring wells for VOC and nitrate analyses. A duplicate sample from MW 1D was collected for VOC analysis, and a composite sample from PWS 1 and PWS 2 was collected for organochlorine pesticide/herbicide analysis. Carbon tetrachloride was detected in PWS 1 at 15.0 µg/L, PWS 2 at 1.9 µg/L, MW 1D at 39.3 µg/L, and MW 2D at 7.1 µg/L. Carbon tetrachloride was measured in the duplicate sample from MW 1D at 38.7 µg/L. Chloroform was detected in PWS 1 at 1.5 µg/L, in PWS 2 at 3.8 µg/L, in MW 1D at 1.3 µg/L, in the duplicate sample from MW 1D at 1.2 µg/L, and in MW 2D at 0.5 µg/L. The presence of bromodichloromethane and dibromochloromethane in the samples from PWS 1 and PWS 2 indicates that some portion of the chloroform detected in the PWS samples probably resulted from the chlorination process. Although the nitrate contamination pattern exhibited in the June 1994 and November 1994 sampling episodes was repeated in the February 1995 sampling, migration of the nitrate plume within both the shallow and deeper aquifers was evident. Nitrate contamination in the shallow wells MW 1S and MW 2S decreased from 132.0 mg/L (in June 1994) to 71.5 mg/L (in November 1994) to 60.24 mg/L (in February 1995) in MW 1S and from 85.9 mg/L to 60.5 mg/L to 58.31 µg/L in MW 2S. Nitrate contamination within the deeper well MW 2D *decreased* from 46.3 mg/L to

34.5 mg/L to 20.86 mg/L, while nitrate contamination within the deeper well MW 1D *increased* from 1.74 mg/L to 4.34 mg/L to 6.33 mg/L. Nitrate contamination in both PWS wells increased between June 1994 and February 1995 to approximately 5 mg/L. No pesticides/herbicides were detected in the composite sample from PWS 1 and PWS 2. The reported detection limit for the herbicide Atrazine, the primary pesticide/herbicide contaminant of concern within the area of investigation, was 0.3 µg/L. During the February 7, 1995, sampling of MW 3S, a bailer became untied and dropped to the bottom of the well; it was not retrieved (Dallen 1995).

- *June 1995*. The most recent sampling of the Agenda PWS wells with results available for Argonne's ESC was conducted by the KDHE on June 22 (KDHE 1995a). Carbon tetrachloride was detected in PWS 1 at 1.5 µg/L and in PWS 2 at 1.7 µg/L. Chloroform was detected in PWS 1 at 36.3 µg/L and in PWS 2 at 5.8 µg/L. The presence of other trihalomethane compounds in the PWS samples indicates that the chloroform is primarily the result of chlorination of the water prior to distribution.

2.2.3 Water Supply Issues

Water presently supplied to Agenda residents via the public system is free of VOC contamination. The air stripper system has been in operation since January 1994, and samples collected before and after treatment verify the successful operation of the system (KDHE 1995b). The installation of the air stripper system was considered an interim measure (Stover 1996). Subsequent discussions between the KDHE and Agenda officials involved consideration of three alternatives for providing a permanent supply of uncontaminated water to Agenda. The three options were (1) continued operation of the air stripper system, (2) installation of a new PWS well outside the area of VOC contamination, and (3) connection to the rural water district.

Continued operation of the air stripper system would remove VOC contamination from the municipal water supply. However, nitrate contamination is present in area wells above the MCL of 10 mg/L (as high as 132 mg/L in MW 1S, located northwest of the two PWS wells). This level of nitrate contamination has not yet been detected in the two existing PWS wells. Pesticide/herbicide contamination has also been detected in area wells. These contaminants are not removed during the air stripping process.

Installation of a new well in an area upgradient of the existing carbon tetrachloride contamination was considered. Although preliminary data indicate that a well in the north end of town (near MW 3S and MW 3D) would be upgradient of the carbon tetrachloride contamination, nitrate contamination is present throughout the area. The city applied for a Community Development Block Grant (CDBG) on two occasions, asking for funding to construct a new well. Both requests were denied (Kopsa 1996).

The city subsequently applied for a CDBG, proposing to use the funds to connect Agenda to the Republic County Rural Water District 2, which has a distribution line in place approximately 3 mi north of town. This application was approved. Numerous residents outside the city limits already obtain their water from the RWD. The estimated cost of connecting Agenda to the RWD is $92,000. The CDBG will cover about two-thirds of the cost, with the remaining portion being funded by the KDHE State Water Plan. Connection is expected to be completed in the spring of 1996. Two residences within Agenda currently rely on domestic wells rather than the Agenda PWS for drinking water; whether they will connect to the RWD has not been determined (Kopsa 1996).

2.3 Summary of Previous Findings

The principal findings from previous work can be summarized as follows:

- The groundwater at Agenda, Kansas, in the vicinity of PWS 1 and PWS 2 is contaminated with carbon tetrachloride at concentrations exceeding the MCL of 5 µg/L. The maximum concentration detected in sampling performed in 1986-1995 was 39.3 µg/L in monitoring well MW 1D, located about 100 ft northwest of the two PWS wells.

- Carbon tetrachloride contamination in PWS 2 increased above the MCL when use of well PWS 1 as a primary municipal water source was terminated.

- In addition to carbon tetrachloride and other VOCs, nitrate contamination exceeding the MCL of 10 mg/L is present in vicinity wells. Atrazine has been detected at levels exceeding the MCL of 3 µg/L. Other pesticides and herbicides have also been detected.

- Two potential sources of carbon tetrachloride contamination have been identified: (1) the United Grain elevator site and (2) the former CCC/USDA grain storage site.

- Nitrate and pesticide/herbicide contamination in Agenda groundwater probably results from releases associated with the bulk storage of these chemicals at the United Grain and Boettcher Enterprises facilities, although routine use or spillage of pesticides/herbicides and fertilizers by individual farming operations in and around Agenda might contribute to the detected pesticide/herbicide and nitrate contamination.

- The Agenda sewage treatment system was constructed in 1971. Abandoned, leaking septic tanks might also be contributing to the nitrate contamination within the area of concern.

- An air stripper treatment system has been operating since January 1994 to remove VOCs from water pumped from PWS 1 and PWS 2; both wells are currently in use.

- Connection of Agenda to the Republic County Rural Water District 2 has been approved, and funding has been obtained. The connection is scheduled for the spring of 1996. This connection is necessary because of elevated concentrations of nitrate and Atrazine in the groundwater in proximity to the PWS wells. These contaminants are not removed by the air stripper treatment system.

3 Environmental Setting

3.1 Geologic Setting

3.1.1 Regional Physiography and Geology

Republic County is in the Plains Border division of the Great Plains physiographic province (Frye and Leonard 1965). Three distinct types of topography are present in the county: (1) a loess-mantled, gently sloping plain in the north-central part of the county, associated with Quaternary age sand and gravel deposits of the Belleville Formation; (2) alluvial valleys associated with Quaternary age terrace deposits bordering the Republican River and its primary tributaries; and (3) dissected uplands in the eastern, southeastern, and southwestern parts of the county, coincident with an area of Cretaceous age bedrock (Fishel 1948, Wing 1930).

The climate is subhumid, with large daily and annual variations in temperature. Winters are moderate (18°-45°F) with short periods of severe cold, while summers are hot (90°F), with relatively short transitions during spring and fall (EPA 1992). The growing season lasts approximately five months, from May through September (Fishel 1948). Mean annual precipitation is 27.5 in. (KDHE 1992). Approximately 78% of the precipitation occurs during the six-month period from April 1 through September 30 (Fishel 1948).

All but the northeast corner of Republic County is drained by the Republican River and its tributaries (Figure 3.1). The northeast corner is at the headwaters of the Little Blue River, which flows into the Big Blue River, a tributary of the Kansas River. The Republican River enters the county at its northwest corner and follows a southerly course, crossing the southern boundary approximately 8 mi from the southwest corner of the county. After exiting Republic County, the river follows a southeasterly course as far as Concordia in north-central Cloud County. From Concordia, the river runs eastward to the Cloud County line. Streams in the western third of Republic County flow generally southwest or southeast to the Republican River, while those in the southeastern portion of the county flow south to the river.

The shallow geologic section (to approximately 500 ft BGL [below ground level]) in Republic County consists of unconsolidated deposits of Quaternary age overlying Cretaceous age

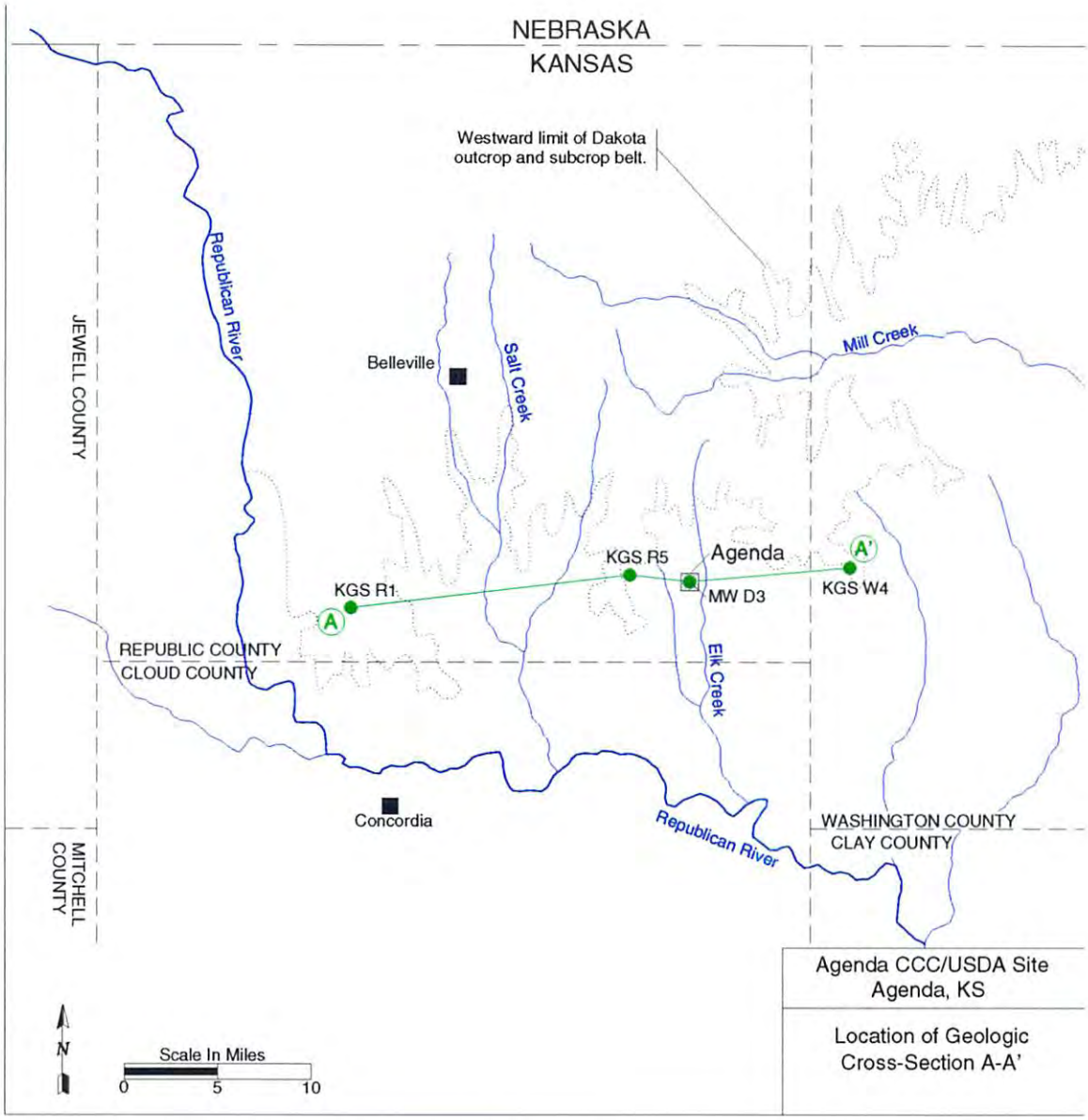


FIGURE 3.1 Map of Republic County and Portions of Adjacent Counties, Illustrating Drainage Patterns and the Location of Regional West-East Geologic Cross Section A-A'

bedrock (Figure 3.2). The youngest deposits are Recent alluvium and Pleistocene age terrace deposits that are present primarily along the course of the Republican River. Upland surfaces throughout the county are typically mantled by Pleistocene age loess. In the loess sequence, the Peoria Loess (Wisconsinan glacial stage), which is a buff-colored silt, is underlain by the Loveland Loess (Illinoisan glacial stage), a reddish-brown silt that contains some fine sand and clay and locally, near its base, also contains some lenses of coarse sand and fine gravel derived from the underlying stratigraphic units (Byrne et al. 1950). The loess formations are generally separated by a paleosol that formed during the Sangamonian interglacial stage (Fishel 1948; Wing 1930). In some locations, the Loveland Loess was completely eroded before deposition of the Peoria Loess (Fishel 1948; Wing 1930).

Below the gently sloping plain in the north-central portion of the county, the loess deposits overlie a package of fluvial sand, gravel, and silt that constitute the Pleistocene age Belleville Formation (Nebraskan and Kansan glacial stages, Figure 3.2). The Belleville Formation is associated with the ancestral course of the Republican River, which traversed northern Republic County; it is not present in the dissected upland area in the eastern and southern parts of the county. In these areas, the loess sequence was deposited onto a low-relief land surface developed on Cretaceous age bedrock (Fishel 1948; Wing 1930).

Across the county, several Cretaceous age formations outcrop or subcrop beneath the unconsolidated Pleistocene age deposits (Figure 3.2). The youngest is the Carlile Formation, a noncalcareous blue-gray shale that grades downward to an orange-brown to yellow-brown chalky shale containing thin interbeds of soft tan-gray chalky limestone. The Carlile Formation is underlain by the Greenhorn Formation, a sequence of tan and orange-gray shales interbedded with thin beds of gray limestone and very thin bentonites. The Greenhorn in turn is underlain by the Graneros Formation, a gray to blue-black, noncalcareous, fossiliferous, fissile shale of shallow marine origin, which contains some slightly calcareous, very fine-grained, wavy laminated sandstones near its base (Wade 1992; Byrne et al. 1950; Fishel 1948; Wing 1930). Below the Graneros Formation is the Dakota Formation, the oldest unit that subcrops below the unconsolidated Pleistocene age deposits in the county.

Stratigraphic relationships within the Dakota Formation and between the Dakota and the overlying Graneros Formation and the underlying formations across the county are illustrated in west-to-east cross section A-A' (Figures 3.1 and 3.3). The Dakota Formation consists generally of fine-grained, gray to white to yellow-brown, cross-bedded sandstones interbedded with

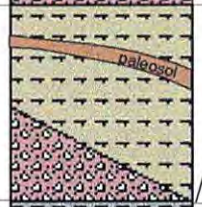
System	Series	Stratigraphy	Formation	Thickness (ft)	Physical Character
Quaternary	Recent and Pleistocene		Alluvium & Terrace deposits	0-125	Sand, gravel and silt, comprising stream deposits in the Republican River Valley and in the valleys of many smaller streams. Coarse gravels occur as terrace deposits bordering the present flood plain of Republican River at levels of 10 to 20 feet above the flood plain.
			unconformable on older formations		
	Pleistocene		Loess	0-40	Buff silt at top ("Peorian"), underlain by thin dark paleosol, underlain in turn by reddish-brown silt ("Loveland") containing some fine sand and clay and, locally near the base, some coarse sand and fine gravel.
			unconformable on older formations		
			Belleville	0-235	Sand, gravel, and silt comprising stream deposits in and near the ancestral Republican River Valley.
			unconformable on older formations		
Cretaceous	Upper		Carlile: Blue Hill shale member	280±	Shale, blue-gray, massive to thin bedded.
			Carlile: Fairport chalky shale member		
			Greenhorn: Pfeifer shale member	15-16	Chalky shale with beds of thin chalky limestone, discoided concretions, and thin beds of bentonite.
			Greenhorn: Jetmore chalk member	13-14	Alternating beds of chalky shale and chalky limestone, "shell" limestone at top.
			Greenhorn: Hartland shale member	45-53	Chalky shale with a few thin beds of chalky limestone and bentonite.
			Greenhorn: Lincoln limestone member		Yellowish chalky shale with hard, thin-bedded, finely laminated, crystalline limestone at top and bottom, and a few thin beds of chalky limestone.
			Graneros	20-30	Dark bluish-black, fissile, noncalcareous clay shale with numerous thin lenses of sandy shale, sandstone, and interbedded ironstone concretions.
			Dakota: Deltaic Facies	75±	Deltaic facies assemblage: 50 percent interlaminated mudstone and very fine to fine grained sandstone with a high organic content (abandoned distributary channels and delta fronts); remainder clean fine-grained sandstone (distributary channel and mouth bars). Approximately the upper 25% of the formation.
			Dakota: Fluvial Facies		
	Lower		*unconformable on older formations*	225±	Fluvial facies assemblage: 60 percent variegated mudstones with some thin, very fine grained levee and splay sandstones (flood plains); 40 percent fine to medium grained sandstones, commonly upward fining and cross bedded (river channels).

FIGURE 3.2 Generalized Stratigraphic Column for Republic County, Kansas

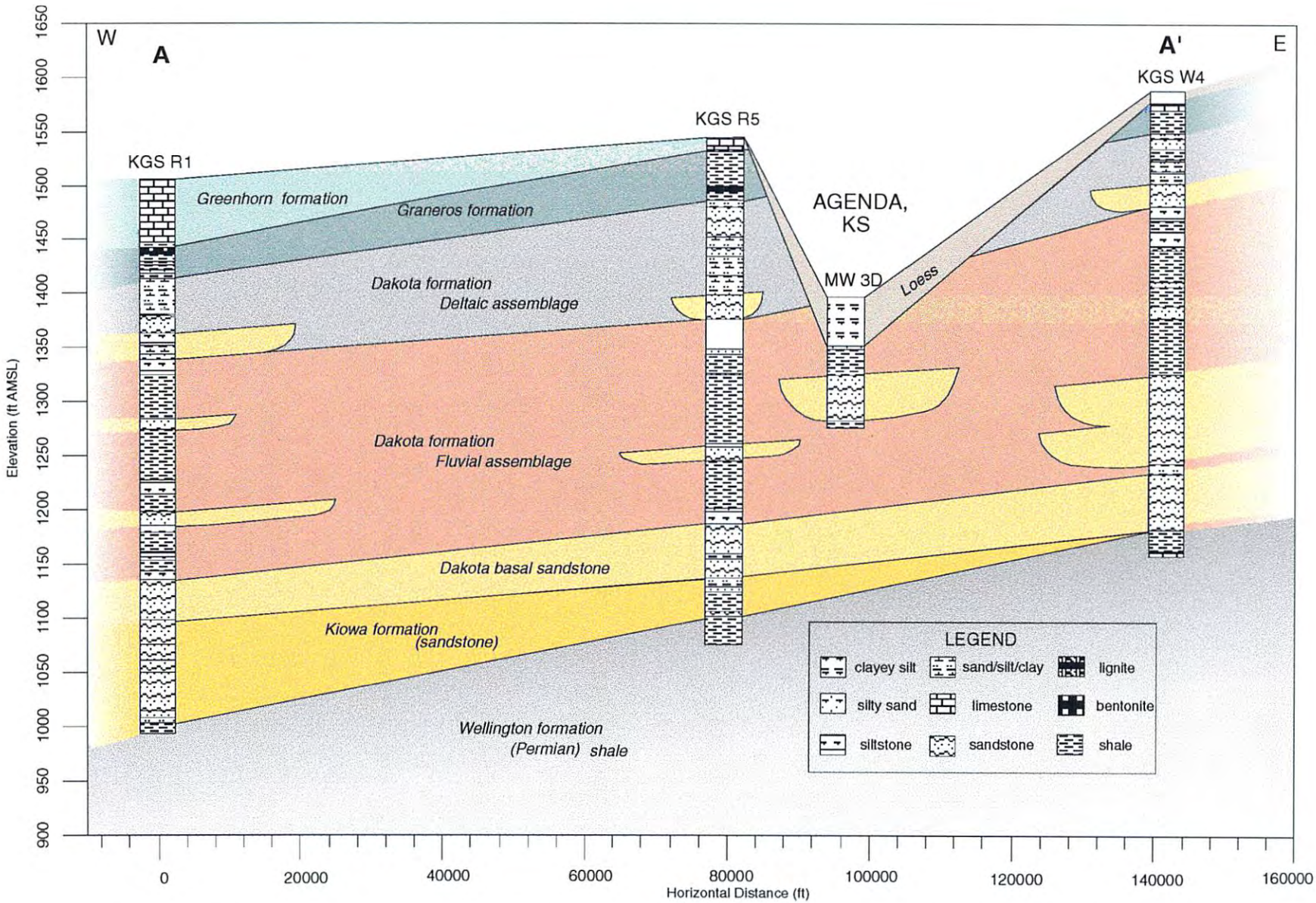


FIGURE 3.3 West to East Geologic Cross Section A-A', Illustrating Stratigraphic Relationships across Portions of Republic and Washington Counties

varicolored mudstones and sandy shales (Wade 1992; Byrne et al. 1950; Fishel 1948; Wing 1930). The top of the formation dips generally west-northwest across the county at approximately 10 ft/mi (Wade 1992). The contact between the Dakota and the overlying Graneros is laterally gradational, but vertically it is often abrupt (Wade 1992). Where the formation subcrops beneath the Pleistocene age loess, particularly in southeast Republic County, the contact is often difficult to define because of similarity in color and lithology to the overlying loess (Byrne et al. 1950).

The Dakota Formation contains two distinct facies assemblages: a deltaic assemblage and a fluvial assemblage (Wade 1992; Macfarlane et al. 1991). These assemblages are separated by a flooding surface, above which sediments were deposited in the subaqueous portion of a river-dominated delta system and below which sediments were deposited by rivers on a coastal plain (Macfarlane et al. 1991).

The deltaic facies assemblage consists of approximately 50% interlaminated mudstone and very fine to fine-grained sandstone with a high organic content. The remainder is composed of relatively clean, fine-grained sandstone. Wade (1992) interpreted the interlaminated sequence as abandoned distributary channel and delta front deposits, with the relatively clean sandstones representing active distributary channels and distributary mouth bars. The deltaic assemblage typically contains sandstones at its base and top, with mudstones in the middle reflecting the predominance of fining-upward distributary channel fill at the base and coarsening-upward delta front deposits close to the top. In this context, the generally abrupt vertical contact between the deltaic assemblage and the overlying Graneros Shale represents a transgressive disconformity, where delta front deposits were overstepped by a rising sea (Wade 1992). The deltaic assemblage constitutes approximately the upper 25% of the Dakota Formation (Wade 1992).

The underlying fluvial facies assemblage of the Dakota Formation consists of approximately 60% variegated mudstones, with some thin, very fine-grained levee and splay sandstones deposited on coastal floodplains. The remaining 40% of the formation is composed of fine- to medium-grained sandstones, which commonly fine upward and contain large-scale cross beds, characteristics indicating that they were deposited in river channels (Wade 1992). The individual channel sandstones are largely discontinuous and ribbon-like (Macfarlane et al. 1991), except for the channel sandstones at the base of the formation, which form a laterally continuous package (Wade 1992). Measured dips on the cross beds in the channel sandstones indicate that the rivers depositing these sandstones flowed in a west-southwesterly direction (Wade 1992; Karl 1976). The sandstones in the Dakota are typically poorly cemented in the subsurface (Wade 1992, Byrne et al. 1950).

The Dakota Formation was deposited on an erosional surface of Lower Cretaceous age (Wade 1992). To the west, this surface developed on Lower Cretaceous age rocks of the Kiowa Formation, which consists mainly of interbedded sandstones and silty mudstones deposited in a tidally influenced deltaic environment (Wade 1992). To the east, however, the Kiowa was completely eroded, exposing older Permian age marine shales (Wade 1992).

3.1.2 Local Physiography and Geology

Agenda (Section 16, T4S, R1W) is located in southeast Republic County within the area of dissected uplands. The city is situated on a narrow upland between the eastern and western forks of Elk Creek, two south-flowing perennial tributaries of the Republican River, which lies about 10 mi south of Agenda (Figure 3.1). The area is within the 100- to 500-year floodplain (EPA 1992). No wetlands, fisheries, or drinking water intakes are associated with these streams in the vicinity of the city (EPA 1992). Elevations within the city limits range from approximately 1,385 ft to 1,415 ft above mean sea level (AMSL) (USGS 1965). An unnamed ephemeral tributary to the western fork of Elk Creek lies immediately west of the city (Figure 3.4). Surface runoff from the former CCC/USDA site, the United Grain facilities, and the Boettcher Enterprises facilities drains to this unnamed tributary. At the former CCC/USDA site (Figure 3.4), runoff flows north into a small branch of this unnamed tributary (USGS 1965).

Stratigraphic relationships in the shallow subsurface at Agenda are illustrated in south-to-north cross section B-B' (Figures 3.4 and 3.5). This cross section was constructed from the lithologic logs of three soil borings (MW 1D, MW 2D, and MW 3D) drilled by PRC during the CI (PRC 1994) and the driller's log from PWS well 2 (KDHE 1983). Copies of these logs are presented in Appendix A.

The uppermost stratigraphic unit consists of light to dark brown, unconsolidated silt and silty clay at approximately 20-55 ft BGL. The associated soils are deep, dark-colored, well-drained silt and silty clay loams with slow to moderately slow permeability (0.05-0.5 in./hr) of the Crete and Hastings soil series (USDA 1967). This unit is underlain by a tan to orange-brown, fine- to medium-grained, well-sorted, subrounded quartz sand that occasionally contains clasts of sandstone (PRC 1994c). This sand is approximately 40 ft thick to the south at PWS 2 and thins to the north to approximately 4 ft thick at MW 3D. Beneath this sand is a gray shale, from approximately 30 to 40 ft thick, that exhibits some deep red mottling and at MW 1D contains a

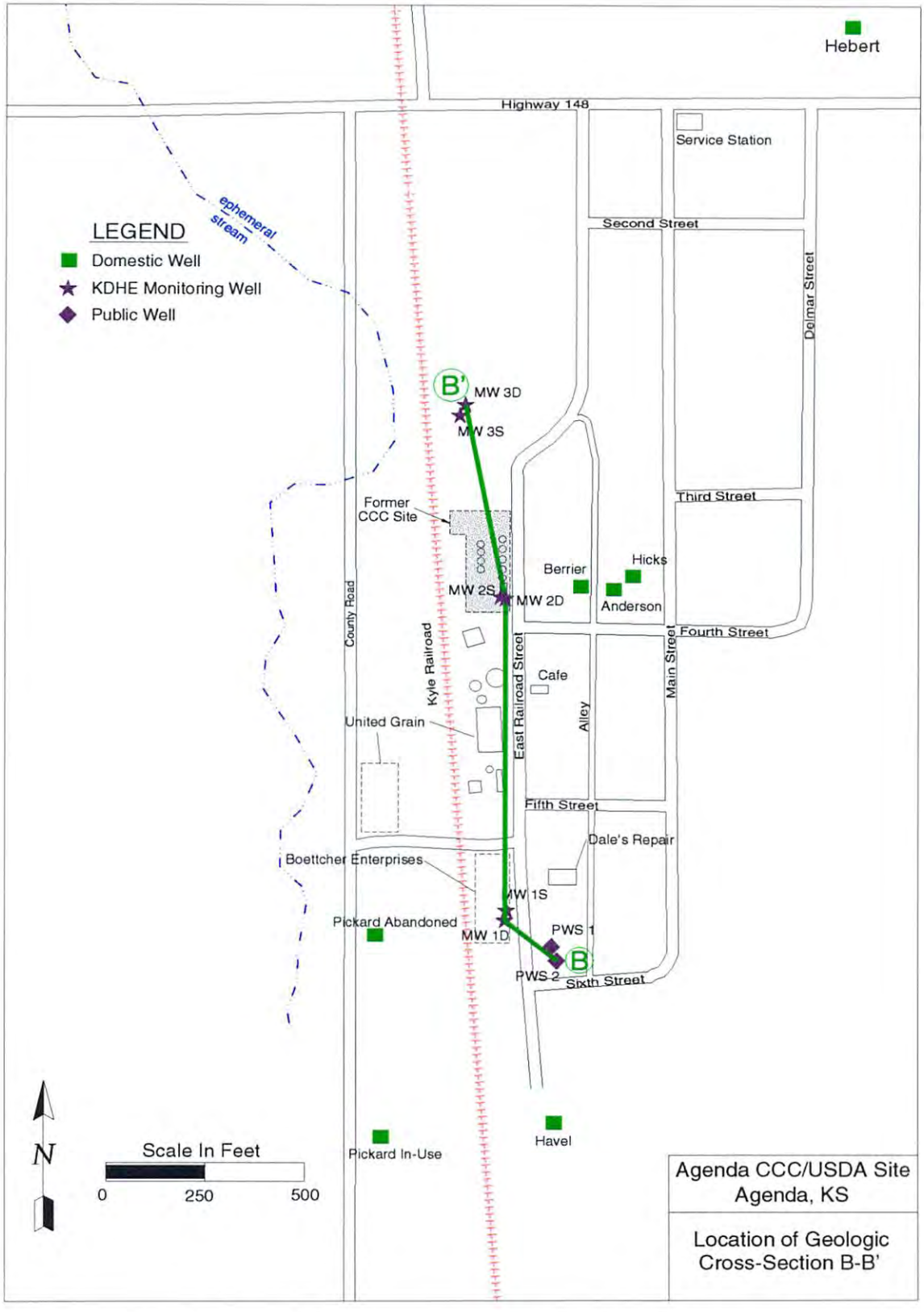


FIGURE 3.4 Map of Agenda, Kansas, Showing the Former CCC/USDA Site; the Approximate Locations of PWS Wells, Domestic Wells, and KDHE Monitoring Wells; and the Location of Geologic Cross Section B-B'

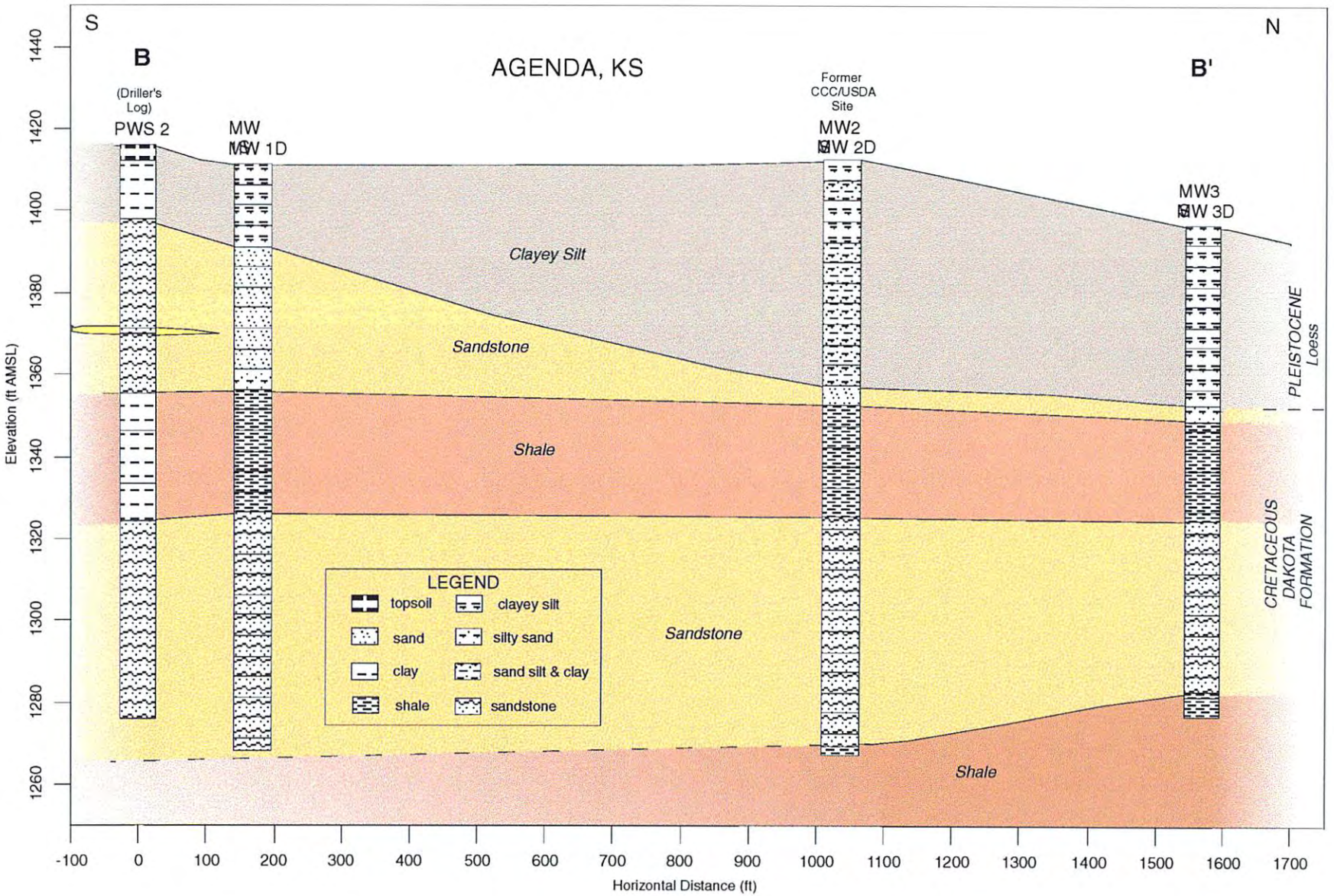


FIGURE 3.5 South to North Geologic Cross Section B-B', Illustrating Stratigraphic Relationships in the Vicinity of the Former CCC/USDA Site at Agenda, Kansas

lignite (PRC 1994c). This shale is underlain by an orange-brown, fine- to medium-grained, well-sorted, subrounded quartz sandstone (PRC 1994c). The sandstone ranges from 42 ft thick at MW 3D to more than 60 ft thick at MW 1D at the south end of the cross section. In MW 2D and MW 3D, this sandstone is underlain by a gray shale. The base of the sandstone was not encountered in either MW 1D or PWS 2.

PRC interpreted the uppermost shale as the Graneros Formation (PRC 1994c). This conclusion is inconsistent with geologic mapping by the KGS, which indicates that the city is located within the outcrop belt of the Dakota Formation (Byrne et al. 1950; Fishel 1948; Wing 1930), and with the results of recent KGS test hole drilling (Wade 1992; Macfarlane et al. 1991). The lithologic log for KGS test hole R5 (Figure 3.3 and Appendix A), located in Section 12CDC, T4S, R2W, approximately 3 mi west of Agenda (east 1/2 of Section 16, T4S, R1W), indicates that the contact between the Graneros and the Dakota Formations is at an elevation of approximately 1,485 ft AMSL. Projecting this contact eastward to Agenda at a dip rate of approximately 10 ft/mi places this contact at approximately 1,515 ft AMSL, approximately 100 ft above the ground surface elevation (cross section A-A', Figure 3.3). Furthermore, PRC's logs (see Appendix A) indicate the presence of a lignite in this shale and red mottling, characteristics consistent with the lithology of the Dakota Formation (Wade 1992). Thus, this shale appears to be part of the Dakota Formation, rather than the Graneros Formation.

In KGS test hole R5, the contact between the fluvial and deltaic assemblages of the Dakota is at approximately 1,375 ft AMSL, and the top of the basal Dakota sandstone is at approximately 1,185 ft AMSL. Projecting the fluvial-deltaic contact 3 mi eastward to Agenda places it at approximately 1,405 ft AMSL, essentially at ground level and well above the base of the unconsolidated materials (cross section A-A', Figure 3.3). This projection implies that the shales and sandstones in the Dakota Formation at Agenda are in the fluvial assemblage. Projecting the top of the basal sandstone from KGS R5 eastward to Agenda places this contact at approximately 1,215 ft AMSL. This elevation is approximately 70 ft below the base of the sandstone in MW 3D (cross section A-A', Figure 3.3) and approximately 55 ft below the base in MW 2D. This projection implies that the sandstone encountered in the KDHE monitoring wells and PWS 2 is not the laterally continuous basal Dakota sandstone.

Drillers' logs of nearby irrigation wells (see Appendix A) record one to five sandstones interbedded with "red clay" and "blue clay" within the stratigraphic interval of the Dakota that is equivalent to the section at Agenda. The red staining is characteristic of the fluvial assemblage of the Dakota (Wade 1992). Unfortunately, the sinuous distribution of sandstones deposited in a

fluvial environment precludes reliable correlation between the sandstones over all but very short distances. Nevertheless, their frequency of occurrence does suggest a significant potential for cross-cutting between the individual sandstones in the immediate area.

Regional geologic studies indicate that (1) the sands at the base of the loess sequence are derived from the underlying units (Byrne et al. 1950; Fishel 1948; Wing 1930); (2) the contact between the loess and the underlying bedrock is often difficult to define, owing to similarity in color and lithology (Byrne et al. 1950); and (3) the sandstones in the Dakota are often poorly consolidated (Wade 1992). The KDHE soil borings contained 4-27 ft of sand below the Pleistocene age loess (PRC 1994c), which PRC interpreted as a Pleistocene age fluvial sand (PRC 1994c). PRC described this sand as a tan to orange-brown, fine- to medium-grained, well-sorted, subrounded quartz sand, which in MW 1D contained some "pebbly clasts of Dakota sandstone" (PRC 1994c). This description is strikingly similar to the description of the deeper sandstone in the monitoring wells. In addition, the driller's log for PWS 2 described the equivalent sand as a "sandrock" (KDHE 1983), the term used by the local well driller to describe the local sandstones (see Appendix A). This sand also lies stratigraphically below the projected top of the alluvial assemblage of the Dakota Formation (Figure 3.3). The similarity in appearance, the presence of sandstone clasts, the stratigraphic position, and regional observations on the character of the Dakota sandstones and the contact between the bedrock formations and the overlying loess are all consistent with identifying this sand as a weathered, partially eroded channel sandstone in the fluvial assemblage of the Dakota Formation, possibly having a veneer of Pleistocene age alluvium, rather than as a Pleistocene age fluvial sand.

3.2 Hydrogeology

3.2.1 Regional Hydrogeology

The sandstones of the Dakota Formation and its stratigraphic equivalents constitute a widespread aquifer extending from the Rocky Mountain front throughout the midwestern United States. Regional studies have shown that the water in the western portion of the aquifer is largely stagnant and saline. Potable water occurs primarily along the aquifer's eastern margin, where the Dakota Formation either outcrops or subcrops below the formations composing the High Plains aquifer (Helgesen et al. 1982; Leonard et al. 1982). In these areas, the Dakota aquifer is recharged either by percolation of rainwater or by inflow from the overlying High Plains aquifer. The recharge areas are generally located on uplands, with discharge occurring along the major

rivers and their primary tributaries near the eastern limit of the formation. In a few locations, the saline waters also discharge to the surface. Where this occurs, they produce brine springs and salt marshes, such as the Tuthill Marsh in the watershed of Salt Creek in south-central Republic County (Fishel 1948) (Figure 3.6).

In Republic County, only the laterally continuous basal sandstone package significantly affects regional flow within the aquifer (Wade 1992). The stratigraphically higher sandstones within the remainder of the fluvial assemblage and in the overlying deltaic assemblage form geographically restricted aquifers, which are limited by the lateral extent of the individual sandstones (Wade 1992).

Wade (1992) mapped the potentiometric surface in the basal sandstone of the Dakota throughout Republic County and portions of adjacent Washington and Cloud Counties. A portion of this map is presented in Figure 3.6. In southeastern Republic County, where Agenda is located, groundwater in the basal sand of the Dakota flows generally south toward the Republican River, with water discharging to the Republican River and along its major tributaries.

Regional patterns of groundwater flow in the sandstones stratigraphically above the basal sandstone have not been studied because of the discontinuous character of the sandstones (Wade 1992). Geologic data indicate that the sandstones in the upper portions of the fluvial assemblage occur in sinuous, ribbonlike bands, oriented along the depositional trend of paleoriver channels to the west-southwest. The degree to which this large-scale heterogeneity influences groundwater flow in these sandstones is not known.

3.2.2 Local Hydrogeology

PRC identified two aquifers at Agenda: (1) a shallow aquifer consisting of the unconsolidated silt (loess) and the upper sand and (2) a deep aquifer hosted by a Dakota sandstone (PRC 1994c). During the CI, three monitoring wells were installed in each aquifer: MW 1S, MW 2S, and MW 3S in the shallow aquifer and MW 1D, MW 2D, and MW 3D in the deep aquifer (PRC 1994c). The locations of these wells are shown in Figure 3.4. Well specifications and water level measurements in the six KDHE monitoring wells, the two PWS wells, and nearby domestic wells are summarized in Table 3.1.

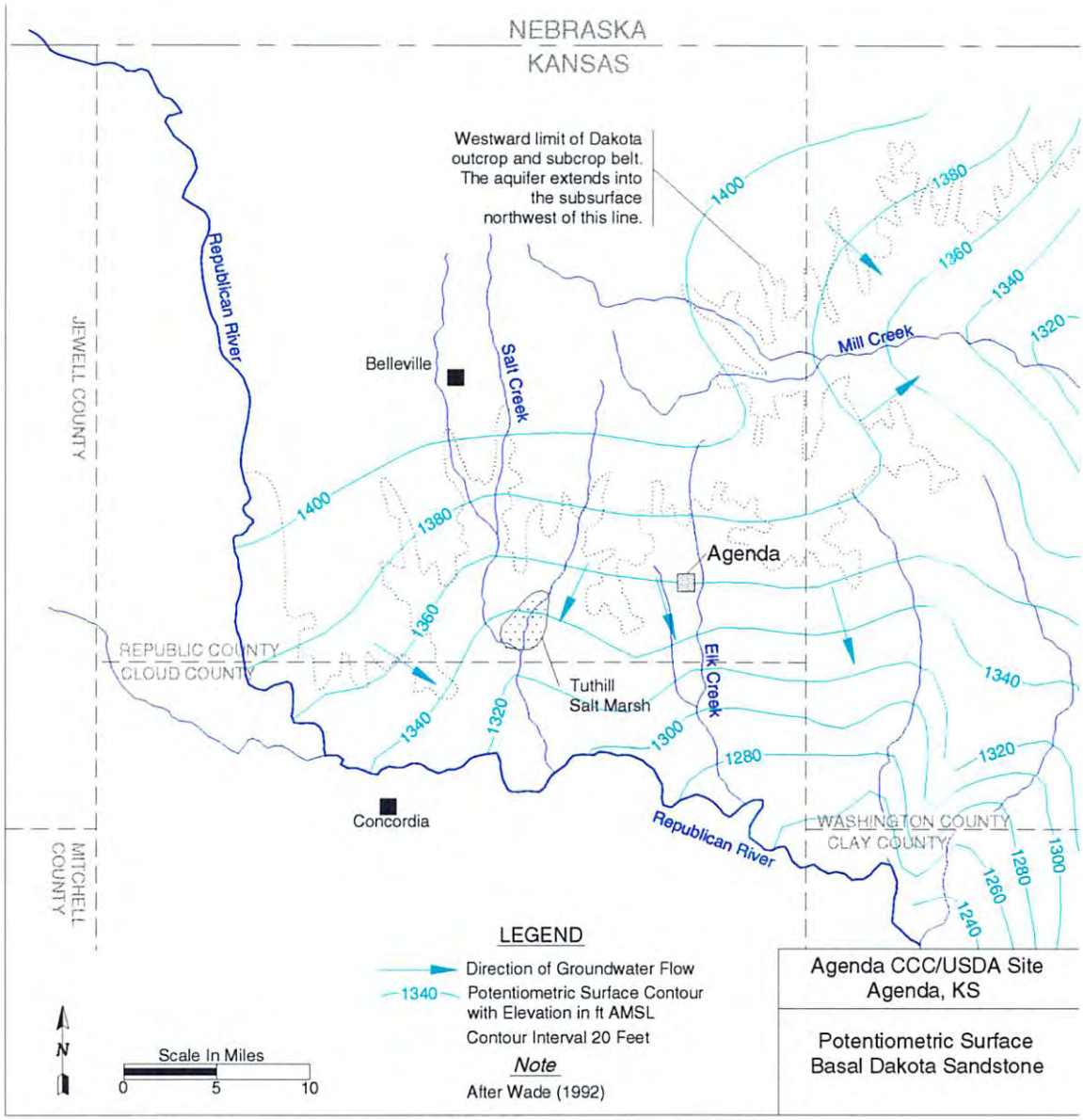


FIGURE 3.6 Map of Republic County and Portions of Adjacent Counties, Illustrating Drainage Patterns and the Potentiometric Surface for the Basal Sandstone of the Dakota Formation

TABLE 3.1 Groundwater Elevations in the Shallow and Deep Aquifers at Agenda, Kansas

Well	Ground Elevation (ft AMSL)	Completed Depth (ft AMSL)	Elevation (ft AMLS) Bottom	Elevation (ft AMLS) Screened Interval	Groundwater Elevation (ft AMSL) on Date Shown 06/06/94	06/20-22/94	07/22/94	11/22/94	02/07/95
Shallow Aquifer									
MW 1S	1411.25	54	1357	1357-1367	NA[a]	1373.27	1373.26	1374.11	1372.41
MW 2S	1412.42	59	1353	1353-1363	NA	1373.87	1375.18	1375.14	1374.14
MW 3S	1396.89	48	1349	1348-1358	NA	1376.66	1376.26	1375.38	1375.28
Havel	1413.99	62	1352	Unknown	1372.04	1371.86	NR[b]	NR	NR
Hebert	1420.43	62	1359	Unknown	1378.13	1378.11	NR	NR	NR
Hicks	1413.73	66	1348	Unknown	1374.13	1374.39	NR	NR	NR
Pickard (abandoned)	1396.78	43	1354	Unknown	1373.18	1373.18	NR	NR	NR
Deep Aquifer									
MW 1D	1410.92	140	1271	1271-1281	NA	1362.21	1366.56	1367.51	1365.41
MW 2D	1412.53	139	1274	1274-1284	NA	1367.84	1368.69	1369.81	1366.51
MW 3D	1396.78	114	1283	1283-1293	NA	NA	1367.04	1366.54	1366.54
PWS 1	1415.56	79[c]	1337[c]	Unknown	1367.23	1367.23	NR	NR	NR
PWS 2	1416.17	140[d]	1276	1276-1316	1334.17[e]	1335.17[e]	NR	NR	NR

[a] NA, not available; monitoring well not yet installed.

[b] NR, groundwater elevation not recorded; groundwater elevation was recorded in monitoring wells only.

[c] Well was originally installed to 128 ft BGL, then reduced to 79 ft BGL when problems were encountered during well development (Stover 1994a).

[d] Constructed well depth obtained from well installation record.

[e] Depth to water is questionable, because it was measured with the public water supply well pressure gauge, not a water level indicator.

Source: PRC (1994c).

PRC mapped the potentiometric surface in the upper aquifer following the CI by using water levels measured on June 20-21, 1994 (Table 3.1) in the three shallow monitoring wells, three domestic wells (Havel, Herbert, and Hicks), and one abandoned domestic well (Pickard abandoned) that reportedly are completed in the shallow aquifer (PRC 1994c). PRC's map indicates that the shallow aquifer flows south-southeast under a gradient of approximately 0.0022 ft/ft (PRC 1994c). The direction of flow inferred from these data is approximate, because the screened intervals in the domestic wells are not known, and the water levels were measured over a period of two days.

PRC did not map the potentiometric surface in the deeper aquifer, because the linear arrangement of the wells was considered unsuitable for determination of the direction of groundwater flow. However, PRC did suggest that flow in the deeper aquifer was probably toward the south, because this was the direction of regional flow in the basal sandstone of the Dakota (PRC 1994c).

Figure 3.7 illustrates the water levels in the six KDHE monitoring wells, as measured on February 7, 1995 (PRC 1995), superimposed on geologic cross section B-B' (Figure 3.5). The water level in MW 1S (1,372 ft AMSL, Figure 3.7) is below the top of the sand and consistent with the water level encountered during drilling (40 ft BGL, approximately 1,371 ft AMSL), indicating that this aquifer is unconfined at this location. Water levels in MW 2S and MW 3S are above the sand in the silty clay loess. The lithologic log for MW 2S (PRC 1994c) does not contain information on soil moisture, but the log for MW 3S (PRC 1994c) indicates a "moist wet" soil at 44 ft BGL (approximately 1,353 ft AMSL). This elevation corresponds to the top of the upper sand in this well. These observations may indicate that the shallow aquifer is confined at this location.

The pattern of flow in a shallow unconfined aquifer can be significantly influenced by variations in topography (Freeze and Cherry 1979). At the former CCC/USDA site, the observed water levels in the shallow aquifer are approximately 10 ft below the elevation of the ephemeral stream that drains the western portion of the city. The base of the stream lies approximately 20 ft below the ground surface elevation of the site, which slopes generally northward toward a small tributary to the ephemeral stream (USGS 1965). During wet periods, the water level in the shallow aquifer could rise, and the direction of flow might reverse, causing groundwater to discharge to the small tributary to the north of the site. Both the character of the shallow aquifer in the vicinity

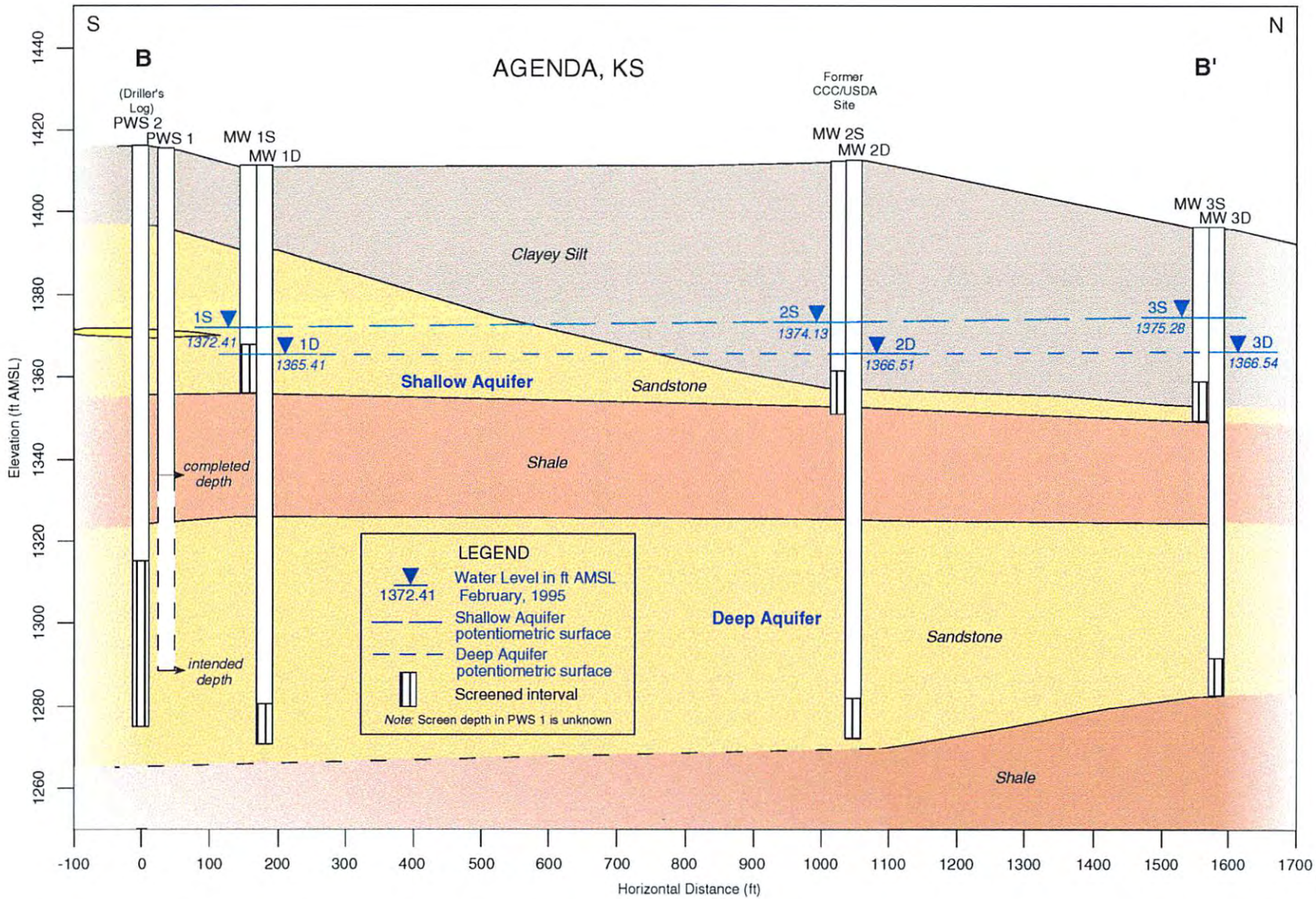


FIGURE 3.7 South to North Geologic Cross Section B-B', Illustrating Relationships between Local Stratigraphy and the Aquifers in the Vicinity of the Former CCC/USDA Site at Agenda, Kansas

of the former CCC/USDA site and its direction of flow will be examined further during the ESC investigation by installing several piezometers in the upper aquifer to supplement the existing KDHE monitoring wells.

The water levels in the three deep KDHE monitoring wells on February 7, 1995 (Figure 3.7), were consistent with water flow in the deeper aquifer generally to the south. However, a reliable determination of flow direction in this aquifer cannot be made because of the linear alignment of the wells. Regional data (Wade 1992) do indicate that groundwater in the basal sandstone of the Dakota near Agenda flows to the south (Figure 3.6), but the deep-aquifer sandstone at Agenda is not deep enough stratigraphically to be the basal sandstone. Consequently, the flow direction in the basal sandstone may not strictly apply to the deeper aquifer at Agenda, because the groundwater flow might be influenced by the orientation of the former river channel, which is expected to trend west-southwest. Water level data from July and November 1994 (Table 3.1) indicate that the level in the centrally located well MW 2D was higher than the levels in MW 1D to the south and in MW 3D to the north (Figures 3.4 and 3.5), suggesting that the groundwater was not flowing strictly to the south at that time. One temporary monitoring well will be installed in the deep aquifer, off-line from the existing KDHE monitoring wells, to clarify the local direction of groundwater flow in the deeper aquifer.

The well registration record for PWS 2 (KDHE 1983) indicates that it is screened from 100 to 140 ft BGL (1,376 to 1,276 ft AMSL). This interval corresponds well with the sandstone that hosts the deeper aquifer (Figure 3.7). Nevertheless, the water levels for this well, as reported in the CI documentation (Table 3.1, PRC 1994c), are not consistent with the static water levels measured in the deeper-aquifer monitoring wells. However, the water levels in PWS 2 were not measured but rather were calculated from readings on a pressure device installed in the well (PRC 1994c). Consequently, these data are not considered to be a reliable indication of the static water level in the deep aquifer at this location. A possible explanation for the discrepancy is that these elevations represent pumping rather than static water levels in this well.

Since the KDHE monitoring wells were installed in June of 1994, the hydraulic heads in the shallow aquifer have remained approximately 6-10 ft above the corresponding heads in the deep aquifer (PRC 1995). At Agenda, the two aquifers are separated by approximately 35 ft of unfractured shale (PRC 1994c). The head difference between the two aquifers implies that this shale is the confining horizon for the deep aquifer and that the two aquifers are not naturally interconnected hydraulically. Nevertheless, the head difference also indicates that water will flow downward from the shallow aquifer into the deep aquifer in the presence of a artificial conduit.

Prior to 1956, the city did not have a public water supply water system. Instead, the individual homes had private wells. Mr. Anderson, the Agenda city manager, believes that the majority of the domestic wells in the city were completed in the deeper aquifer (Anderson 1996). In numerous locations, Argonne has found that older wells were constructed by setting a sand or gravel pack to within a few feet of the ground surface. Wells packed with sand and gravel are known to conduct water and dissolved contaminants through confining horizons elsewhere (for example, near the former CCC/USDA grain storage site in Humphrey, Nebraska, also the subject of an Argonne ESC program).

The approximate locations of three abandoned wells are known from city records and interviews with city residents (PRC 1995; Anderson 1996; Havel 1996). Locations of two of these wells are shown on a sketch map, dated September 15, 1955, drawn to show the proposed location for PWS 1 (PRC 1995). The third abandoned well was reportedly located at the south end of the railroad depot that formerly stood along the railroad tracks west of the United Grain facilities (Anderson 1996; Havel 1996). These wells and possibly others could provide a migration path for carbon tetrachloride between the shallow and deep aquifers.

Well PWS 1, located approximately 50 ft north of PWS 2, was originally drilled to 128 ft BGL (1,287 ft AMSL), but problems during development of the well required its depth to be reduced to 79 ft BGL (1,336 ft AMSL) (Stover 1994a). This depth places the base of PWS 1 within the shale that separates the shallow and the deep aquifers (Figure 3.7). The screened interval in PWS 1 is unknown. The intended depth of the well implies that it was to be screened in the deeper aquifer, but the development problems necessitated a shallower completion. Because an adequate volume of water for a public water supply system probably could not be produced from the shale, it is likely that PWS 1 was screened in the shallow aquifer. Nevertheless, the measured water levels in the well (Table 3.1) are consistent with those in the deeper-aquifer monitoring wells. These observations indicate that PWS 1 is connected hydraulically with the deeper aquifer, perhaps through gravel packing placed within the original borehole.

3.3 Summary

The available information on the environmental setting at Agenda can be summarized as follows:

- The geologic section at Agenda penetrated by the PWS wells, KDHE monitoring wells, and nearby irrigation wells consists of Pleistocene age loess overlying Dakota Formation bedrock. Regional correlations indicate that the section of the Dakota underlying Agenda is part of the lower fluvial facies assemblage.

- At Agenda, the Dakota Formation contains two fluvial channel sandstones, separated by an intervening shale. Both sandstones are poorly consolidated. Nearby irrigation wells contain up to five sandstones in the stratigraphic interval equivalent to the section at Agenda, but the sinuous distribution of sandstones deposited in a fluvial environment precludes reliable correlation between the sandstones over all but very short distances. Nevertheless, their frequency of occurrence does suggest a significant potential for cross-cutting between the individual sandstones in the area.

- At least two aquifers exist at Agenda: (1) a shallow, unconfined or partially confined aquifer hosted by a poorly consolidated sandstone that immediately underlies the Pleistocene age underlying loess and (2) a deeper aquifer, hosted by a channel sandstone in the fluvial section of the Dakota formation. Regional correlations indicate that the deep aquifer is not stratigraphically deep enough to be the widespread basal Dakota sandstone.

- Groundwater flows generally to the south in both aquifers, but precise flow directions flow are unknown. The head differential between the two aquifers indicates that water will flow from the shallow to the deeper aquifer in the presence of a conduit, such as an abandoned well, through the intervening shale.

4 Community Relations Plan

This community relations plan identifies issues of community concern regarding the Agenda site and outlines community relations activities to be conducted in conjunction with the ESC investigation.

The CCC/USDA, which operated a grain storage facility in Agenda, has assumed lead responsibility for all technical and community relations activities relative to the carbon tetrachloride contamination at the Agenda site. Argonne will conduct these activities for the CCC/USDA. Officials from the KDHE and the EPA Region VII office may also be involved in activities at the site.

To have an effective community relations effort, Argonne will need to work closely with Agenda officials and community leaders, because community concern is likely to increase when the ESC field work begins and Argonne's presence becomes known throughout the city. In addition, as discussed in this community relations plan, information should be disseminated widely in the local community to ensure that all sectors of the community are informed adequately.

This community relations plan is divided into five sections:

1. Site description
2. Community background
3. Community relations objectives
4. Timing of community relations activities
5. Contact list of key officials

4.1 Site Description

Section 2.1 of this report contains a complete description of the site and its history.

4.2 Community Background

4.2.1 Community Profile

The city of Agenda is an agriculture-based residential community with a population of approximately 100. The population has been declining in recent years. The city of Belleville, the county seat of Republic County, population of 2,517, is located approximately 18 mi northwest of Agenda. The city of Salina, located approximately 70 mi south of Agenda, is the largest city in the region, with a population of 42,303.

Agenda is governed by a mayor and city council. In addition to public works and other city responsibilities, the mayor and council have authority to provide and maintain the public water supply system. The city has a part-time manager who is responsible for the routine operation and maintenance of the water supply system. All but two city residences are connected to the system. Several private wells in the city are reportedly used only for watering lawns and gardens (Anderson 1996). Nearby residences outside the city limits obtain their water from either domestic wells or the Republic County Rural Water District 2.

The most prominent businesses in the city are the grain elevator, which is operated by United Grain, Inc., and Boettcher Enterprises, a distributor of agricultural chemicals. Other businesses include a Conoco service station, Dale's Repair (an automotive repair shop), and a cafe. The city also has a fire house and a church. The city's public high school and grammar school have been closed for many years. The city's post office burned in 1995; whether it will be rebuilt has not been determined. All city residents are currently on a rural route. The Kyle Railroad operates a spur that runs through the west side of the city. The line is leased from the Mid-States Port Authority. No trains have run through Agenda for about two years, since flooding washed out a section of the railroad tracks south of the city. The railroad is reportedly planning to demolish the line (Anderson 1996). Both the United Grain and Boettcher Enterprises facilities are on property leased from the Mid-States Port Authority (KDR 1995). This property includes the former CCC/USDA grain storage site.

From a community relations perspective, one of the most important features of Agenda is its small size. Most area residents know one another, and, as a result, news travels fast. Most members of the community are likely to be aware of the presence of officials or contractors for the federal or state governments. Area residents appreciate being informed of activities through

credible sources, such as their mayor, the city council, and the *Belleville Telescope*, a weekly newspaper published in Belleville. The closest daily newspaper is the *Salina Journal*, published in Salina.

4.2.2 History of Community Involvement

Since carbon tetrachloride and other contaminants were first found in the city's wells and several private wells, community interest has focused on the need for a new drinking water supply. City residents initially became interested in obtaining a new public well to ensure an adequate water supply for the city residents. When the city's requests for funding assistance for new well construction were not successful, the community's interest focused on connecting to the rural water district.

4.2.3 Key Community Concerns

The community's immediate concern is that residents continue to have access to an adequate, safe drinking water supply. Installation of the air stripper system in 1994 provided an interim solution. Community concern has since focused on obtaining a permanent clean water source. When the city is connected to the rural water district in 1996, community concern regarding the water contamination problems is expected to diminish.

Once the ESC begins and the presence of Argonne officials and CCC/USDA contractors is known, concern and curiosity will probably increase. In developing and implementing a community relations program for Agenda, it is important to anticipate the potential for more active community interest.

4.3 Community Relations Objectives

The Agenda community relations plan has the following major objectives:

1. Explain the ESC plans of the CCC/USDA and provide general information about the program to gain community acceptance.

2. Inform the local community about ESC findings and developments.

3. Respond to citizens' inquiries about site activities and the presence of health and/or environmental hazards.

4. Ensure that the public has appropriate opportunities for involvement in site-related ESC decisions.

5. Determine, on the basis of community interviews, appropriate activities to ensure such public involvement.

6. Provide appropriate opportunities for the community to learn about the site.

4.4 Timing of Community Relations Activities

This section describes the numerous activities needed to meet the community relations objectives. Many of these activities need to take place before ESC field work begins. Listed below are ESC milestones and planned community relations activities.

4.4.1 Activities before ESC Field Work Begins

The CCC/USDA and Argonne will provide for the conduct of the following community relations activities, to the extent practicable, before ESC field work begins:

- A point of contact will be designated for Argonne. The individual will be Argonne's liaison with the community regarding implementation of the community relations plan.

- Upon obtaining clearance from CCC/USDA, Argonne will make initial contact with leaders of the city government to explain proposed ESC activities and schedules.

- Argonne, in coordination with the mayor and city council, will make arrangements to conduct discussions (by telephone and in person) with other local officials, residents, and other interested or affected parties, as appropriate, to determine their concerns and information needs and to learn how and when

citizens would like to be involved in the ESC process. This activity can accomplish the following specific tasks:

- Develop a list of names, addresses, and telephone numbers of local officials and interested citizens.

- Identify an information repository, as agreed by community leaders.

- Identify wells near the site that could be used for sampling.

- Discuss access issues.

- Learn of any physical or legal constraints or barriers to ESC plans.

- Upon completion and approval of this site-specific work plan for the ESC, Argonne will request the assistance of local community leaders in arranging a meeting or meetings between appropriate CCC/USDA, Argonne, and community officials and interested citizens. State and EPA officials will also be invited. The purpose of the meeting(s) will be for the CCC/USDA and Argonne to accomplish the following:

  - Describe the site location and problem.

  - Explain why action is required (legal, health, other issues).

  - Explain what the CCC/USDA and Argonne hope to accomplish through the ESC.

  - Describe the site-specific work plan and its schedule in detail, including staff, contractors, and equipment to be on-site.

  - Introduce key staff people, including points of contact (telephone numbers and addresses).

- Present the CCC/USDA-Argonne communications plan to be followed during all phases of the ESC.

- Seek input and answer questions from the community regarding the ESC and the communications plan.

- Discuss any access issues/problems that may need to be addressed.

- Announce the location of the information repository.

- Argonne, the mayor, and the city council will make every effort to ensure that individuals living just outside the city boundaries are provided with information about the ESC.

- Argonne will establish an information repository and an administrative record file. The repository will be available for public inspection and copying and will include the following:

  - The contact list of key officials (names, telephone numbers, and addresses of the CCC/USDA and Argonne officials, other federal officials, state and local leaders, and interested groups and citizens).

  - Copies of this site-specific work plan, the community relations plan, all applicable correspondence, fact sheets, ESC results, guidance documents, and any other relevant information.

4.4.2 Activities during the ESC Field Work

The CCC/USDA and Argonne will provide for the conduct of the following community relations activities, to the extent practicable, during ESC field work:

- Arrange for meetings with public officials and interested citizens when needed.

- Continue to update the information repository and the contact list.

- Prepare and distribute fact sheets or letters to inform the community of ESC progress, significant milestones, or changes in plans.

- Maintain telephone contact with state and local officials, as well as any interested residents.

4.4.3 Activities upon Completion of the ESC

The CCC/USDA and Argonne will provide for the conduct of the following community relations activities, to the extent practicable, upon completion of the ESC:

- Arrange for meetings with public officials and interested citizens to discuss ESC findings, results, recommendations, and any future activities at the site.

- Prepare and distribute information outlining ESC results and any future activities at site.

- Conduct informal sessions with citizens and/or key community leaders.

4.5 Contact List of Key Officials

The contact list of key officials includes federal, state, and local officials; interest groups; interested citizens; media representatives; individuals living or working near the site; and principals of nearby schools.

4.5.1 Federal Elected Officials

Senator Robert J. Dole
Washington, D.C., Office
141 Senate Hart Office Building
Washington, DC 20510-1601
(202) 224-6521

Senator Robert J. Dole
State Office
4th Financial Center
100 North Broadway
Wichita, KS 67202
(316) 263-4956

Senator Nancy L. Kassebaum
Washington, D.C., Office
302 Senate Russell Office Building
Washington, DC 20510-1602
(202) 224-4774

Senator Nancy L. Kassebaum
State Office
4200 Somerset Street
Suite 152
Prairie Village, KS 66208
(913) 648-3103

Congressman Pat Roberts
Washington, D.C., Office
1110 Longworth House Office Building
Washington, DC 20515-1601
(202) 225-2715

Congressman Pat Roberts
District Office
P.O. Box 1334
Salina, KS 67402-1334
(913) 825-5409

4.5.2 State Elected Officials

Governor Bill Graves
Office of the Governor
State Capitol Building
Second Floor
300 SW 10th Street
Topeka, KS 66612-1590
(913) 296-3232

State Senator Janice Lee
State Capitol
Room 402-S
300 SW 10th Street
Topeka, KS 66612
(913) 296-7366

State Representative Bill Bryant
State House
State Capitol
300 SW 10th Street
Topeka, KS 66612
(913) 325-2618 (H)

4.5.3 Local Officials

Mayor Gail Kopsa
P.O. Box 112
Agenda, KS 66930
(913) 732-6424

Councilman Kent Kalivoda
P.O. Box 85
Agenda, KS 66930
(913) 732-6469

Councilman Clarence Havel
P.O. Box 107
Agenda, KS 66930
(913) 732-6678 (Agenda Cafe)

Councilman Dale Kopsa
P.O. Box 103
Agenda, KS 66930
(913) 732-6560

Councilman Ed Junek
P.O. Box 101
Agenda, KS 66930
(913) 732-6622

Councilman Terry Cherney
P.O. Box 33
Agenda, KS 66930
(913) 732-6642

Alma Schulz, City Clerk
P.O. Box 36
Agenda, KS 66930
(913) 732-6678 (Agenda Cafe)

Paula Cherney, City Treasurer
P.O. Box 33
Agenda, KS 66930

Donald "Bud" Anderson, City Manager
P.O. Box 66
Agenda, KS 66930
(913) 732-6543

4.5.4 Federal Officials

Robert Stephenson, Deputy Director
Conservation and Environmental Protection Division, Farm Service Agency
Commodity Credit Corporation
U.S. Department of Agriculture
Room 4714, South Agriculture Building
P.O. Box 2415
Washington, DC 20013
(202) 720-5295

Michael Linsenbigler
Conservation and Environmental Protection Division, Farm Service Agency
U.S. Department of Agriculture
Room 4709, South Agriculture Building
P.O. Box 2415
Washington, DC 20013
(202) 690-0224

Victor Lyke
U.S. Environmental Protection Agency
726 Minnesota Avenue
Kansas City, Kansas 66101
(913) 551-7256

Ralph Langemeier, Chief
Drinking Water Branch
U.S. Environmental Protection Agency
Region VII
726 Minnesota Avenue
Kansas City, Kansas 66101
(913) 551-7440

4.5.5 State Officials

Susan Stover, Environmental Geologist
Bureau of Environmental Remediation
Kansas Department of Health and Environment
Forbes Field, Building 740
Topeka, KS 66620
(913) 296-5531

4.5.6 Citizens and Other Interested Parties

Shirley Strnad
United Grain, Inc.
P.O. Box 507
Belleville, KS 66935
(913) 527-5013

Jarold Boettcher
Boettcher Enterprises, Inc.
118 West Court Street
Beloit, KS 67420
(913) 738-5781

5 Phase I Technical Work Plan

This section discusses the primary objectives of the initial phase of Argonne's ESC investigation at Agenda, Kansas. Procedures governing activities, such as drilling, sampling, and sample analysis, that will be applied to achieve these objectives are described in the *Master Work Plan* (Argonne 1994).

5.1 Determination of the Detailed Stratigraphic Sequence

One continuously cored, mud rotary borehole will be drilled to obtain additional stratigraphic control for the investigation. This borehole will be drilled through the deep-aquifer sandstone into the underlying shale. An approximate location for this borehole is shown in Figure 5.1. Mud rotary drilling procedures are described in the *Master Work Plan* (Argonne 1994). The core from this borehole will be examined to confirm the stratigraphic sequence and obtain detailed lithologic and structural information on the individual stratigraphic units. Core descriptions will be made in accordance with quality assurance/quality control procedures outlined in the *Master Work Plan* (Argonne 1994). Representative samples of the lithologies will be selected from the core and analyzed for grain size to obtain estimates of hydraulic properties. Direct measurements of permeability may also be made on well-cemented samples of shale, mudstone, siltstone, and sandstone. This information will be used in conjunction with aquifer gradients, calculated from water level measurements, to estimate rates of flow and contaminant transport in the aquifers. The stratigraphic sequence in the core will also be used to calibrate wire line resistivity and natural gamma logs and, in the unconsolidated portion of the stratigraphic section, electronic cone penetrometer (ECPT) mechanical and resistivity logs. Results of these calibrations will be used in conjunction with the existing data to correlate the various stratigraphic units throughout the area of investigation.

5.2 Determination of the Direction of Groundwater Flow

The linear alignment of the KDHE monitoring wells does not allow accurate determination of the pattern of groundwater flow in the aquifers. To determine the pattern of flow in the shallow aquifer, temporary piezometers will be installed by using Argonne's ECPT truck. Potential locations for the piezometers are shown in Figure 5.1. To establish the direction of flow in the deeper aquifer, a temporary well will be installed at the location of the continuously cored

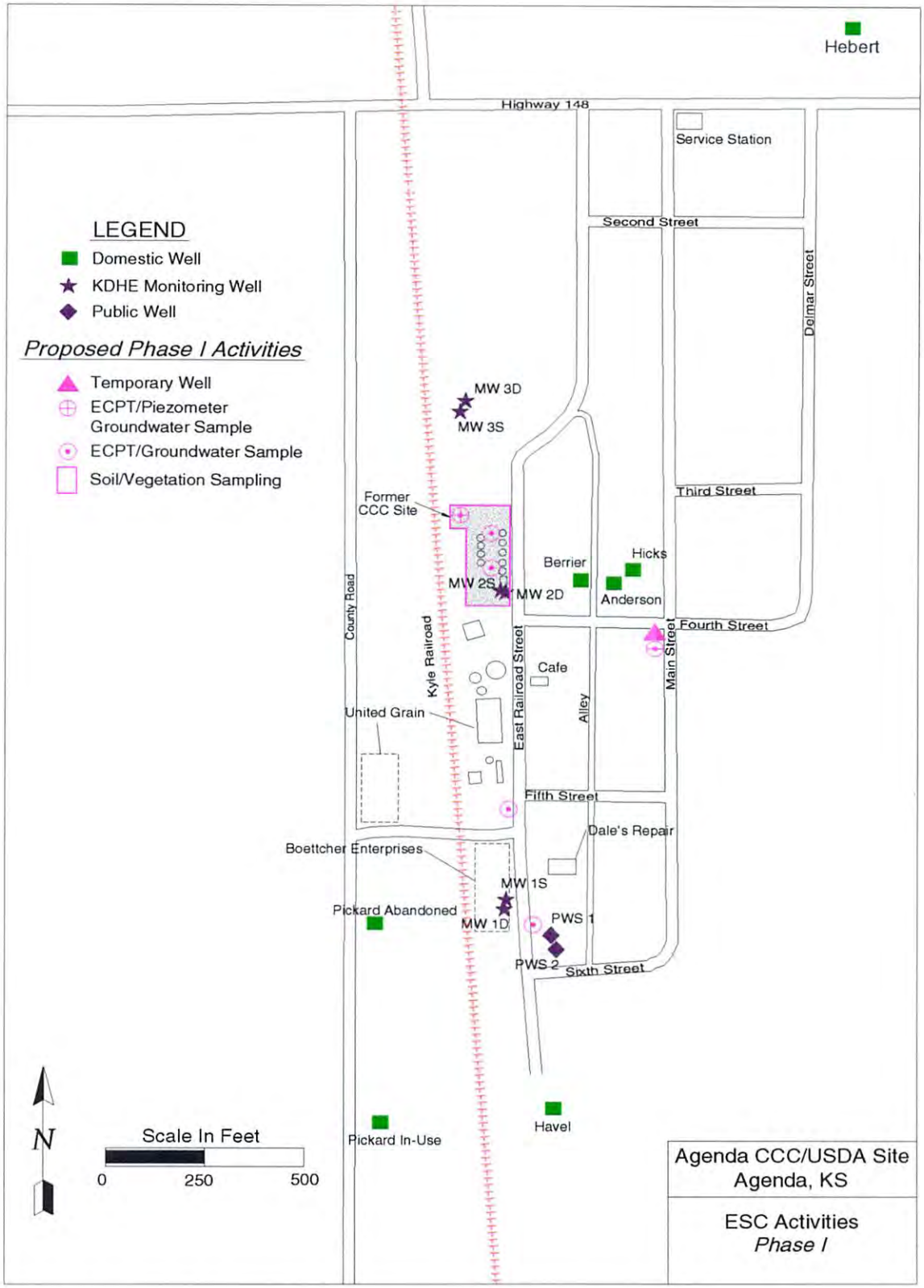


FIGURE 5.1 Map of Agenda, Kansas, Showing the Former CCC/USDA Site; the Approximate Locations of PWS Wells, Domestic Wells, and KDHE Monitoring Wells; and the Approximate Locations of Phase I Activities

borehole, which will be offset from the line of KDHE monitoring wells (Figure 5.1). Additional temporary wells may be installed during subsequent phases of the investigation if they are needed to complete characterization and to provide control for modeling and aquifer testing in conjunction with a possible feasibility study of the site. Temporary wells and piezometers will be installed and developed in accordance with procedures described in the *Master Work Plan* (Argonne 1994). Aboveground completions will be used on all piezometers and temporary wells, except where they will pose a hazard to vehicular traffic, or where a flush mount is specifically requested by a landowner.

5.3 Groundwater Sampling and Delineation of Groundwater Contamination

A suite of groundwater samples will be collected to quantify groundwater chemistry and contaminant concentration within the aquifers. Samples will be analyzed for carbon tetrachloride, chloroform, and a variety of other chemical and physical characteristics, as described in the *Master Work Plan* (Argonne 1994). Samples will be obtained from the two PWS wells, the six KDHE monitoring wells, the nearby domestic wells, and the temporary wells. Additional samples of shallow-aquifer groundwater will be obtained by using Argonne's ECPT truck. Approximate locations for these samples are shown on Figure 5.1. The deep aquifer may also be sampled during drilling of the continuously cored borehole by collecting HydroPunch® samples at selected intervals. Results of groundwater analyses will be used to map the distribution of contaminants in the aquifers, to establish their chemical characteristics, and to identify areas where shallow-aquifer water may be entering the deeper aquifer. Groundwater sampling will be conducted in accordance with procedures described in the *Master Work Plan* (Argonne 1994). Analyses will be performed off-site at an EPA-approved Contract Laboratory Program (CLP) laboratory.

5.4 Surface Water Sampling

The former CCC/USDA site is situated southeast of a small tributary to the ephemeral stream that drains the western portion of the city (USGS 1965). Surface water drainage from the site flows north to this tributary, the base of which is approximately 20 ft below the elevation of the site. During wet periods, this tributary may carry surface water runoff from the site and may also receive base flow from seeps along its banks. If surface water is present during the field program, samples will be collected and analyzed for carbon tetrachloride and chloroform to determine whether surface water is being contaminated by runoff from the site or by in-flowing contaminated groundwater. Surface water sampling will be performed by using procedures

outlined in the *Master Work Plan* (Argonne 1994). Analyses will be performed off-site at an EPA-approved CLP laboratory.

5.5 Soil and Vegetation Sampling

Soils and vegetation at the former CCC/USDA site (Figure 5.1) will be sampled to obtain information on the distribution and behavior of contaminants in near-surface soils. Preliminary soil and soil gas sampling performed during the CI did not detect any carbon tetrachloride contamination in the near-surface soils at the former CCC/USDA site or elsewhere (PRC 1994c). Additional near-surface soil sampling and vegetation sampling for carbon tetrachloride and chloroform will be performed to corroborate this finding of the CI and to allow a risk analysis of the surface soils to be calculated. Figure 5.2 shows the locations of the wooden storage buildings and the steel bins at the site in 1962 (USDA 1962), when the site was an active CCC/USDA facility. Targeted sampling will be performed at and around the locations of the existing bins and buildings and at the former locations of buildings as shown in Figure 5.2. Both soil and vegetation sampling will be performed. The specific locations and sample types will be determined in the field on the basis of the on-site conditions at time of sampling. Vegetation sampling may include leaf, stem, seed, root, and/or trunk samples; soil samples will be collected from each lithologic material within the first 2-3 ft BGL. Sampling of deeper soil horizons may be performed during subsequent phases of the investigation, depending on the results of the Phase I groundwater and surface soil analyses. The detailed procedures governing soil and vegetation sampling and analysis are presented in the *Master Work Plan* (Argonne 1994). Soil analyses will be performed off-site at an EPA-approved CLP laboratory. Vegetation samples will be analyzed at the Hazardous Waste Research and Information Center in Champaign, Illinois.

5.6 Determination of Vertical Resistivity and Gamma Emissivity Profiles

Vertical resistivity and gamma emissivity profiles will be determined from the surface to total depth (through both aquifers) by wire line logging of the temporary well and the three deep KDHE monitoring wells. Induction logs and natural gamma logs will be run by following the procedures outlined in the *Master Work Plan* (Argonne 1994). Logs will be compared to known lithology from the core and sample descriptions from previous investigations to identify geophysical characteristics that will help in mapping the stratigraphy throughout the area of investigation.

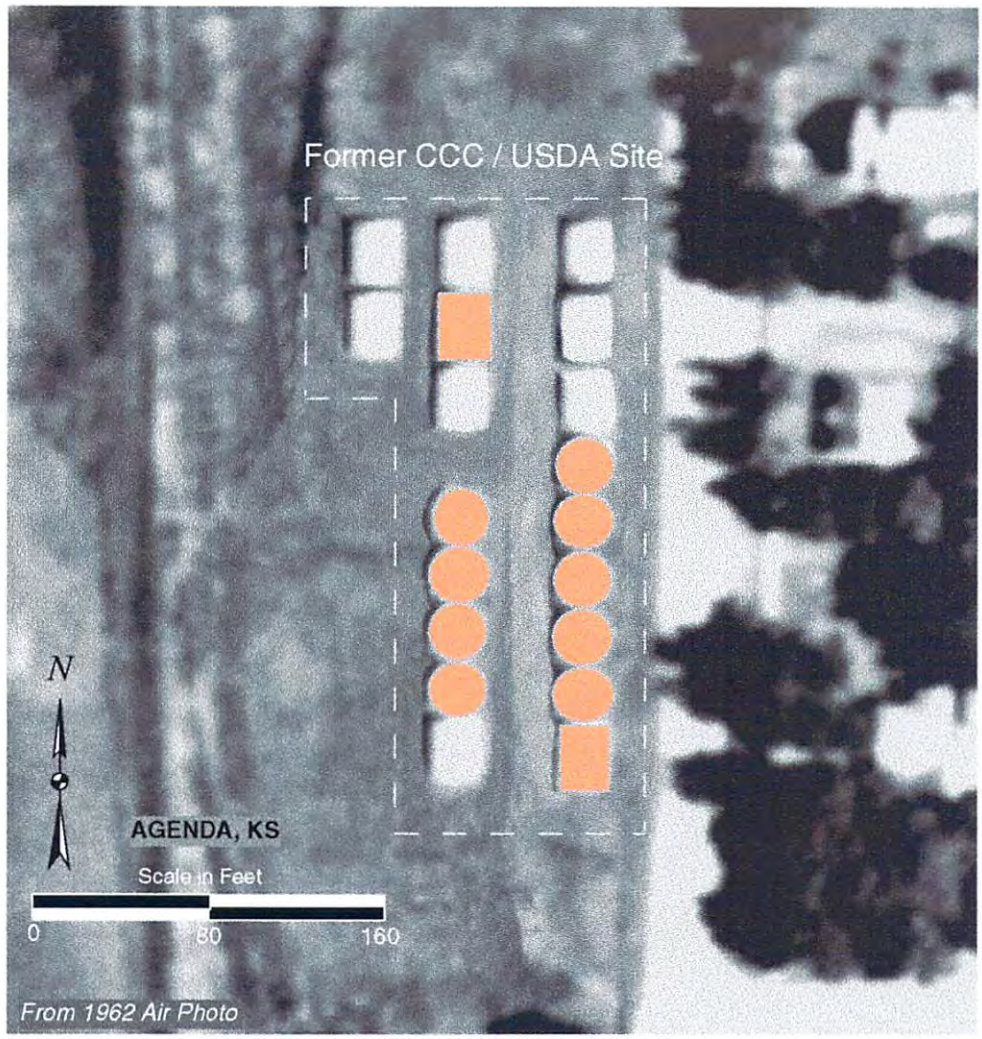


FIGURE 5.2 Enlarged Portion of a 1962 Aerial Photograph of Agenda, Kansas, Showing Locations of Steel Grain Bins and Wooden Storage Buildings at the Former CCC/USDA Grain Storage Site

6 Health and Safety Information for Agenda

The general health and safety plan for the Agenda site is described in Section 3 of the *Master Work Plan* (Argonne 1994). The general plan addresses all anticipated safety issues for the investigation at Agenda. Specific emergency information for use at the Agenda site is detailed below. The emergency route to the Republic County Hospital in Belleville, Kansas, is shown in Figure 6.1. In addition, the Cloud County Health Center in Concordia is available as an alternate emergency hospital (see Figure 6.2). Emergency 911 calls, including police and fire calls, from Agenda will initiate only a Belleville response. However, the Belleville and Concordia emergency facilities are approximately the same road distance from Agenda. Other emergency information, including the list of emergency telephone numbers, is given in Table 6.1. A list of Argonne project personnel responsible for activities at the site is presented in Table 6.2.

Directions from Agenda, Kansas, to Republic County Hospital (2420 G Street, Belleville)

- Follow Main Street or East Railroad Street north (0.2 mi) to Kansas Highway 148.
- Follow Kansas Highway 148 west (13 mi) to U.S. Highway 81.
- Follow U.S. Highway 81 north (9 mi) to the first road (unnamed) north of U.S. Highway 36.
- Follow the hospital road (unnamed) east (0.2 mi) to G Street and the Republic County Hospital.
- Emergency Room is on the west end of the hospital building.

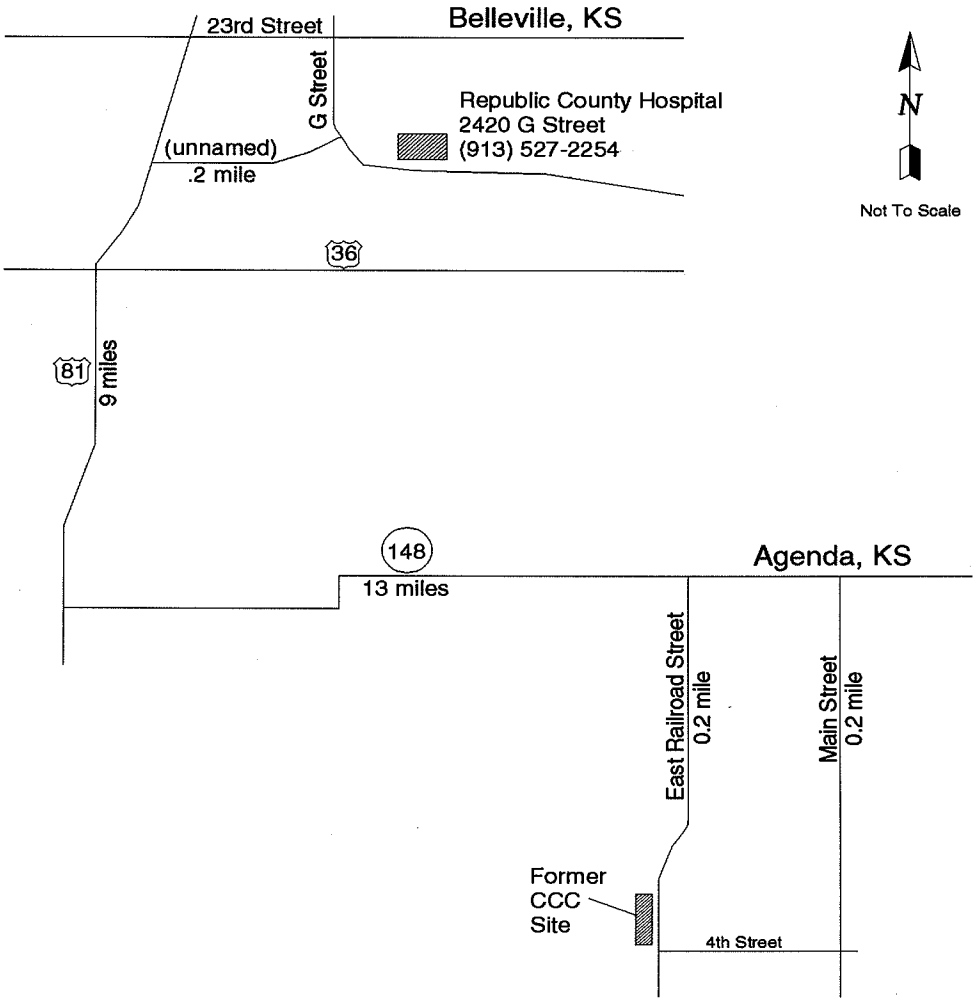


FIGURE 6.1 Emergency Route from Agenda to Republic County Hospital, Belleville, Kansas

Directions from Agenda, Kansas, to Cloud County Health Center (1100 Highland Drive, Concordia, Kansas)

- Follow Main Street or East Railroad Street north (0.2 mi) to Kansas Highway 148.
- Follow Kansas Highway 148 west (13 mi) to U.S. Highway 81.
- Follow U.S. Highway 81 south (8 mi) to Route 350.
- Follow Route 350 west (8 blocks) to Highland Drive/Elmhurst Street.
- Follow Highland Drive south (200 ft) to the hospital driveway.
- Emergency Room is on the west end of hospital building.

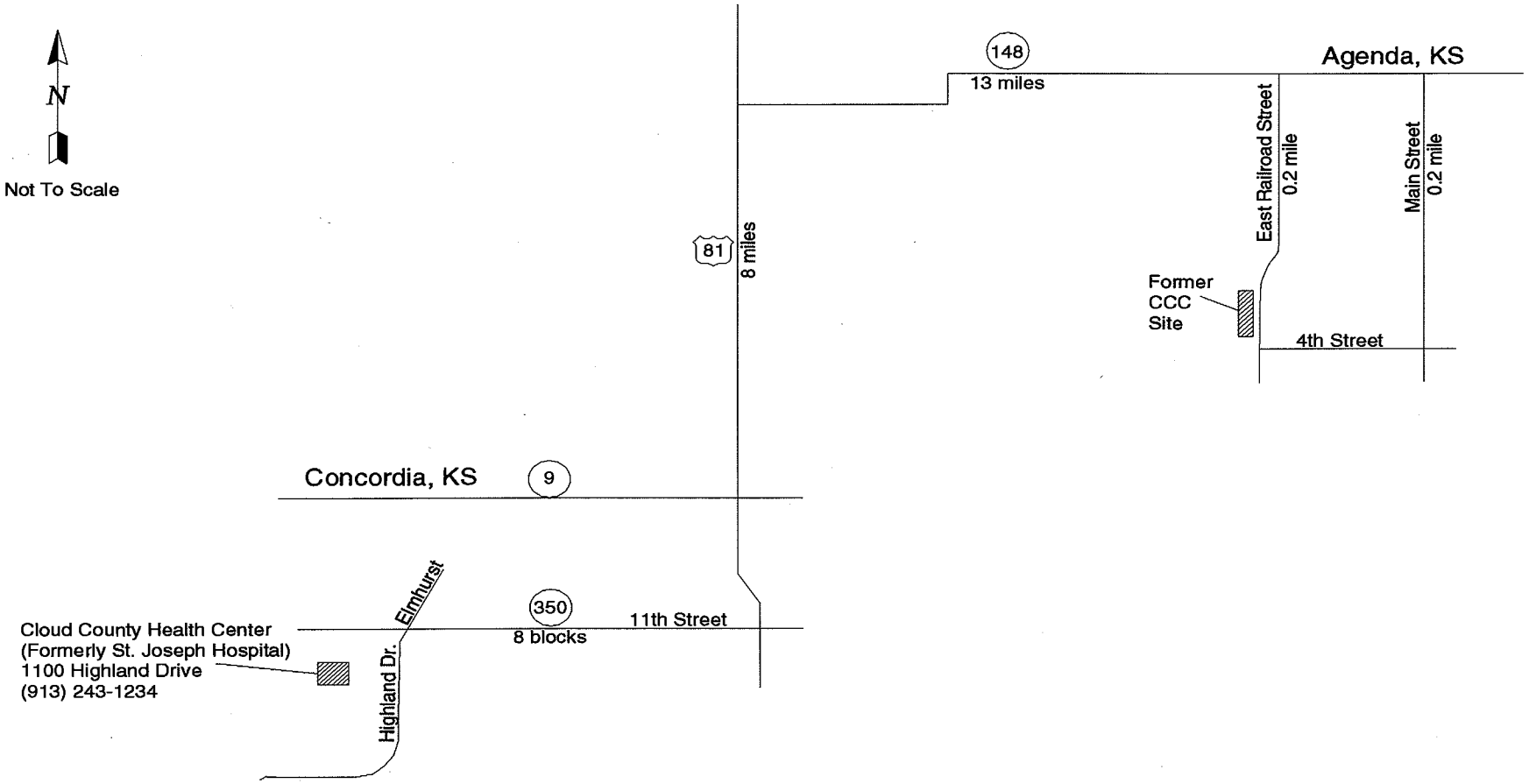


FIGURE 6.2 Emergency Route from Agenda to Cloud County Health Center, Concordia, Kansas

TABLE 6.1 Emergency Information for Agenda Expedited Site Characterization[a]

Resource	Telephone Number	Name
At the Site		
Ambulance	911 or (913) 527-5655	Republic County Service Belleville, Kansas
Medical care[b]	(913) 527-2254	Republic County Hospital 2420 G Street Belleville, Kansas
Medical care[b]	(913) 243-1234	Cloud County Health Center (Formerly St. Joseph Hospital) 1100 Highland Drive Concordia, Kansas
Fire	911 or (913) 732-6555	Emergency response
Industrial hygiene	(708) 252-3310	Argonne-Industrial Hygiene
Safety	(708) 252-2885	ER Division[c] Safety Officer (Monte Brandner)
Environmental concerns	(708) 252-4852	ER Division Regulatory Supervisor (Ron Kolpa)
Security	(708) 252-5731	Argonne-Operations Security
In the Local Area		
Ambulance	911 or (913) 527-5655	Republic County Services Belleville, Kansas
Hospital[b]	(913) 527-2254	Republic County Hospital 2420 G Street Belleville, Kansas
Hospital[b]	(913) 243-1234	Cloud County Health Center (Formerly St. Joseph Hospital) 1100 Highland Drive Concordia, Kansas
Fire	911 or (913) 732-6555	Belleville, Fire Department, Belleville, Kansas
Police	(913) 527-5655	Republic County Law Enforcement Belleville, Kansas
Poison control	(800) 332-6633	Kansas City, Kansas

[a] Post this table in the field operations base.

[b] Routes to the hospitals are in Figures 6.1 and 6.2.

[c] ER Division is the Environmental Research Division at Argonne.

TABLE 6.2 Information for Expedited Site Characterization Team at Agenda

Position	Name	Permanent Telephone No.	Field Address[a]	Field Telephone No.[a]
Project manager	J. Burton	(708) 252-8795	TBD	TBD
Field team leader	J. Walker	(708) 252-6803	TBD	TBD
Health and safety coordinators	M. Krokosz	(708) 252-5027	TBD	TBD
	B. Nashold	(708) 252-7698	TBD	TBD
Team members	J. Alvarado	(708) 252-5267	TBD	TBD
	S. Armstrong	(708) 252-1251	TBD	TBD
	S. Cook	(708) 252-9513	TBD	TBD
	C. Dennis	(708) 252-5999	TBD	TBD
	J. Hansen	(708) 252-4938	TBD	TBD
	G. Hildebrandt	(708) 252-4991	TBD	TBD
	M. Krokosz	(708) 252-5027	TBD	TBD
	T. Meyer	(708) 252-5781	TBD	TBD
	B. Nashold	(708) 252-7698	TBD	TBD
	C. Rose	(708) 252-3499	TBD	TBD
	C. Rosignolo	(708) 252-8589	TBD	TBD
	W. Saunders	(708) 252 3205	TBD	TBD
	B. Sedivy	(708) 252-6575	TBD	TBD
	G. Young	(708) 252-1567	TBD	TBD
Subcontractors	Layne-Western, Inc., Wichita, Kansas	(316) 264-5365		
	Applied Research Associates, Utica, Nebraska	(402) 534-2301 (402) 363-1537 (ECPT Truck)		
	Sequoyah, Inc., Lincoln, Nebraska	(402) 467-2996 (402) 432-3124		

[a] Locations and telephone numbers for team members are to be determined (TBD) before field sampling begins.

7 Field Schedule

The field program has been tentatively scheduled to begin on April 15, 1996, subject to obtaining access agreements from landowners. Field operations are expected to require approximately three weeks to complete. Community relations activities will be scheduled commensurate with field activities, as described in Section 4 of this report.

8 References

Anderson, D., 1996, personal communication from D. Anderson, City Manager, Agenda, Kansas, to S.J. Cook, Argonne National Laboratory, January 10.

Argonne, 1994, *Master Work Plan: Expedited Site Characterizations at CCC/USDA Sites in Kansas*, report prepared for Commodity Credit Corporation, U.S. Department of Agriculture, by Argonne National Laboratory, Argonne, Illinois, January.

Bean, R., 1993, memorandum from R. Bean, Kansas Department of Health and Environment, Bureau of Environmental Remediation, to D. Waldo and R. Gelvin, Kansas Department of Health and Environment, Bureau of Water, regarding Agenda air stripper, December 17.

Byrne, F.E., H.V. Beck, V.B. Coombs, and W.B. Johnson, 1950, *Geologic Construction-Material Resources in Republic County, Kansas*, U.S. Geological Survey Circular 79, U.S. Government Printing Office, Washington, D.C.

Dallen, F., 1995, *Field Notes from Agenda Site, February 7, 1995*, F. Dallen, Environmental Technician, Kansas Department of Health and Environment, Bureau of Environmental Remediation.

EPA, 1992, *U.S. Environmental Protection Agency Potential Hazardous Waste Site Preliminary Assessment Form*, Agenda Public Water Supply Site, Agenda Kansas, Evaluator: J. Alldritt, Kansas Department of Health and Environment, Bureau of Environmental Remediation, February 4.

Fishel, V.C., 1948, *Ground-Water Resources of Republic County and Northern Cloud County, Kansas*, Kansas Geological Survey Bulletin 79, University of Kansas Publications, Lawrence, Kansas.

Freeze, R.A., and J.A. Cherry, 1979, *Groundwater*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Frye, J.C., and A.B. Leonard, 1965, "Quaternary of the Southern Great Plains," pp. 203-216 in H.E. Wright, Jr., and D.C. Frey, editors, *The Quaternary of the United States*, International Association of Quaternary Research, Seventh Congress, Princeton University Press, Princeton, New Jersey.

Havel, C., 1996, personal communication from C. Havel, former mayor, Agenda, Kansas, to S.J. Cook, Argonne National Laboratory, January 10.

Helgesen, J.O., D.G. Jorgensen, R.B. Leonard, and D.C. Signor, 1982, "Regional Study of the Dakota Aquifer (Darton's Dakota Revisited)," *Ground Water* 20:410-414.

Karl, H.A., 1976, "Depositional History of the Dakota Formation (Cretaceous) Sandstones, Southeastern Nebraska," *Journal of Sedimentary Petrology* 46:124-131.

KDHE, 1983, *Water Well Record for City of Agenda PWS 2*, Kansas Department of Health and Environment, Bureau of Water, October 25.

KDHE, 1988, *Kansas Department of Health and Environment Spills System Report, Spill No. 06/14/88 5DR1 0930, Incident Description and Cleanup Description of Nitrate Spill at Boettcher Enterprises*, Kansas Department of Health and Environment, June 14.

KDHE, 1992, *Preliminary Assessment Report for Agenda Public Water Supply Site, KSD984997528, Agenda, Kansas*, Kansas Department of Health and Environment, Bureau of Environmental Remediation, March.

KDHE, 1995a, *GC/MS Analysis Report for Groundwater Samples Collected at PWS #1 and PWS #2 at Agenda, Kansas, on June 22, 1995*, Kansas Department of Health and Environment, Organic Chemistry Laboratory, Topeka, Kansas, July 6.

KDHE, 1995b, *Monitoring of the Agenda Air Treatment System, Kansas Department of Health and Environment*, information package from the Kansas Department of Health and Environment including (1) an outline of *Monitoring Plan for the Agenda Project*, (2) analytical results for samples collected by the vendor during the startup period of the treatment system, and (3) analytical results for samples collected quarterly thereafter by the city of Agenda.

KDR, 1995, *Ownership Map, Republic County Kansas 205-16-10,* Kansas Department of Revenue, Division of Property Valuation, and Republic County Board of Commissioners, prepared by Pirrie and Associates, Perryville, Missouri.

Kopsa, G., 1996, personal communication from G. Kopsa, Mayor, Agenda, Kansas, to S.J. Cook, Argonne National Laboratory, January 10.

Leonard, R.B., D.C. Signor, D.G. Jorgensen, and Helgesen, J.O., 1982, "Geohydrology and Hydrogeochemistry of the Dakota Aquifer, Central United States," pp. 120-127 in D.G. Jorgensen, and D.C. Signor, editors, *Proceedings of the Geohydrology Dakota Aquifer Symposium*, National Well Water Association, Worthington, Ohio.

Macfarlane, P.A., A. Wade, J.H. Doveton, and V.J. Hamilton, 1991, *Revised Stratigraphic Interpretation and Implications for Pre Graneros Paleogeography from Test-Hole Drilling in Central Kansas*, Kansas Geological Survey Open File Report 91-1.

PRC, 1994a, *Final Site Assessment Report for the Agenda Public Water Supply Site, Agenda, Kansas*, prepared by PRC Environmental Management, Inc., for Kansas Department of Health and Environment, Bureau of Environmental Remediation, August 3.

PRC, 1994b, field log recorded by PRC Environmental Management, Inc., staff during the November 2, 1993, site reconnaissance of the Agenda Public Water Supply Site, Project 084-0207.

PRC, 1994c, *Revised Interim Comprehensive Investigation of Agenda Public Water Supply Site, Agenda, Republic County, Kansas*, prepared by PRC Environmental Management, Inc., for Kansas Department of Health and Environment, Bureau of Environmental Remediation, December 22.

PRC, 1995, *Addendum to the Revised Interim Comprehensive Investigation Report of Agenda Public Water Supply Site, Agenda, Republic County, Kansas*, prepared by PRC Environmental Management, Inc., for Kansas Department of Health and Environment, Bureau of Environmental Remediation, April 5.

Splichal, P., 1995, record of telephone conversation between P. Splichal, PRC Environmental Management, Inc., Kansas City, Kansas, and Donald Anderson, City Manager, Agenda, Kansas, March 23.

Stover, S., 1994a, *Excerpt from Kansas State Water Plan — Lower Republican Drainage Basin, Agenda Public Water Supply Site, Republic County, Kansas*, S. Stover, project manager, Kansas Department of Health and Environment, Bureau of Environmental Remediation, September.

Stover, S., 1994b, *Scope of Work for a Comprehensive Investigation of Agenda Public Water Supply Site*, with letter of transfer from S. Stover, Kansas Department of Health and Environment, Bureau of Environmental Remediation, to E. Hubert, PRC Environmental Management, Inc., Kansas City, Kansas, April 26.

Stover, S., 1994c, *Review of Interim Comprehensive Investigation Report, Agenda Public Water Supply Site*, with letter of transfer from S. Stover, Kansas Department of Health and Environment, Bureau of Environmental Remediation, to P. Splichal, PRC Environmental Management, Inc., Kansas City, Kansas, October 13.

Stover, S., 1995, *Field Log and Analytical Data Pertaining to 11/22/94 and 2/7/95 Sampling Events at Agenda Public Water Supply Site*, with letter of transfer from S. Stover, Kansas Department of Health and Environment, Bureau of Environmental Remediation, to P. Splichal, PRC Environmental Management, Inc., Kansas City, Kansas, March 3.

Stover, S., 1996, personal communication from S. Stover, Kansas Department of Health and Environment, Bureau of Environmental Remediation, to S.J. Cook, Argonne National Laboratory, January 9.

USDA, 1962, *Air Photograph of Agenda, Kansas*, U.S. Department of Agriculture, Photographic Laboratory, Photo YU-2CC-50, Salt Lake City, Utah, July 21.

USDA, 1967, *Soil Survey of Republic County, Kansas*, U.S. Department of Agriculture, Soil Conservation Service, U.S. Government Printing Office, Washington, D.C.

USGS, 1965, *Agenda Quadrangle, Kansas*. U.S. Geological Survey 7.5 Minute Topographic Map Series, U.S. Government Printing Office, Washington, D.C.

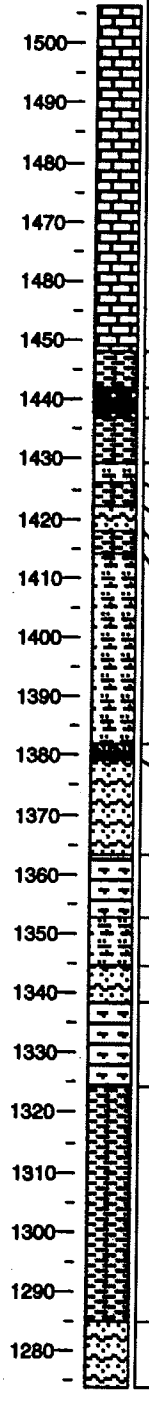
Wade A., 1992, *Ground-Water Flow Systems and the Water Resources Potential of the Dakota Aquifer in a Two-County Area in North Central Kansas*, M.S. Thesis, University of Kansas, Lawrence, Kansas.

Wing, M.E., 1930, *The Geology of Cloud and Republic Counties, Kansas*, Kansas Geological Survey Bulletin 15, University of Kansas Publications, Lawrence, Kansas.

Appendix A:

Lithologic and Geophysical Logs for PWS Wells, Irrigation Wells, Monitoring Wells, and KGS Test Holes

Kansas Geological Survey		Soil Boring ID: KGS R1 Log Type: Soil Boring	
Project: DAKOTA	Ground Elevation: 1506	Total Depth: 512	Driller: Company: -----
Date: 9/89	Plot Date: 2/02/96	Geologist: Wade	Rig: Mud Rotary



LITHOLOGY

Limestone: (Greenhorn formation)

Shale: (Graneros formation)

Bentonite

Shale

Shale and Sandstone

Shale

Sandstone: (Dakota formation, Deltaic assemblage)

Shale

Shale and Sandstone

Lignite

Sandstone

Siltstone

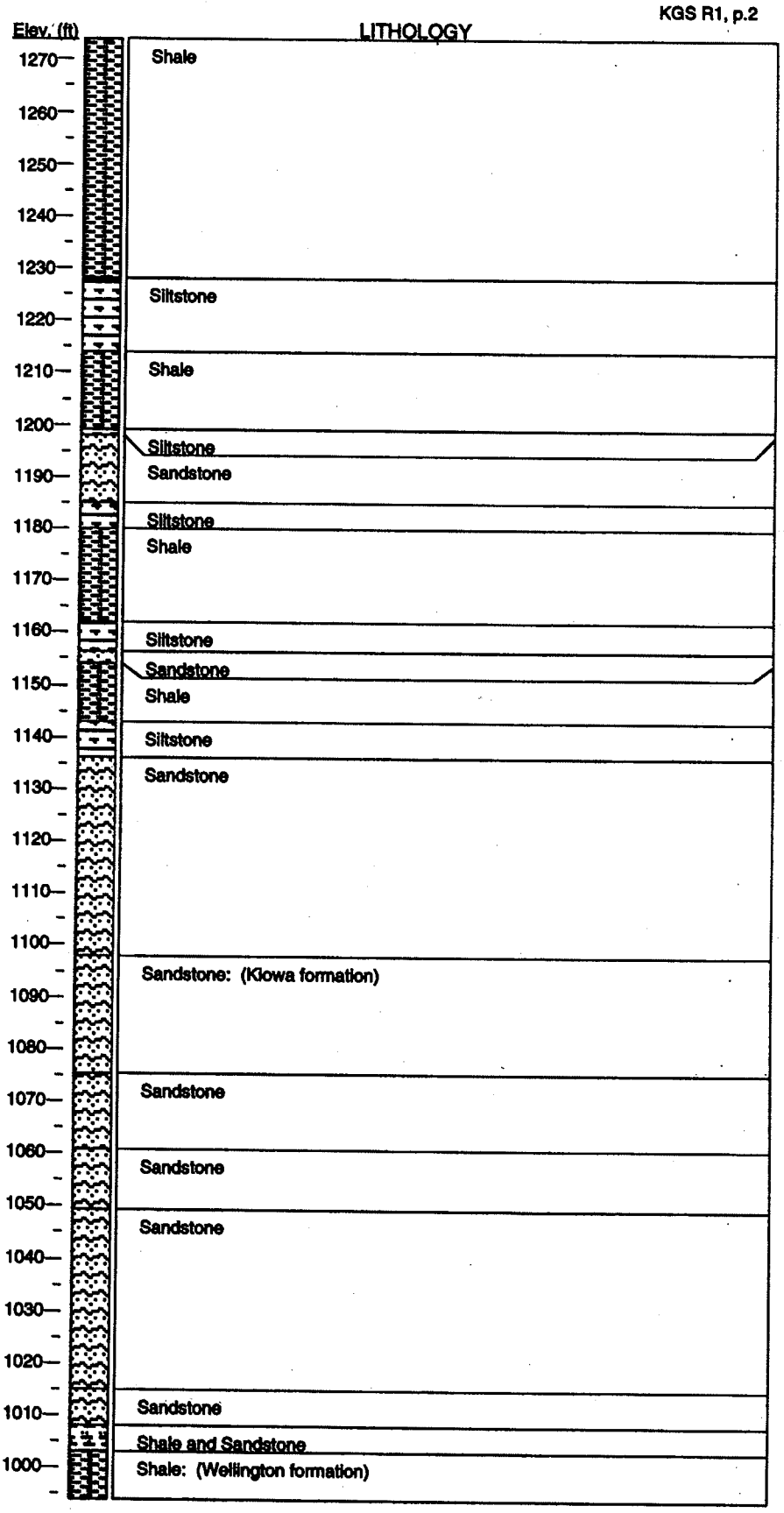
Shale and Sandstone

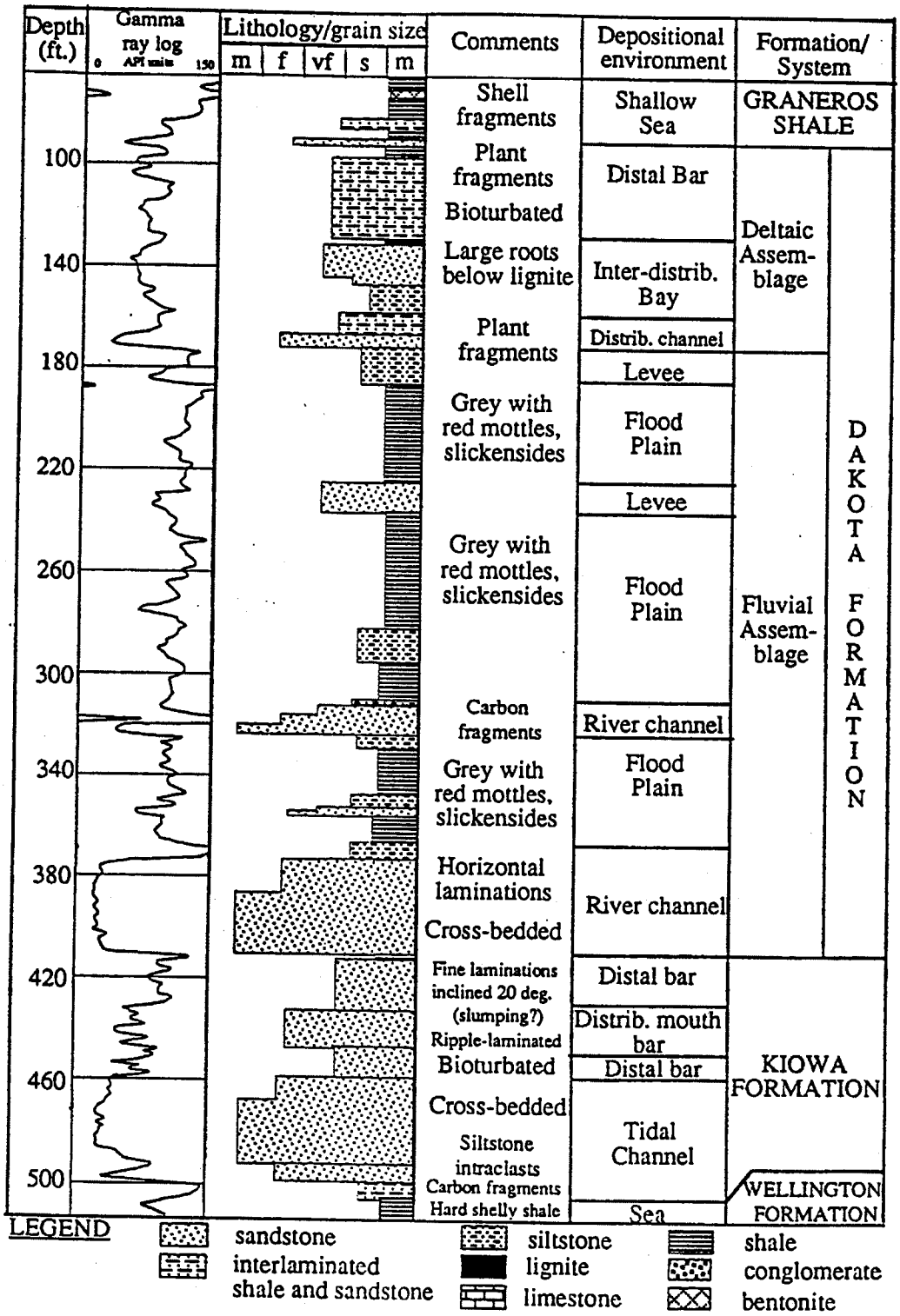
Sandstone

Siltstone: (Dakota formation, Fluvial assemblage)

Shale

Sandstone


KGS R1, p.2
Elev. (ft)
LITHOLOGY
1270
1260
1250
1240
1230
1220
1210
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
Shale
Siltstone
Shale
Siltstone
Sandstone
Siltstone
Shale
Siltstone
Sandstone
Shale
Siltstone
Sandstone
Sandstone: (Kiowa formation)
Sandstone
Sandstone
Sandstone
Sandstone
Shale and Sandstone
Shale: (Wellington formation)

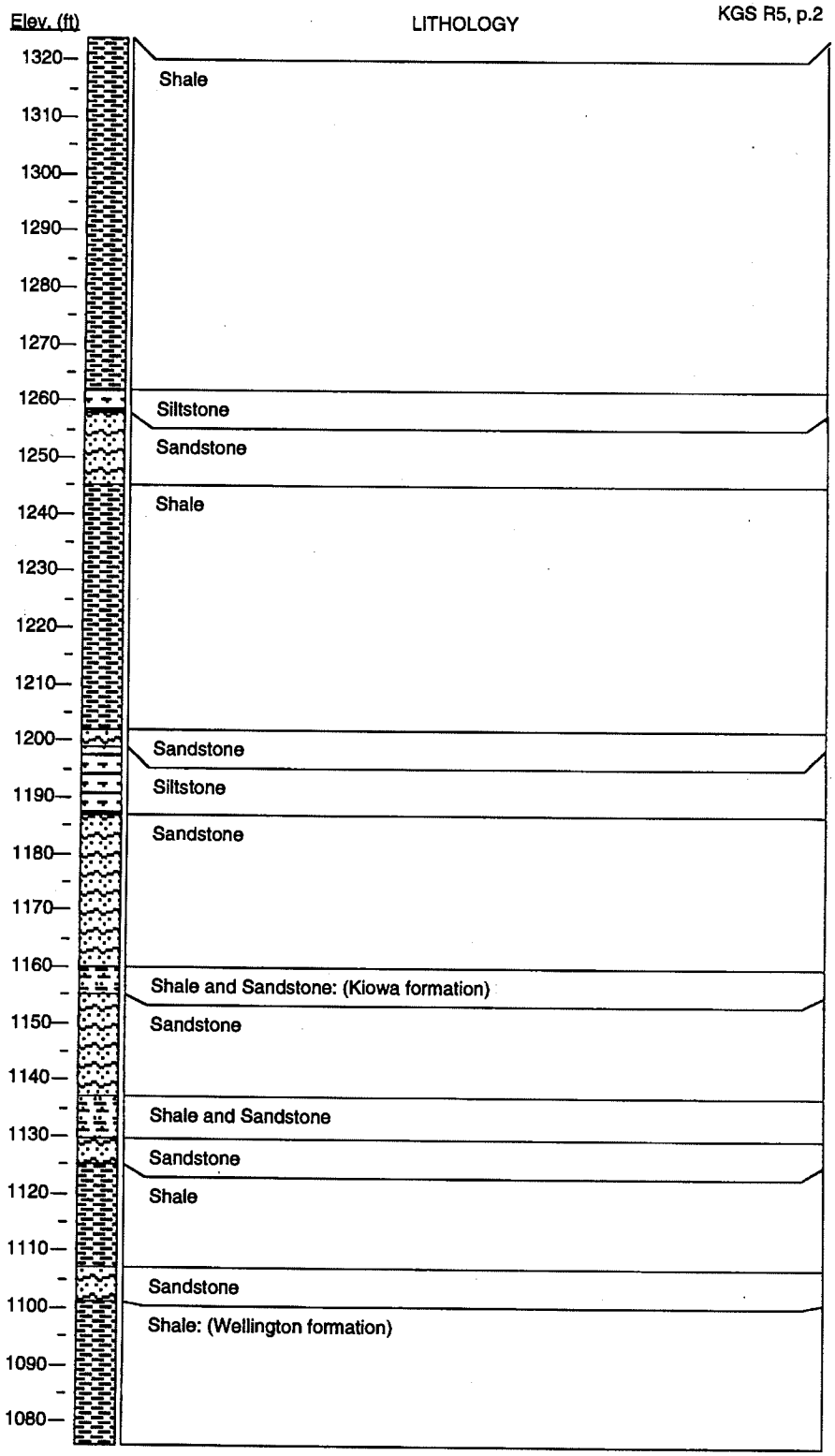


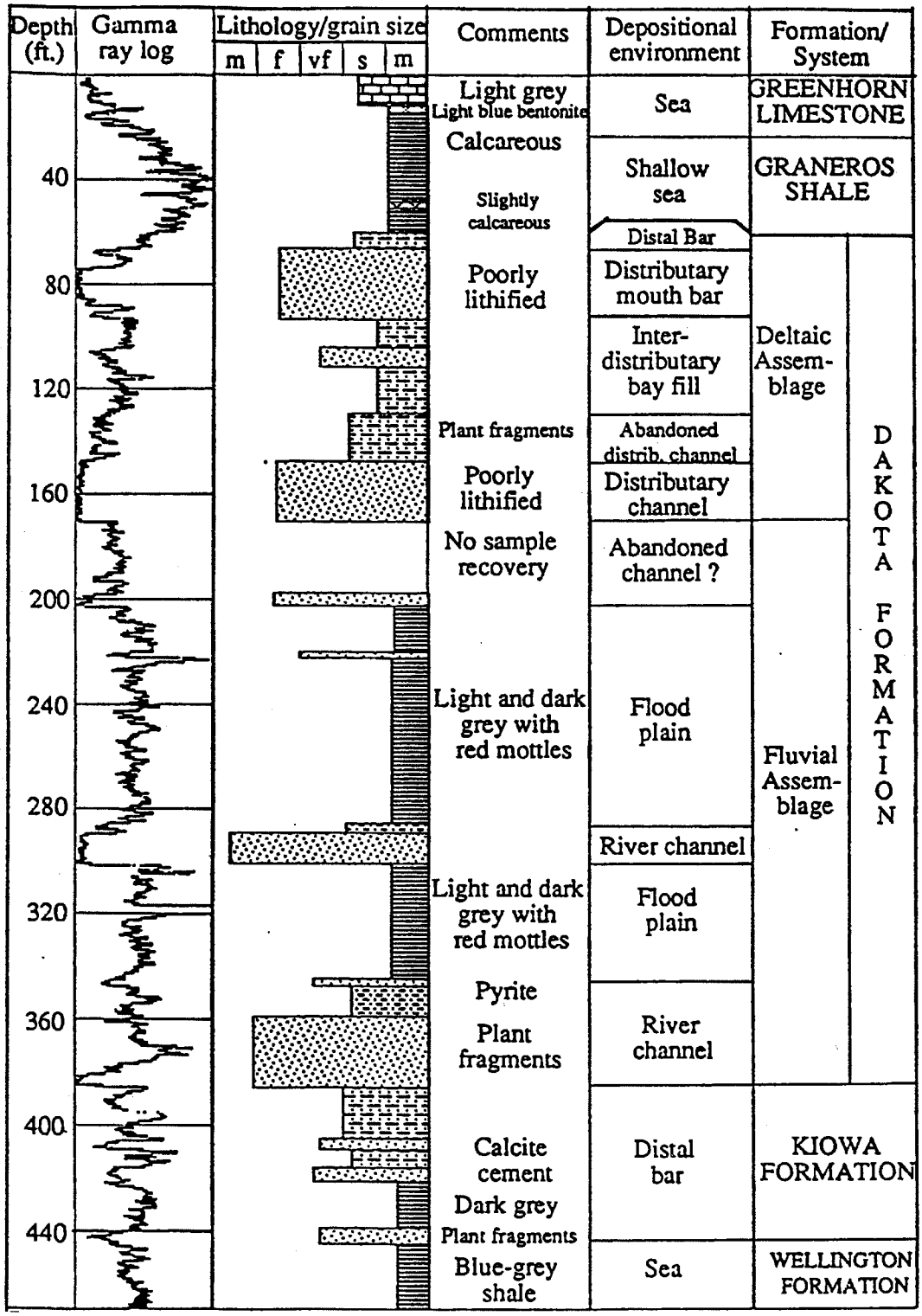
Log of test hole R1 (T4S, R4W, Section 24DD), showing lithologies and interpretations of depositional environments. Lithologic types are from the core description. The grain size scale ranges from mud on the right to medium-grained sand on the left. Land surface elevation is 1,506 ft.

Kansas Geological Survey		Soil Boring ID: KGS R5 Log Type: Soil Boring	
Project: DAKOTA	Ground Elevation: 1546	Total Depth: 470	Driller: ----- Company: -----
Date: 4/90	Plot Date: 2/02/96	Geologist: Wade	Rig: Mud Rotary

LITHOLOGY

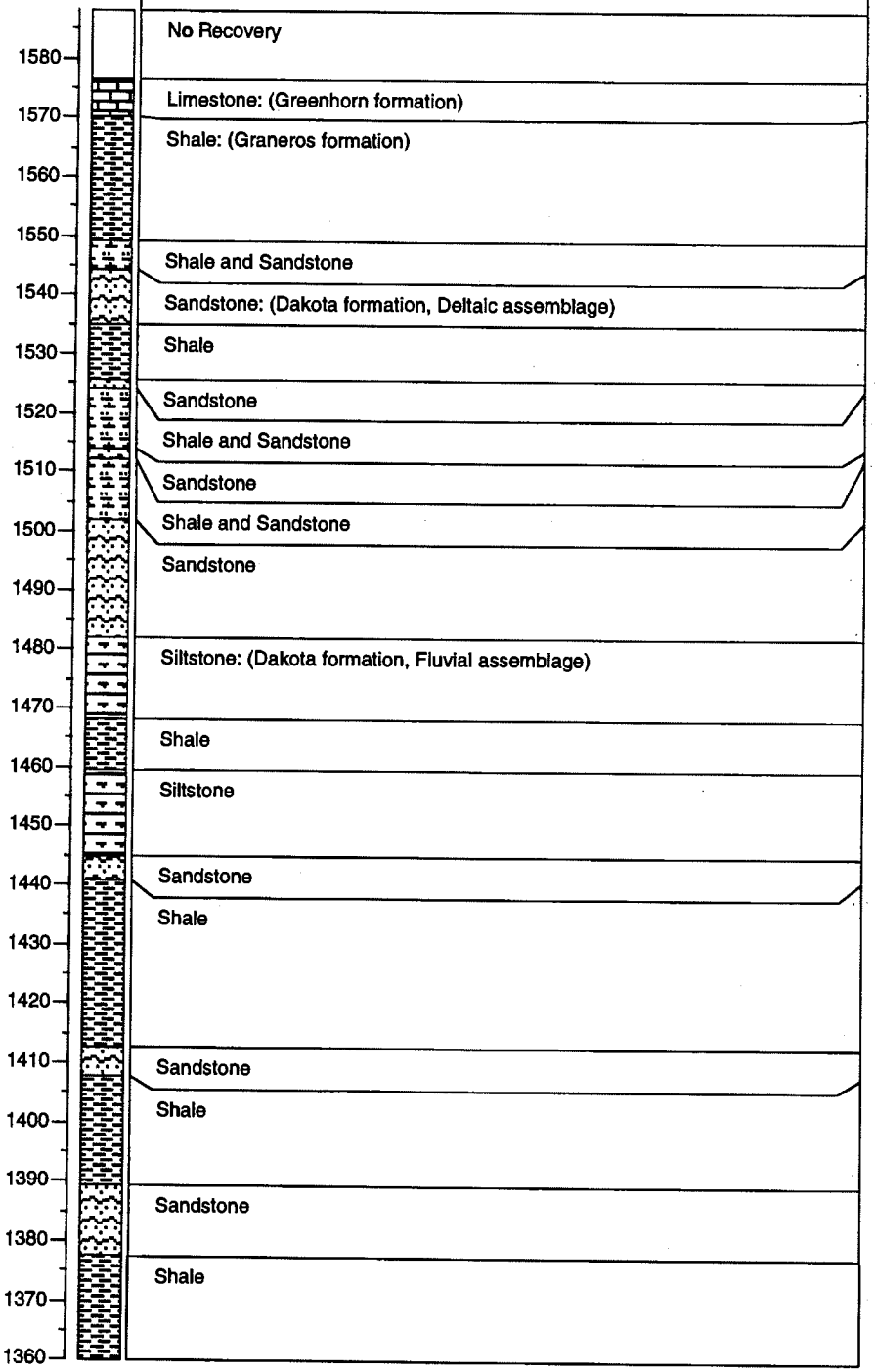
- Limestone: (Greenhorn formation)
- Bentonite
- Shale: (Graneros formation)
- Bentonite
- Shale
- Shale and Sandstone: (Dakota formation, Deltaic assemblage)
- Sandstone
- Shale and Sandstone
- Sandstone
- Shale and Sandstone
- Shale and Sandstone
- Sandstone
- No Recovery: (Dakota fromation, Fluvial assemblage)
- Sandstone
- Shale
- Sandstone

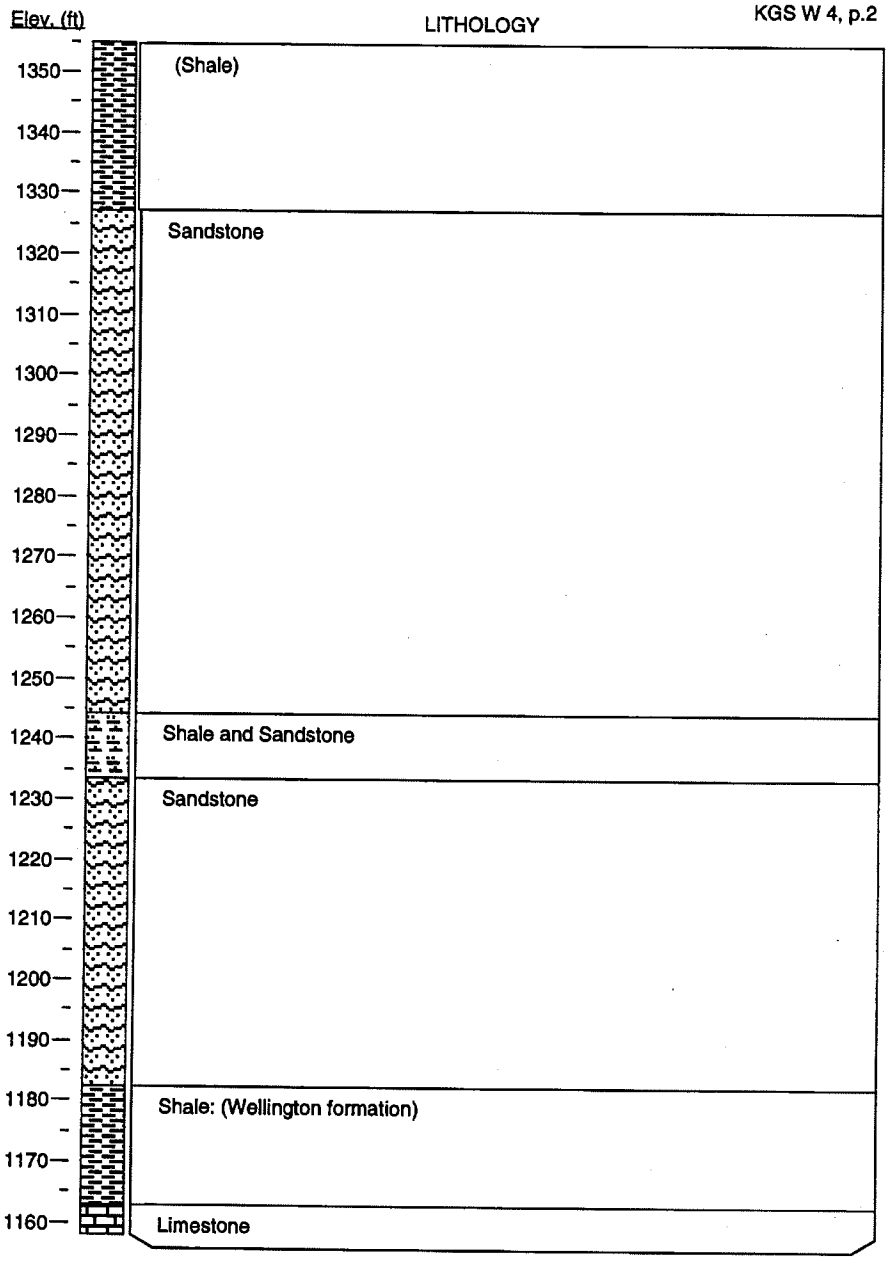

Elev. (ft)
LITHOLOGY
KGS R5, p.2
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
Shale
Siltstone
Sandstone
Shale
Sandstone
Siltstone
Sandstone
Shale and Sandstone: (Kiowa formation)
Sandstone
Shale and Sandstone
Sandstone
Shale
Sandstone
Shale: (Wellington formation)

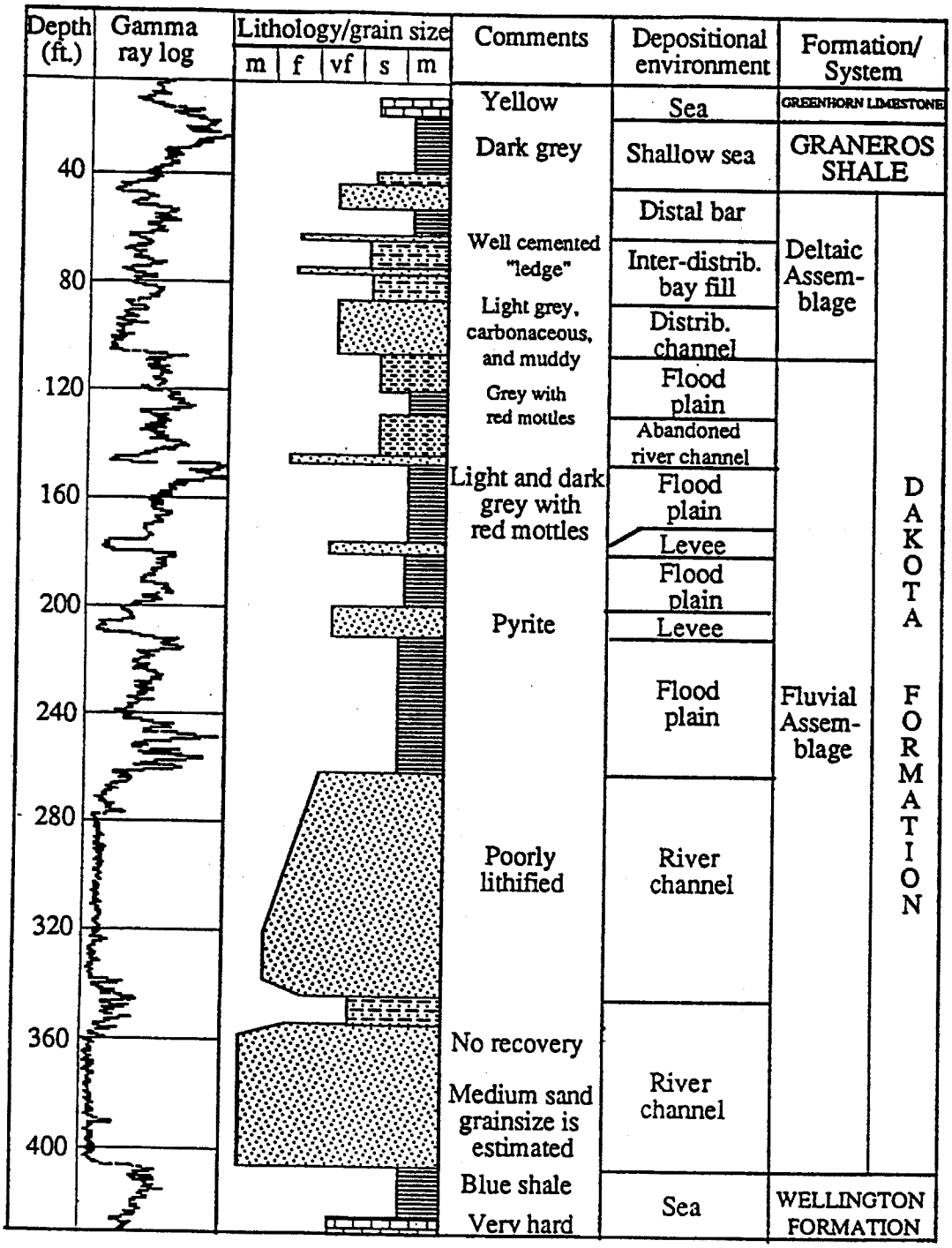


Log of test hole R5 (T4S, R2W, Section 12CDC), showing lithologies and interpretations of depositional environments. Lithologic types are from sample descriptions. The grain size scale ranges from mud on the right to medium-grained sand on the left. Symbols for lithologies are explained on the log for test hole R1. Land surface elevation is 1,546 ft.

Kansas Geological Survey		Soil Boring ID: KGS W4 Log Type: Soil Boring	
Project: DAKOTA	Ground Elevation: 1588	Total Depth: 430	Driller: ----- Company: -----
Date: 4/90	Plot Date: 2/02/96	Geologist: Wade	Rig: Mud Rotary




Elev. (ft)
LITHOLOGY
KGS W 4, p.2
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210
1200
1190
1180
1170
1160
(Shale)
Sandstone
Shale and Sandstone
Sandstone
Shale: (Wellington formation)
Limestone



Log of test hole W4 (T4S, R1E, Section 10BBB), showing lithologies and interpretations of depositional environments. Lithologic types are from sample descriptions. The grain size scale ranges from mud on the right to medium-grained sand on the left. Symbols for the lithologies are explained on the log for test hole R1. Land surface elevation is 1,588 ft.

Location of Borehole

FIELD BOREHOLE LOG

PRC Environmental Management, Inc.

Job No.	Client KDHE
Drilling Contractor	GSI
Drilling Method	Hollow Stem Auger
Surface Conditions	
Logged By 1. Tom Wiberg 2.	

Site/Subsite	
Borehole/Location Code	1-S
Surface Elevation	
Sheet	1 of 2
Date	6/16/94

MEDIA G/S/W	SAMPLER TYPE	BLOWS/6" SAMPLER	INCHES RECOVERED / INCHES DRIVEN	TIME	SAMPLE TAG NUMBER	ANALY Fld	ANALY Chm	DEPTH IN FEET	USCS SOIL TYPE	SOIL DESCRIPTION
								5		light brown - brown silty clay - clayey silt HNu = ppm
								10		Dark brown - chocolate brown silty clay - clayey silt HNu = ppm
	SS				13.5 - 15.0			15		med brown silty clay - clayey silt 5YR 4/4 HNu = ppm root traces, well bioturbated
	SS				18.5 - 20.0			20		same as above - moist, a few sandy globs/weathering 5YR 4/4 HNu = ppm
	SS				23.5 - 25.0			25		23' - change to tan, fine - med grained, well sorted, sub rounded quartz sand moist HNu = ppm
	SS				28.5 - 30.0			30		same as above HNu = ppm
	SS				33.5 - 35.0			35		same as above HNu = ppm
	SS				38.5 - 40.0			40		same as above moist - wet at 40' HNu = ppm
	SS				43.5 - 45.0			45		same as above - water at 43' HNu = ppm
	SS				48.5 - 50.0			50		same as above 10YR 6/6 at 49', orange-brown sandy w/c-vc-pebbley clasts of Dakota sandstone HNu = ppm

G = Gas S = Soil W = Water

Instructions on back.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

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FBG-1 (Rev. 10/92)

Location of Borehole

FIELD BOREHOLE LOG

PRC Environmental Management, Inc.

Job No.	Client KDHE
Drilling Contractor GSI	Site/Subsite
Drilling Method Hollow Stem Auger	Borehole/Location Code 1-S
Surface Conditions	Surface Elevation
	Sheet 2 of 2
Logged By 1. Tom Wiberg 2.	Date

MEDIA G/S/W	SAMPLER TYPE	BLOWS/6" SAMPLER	INCHES RECOVERED / INCHES DRIVEN	TIME	SAMPLE TAG NUMBER	ANALY Phy	ANALY Chm	DEPTH IN FEET	USCS SOIL TYPE	SOIL DESCRIPTION
	SS				53.5-55.0			50		Transition from orange-red sand to gray clayey, silty sand-
								55		gray sand lies directly on gray shale with carbonaceous material at 54 Feet.
								60		— Bottom of Hole at 54 Feet —
								3		
								4		
								5		
								6		
								7		
								8		
								9		
								0		

G = Gas S = Soil W = Water

Instructions on back.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

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PRC Environmental Management, Inc.

MONITORING WELL INSTALLATION RECORD

Borehole No. _____ Well No. 1-S
Site/ Subsite Agenda PWS
Well Permit No. _____
Recorded By Tom Wiberg
Date Well Installation Completed 6/21/94

MEASURING POINT
☒ TOP OF WELL CASING ☐ GROUND SURFACE
☐ TOP OF PROTECTIVE CASING ☐ _____

HEIGHT/DEPTH OF PROTECTIVE CASING
☒ ABOVE GROUND ☐ BELOW GROUND NA FT

HEIGHT/DEPTH OF WELL CASING
☒ ABOVE GROUND ☐ BELOW GROUND 2.6 FT

GROUND SURFACE ELEVATION ABOVE MEAN SEA LEVEL 1411.25 FT

0 DEPTH TO TOP OF GROUT

TYPE OF INSTALLATION
☐ FLUSH MOUNT INSTALLATION ☒ ABOVE GROUND INSTALLATION
TYPE _____
☐ TRAFFIC RATED ☒ PROTECTIVE POSTS INSTALLED
☐ WATERTIGHT SEAL
☐ WATERTIGHT WELL CAP

DRILLING INFORMATION
DRILLING COMPANY/PERSONNEL GSI
Steve + Cosie
DRILL RIG Mobil Rig
DRILLING METHOD ☒ HOLLOW STEM AUGER ☐ AIR ROTARY ☐ MUD/WATER ROTARY
DRILLING BEGAN DATE 6/16/94 TIME _____
DRILLING FINISHED DATE 6/16/94 TIME _____
DRILLING FLUID TYPE ☐ BENTONITE ☐ WATER ☐ POLYMER
DRILLING FLUID LOSS ☐ YES _____ GALS ☐ NO
WATER ADDED DURING INSTALLATION ☐ YES _____ GALS ☒ NO
TOTAL FLUID LOSS TO FORMATION: _____ GALS

CENTRALIZERS USED
☐ YES, AT _____
☐ STAINLESS STEEL
☐ OTHER
☒ NO

38 DEPTH TO TOP OF BENTONITE SEAL
— DEPTH TO TOP OF FINE SAND COLLAR
40 DEPTH TO TOP OF FILTER PACK
44 DEPTH TO TOP OF SCREEN
54 DEPTH TO BOTTOM OF SCREEN
— DEPTH TO BOTTOM OF CASING
54 DEPTH TO BOTTOM OF FILTER PACK
54 DEPTH TO BOTTOM OF BOREHOLE

LOCKABLE COVER
VENTED CAP (WATERTIGHT CAP FOR FLUSHMOUNT)

GROUND SURFACE ELEVATION
SURVEYED ☒ YES ☐ NO

TYPE OF PROTECTIVE CASING
☒ STEEL ☐ _____
☐ SIZE _____

SURFACE SEAL
☐ NON-SHRINKING CEMENT ☒ NA
☐ CONCRETE ☐ CHECKED FOR SETTLEMENT
☐ INTERNAL MORTER ADDED

GROUT
☐ GROUT FORMULA (INDICATE QUANTITY OF EACH)
CEMENT _____ BENTONITE _____
WATER _____ OTHER _____
☒ PREPARED MIX
NAME OF PRODUCT Enviroplug grout
MANUFACTURED BY Wyo-Ben
QUANTITY USED (WEIGHT) 3 bags

TYPE OF CASING
☐ STAINLESS STEEL
☒ SCHEDULE 40 PVC
☐ SCHEDULE 80 PVC
☐ _____
CASING DIAMETER: INSIDE 2-inch OUTSIDE _____
CASING MANUFACTURED BY NA

BENTONITE SEAL
☒ PELLETS chips ☐ SLURRY
☐ SLEEVES ☐ POWDER/GRANULAR
☐ NOT USED ☐ _____
QUANITY USED NA

FINE SAND COLLAR (OPTIONAL)
SIZE/TYPE Not used

FILTER PACK
☐ GRAVEL, SIZE: _____ DEPTH: ___ TO ___ FT.
☒ SAND, SIZE: 2c-4c DEPTH: 54 TO 40 FT.
☐ FORMATION COLLAPSE, DEPTH: ___ TO ___ FT.
MATERIAL _____
QUANTITY USED 4 bags METHOD INSTALLED ☐ TREMIE ☒ POURED

GRAIN SIZE TESTS FOR FILTER PACK
☐ CONDUCTED; FOR REPORT, REFER TO: _____
☒ NOT CONDUCTED

TYPE OF SCREEN
☐ STAINLESS STEEL ☒ SCHEDULE 40 PVC
☐ SCHEDULE 80 PVC ☐ _____
SLOT SIZE 10 MANUFACTURED BY NA
SCREEN DIAMETER INSIDE 2-inch OUTSIDE _____

BACKFILL MATERIAL
☐ GRAVEL ☐ FORMATION COLLAPSE; MATERIAL: _____
☐ BENTONITE
☐ SAND ☒ NA

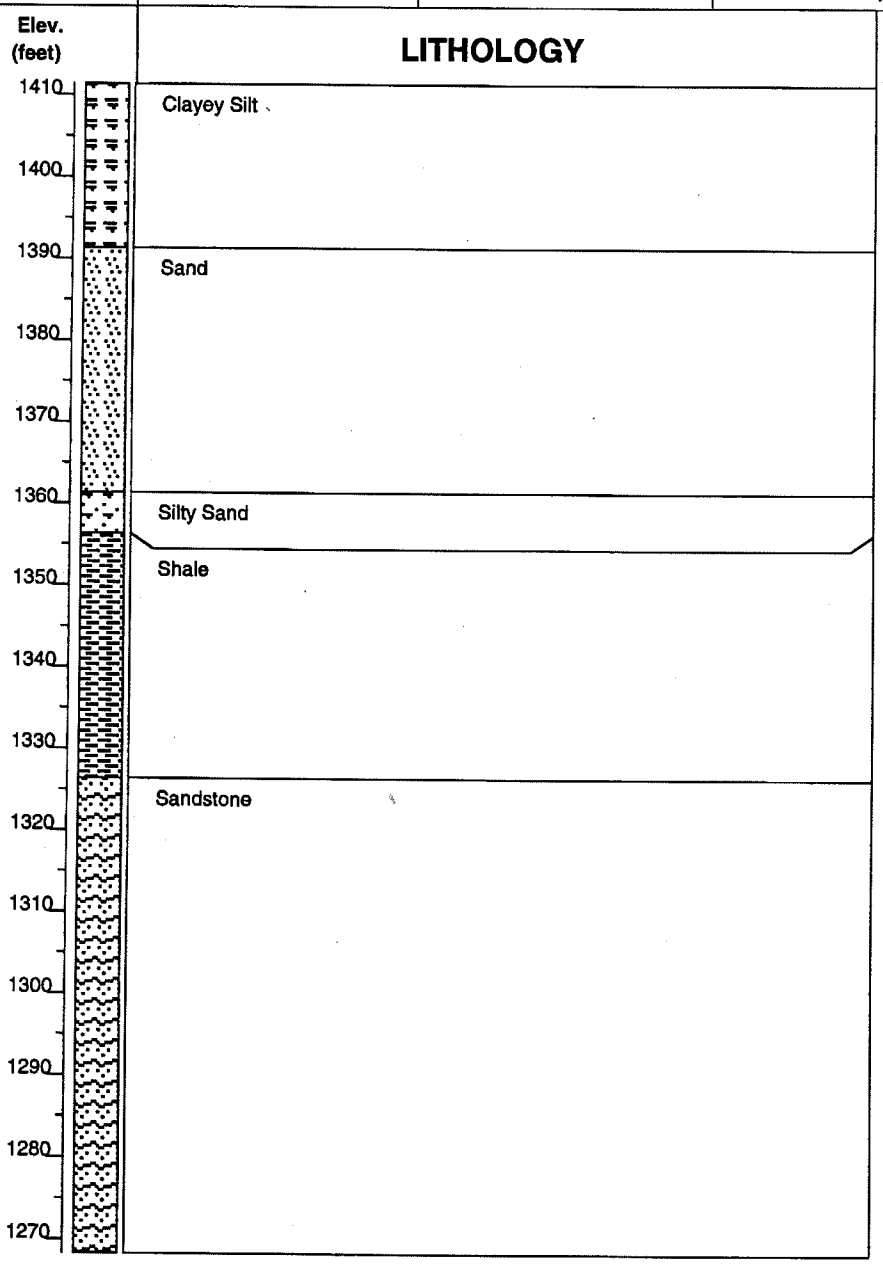
DIAMETER OF BOREHOLE 8.25 inches

NOTES
- Scale: none
- Record the fraction of a foot in decimal, not in inches.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

999-AGE001 MW-1.DRW 10/17/95
MW-1 (Rev. 10/95)

PRC Environmental Management, Inc./ KDHE		Soil Boring ID: MW 1D Log Type: Monitoring Well	
Project: AGENDA	Ground Elevation: 1411.25	Total Depth: 143	Driller: ----- Company: GSI
Date: 6/16/94	Plot Date: 1/29/96	Geologist: Wiberg	Rig: Mud Rotary



Location of Borehole

FIELD BOREHOLE LOG

PRC Environmental Management, Inc.

Job No. | Client KDHE

Drilling Contractor GSI

Drilling Method Hollow Stem Auger TO ≈ 90'
Mud Rotary TO ≈ 140'

Surface Conditions

Logged By 1. 2.

Site/Subsite

Borehole/Location Code 1-D

Surface Elevation

Sheet 1 of 2

Date 6/14-6/16 94

MEDIA G/A/W	SAMPLER TYPE	BLOWS/6" SAMPLER	INCHES RECOVERED / INCHES DRIVEN	TIME	SAMPLE TAG NUMBER	ANALY Phy	ANALY Chm	DEPTH IN FEET	USCS SOIL TYPE	SOIL DESCRIPTION
								50		*For 0 to 55 Feet, See log For 1-S
								55'		gray shale
								60'		gray shale
								65'		gray shale
								70'		gray shale
								75'		gray shale
								80'		gray shale
								85'		Sandstone encountered at 85'
								90'		Fine-medium, well sorted, subrounded quartz sandstone lightbrown-brown
								95'		same as above
								100		Same as above

G = Gas S = Soil W = Water

Instructions on back.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

999-AGEO01 FBG-1.DRW 10/17/02
FBG-1 (Rev. 10/92)

Location of Borehole

FIELD BOREHOLE LOG

PRC Environmental Management, Inc.

Job No.	Client EDITE
Drilling Contractor USI	Site/Subsite
Drilling Method	Borehole/Location Code 1-D
	Surface Elevation
Surface Conditions	Sheet 2 of 2
Logged By 1. Tom Wiberg 2.	Date

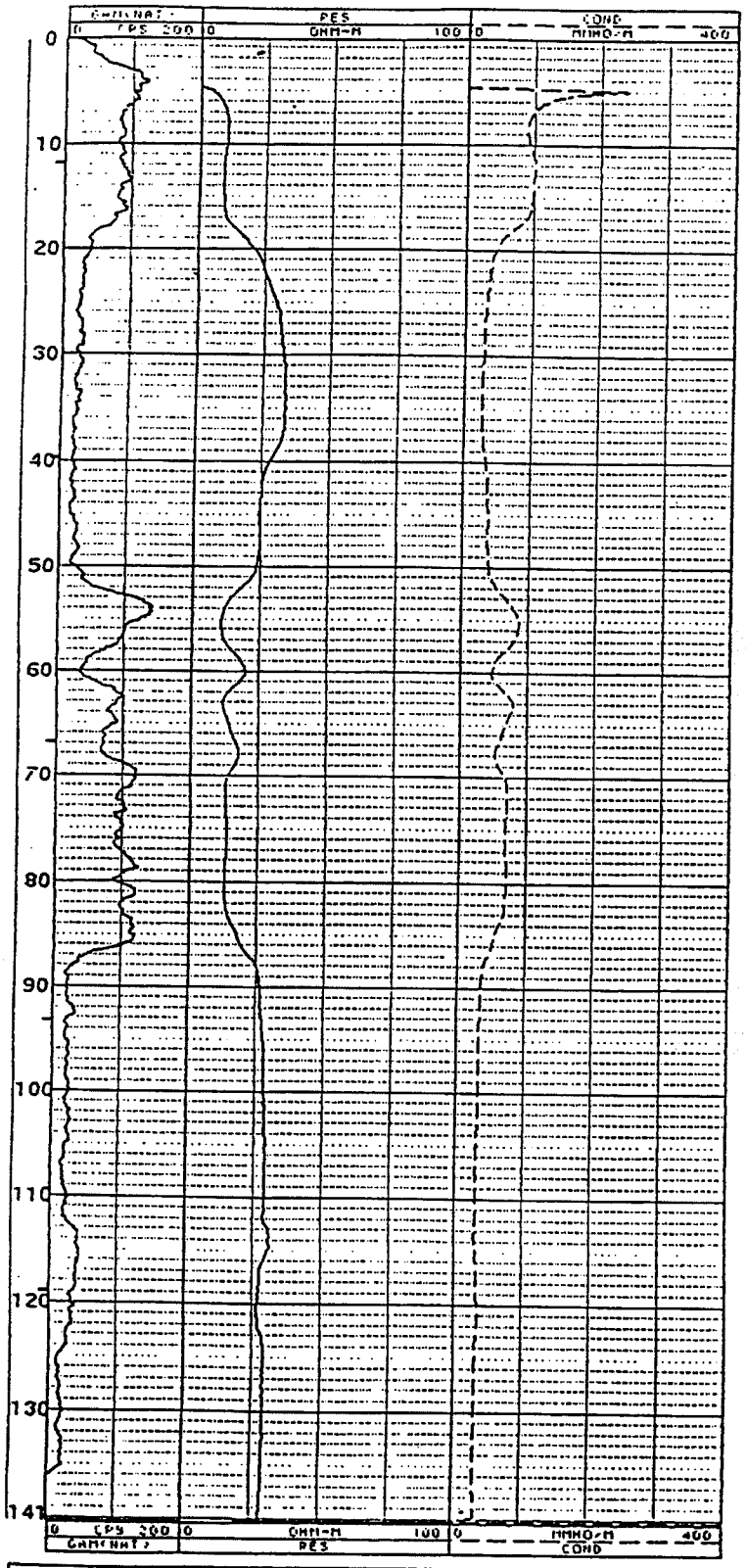
MEDIA G/S/W	SAMPLER TYPE	BLOWOUT SAMPLER	INCHES RECOVERED / INCHES DRIVEN	TIME	SAMPLE TAG NUMBER	ANALY Hy	ANALY Chm	DEPTH IN FEET	USCS SOIL TYPE	SOIL DESCRIPTION
								100		light brown-brown fine-med. grained, well sorted,
								105 A		subrounded quartz sandstone
								110 A		same as above
								115 A		same as above
								120 A		same as above
								125 A		same as above
								130 A		same as above
								135 A		same as above
								140 A		same as above
								145 A		same as above — Bottom of Hole at 143 feet —
								150		

G = Gas S = Soil W = Water

Instructions on back.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

999-AGE001 FBG-1.DRW 10/17/92
FBG-1 (Rev. 10/92)



MW-1D

TOOL CALIBRATION TOOL # 9510C SERIAL NUMBER # 758

	CAL-DATE	CAL-TIME	SRCE	SENSOR	RESPONSE	STANDARD	
3	FEB15-93	09:38:50	3	GAMMA RAY	3.000 CPS	3.000	*

PRC

PRC Environmental Management, Inc.

MONITORING WELL INSTALLATION RECORD

Borehole No. _____ Well No. 1-D
Site/ Subsite Agenda PWS
Well Permit No. _____
Recorded By Tom Wiberg
Date Well Installation Completed 6/21/94

MEASURING POINT
☒ TOP OF WELL CASING ☐ GROUND SURFACE
☐ TOP OF PROTECTIVE CASING ☐ _____

HEIGHT/DEPTH OF PROTECTIVE CASING
☒ ABOVE GROUND ☐ BELOW GROUND N/A FT

HEIGHT/DEPTH OF WELL CASING
☒ ABOVE GROUND ☐ BELOW GROUND 3.09 FT

GROUND SURFACE ELEVATION ABOVE MEAN SEA LEVEL 140.92 FT

0 DEPTH TO TOP OF GROUT

TYPE OF INSTALLATION
☐ FLUSH MOUNT INSTALLATION ☒ ABOVE GROUND INSTALLATION
TYPE _____
☐ TRAFFIC RATED ☒ PROTECTIVE POSTS INSTALLED
☐ WATERTIGHT SEAL
☐ WATERTIGHT WELL CAP

DRILLING INFORMATION
DRILLING COMPANY/PERSONNEL GSI
Doug and Dana
DRILL RIG Mobil Rig
DRILLING METHOD
☐ HOLLOW STEM AUGER
☐ AIR ROTARY
☒ MUD/WATER ROTARY
DRILLING BEGAN DATE 6/14/94 TIME _____
DRILLING FINISHED DATE 6/16/94 TIME _____
DRILLING FLUID TYPE
☐ BENTONITE
☒ WATER
☐ POLYMER
DRILLING FLUID LOSS
☐ YES _____ GALS
☐ NO
WATER ADDED DURING INSTALLATION
☐ YES _____ GALS
☐ NO
TOTAL FLUID LOSS TO FORMATION: _____ GALS

CENTRALIZERS USED
☐ YES, AT _____
☐ STAINLESS STEEL
☐ OTHER
☒ NO

119 DEPTH TO TOP OF BENTONITE SEAL
— DEPTH TO TOP OF FINE SAND COLLAR
126 DEPTH TO TOP OF FILTER PACK
130 DEPTH TO TOP OF SCREEN
140 DEPTH TO BOTTOM OF SCREEN
— DEPTH TO BOTTOM OF CASING
141 DEPTH TO BOTTOM OF FILTER PACK
143 DEPTH TO BOTTOM OF BOREHOLE

LOCKABLE COVER
VENTED CAP (WATERTIGHT CAP FOR FLUSHMOUNT)

GROUND SURFACE ELEVATION
SURVEYED ☒ YES ☐ NO

TYPE OF PROTECTIVE CASING
☒ STEEL ☐ _____
☐ SIZE _____

SURFACE SEAL
☐ NON-SHRINKING CEMENT ☒ NA
☐ CONCRETE ☐ CHECKED FOR SETTLEMENT
☐ INTERNAL MORTER ADDED

GROUT
☐ GROUT FORMULA (INDICATE QUANTITY OF EACH)
CEMENT _____ BENTONITE _____
WATER _____ OTHER _____
☒ PREPARED MIX
NAME OF PRODUCT Envirp plug grout
MANUFACTURED BY Wyo-Ben
QUANTITY USED (WEIGHT) 12 bags

TYPE OF CASING
☐ STAINLESS STEEL
☒ SCHEDULE 40 PVC
☐ SCHEDULE 80 PVC
☐ _____
CASING MANUFACTURED BY NA

CASING DIAMETER:
INSIDE 4-inch
OUTSIDE _____

BENTONITE SEAL
☒ PELLETS Chips ☐ SLURRY
☐ SLEEVES ☐ POWDER/GRANULAR
☐ NOT USED ☐ _____
QUANITY USED 2bags

FINE SAND COLLAR (OPTIONAL)
SIZE/TYPE Not used

FILTER PACK
☐ GRAVEL, SIZE: _____ DEPTH: ___ TO ___ FT.
☒ SAND, SIZE: 20-40 DEPTH: 141 TO 126 FT.
☐ FORMATION COLLAPSE, DEPTH: ___ TO ___ FT.
MATERIAL _____
QUANTITY USED 7 bags
METHOD INSTALLED
☐ TREMIE
☒ POURED

GRAIN SIZE TESTS FOR FILTER PACK
☐ CONDUCTED; FOR REPORT, REFER TO: _____
☒ NOT CONDUCTED

TYPE OF SCREEN
☐ STAINLESS STEEL ☒ SCHEDULE 40 PVC
☐ SCHEDULE 80 PVC ☐ _____
SLOT SIZE 10 MANUFACTURED BY NA
SCREEN DIAMETER
INSIDE 4-inch
OUTSIDE _____

BACKFILL MATERIAL
☐ GRAVEL ☐ FORMATION COLLAPSE; MATERIAL: _____
☒ BENTONITE
☐ SAND ☐ 2 bags

DIAMETER OF BOREHOLE 9 inches

NOTES
- Scale: none
- Record the fraction of a foot in decimal, not in inches.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

Location of Borehole

FIELD BOREHOLE LOG

PRC Environmental Management, Inc.

Job No.	Client EDHE
Drilling Contractor GSI	Site/Subsite
Drilling Method mud Rotary	Borehole/Location Code 2-5
	Surface Elevation
Surface Conditions	Sheet 1 of 1
Logged By 1. Tom Wibera 2.	Date 6/21/94

MEDIA G/S/W	SAMPLER TYPE	BLOWS/6" SAMPLER	INCHES RECOVERED / INCHES DRIVEN	TIME	SAMPLE TAG NUMBER	ANALY Rfy	ANALY Chm	DEPTH IN FEET	USCS SOIL TYPE	SOIL DESCRIPTION
										For log of 2-5, see log for 2-D.
								1		-Bottom of Hole at 63 feet-
								2		
								3		
								4		
								5		
								6		
								7		
								8		
								9		
								0		

G = Gas S = Soil W = Water

Instructions on back.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

999-AGEO01 FBG-1.DRW 10/17/92
FBG-1 (Rev. 10/92)

PRC Environmental Management, Inc.

MONITORING WELL INSTALLATION RECORD

Borehole No. _____ Well No. 2-S
Site/ Subsite Agenda DWS
Well Permit No. _____
Recorded By Tom Wiberg
Date Well Installation Completed 6/22/94

MEASURING POINT
☒ TOP OF WELL CASING ☐ GROUND SURFACE
☐ TOP OF PROTECTIVE CASING

HEIGHT/DEPTH OF PROTECTIVE CASING
☐ ABOVE GROUND ☐ BELOW GROUND NA FT

HEIGHT/DEPTH OF WELL CASING
☐ ABOVE GROUND ☒ BELOW GROUND 0.28 FT

GROUND SURFACE ELEVATION ABOVE MEAN SEA LEVEL 412.42 FT

0 DEPTH TO TOP OF GROUT

TYPE OF INSTALLATION
☒ FLUSH MOUNT INSTALLATION ☐ ABOVE GROUND INSTALLATION
TYPE _____
☐ TRAFFIC RATED ☐ PROTECTIVE POSTS INSTALLED
☐ WATERTIGHT SEAL
☐ WATERTIGHT WELL CAP

DRILLING INFORMATION
DRILLING COMPANY/PERSONNEL GSI
Doug and Dana
DRILL RIG Mobil Rig
DRILLING METHOD
☐ HOLLOW STEM AUGER
☐ AIR ROTARY
☒ MUD/WATER ROTARY
DRILLING BEGAN DATE 06/20/94 TIME _____
DRILLING FINISHED DATE 06/21/94 TIME _____
DRILLING FLUID TYPE
☐ BENTONITE
☒ WATER
☐ POLYMER
DRILLING FLUID LOSS ☐ YES _____ GALS ☐ NO
WATER ADDED DURING INSTALLATION ☐ YES _____ GALS ☐ NO
TOTAL FLUID LOSS TO FORMATION: _____ GALS

CENTRALIZERS USED
☐ YES, AT _____
☐ STAINLESS STEEL
☐ OTHER
☒ NO

42 DEPTH TO TOP OF BENTONITE SEAL
— DEPTH TO TOP OF FINE SAND COLLAR
45 DEPTH TO TOP OF FILTER PACK
49 DEPTH TO TOP OF SCREEN
59 DEPTH TO BOTTOM OF SCREEN
— DEPTH TO BOTTOM OF CASING
60 DEPTH TO BOTTOM OF FILTER PACK
63 DEPTH TO BOTTOM OF BOREHOLE

LOCKABLE COVER
VENTED CAP (WATERTIGHT CAP FOR FLUSHMOUNT)

GROUND SURFACE ELEVATION
SURVEYED ☒ YES ☐ NO

TYPE OF PROTECTIVE CASING
☒ STEEL ☐ _____
☐ SIZE _____

SURFACE SEAL
☐ NON-SHRINKING CEMENT ☒ NA
☐ CONCRETE ☐ CHECKED FOR SETTLEMENT
☐ INTERNAL MORTER ADDED

GROUT
☐ GROUT FORMULA (INDICATE QUANTITY OF EACH)
CEMENT _____ BENTONITE _____
WATER _____ OTHER _____
☒ PREPARED MIX
NAME OF PRODUCT Enviroplug grout
MANUFACTURED BY Wyo-Ben
QUANTITY USED (WEIGHT) 3 bags

TYPE OF CASING
☐ STAINLESS STEEL
☒ SCHEDULE 40 PVC
☐ SCHEDULE 80 PVC
☐ _____
CASING DIAMETER: INSIDE 5-inch OUTSIDE _____
CASING MANUFACTURED BY NA

BENTONITE SEAL
☒ PELLETS chips ☐ SLURRY
☐ SLEEVES ☐ POWDER/GRANULAR
☐ NOT USED ☐ _____
QUANITY USED TLW 24 bags

FINE SAND COLLAR (OPTIONAL)
SIZE/TYPE _____

FILTER PACK
☐ GRAVEL, SIZE: _____ DEPTH: ___ TO ___ FT.
☒ SAND, SIZE: 20-40 DEPTH: 60 TO 45 FT.
☐ FORMATION COLLAPSE, DEPTH: ___ TO ___ FT.
MATERIAL _____
QUANTITY USED 12 bags
METHOD INSTALLED ☐ TREMIE ☒ POURED

GRAIN SIZE TESTS FOR FILTER PACK
☐ CONDUCTED; FOR REPORT, REFER TO: _____
☒ NOT CONDUCTED

TYPE OF SCREEN
☐ STAINLESS STEEL ☒ SCHEDULE 40 PVC
☐ SCHEDULE 80 PVC ☐ _____
SLOT SIZE 10 MANUFACTURED BY _____
SCREEN DIAMETER INSIDE 5-inch OUTSIDE _____

BACKFILL MATERIAL
☐ GRAVEL ☐ FORMATION COLLAPSE; MATERIAL: _____
☒ BENTONITE TLW
☐ SAND ☐ 43 bags

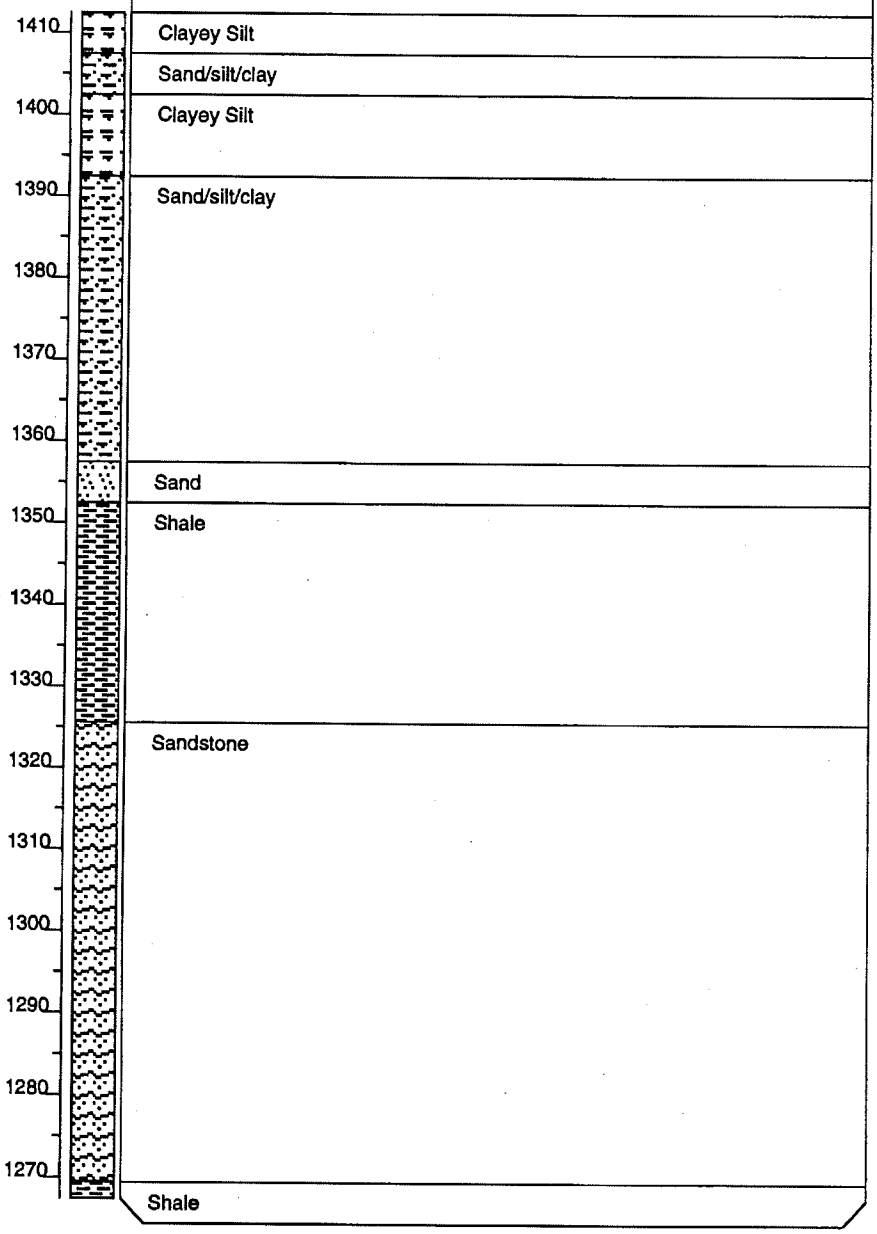
DIAMETER OF BOREHOLE 12 inches

NOTES
- Scale: none
- Record the fraction of a foot in decimal, not in inches.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

929-AGE001 MW-1.DRW 10/17/92

PRC Environmental Management, Inc./ KDHE		Soil Boring ID: MW 2D Log Type: Monitoring Well	
Project: AGENDA	**Ground Elevation:** 1412.53	**Total Depth:** 145	**Driller:** ----- **Company:** GSI
Date: 6/16/94	**Plot Date:** 1/29/96	**Geologist:** Wiberg	**Rig:** Mud Rotary



Location of Borehole

FIELD BOREHOLE LOG

PRC Environmental Management, Inc.

Job No.	Client KDHE
Drilling Contractor	GSI
Drilling Method	mud ROTary
Surface Conditions	
Logged By 1. Tom Wibery 2.	

Site/Subsite	
Borehole/Location Code	2-D
Surface Elevation	
Sheet	1 of 3
Date	6/14 - 6/16 94

MEDIA G/S/W	SAMPLER TYPE	BLOWS/6" SAMPLER	INCHES RECOVERED / INCHES DRIVEN	TIME	SAMPLE TAG NUMBER	ANALY PID	ANALY OVM	DEPTH IN FEET	USCS SOIL TYPE	SOIL DESCRIPTION
										Brown-Dark brown silty clay-clayey silt HNU=ppm
								5		AT 4', change to light brown silt clay-clayey silt
								10		AT 7', change to Dark-chocolate brown clayey silt, 10YR 4/2 very fine sandy, clayey silt
								15		AT 11', change to red-brown clayey silt 10YR 5/4
								20		Same as above
								25		Same as above, with minor very Fine-Fine Sand 10YR 5/4
								30		Same as above 10YR 5/4
								35		Same as above 10YR 5/4
								40		Same as above 10YR 5/4
								45		Same as above 10YR 5/4
								50		Same as above - Sandy zone From 46-47 Feet 10YR 5/4

G = Gas S = Soil W = Water

Instructions on back.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

999-AGEC01 FBG-1.DRW 10/17/92
FBG-1 (Rev. 10/92)

Location of Borehole

FIELD BOREHOLE LOG

PRC Environmental Management, Inc.

Job No.	Client KDHE
Drilling Contractor	GSI
Drilling Method	mud ROTARY
Surface Conditions	
Logged By 1. Tom Wiberg 2.	
Site/Subsite	
Borehole/Location Code	2-D
Surface Elevation	
Sheet	2 of 3
Date	

MEDIA G/S/W	SAMPLER TYPE	BLOWS/6" SAMPLER	INCHES RECOVERED / INCHES DRIVEN	TIME	SAMPLE TAG NUMBER	ANALY Fld	ANALY Chm	DEPTH IN FEET	USCS SOIL TYPE	SOIL DESCRIPTION
								50		Fine-med grained sand interbedded with red-brown clayey silt
								55		AT 56 Feet, f-VC, poorly sorted, subangular sand with weathered K-spar(?) clasts
								60		59' gray shale with deep red mottles
								65		gray shale
								70		gray shale
								75		gray shale
								80		gray shale
								85		gray shale
								90		AT 87', change to brown, fine-med grained, well sorted, subrounded quartz sandstone
								95		Same as above
								100		Same as above

G = Gas S = Soil W = Water

Instructions on back.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

999-AGE001 FBG-1.DRW 10/17/02
FBG-1 (Rev. 10/92)

Location of Borehole

FIELD BOREHOLE LOG

PRC Environmental Management, Inc.

Job No.	Client ICD II E
Drilling Contractor	GSI
Drilling Method	mud Rotary
Surface Conditions	
Logged By 1. Tom Wiberg 2.	

Site/Subsite

Borehole/Location Code 2-D

Surface Elevation

Sheet 3 of 3

Date

MEDIA G/S/W	SAMPLER TYPE	BLOWS/6" SAMPLER	INCHES RECOVERED / INCHES DRIVEN	TIME	SAMPLE TAG NUMBER	ANALY PID	ANALY OVM	DEPTH IN FEET	USCS SOIL TYPE	SOIL DESCRIPTION
								100		Fine-med grained, well sorted, sub rounded quartz sandstone.
								105		
								110		Same as above
								115		Same as above
								120		Same as above
								125		Same as above
								130		Same as above
								135		Same as above
								140		Same as above
								145		Same as above 141' change to c.vf sandstone, less quartz, more lithics
								150		145' change to gray shale
										— Bottom of Hole at 145 Feet —

G = Gas S = Soil W = Water

Instructions on back.

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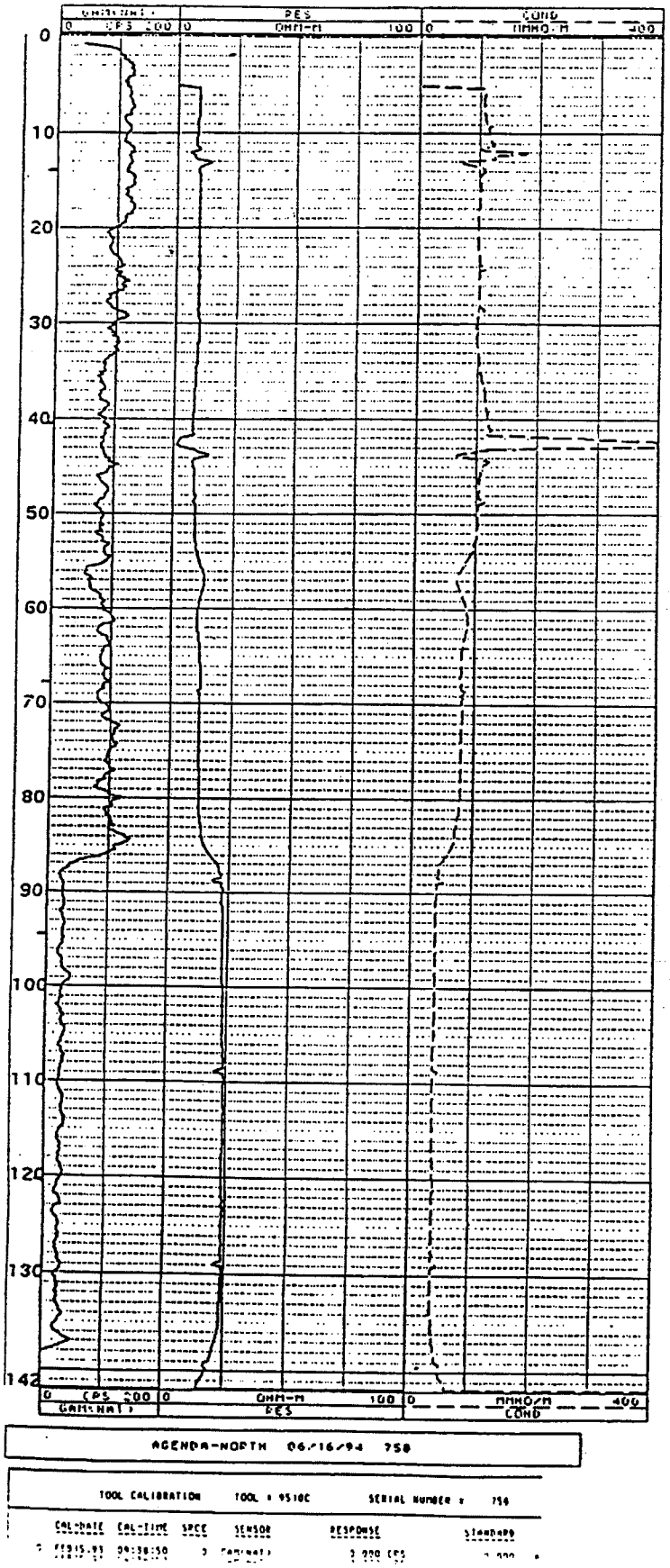
999-AGEO01 FBG-1.DRW 10/17/92
FBG-1 (Rev. 10/92)


RES
COND
0
CPS 200
OHM-M 100
MMHO/M 400
10
20
30
40
50
60
70
80
90
100
110
120
130
142
AGENDA-NORTH 06/16/94 758
TOOL CALIBRATION
TOOL = 9510C
SERIAL NUMBER = 758
CAL-DATE
CAL-TIME
SRCE
SENSOR
RESPONSE
standard

MW-2D

PRC

PRC Environmental Management, Inc.

MONITORING WELL INSTALLATION RECORD

Borehole No. _____ Well No. 2-D
Site/ Subsite Agenda DWS
Well Permit No. _____
Recorded By Tom Wiberg
Date Well Installation Completed 6/22/94

MEASURING POINT
☒ TOP OF WELL CASING ☐ GROUND SURFACE
☐ TOP OF PROTECTIVE CASING ☐ _____

HEIGHT/DEPTH OF PROTECTIVE CASING
☐ ABOVE GROUND ☐ BELOW GROUND NA FT

HEIGHT/DEPTH OF WELL CASING
☐ ABOVE GROUND ☒ BELOW GROUND 0.22 FT

GROUND SURFACE ELEVATION ABOVE MEAN SEA LEVEL 142.53 FT

0 DEPTH TO TOP OF GROUT

TYPE OF INSTALLATION
☒ FLUSH MOUNT INSTALLATION ☐ ABOVE GROUND INSTALLATION
TYPE _____
☐ TRAFFIC RATED ☐ PROTECTIVE POSTS INSTALLED
☐ WATERTIGHT SEAL
☐ WATERTIGHT WELL CAP

DRILLING INFORMATION
DRILLING COMPANY/PERSONNEL GSI
Doug and Dana
DRILL RIG _____
DRILLING METHOD
☐ HOLLOW STEM AUGER
☐ AIR ROTARY
☒ MUD/WATER ROTARY
DRILLING BEGAN DATE 6/14/94 TIME _____
DRILLING FINISHED DATE 6/15/94 TIME _____
DRILLING FLUID TYPE
☐ BENTONITE
☒ WATER
☐ POLYMER
DRILLING FLUID LOSS
☐ YES _____ GALS
☐ NO
WATER ADDED DURING INSTALLATION
☐ YES _____ GALS
☐ NO
TOTAL FLUID LOSS TO FORMATION: _____ GALS

CENTRALIZERS USED
☐ YES, AT _____
☐ STAINLESS STEEL
☐ OTHER
☒ NO

119 DEPTH TO TOP OF BENTONITE SEAL
_____ DEPTH TO TOP OF FINE SAND COLLAR
124 DEPTH TO TOP OF FILTER PACK
129 DEPTH TO TOP OF SCREEN
139 DEPTH TO BOTTOM OF SCREEN
_____ DEPTH TO BOTTOM OF CASING
140 DEPTH TO BOTTOM OF FILTER PACK
145 DEPTH TO BOTTOM OF BOREHOLE

LOCKABLE COVER
VENTED CAP (WATERTIGHT CAP FOR FLUSHMOUNT)

GROUND SURFACE ELEVATION
SURVEYED ☒ YES ☐ NO

TYPE OF PROTECTIVE CASING
☒ STEEL ☐ _____
☐ SIZE _____

SURFACE SEAL
☐ NON-SHRINKING CEMENT ☒ NA
☐ CONCRETE ☐ CHECKED FOR SETTLEMENT
☐ INTERNAL MORTER ADDED

GROUT
☐ GROUT FORMULA (INDICATE QUANTITY OF EACH)
CEMENT _____ BENTONITE _____
WATER _____ OTHER _____
☒ PREPARED MIX
NAME OF PRODUCT Envirosplug grout
MANUFACTURED BY Wyo-Ben
QUANTITY USED (WEIGHT) 6 bags

TYPE OF CASING
☐ STAINLESS STEEL
☒ SCHEDULE 40 PVC
☐ SCHEDULE 80 PVC
☐ _____
CASING DIAMETER:
INSIDE 5-inch
OUTSIDE _____
CASING MANUFACTURED BY NA

BENTONITE SEAL
☒ PELLETS & chips ☐ SLURRY
☐ SLEEVES ☐ POWDER/GRANULAR
☐ NOT USED ☐ _____
QUANITY USED 12½ bags TW

FINE SAND COLLAR (OPTIONAL)
SIZE/TYPE Not used

FILTER PACK
☐ GRAVEL, SIZE: _____ DEPTH: ___ TO ___ FT.
☒ SAND, SIZE: 2c-40 DEPTH: 140 TO 124 FT.
☐ FORMATION COLLAPSE, DEPTH: ___ TO ___ FT.
MATERIAL _____
QUANTITY USED 6½ bags TW
METHOD INSTALLED
☐ TREMIE
☒ POURED

GRAIN SIZE TESTS FOR FILTER PACK
☐ CONDUCTED; FOR REPORT, REFER TO: _____
☒ NOT CONDUCTED

TYPE OF SCREEN
☐ STAINLESS STEEL ☒ SCHEDULE 40 PVC
☐ SCHEDULE 80 PVC ☐ _____
SLOT SIZE 10 MANUFACTURED BY _____
SCREEN DIAMETER
INSIDE 5-inch
OUTSIDE _____

BACKFILL MATERIAL
☐ GRAVEL ☐ FORMATION COLLAPSE; MATERIAL: _____
☒ BENTONITE
☐ SAND ☐ 1 bag

DIAMETER OF BOREHOLE 9 inches

NOTES
- Scale: none
- Record the fraction of a foot in decimal, not in inches.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

929-AGED01 MW-1.DRW 10/1/92
MW-1 (Rev. 10/92)

Location of Borehole

FIELD BOREHOLE LOG

PRC Environmental Management, Inc.

Job No. | Client KDHE

Drilling Contractor GSI

Drilling Method Hollow Stem Auger

Surface Conditions

Logged By 1. Tom Wiberg 2.

Site/Subsite

Borehole/Location Code 3-5

Surface Elevation

Sheet 1 of 1

Date 6/16/94

MEDIA G/S/W	SAMPLER TYPE	BLOWS/6" SAMPLER	INCHES RECOVERED / INCHES DRIVEN	TIME	SAMPLE TAG NUMBER	ANALY Phy	ANALY Chm	DEPTH IN FEET	USCS SOIL TYPE	SOIL DESCRIPTION
										Very dark brown clayey silt, some v.f. sand moist 5YR 2/1
	SS				8.5-10.0			5		At 4', change to brown silty clay, clayey silt · root traces, moist 10YR 4/2
	SS				13.5-15.0			10		change to red-brown silty clay-clayey silt moist 10YR 5/4
	SS				18.5-20.0			15		Same as above 10YR 5/4
	SS				23.5-25.0			20		10YR 5/4 Same as above
	SS				28.5-30.0			25		same as above, but more dark zones around root traces and white, chalcrete-like zones also around root traces- probably thizocretions
	SS				33.5-35.0			30		Same as above
	SS				38.5-40.0			35		Same as above
	SS				43.5-45.0			40		loss in larger concretions, now appear more as coatings around root tubules, At 44', change to red-brown silty, very fine sand moist-wet
	SS				48.5-50.0			45		At 48' change to gray shale
								50		- Bottom of Hole at 48.5 feet -

G = Gas S = Soil W = Water

Instructions on back.

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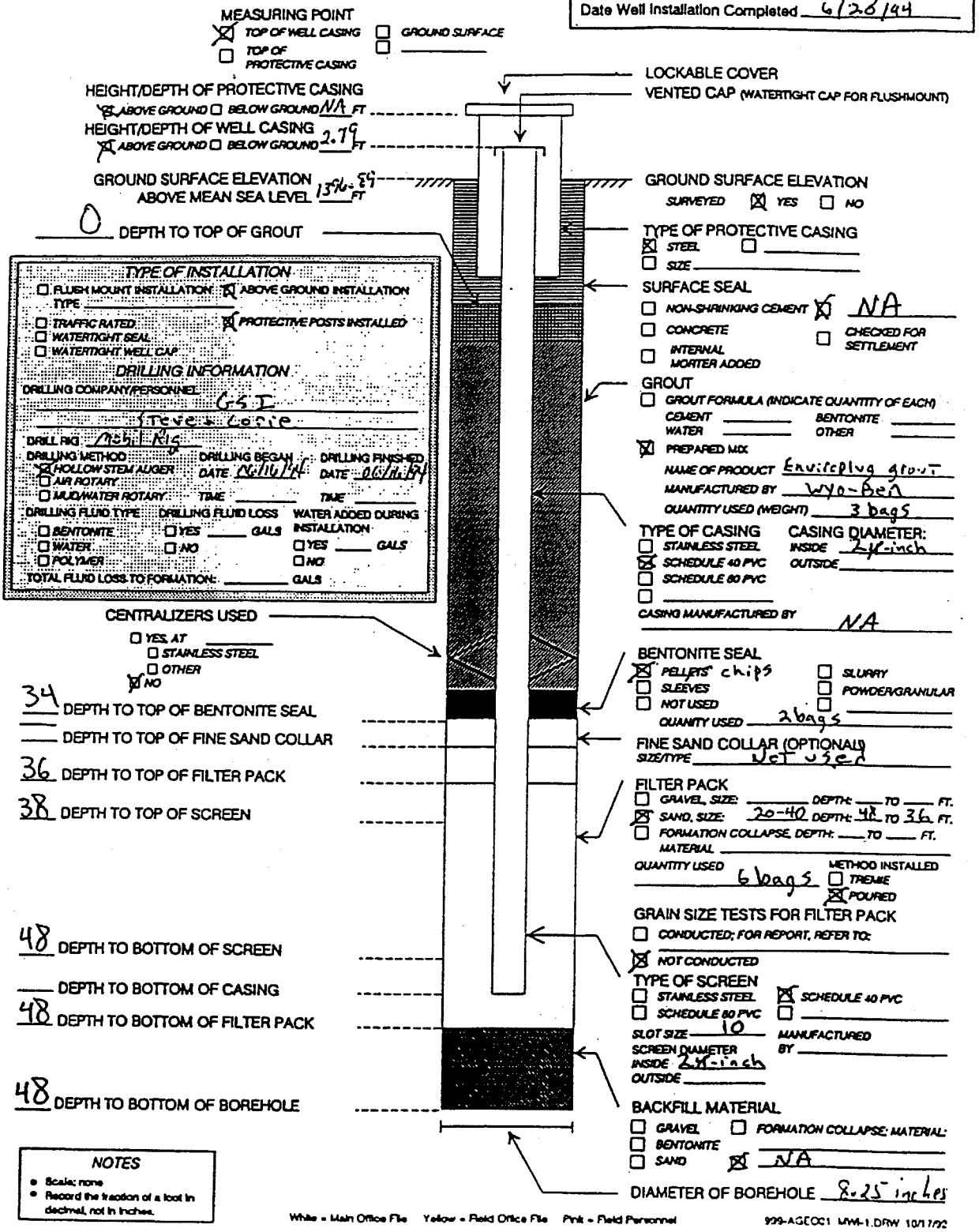
999-AGEO01 FBG-1.DRW 10/17/92
FBG-1 (Rev. 10/92)

PRC Environmental Management, Inc.

MONITORING WELL INSTALLATION RECORD

Borehole No. _____ Well No. 3-S
Site/ Subsite Agenda PWS
Well Permit No. _____
Recorded By Tom Wiberg
Date Well Installation Completed 6/20/94

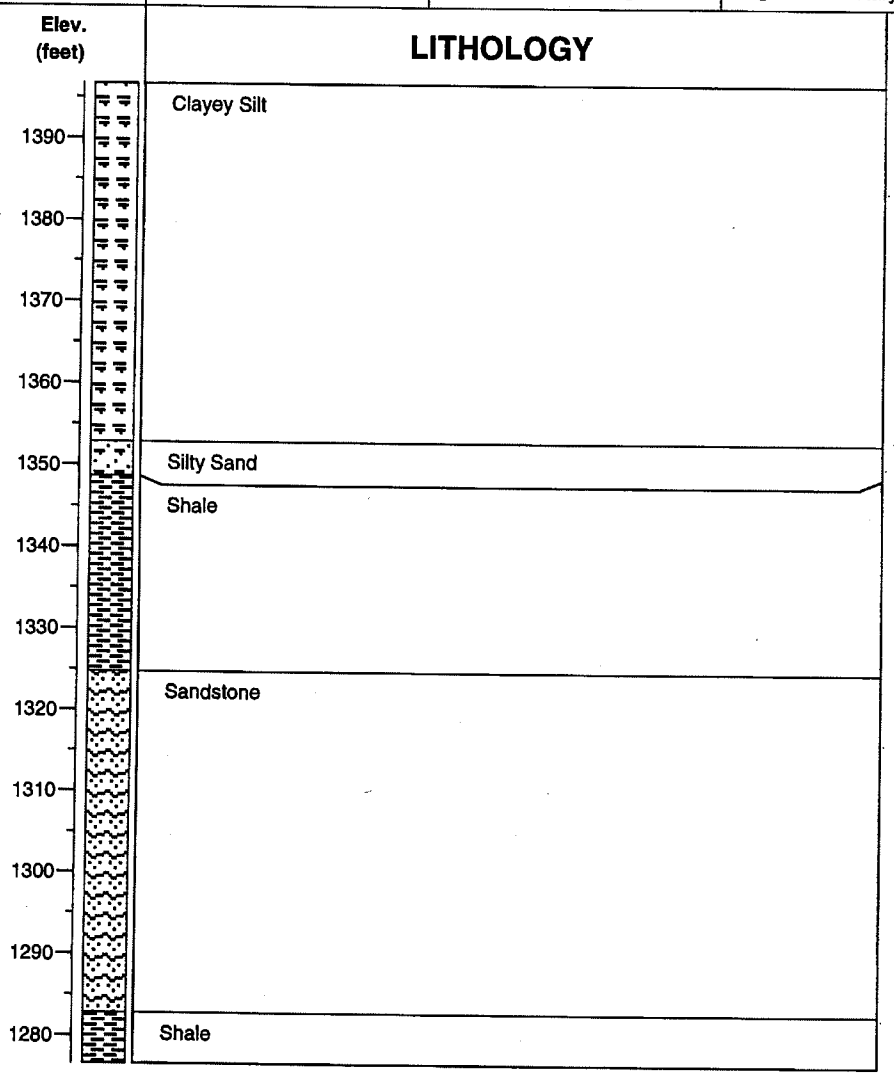


NOTES
- Scale: none
- Record the fraction of a foot in decimal, not in inches.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

999-AGECC1 MW-1.DRW 10/17/92

PRC Environmental Management, Inc./ KDHE		Soil Boring ID: MW 3D Log Type: Monitoring Well	
Project: AGENDA	Ground Elevation: 1396.78	Total Depth: 120	Driller: ----- Company: GSI
Date: 6/17/94	Plot Date: 2/02/96	Geologist: Wiberg	Rig: Mud Rotary



Location of Borehole

FIELD BOREHOLE LOG

PRC Environmental Management, Inc.

Job No.
Client KDHE
Drilling Contractor GSI
Drilling Method Mud Rotary
Surface Conditions
Logged By 1. Tom Wiberg 2.

Site/Subsite
Borehole/Location Code 3-D
Surface Elevation
Sheet 1 of 2
Date 6/16-6/17 94

MEDIA G/S/W	SAMPLER TYPE	BLOWS/6" SAMPLER	INCHES RECOVERED / INCHES DRIVEN	TIME	SAMPLE TAG NUMBER	ANALY Ftv	ANALY Chm	DEPTH IN FEET	USCS SOIL TYPE	SOIL DESCRIPTION
								50		*For 0-50 Feet, see log For 3-5
								55		gray shale with red mottles
								60		Same as above
								65		same as above
								70		same as above
								75		At 72 Feet, change to fine-med. grained, well sorted, subrounded quartz sandstone
								80		Same as above
								85		Same as above
								90		Same as above
								95		Same as above - slightly coarser grained zone, mostly med. grained sand.
								100		same as above - back to Fine-med grained sand

G = Gas S = Soil W = Water

Instructions on back.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

999-AGEO01 FBG-1.DRW 10/17/92
FBG-1 (Rev. 10/92)

Location of Borehole

FIELD BOREHOLE LOG

PRC Environmental Management, Inc.

Job No.	Client KDHE
Drilling Contractor GSE	Site/Subsite
Drilling Method mud Rotary	Borehole/Location Code 3-D
	Surface Elevation
Surface Conditions	Sheet 2 of 2
Logged By 1. Tom Wiberg 2.	Date

MEDIA G/S/W	SAMPLER TYPE	BLOWS/6" SAMPLER	INCHES RECOVERED / INCHES DRIVEN	TIME	SAMPLE TAG NUMBER	ANALY Hnu / OVM	DEPTH IN FEET	USCS SOIL TYPE	SOIL DESCRIPTION
							100		Fine-med grained, well sorted, subrounded quartz sandstone
							105		same as above
							110		At 114', change to gray shale
							115		gray shale
							120		- Bottom of Hole at 120 Feet -
							5		
							6		
							7		
							8		
							9		
							0		

G = Gas S = Soil W = Water

Instructions on back.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

999-AGEO01 FBG-1.DRW 10/17/92
FBG-1 (Rev. 10/92)

PRC Environmental Management, Inc.

MONITORING WELL INSTALLATION RECORD

Borehole No. _____ Well No. 3-D
Site/ Subsite Agenda PWS
Well Permit No. _____
Recorded By Tom Wiberg
Date Well Installation Completed 6/20/94

MEASURING POINT
☒ TOP OF WELL CASING ☐ GROUND SURFACE
☐ TOP OF PROTECTIVE CASING ☐ _____

HEIGHT/DEPTH OF PROTECTIVE CASING
☒ ABOVE GROUND ☐ BELOW GROUND NA FT

HEIGHT/DEPTH OF WELL CASING 2.86
☒ ABOVE GROUND ☐ BELOW GROUND ___ FT

GROUND SURFACE ELEVATION ABOVE MEAN SEA LEVEL 1396.76 FT

0 DEPTH TO TOP OF GROUT

TYPE OF INSTALLATION
☐ FLUSH MOUNT INSTALLATION ☒ ABOVE GROUND INSTALLATION
TYPE _____
☐ TRAFFIC RATED ☒ PROTECTIVE POSTS INSTALLED
☐ WATERTIGHT SEAL
☐ WATERTIGHT WELL CAP

DRILLING INFORMATION
DRILLING COMPANY/PERSONNEL GSI
Doug and Dana
DRILL RIG Mobil Rig
DRILLING METHOD: ☐ HOLLOW STEM AUGER ☐ AIR ROTARY ☒ MUD/WATER ROTARY
DRILLING BEGAN DATE 6/16/94 TIME _____
DRILLING FINISHED DATE 6/17/94 TIME _____

DRILLING FLUID TYPE	DRILLING FLUID LOSS	WATER ADDED DURING INSTALLATION
☐ BENTONITE	☐ YES ___ GALS	☐ YES ___ GALS
☒ WATER	☐ NO	☐ NO
☐ POLYMER		

TOTAL FLUID LOSS TO FORMATION: _____ GALS

CENTRALIZERS USED
☐ YES, AT _____
☐ STAINLESS STEEL
☐ OTHER
☒ NO

96 DEPTH TO TOP OF BENTONITE SEAL
— DEPTH TO TOP OF FINE SAND COLLAR
99 DEPTH TO TOP OF FILTER PACK
104 DEPTH TO TOP OF SCREEN
114 DEPTH TO BOTTOM OF SCREEN
___ DEPTH TO BOTTOM OF CASING
115 DEPTH TO BOTTOM OF FILTER PACK
120 DEPTH TO BOTTOM OF BOREHOLE

LOCKABLE COVER
VENTED CAP (WATERTIGHT CAP FOR FLUSHMOUNT)

GROUND SURFACE ELEVATION
SURVEYED ☒ YES ☐ NO

TYPE OF PROTECTIVE CASING
☒ STEEL ☐ _____
☐ SIZE _____

SURFACE SEAL
☐ NON-SHRINKING CEMENT ☒ NA
☐ CONCRETE ☐ CHECKED FOR SETTLEMENT
☐ INTERNAL MORTER ADDED

GROUT
☐ GROUT FORMULA (INDICATE QUANTITY OF EACH)
CEMENT _____ BENTONITE _____
WATER _____ OTHER _____
☒ PREPARED MIX
NAME OF PRODUCT Envirocplug grout
MANUFACTURED BY Wyo-Ben
QUANTITY USED (WEIGHT) 8 bags

TYPE OF CASING
☐ STAINLESS STEEL
☒ SCHEDULE 40 PVC
☐ SCHEDULE 80 PVC
☐ _____
CASING DIAMETER: INSIDE 4-inch OUTSIDE _____
CASING MANUFACTURED BY NA

BENTONITE SEAL
☒ PELLETS chips ☐ SLURRY
☐ SLEEVES ☐ POWDER/GRANULAR
☐ NOT USED ☐ _____
QUANITY USED 2 bags

FINE SAND COLLAR (OPTIONAL)
SIZE/TYPE Not Used

FILTER PACK
☐ GRAVEL, SIZE: ___ DEPTH: ___ TO ___ FT.
☒ SAND, SIZE: 20-40 DEPTH: 114 TO 99 FT.
☐ FORMATION COLLAPSE, DEPTH: ___ TO ___ FT.
MATERIAL _____
QUANTITY USED 7 bags
METHOD INSTALLED ☐ TREMIE ☒ POURED

GRAIN SIZE TESTS FOR FILTER PACK
☐ CONDUCTED; FOR REPORT, REFER TO: _____
☒ NOT CONDUCTED

TYPE OF SCREEN
☐ STAINLESS STEEL ☒ SCHEDULE 40 PVC
☐ SCHEDULE 80 PVC ☐ _____
SLOT SIZE 10 MANUFACTURED BY _____
SCREEN DIAMETER INSIDE 4-inch OUTSIDE _____

BACKFILL MATERIAL
☐ GRAVEL ☐ FORMATION COLLAPSE; MATERIAL: _____
☒ BENTONITE
☐ SAND ☒ 4 bags

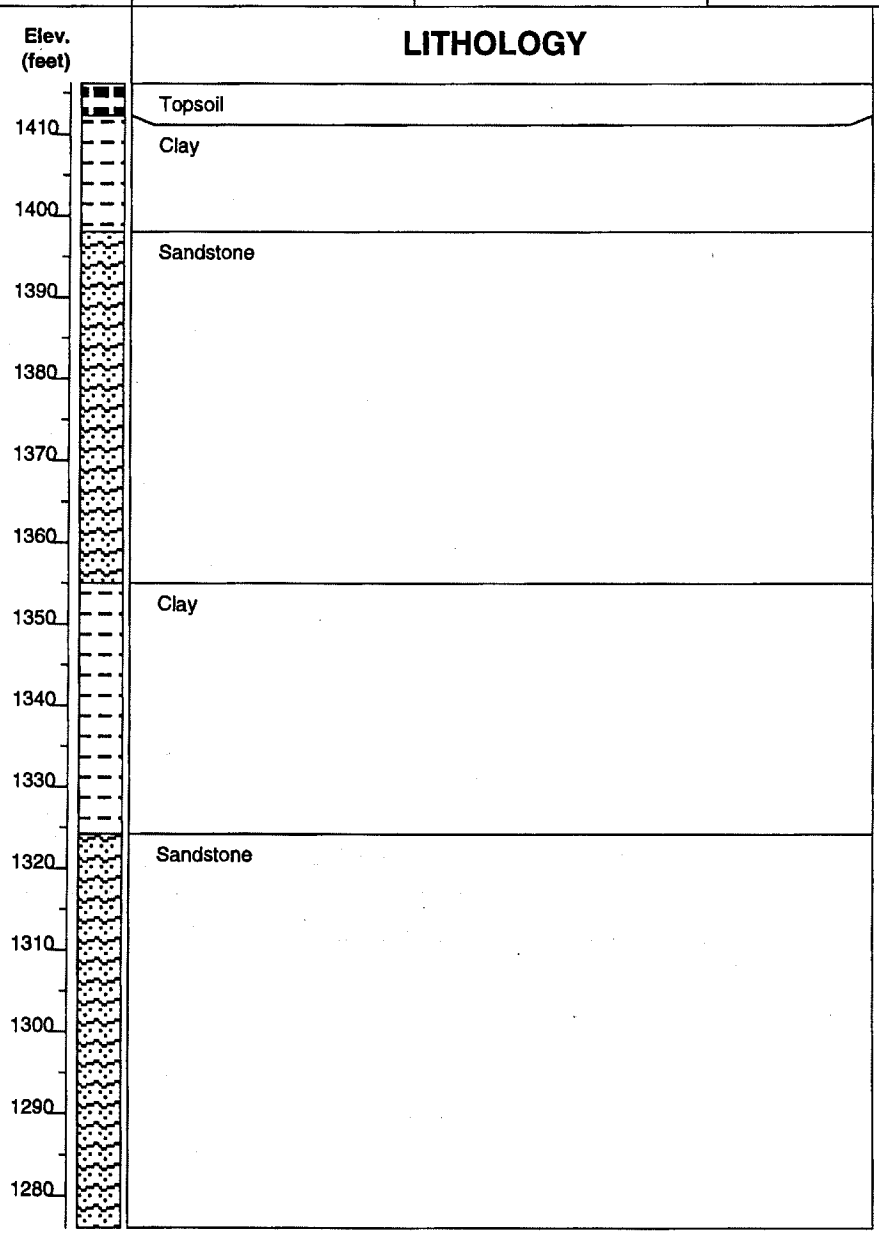
DIAMETER OF BOREHOLE 9 inches

NOTES
- Scale: none
- Record the fraction of a foot in decimal, not in inches.

White = Main Office File Yellow = Field Office File Pink = Field Personnel

999-AGE001 MW-1.DRW 10/17/92
MW-1 (Rev 10/92)

City of Agenda		**Soil Boring ID:** PWS 2 **Log Type:** Public Well	
Project: AGENDA	**Ground Elevation:** 1416.17	**Total Depth:** 140	**Driller:** Daryl Cox **Company:** Cox & Sons
Date: 10/25/83	**Plot Date:** 1/29/96	**Geologist:** -----	**Rig:** -----



WATER WELL RECORD Form WWC-5 KSA 82a-1212

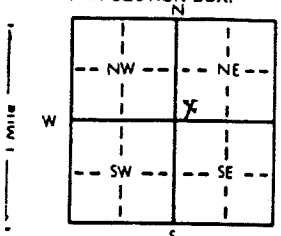
LOCATION OF WATER WELL: County: [illegible] 157 | Fraction: SW ¼ SW ¼ NE ¼ | Section Number: 16 | Township Number: T 4 S | Range Number: R 1 EW

Distance and direction from nearest town or city street address of well if located within city?
Lot 19, Block [illegible] the City of Agenda

WATER WELL OWNER: City of Agenda
RR#, St. Address, Box # : [illegible]
City, State, ZIP Code : [illegible] 66930

Board of Agriculture, Division of Water Resources
Application Number: [illegible]

LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:



DEPTH OF COMPLETED WELL 140 ft. ELEVATION:
Depth(s) Groundwater Encountered 1. ft. 2. ft. 3. ft
WELL'S STATIC WATER LEVEL 37 ft. below land surface measured on mo/day/yr 10/25/83
Pump test data: Well water was ft. after hours pumping gpm
Est. Yield gpm: Well water was ft. after hours pumping gpm
Bore Hole Diameter 10 in. to ft., and in. to ft
WELL WATER TO BE USED AS: 5 Public water supply 8 Air conditioning 11 Injection well
1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Lawn and garden only 10 Observation well
Was a chemical/bacteriological sample submitted to Department? Yes X No: If yes, mo/day/yr sample was submitted 10/27/1983
Water Well Disinfected? Yes X No

TYPE OF BLANK CASING USED: 5 Wrought iron 8 Concrete tile CASING JOINTS: Glued X Clamped
1 Steel 3 RMP (SR) 6 Asbestos-Cement 9 Other (specify below) Welded
2 PVC 4 ABS 7 Fiberglass Threaded
Blank casing diameter 5 in. to 100 ft., Dia in. to ft., Dia in. to ft
Casing height above land surface 8 in., weight 3 lbs./ft. Wall thickness or gauge No. SDR 21

TYPE OF SCREEN OR PERFORATION MATERIAL: 7 PVC 10 Asbestos-cement
1 Steel 3 Stainless steel 5 Fiberglass 8 RMP (SR) 11 Other (specify)
2 Brass 4 Galvanized steel 6 Concrete tile 9 ABS 12 None used (open hole)

SCREEN OR PERFORATION OPENINGS ARE: 5 Gauzed wrapped 8 Saw cut 11 None (open hole)
1 Continuous slot 3 Mill slot 6 Wire wrapped 9 Drilled holes
2 Louvered shutter 4 Key punched 7 Torch cut 10 Other (specify)

SCREEN-PERFORATED INTERVALS: From 100 ft. to 140 ft., From ft. to ft
From ft. to ft., From ft. to ft
GRAVEL PACK INTERVALS: From 24 ft. to 140 ft., From ft. to ft
From ft. to ft., From ft. to ft

GROUT MATERIAL: Neat cement 2 Cement grout 3 Bentonite 4 Other
Grout Intervals: From 4 ft. to 24 ft., From ft. to ft., From ft. to ft

What is the nearest source of possible contamination:
1 Septic tank 4 Lateral lines 7 Pit privy 10 Livestock pens 14 Abandoned water well
2 Sewer lines 5 Cess pool 8 Sewage lagoon 11 Fuel storage 15 Oil well/Gas well
3 Watertight sewer lines 6 Seepage pit 9 Feedyard 12 Fertilizer storage 16 Other (specify below)
13 Insecticide storage
Direction from well? East How many feet? 95

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
0	4	topsoil			
4	18	brown clay			
18	45	sandrock			
45	46	blue clay			
46	71	sandrock			
71	70	blue clay			
70	93	red clay			
93	92	blue clay			
92	140	sandrock			
140					

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DEC 12 1983
BUREAU OF OIL FIELD & ENVIRONMENTAL GEOLOGY

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was X constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) October 25, 1983 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 359 This Water Well Record was completed on (mo/day/yr) October 25, 1983 under the business name of Daryl Cox & Sons Inc. by (signature)

INSTRUCTIONS: Use typewriter or ball point pen, *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Environmental Geology Section, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.

LOCATION OF WATER WELL — County: ELLSWORTH — Fraction: SW ¼ SW ¼ SE ¼ — Section Number: 18 — Township Number: T 4 S — Range Number: R 1 E(W)

Distance and direction from nearest town or city? 2 WEST 1 SOUTH & WEST AGENDA — Street address of well if located within city?

WATER WELL OWNER: JIM ANDERSON
RR#, St. Address, Box # : AGENDA, KANSAS 67420
City, State, ZIP Code :
Board of Agriculture, Division of Water Resourc
Application Number:

DEPTH OF COMPLETED WELL 180 ft. Bore Hole Diameter 5 in. to 30 ft., and ... in. to ...

Well Water to be used as: 1 Domestic 2 Irrigation 3 Feedlot 4 Industrial 5 Public water supply 6 Oil field water supply 7 Lawn and garden only 8 Air conditioning 9 Dewatering 10 Observation well 11 Injection well 12 Other (Specify below) ...

Well's static water level 25 ft. below land surface measured on 11 month 5 day 87 yea

Pump Test Data: Well water was N/A ft. after ... hours pumping ... gpr
Est. Yield 50+ gpm: Well water was ... ft. after ... hours pumping ... gpr

TYPE OF BLANK CASING USED: 1 Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below) ... Casing Joints: Glued X Clamped ... Welded ... Threaded ...

Blank casing dia 5 in. to 160 ft., Dia ... in. to ... ft., Dia ... in. to ...
Casing height above land surface 12 in., weight 3 lbs. ft. Wall thickness or gauge No ...

TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) ... 12 None used (open hole)

Screen or Perforation Openings Are: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut 9 Drilled holes 10 Other (specify) ... 11 None (open hole)

Screen-Perforation Dia 5 in. to 150 ft., Dia ... in. to ... ft., Dia ... in to ...
Screen-Perforated Intervals: From 160 ft. to 180 ft., From ... ft. to ...
From ... ft. to ... ft., From ... ft. to ...
Gravel Pack Intervals: From 10 ft. to 150 ft., From ... ft. to ...
From ... ft. to ... ft., From ... ft. to ...

GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other ...
Grouted Intervals: From 0 ft. to 10 ft., From ... ft. to ... ft., From ... ft. to ...

What is the nearest source of possible contamination: 1 Septic tank 2 Sewer lines 3 Lateral lines 4 Cess pool 5 Seepage pit 6 Pit privy 7 Sewage lagoon 8 Feed yard 9 Livestock pens 10 Fuel storage 11 Fertilizer storage 12 Insecticide storage 13 Watertight sewer lines 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below) ...

Direction from well N. E. How many feet 200 ? Water Well Disinfected? Yes X No ...
Was a chemical/bacteriological sample submitted to Department? Yes ... No X ... If yes, date samp
was submitted ... month ... day ... year: Pump Installed? Yes ... No X
If Yes: Pump Manufacturer's name ... Model No. ... HP ... Volts ...
Depth of Pump Intake ... ft. Pumps Capacity rated at ... gal. mi
Type of pump: 1 Submersible 2 Turbine 3 Jet 4 Centrifugal 5 Reciprocating 6 Other

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (X) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and wa
completed on 11 month 6 day ... ye
and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 559
This Water Well Record was completed on ... 11 month 6 day ... year under the busine
Name of LOREN COX + SONS INC by (signature) Loren Cox

LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX: N, NW, NE, W, E, SW, SE, X, S, 1 Mile

FROM	TO	LITHOLOGIC LOG
0	3	TOPSOIL
3	6	BROWN CLAY
6	18	BLUE CLAY
18	36	SANDY BLUE CLAY
36	41	SANDROCK
41	86	RED CLAY
86	106	BLUE CLAY
106	134	RED CLAY
134	157	BLUE CLAY
157	163	BLUE CLAY W/ROCK LAYERS
163	180	SANDROCK
180		STOP

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DEC 16 1980
DIVISION OF ENVIRONMENT

ELEVATION:

Depth(s) Groundwater Encountered 1 ... ft. 2 ... ft. 3 ... ft. 4 ... ft. (Use a second sheet if needed)

INSTRUCTIONS: Use typewriter or ball point pen, *please press firmly* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.

WATER WELL RECORD Form WWC-5 KSA 82a-1212

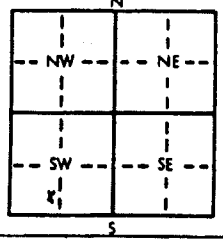
LOCATION OF WATER WELL:	Fraction	Section Number	Township Number	Range Number
County: Republic	SE ¼ SW ¼ SW ¼	8	T 4 S	R 1W E/W

Distance and direction from nearest town or city street address of well if located within city?
1 1/2 Miles West of Agenda

WATER WELL OWNER: Steve Anderson
R#, St. Address, Box # : Rt. 1
City, State, ZIP Code : Agenda, Kansas 66930

Board of Agriculture, Division of Water Resource
Application Number:

LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:



4 DEPTH OF COMPLETED WELL 175' ft. ELEVATION:
Depth(s) Groundwater Encountered 1. 170' ft. 2. ft. 3. ft.
WELL'S STATIC WATER LEVEL 70' ft. below land surface measured on mo/day/yr 9-10-81
Pump test data: Well water was 175' ft. after 1 hours pumping 20 gpm
Est. Yield 20 gpm: Well water was ft. after hours pumping gpm
Bore Hole Diameter 8" in. to 175' ft., and in. to ft.
WELL WATER TO BE USED AS: 5 Public water supply 8 Air conditioning 11 Injection well
X 1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Lawn and garden only 10 Observation well
Was a chemical/bacteriological sample submitted to Department? Yes No X; If yes, mo/day/yr sample was submitted
Water Well Disinfected? Yes X No

TYPE OF BLANK CASING USED: 5 Wrought iron 8 Concrete tile CASING JOINTS: Glued X Clamped
1 Steel 3 RMP (SR) 6 Asbestos-Cement 9 Other (specify below) Welded
X 2 PVC 4 ABS 7 Fiberglass Threaded
Blank casing diameter 5" in. to 155' ft., Dia in. to ft., Dia in. to ft.
Casing height above land surface 12" in., weight 3 lbs./ft. Wall thickness or gauge No. .258

TYPE OF SCREEN OR PERFORATION MATERIAL: X 7 PVC
1 Steel 3 Stainless steel 5 Fiberglass 8 RMP (SR) 10 Asbestos-cement
2 Brass 4 Galvanized steel 6 Concrete tile 9 ABS 11 Other (specify)
12 None used (open hole)

SCREEN OR PERFORATION OPENINGS ARE: 5 Gauzed wrapped X 8 Saw cut 11 None (open hole)
1 Continuous slot 3 Mill slot 6 Wire wrapped 9 Drilled holes
2 Louvered shutter 4 Key punched 7 Torch cut 10 Other (specify)

SCREEN-PERFORATED INTERVALS: From 155 ft. to 175 ft., From ft. to ft.
From ft. to ft., From ft. to ft.

GRAVEL PACK INTERVALS: From 10 ft. to 175 ft., From ft. to ft.
From ft. to ft., From ft. to ft.

GROUT MATERIAL: 1 Neat cement X 2 Cement grout 3 Bentonite 4 Other
Grout Intervals: From 0 ft. to 10 ft., From ft. to ft., From ft. to ft.
What is the nearest source of possible contamination: NONE
1 Septic tank 4 Lateral lines 7 Pit privy 10 Livestock pens 14 Abandoned water well
2 Sewer lines 5 Cess pool 8 Sewage lagoon 11 Fuel storage 15 Oil well/Gas well
3 Watertight sewer lines 6 Seepage pit 9 Feedyard 12 Fertilizer storage 16 Other (specify below)
Direction from well? 13 Insecticide storage
How many feet?

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
0	170	01 Clay			
170	175	23 Sandrock			
175	180	19 Shale			

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DEC 18 1981
DIVISION OF ENVIRONMENT

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) Sept. 9, 1981 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 361 This Water Well Record was completed on (mo/day/yr) 9-9-1981
under the business name of Cox-Beswick Irrigation Service, Inc. by (signature) Francis Cox

INSTRUCTIONS: Use typewriter or ball point pen, *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Environmental Geology Section, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.

USE TYPEWRITER OR BALL POINT PEN–PRESS FIRMLY, PRINT CLEARLY.

WATER WELL RECORD
KSA 82a-1201-1215

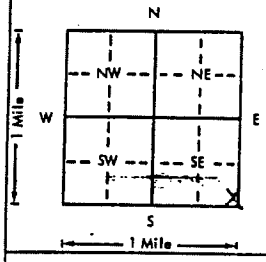
Kansas Department of Health and Environment–Division of Environment
(Water well Contractors)
Topeka, Kansas 66620

1. Location of well: County Republic | Fraction SE 1/4 SE 1/4 SE 1/4 | Section number 12 | Township number T 4 S | Range number R 2 E (W)

2. Distance and direction from nearest town or city: 3 W of
Street address of well location if in city: Agenda

3. Owner of well: Terry & Bennychek
R.R. or street: #
City, state, zip code: Agenda, Kansas 66930

4. Locate with "X" in section below: Sketch map:



6. Bore hole dia. 5 in. Completion date
Well depth 112 ft. 4-17-79

7. ___ Cable tool X Rotary ___ Driven ___ Dug
___ Hollow rod ___ Jetted ___ Bored ___ Reverse rotary

8. Use: ___ Domestic ___ Public supply ___ Industry
___ Irrigation ___ Air conditioning X Stock
___ Lawn ___ Oil field water ___ Other

9. Casing: Material PVC Height: Above or below
Threaded ___ Welded ___ Surface 12 in.
RMP ___ PVC X Weight 3 lbs./ft.
Dia. 5 in. to 112 ft. depth Wall Thickness: inches or
Dia. ___ in. to ___ ft. depth gage No. 250

10. Screen: Manufacturer's name Paragon Type
Type PVC Dia. 5
Slot/gauze 1/4" Length 20
Set between 92 ft. and 112 ft.
ft. and ft.
Gravel pack? X Size range of material 1/2 - 1/4

11. Static water level: mo./day/yr.
40 ft. below land surface Date 4-17-79

12. Pumping level below land surface:
105 ft. after 1½ hrs. pumping 20 g.p.m.
ft. after hrs. pumping g.p.m.
Estimated maximum yield 20 g.p.m.

13. Water sample submitted: mo./day/yr.
___ Yes X No Date

14. Well head completion:
___ Pitless adapter 12 Inches above grade

15. Well grouted? X
With: X Neat cement ___ Bentonite ___ Concrete
Depth: From 0 ft. to 19 ft.

16. Nearest source of possible contamination:
ft. 40 Direction W Type Creek
Well disinfected upon completion? X Yes ___ No

17. Pump: X Not installed
Manufacturer's name
Model number HP Volts
Length of drop pipe ft. capacity g.p.m.
Type:
___ Submersible ___ Turbine
___ Jet ___ Reciprocating
___ Centrifugal ___ Other

5. Type and color of material		From	To
top soil & clay	01	0	28
layers of sand rock in clay	24	28	45
clay	01	45	70
soft sandrock	23	70	82
clay	01	82	91
sand rock @ clay layers	24	91	115
sand rock	23	115	118
clay	01	118	

(Use a second sheet if needed)

18. Elevation:

Topography:
X Hill
___ Slope
___ Upland
___ Valley

19. Remarks:

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MAY 29 1979
DIVISION OF ENVIRONMENT
OF & EG SEC.

20. Water well contractor's certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Cox-Bosnick 361
Business name License No.
Address Clyde, Kansas 66937
Signed Francis Cox Date 4-...
Authorized representative

Forward the white, blue and pink copies to the Department of Health and Environment

Form WWC-5

MT-1023

LOCATION OF WATER WELL: County: Republic 079 | Fraction: NW ¼ NE ¼ NW ¼ | Section Number: 20 | Township Number: T 4 S | Range Number: R 1 E(W)

Distance and direction from nearest town or city street address of well if located within city?
1 south 1½ west Agenda, KS

WATER WELL OWNER: R#, St. Address, Box # : Ron Denk Denk Rt. 1
City, State, ZIP Code : Agenda, KS 66930

Board of Agriculture, Division of Water Resource Application Number:

LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX: N / W / E / S; NW, NE, SW, SE (X in NW)

4 DEPTH OF COMPLETED WELL 50 ft. ELEVATION:
Depth(s) Groundwater Encountered 1. 13 ft. 2. ft. 3. ft.
WELL'S STATIC WATER LEVEL 20 ft. below land surface measured on mo/day/yr 6/1/96
Pump test data: Well water was ft. after hours pumping gpm
Est. Yield 3 gpm: Well water was ft. after hours pumping gpm
Bore Hole Diameter 8 in. to 50 ft., and in. to ft.
WELL WATER TO BE USED AS: 1 Domestic 2 Irrigation 3 Feedlot 4 Industrial 5 Public water supply 6 Oil field water supply 7 Lawn and garden only 8 Air conditioning 9 Dewatering 10 Observation well 11 Injection well 12 Other (Specify below)
Was a chemical/bacteriological sample submitted to Department? Yes No X; If yes, mo/day/yr sample was submitted
Water Well Disinfected? Yes X No

TYPE OF BLANK CASING USED: 1 Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below)
CASING JOINTS: Glued X Clamped Welded Threaded
Blank casing diameter 5 in. to 40 ft., Dia in. to ft., Dia in. to ft.
Casing height above land surface 12 in., weight 3 lbs./ft. Wall thickness or gauge No. 253

TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) 12 None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut 9 Drilled holes 10 Other (specify) 11 None (open hole)
SCREEN-PERFORATED INTERVALS: From 40 ft. to 50 ft., From ft. to ft.
From ft. to ft., From ft. to ft.
GRAVEL PACK INTERVALS: From 20 ft. to 50 ft., From ft. to ft.
From ft. to ft., From ft. to ft.

GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other
Grout Intervals: From 0 ft. to 20 ft., From ft. to ft., From ft. to ft.
What is the nearest source of possible contamination:
1 Septic tank 2 Sewer lines 3 Watertight sewer lines 4 Lateral lines 5 Cess pool 6 Seepage pit 7 Pit privy 8 Sewage lagoon 9 Feedyard 10 Livestock pens 11 Fuel storage 12 Fertilizer storage 13 Insecticide storage 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below)
Direction from well? How many feet? N/A

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
0	3	topsoil			
3	13	01 clay			
13	35	sandrock			
35	50	23 sandrock gravel			

RECEIVED
JUN 25 1990
DIVISION OF ENVIRONMENT

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 6-1-90 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 361 This Water Well Record was completed on (mo/day/yr) 6/3/90
under the business name of Cox-Resuick by (signature) Dave Resuick

INSTRUCTIONS: Use typewriter or ball point pen. *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water Protection, Topeka, Kansas 66620-7320, Telephone: 913-862-9360. Send one to WATER WELL OWNER and retain one for your records.

1 LOCATION OF WATER WELL — County: [illegible] — Fraction: SE ¼ NE ¼ NW ¼ — Section Number: 33 — Township Number: T 4 S — Range Number: R 1 E(W) 6

Distance and direction from nearest town or city? 3¼ South AGENDA — Street address of well if located within city?

2 WATER WELL OWNER: HERMAN KIEFFER
RR#, St. Address, Box # :
City, State, ZIP Code : LOYLE KANSAS — Board of Agriculture, Division of Water Resour — Application Number:

3 DEPTH OF COMPLETED WELL 150 ft. Bore Hole Diameter 5 in. to 150 ft., and ... in. to ...

Well Water to be used as: 1 Domestic 2 Irrigation 3 Feedlot 4 Industrial 5 Public water supply 6 Oil field water supply 7 Lawn and garden only 8 Air conditioning 9 Dewatering 10 Observation well 11 Injection well 12 Other (Specify below)

Well's static water level ... ft. below land surface measured on 11 month ... day ... ye

Pump Test Data: Well water was NA ft. after ... hours pumping ... gp
Est. Yield 50+ gpm: Well water was ... ft. after ... hours pumping ... gp

4 TYPE OF BLANK CASING USED: 1 Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below) — Casing Joints: Glued ... Clamped ... Welded ... Threaded ...

Blank casing dia 5 in. to 130 ft., Dia ... in. to ... ft., Dia ... in. to ...
Casing height above land surface ... in., weight ... lbs. ft. Wall thickness or gauge No ...

TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) ... 12 None used (open hole)

Screen or Perforation Openings Are: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut 9 Drilled holes 10 Other (specify) ... 11 None (open hole)

Screen-Perforation Dia 5 in. to 150 ft., Dia ... in. to ... ft., Dia ... in to ...
Screen-Perforated Intervals: From 130 ft. to 150 ft., From ... ft. to ...
From ... ft. to ... ft., From ... ft. to ...
Gravel Pack Intervals: From 10 ft. to 150 ft., From ... ft. to ...
From ... ft. to ... ft., From ... ft. to ...

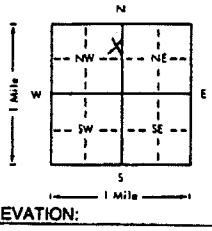
5 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other ...
Grouted Intervals: From C ft. to 10 ft., From ... ft. to ... ft., From ... ft. to ...

What is the nearest source of possible contamination: 1 Septic tank 2 Sewer lines 3 Lateral lines 4 Cess pool 5 Seepage pit 6 Pit privy 7 Sewage lagoon 8 Feed yard 9 Livestock pens 10 Fuel storage 11 Fertilizer storage 12 Insecticide storage 13 Watertight sewer lines 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below)

Direction from well SOUTH How many feet 75 ? Water Well Disinfected? Yes X No ...
Was a chemical/bacteriological sample submitted to Department? Yes ... No X ... If yes, date samp
was submitted ... month ... day ... year: Pump Installed? Yes ... No X
If Yes: Pump Manufacturer's name ... Model No. ... HP ... Volts ...
Depth of Pump Intake ... ft. Pumps Capacity rated at ... gal. m
Type of pump: 1 Submersible 2 Turbine 3 Jet 4 Centrifugal 5 Reciprocating 6 Other

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and w
completed on 11 month 18 day ... ye
and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 357
This Water Well Record was completed on 11 month 18 day ... year under the busine
name of TUREY LOG + SEALS INC by (signature) [signature]

7 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:



ELEVATION:

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
C	3	TOPSOIL			
3	23	01 BROWN CLAY			
23	48	23 SANDROCK			
48	63	BLUE CLAY			
63	67	RED CLAY			
67	126	01 BLUE CLAY			
126	127	20 HARD ROCK			
127	138	01 BLUE CLAY			
138	150	23 SANDROCK			
150	158	01 BLUE CLAY			
158		TD			

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DEC 16 1980
DIVISION OF ENVIRONMENT

Depth(s) Groundwater Encountered 1 ... ft. 2 ... ft. 3 ... ft. 4 ... ft. (Use a second sheet if needed)

INSTRUCTIONS: Use typewriter or ball point pen, *please press firmly* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.

USE TYPEWRITER OR BALL POINT PEN-PRESS FIRMLY, PRINT CLEARLY.

T R EW sec 1/4 1/4 1/4 No.

WATER WELL RECORD
KSA 82a-1201-1215

Kansas State Dept. Of Health
(Water Well Contractors)
Forbes-Bldg. 740
Topeka, Kansas 66620

1 Location of well:	County	Township name	Fraction	Section number	Town number	Range number
	REPUBLIC		CN½ NE¼ SW¼	17	T 4 S	R 1 W

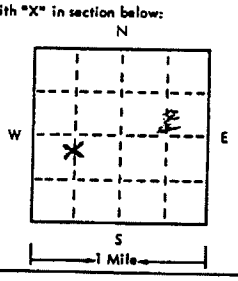
Distance and direction from nearest town or city: 2 WEST

Street address of well location if in city: ½ S OF AGENDA

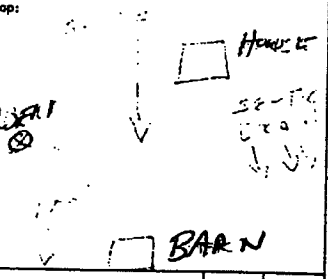
3 Owner of well: JEROME KIEFFER

Address: AGENDA KANSAS

Locate with "X" in section below:



Sketch map:



2 Type and color of material		From	To
TOPSOIL		0	3
BROWN CLAY		3	29
RED CLAY	01	29	32
SANDY CLAY	BROWN 04	32	35
SHALE ROCK	23	35	66
RED CLAY		66	69
BLUE CLAY	01	69	80
STOP		80	

(use a second sheet if needed)

4 Well depth: ___ ft. Date of completion ___
Well diameter ___ in.

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ Reverse rotary

6 Use: ☒ Domestic ☐ Public supply ☐ Industry
☐ Irrigation ☐ Air conditioning ☐ Commercial
☐ Test well ☐ ___

7 Casing: Material PVC Height: above/below
Threaded ☐ Welded ☒ Surface 1 in.
Diam. Weight ___ lbs./ft.
2 in. to 32 ft. depth Drive shoe? ☐ Yes ☒ No
___ in. to ___ ft. depth

8 Screen:
Manufacturer JOHNSON
Type PVC Dia. ___
Slot/gauze .010" Length ___
Set between 60 ft. and 80 ft.
Fittings:
Gravel pack ☒ Yes ☐ No Size range of material ½

9 Static water level:
40 ft. below land surface Date 9-22-75

10 Pumping level below land surface:
___ ft. after N/A hrs. pumping ___ g.p.m.
___ ft. after N/A hrs. pumping ___ g.p.m.
Estimated maximum yield 15 g.p.m.

11 Water sample submitted:
☐ Yes ☒ No Date ___

12 Well head completion:
☐ Pitless adapter ☒ Inches above grade

13 Well grouted? ☒ Yes ☐ No
☒ Neat cement ☐ Bentonite ☐ ___
Depth: From 0 ft. to 20 ft.

14 Nearest source of possible contamination:
ft. 100 Direction SOUTH Type LOT
Well disinfected upon completion? ☒ Yes ☐ No

15 Pump: ☒ Not installed
Manufacturer's name ___
Model number ___ HP ___ Volts ___
Length of drop pipe ___ ft. capacity ___ g.p.m.
Type:
☐ Submersible ☐ Turbine
☐ Jet ☐ Reciprocating
☐ Centrifugal ☐ Other

16 Remarks: elevation

Topography:
☐ Hill
☐ Slope
☒ Upland
☐ Valley

17 Water well contractor's certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Wilcox & Sons Inc 2-51
Business name License No.
Address CLIFTON, KANS.
Signed ___ Date 12-11-75
Authorized representative

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3 DEC 1975
DIVISION OF ENVIRONMENT

Forward the white, blue and pink copies to the Kansas State Dept. Of Health.

Form WWC-5

677-H

WATER WELL RECORD Form WWC-5 KSA 82a-1212

LOCATION OF WATER WELL: County: Republic | Fraction: NE ¼ NE ¼ NW ¼ | Section Number: 34 | Township Number: T 4 S | Range Number: R 1 E(W)

Distance and direction from nearest town or city street address of well if located within city?
2 South, 1 East of Agenda

WATER WELL OWNER: Carl Kieffer Kieffer
RR#, St. Address, Box # : Agenda, Kansas 66930
City, State, ZIP Code :

Board of Agriculture, Division of Water Resources
Application Number:

LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX: N / W / E / S; NW, NE, SW, SE; X in NE

4 DEPTH OF COMPLETED WELL 130 ft. ELEVATION:
Depth(s) Groundwater Encountered 1. 107 ft. 2. ft. 3. ft.
WELL'S STATIC WATER LEVEL 20 ft. below land surface measured on mo/day/yr 11/13/1984
Pump test data: Well water was N/A ft. after hours pumping gpm
Est. Yield 30 gpm: Well water was ft. after hours pumping gpm
Bore Hole Diameter 3 in. to 130 ft., and in. to ft.
WELL WATER TO BE USED AS: 1 Domestic 3 Feedlot 5 Public water supply 6 Oil field water supply 8 Air conditioning 9 Dewatering 11 Injection well 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Lawn and garden only 10 Observation well
Was a chemical/bacteriological sample submitted to Department? Yes No XXX; If yes, mo/day/yr sample was submitted
Water Well Disinfected? Yes XXX No

TYPE OF BLANK CASING USED: 1 Steel 3 RMP (SR) 5 Wrought iron 8 Concrete tile
XXX 2 PVC 4 ABS 6 Asbestos-Cement 9 Other (specify below) 7 Fiberglass
CASING JOINTS: Glued XXX Clamped Welded Threaded
Blank casing diameter 2 in. to 110 ft., Dia in. to ft., Dia in. to ft
Casing height above land surface 12 in., weight 3 lbs./ft. Wall thickness or gauge No. SCH 40

TYPE OF SCREEN OR PERFORATION MATERIAL: XXX 2 PVC
1 Steel 3 Stainless steel 5 Fiberglass 8 RMP (SR) 10 Asbestos-cement
2 Brass 4 Galvanized steel 6 Concrete tile 9 ABS 11 Other (specify) 12 None used (open hole)

SCREEN OR PERFORATION OPENINGS ARE: 5 Gauzed wrapped XXX 8 Saw cut 11 None (open hole)
1 Continuous slot 3 Mill slot 6 Wire wrapped 9 Drilled holes
2 Louvered shutter 4 Key punched 7 Torch cut 10 Other (specify)

SCREEN-PERFORATED INTERVALS: From 110 ft. to 130 ft., From ft. to ft., From ft. to ft
From ft. to ft., From ft. to ft., From ft. to ft
GRAVEL PACK INTERVALS: From 10 ft. to 130 ft., From ft. to ft., From ft. to ft
From ft. to ft., From ft. to ft., From ft. to ft

GROUT MATERIAL: XXX 1 Neat cement 2 Cement grout 3 Bentonite 4 Other
Grout Intervals: From 0 ft. to 10 ft., From ft. to ft., From ft. to ft
What is the nearest source of possible contamination:
XXX 1 Septic tank 4 Lateral lines 7 Pit privy 10 Livestock pens 14 Abandoned water well
2 Sewer lines 5 Cess pool 8 Sewage lagoon 11 Fuel storage 15 Oil well/Gas well
3 Watertight sewer lines 6 Seepage pit 9 Feedyard 12 Fertilizer storage 16 Other (specify below)
13 Insecticide storage
Direction from well? North How many feet? 250

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
0	3	topsoil			
3	23	brown clay			
23	32	gray clay			
32	62	red clay			
62	107	blue clay			
107	130	sandrock			
130		still sandrock--stop			

RECEIVED
NOV 20 1984
BUREAU OF OIL FIELD & ENVIRO...

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was XXX constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 11/13/1984 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 359 This Water Well Record was completed on (mo/day/yr) 11/16/1984
under the business name of Daryl Cox & Sons Inc. by (signature) Daryl Cox

INSTRUCTIONS: Use typewriter or ball point pen, *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Environmental Geology Section, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.

LOCATION OF WATER WELL	Fraction	Section Number	Township Number	Range Number
County: [illegible]	¼ ¼ ¼	32	T 4 S	R 1 E(W)

Distance and direction from nearest town or city? 3 South & 1 mile East of Agenda

Street address of well if located within city?

2] WATER WELL OWNER: Joe Legere

RR#, St. Address, Box # :

City, State, ZIP Code : Agenda, Kansas 66830

Board of Agriculture, Division of Water Resourc
Application Number:

3] DEPTH OF COMPLETED WELL 160' ft. Bore Hole Diameter [illegible] in. to 160' ft., and ..... in. to .....

Well Water to be used as: 5 Public water supply 8 Air conditioning 11 Injection well
1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Lawn and garden only 10 Observation well

Well's static water level 30' ft. below land surface measured on day ..... month 6 day ..... ye

Pump Test Data 20 : Well water was 160' ft. after 3/4 hours pumping 20 gp
Est. Yield gpm: Well water was ft. after hours pumping gp

4] TYPE OF BLANK CASING USED: 5 Wrought iron 8 Concrete tile Casing Joints: Glued ..... Clamped .....
1 Steel 3 RMP (SR) 6 Asbestos-Cement 9 Other (specify below) Welded .....
X 2 PVC 4 ABS 7 Fiberglass Threaded .....

Blank casing dia 5" in. to 140' ft., Dia ..... in. to ..... ft., Dia ..... in. to .....

Casing height above land surface 12" in., weight 3 lbs./ft. Wall thickness or gauge No .258

TYPE OF SCREEN OR PERFORATION MATERIAL: X 7 PVC 10 Asbestos-cement
1 Steel 3 Stainless steel 5 Fiberglass 8 RMP (SR) 11 Other (specify) .....
2 Brass 4 Galvanized steel 6 Concrete tile 9 ABS 12 None used (open hole)

Screen or Perforation Openings Are: 5 Gauzed wrapped X 8 Saw cut 11 None (open hole)
1 Continuous slot 3 Mill slot 6 Wire wrapped 9 Drilled holes
2 Louvered shutter 4 Key punched 7 Torch cut 10 Other (specify) .....

Screen-Perforation Dia 5" in. to 160' ft., Dia ..... in. to ..... ft., Dia ..... in to .....

Screen-Perforated Intervals: From 140' ft. to 160' ft., From ..... ft. to .....
From ..... ft. to ..... ft., From ..... ft. to .....

Gravel Pack Intervals: From 10' ft. to 160' ft., From ..... ft. to .....
From ft. to ft., From ft. to

5] GROUT MATERIAL: 1 Neat cement X 2 Cement grout 3 Bentonite 4 Other .....

Grouted Intervals: From 0 ft. to 10 ft., From ..... ft. to ..... ft., From ..... ft. to .....

What is the nearest source of possible contamination: NONE

1 Septic tank 4 Cess pool 7 Sewage lagoon 10 Fuel storage 14 Abandoned water well
2 Sewer lines 5 Seepage pit 8 Feed yard 11 Fertilizer storage 15 Oil well/Gas well
3 Lateral lines 6 Pit privy 9 Livestock pens 12 Insecticide storage 16 Other (specify below)
13 Watertight sewer lines

Direction from well ..... How many feet ..... ? Water Well Disinfected? Yes ..... X ..... No .....

Was a chemical/bacteriological sample submitted to Department? Yes ..... X ..... No ..... If yes, date samp
was submitted ..... month ..... day ..... year: Pump Installed? Yes ..... No .....

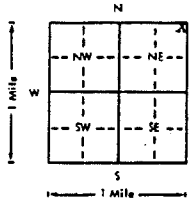
If Yes: Pump Manufacturer's name ..... Model No. ..... HP ..... Volts .....

Depth of Pump Intake ..... ft. Pumps Capacity rated at ..... gal. m

Type of pump: 1 Submersible 2 Turbine 3 Jet 4 Centrifugal 5 Reciprocating 6 Other

6] CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed (2) reconstructed, or (3) plugged under my jurisdiction and w
completed on day ..... month 6 day 1981 ye
and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 361
This Water Well Record was completed on day ..... month 7 day 1981 year under the busine
name of Cox-Deswick Irrigation Service, Inc. by (signature) Francis Cox

7] LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:



ELEVATION:

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
0	14	Clay (soft)			
14	80	01 Clay			
80	85	23 Sandrock			
85	135	01 Clay			
135	160	23 Sandrock			
160		Shale			

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JUN 12 1981
DIVISION OF ENVIRONMENT
OF [illegible]

Depth(s) Groundwater Encountered 1. 35[illegible] ft. 2. ..... ft. 3. ..... ft. 4. ..... ft. (Use a second sheet if needed)

INSTRUCTIONS: Use typewriter or ball point pen, *please press firmly* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER an retain one for your records.

LOCATION OF WATER WELL: County: REPUBLIC | Fraction: SW ¼ SW ¼ SW ¼ | Section Number: 12 | Township Number: T 4 S | Range Number: R 1 E(W)

Distance and direction from nearest town or city? 2-E EAST AGENDA | Street address of well if located within city?

WATER WELL OWNER: RR#, St. Address, Box # : ART OSTLUND | City, State, ZIP Code : | Board of Agriculture, Division of Water Resources Application Number:

DEPTH OF COMPLETED WELL 120 ft. Bore Hole Diameter 8 in. to 120 ft., and ..... in. to .....

Well Water to be used as: 1 Domestic 2 Irrigation 3 Feedlot 4 Industrial 5 Public water supply 6 Oil field water supply 7 Lawn and garden only 8 Air conditioning 9 Dewatering 10 Observation well 11 Injection well 12 Other (Specify below)

Well's static water level 60 ft. below land surface measured on 12 month ..... day ..... yea

Pump Test Data: Well water was ..... ft. after ..... hours pumping ..... gpr
Est. Yield 20 gpm: Well water was N/A ft. after ..... hours pumping ..... gpr

TYPE OF BLANK CASING USED: 1 Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below) | Casing Joints: Glued ... Clamped ... Welded ... Threaded ...

Blank casing dia 5 in. to 100 ft., Dia ..... in. to ..... ft., Dia ..... in. to .....

Casing height above land surface ..... in., weight ..... lbs./ft. Wall thickness or gauge No .....

TYPE OF SCREEN OR PERFORATION MATERIAL: 7 PVC | 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) 12 None used (open hole)

Screen or Perforation Openings Are: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut 9 Drilled holes 10 Other (specify) 11 None (open hole)

Screen-Perforation Dia 5 in. to 120 ft., Dia ..... in. to ..... ft., Dia ..... in to .....

Screen-Perforated Intervals: From 100 ft. to 120 ft., From ..... ft. to .....
From ..... ft. to ..... ft., From ..... ft. to .....

Gravel Pack Intervals: From 14 ft. to 120 ft., From ..... ft. to .....
From ..... ft. to ..... ft., From ..... ft. to .....

GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other .....

Grouted Intervals: From 4 ft. to 14 ft., From ..... ft. to ..... ft., From ..... ft. to .....

What is the nearest source of possible contamination: 1 Septic tank 2 Sewer lines 3 Lateral lines 4 Cess pool 5 Seepage pit 6 Pit privy 7 Sewage lagoon 8 Feed yard 9 Livestock pens 10 Fuel storage 11 Fertilizer storage 12 Insecticide storage 13 Watertight sewer lines 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below) HOUSE

Direction from well SOUTH How many feet 150 ? Water Well Disinfected? Yes X No

Was a chemical/bacteriological sample submitted to Department? Yes ..... No X ..... If yes, date sample
was submitted ..... month ..... day ..... year: Pump Installed? Yes ..... No X .....

If Yes: Pump Manufacturer's name ..... Model No. ..... HP ..... Volts .....

Depth of Pump Intake ..... ft. Pumps Capacity rated at ..... gal. mir

Type of pump: 1 Submersible 2 Turbine 3 Jet 4 Centrifugal 5 Reciprocating 6 Other

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed (2) reconstructed, or (3) plugged under my jurisdiction and wa
completed on 12 month 18 ~~20~~ day ..... 77 yea
and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 359
This Water Well Record was completed on 12 month 22 day 77 year under the busines
Name of JAEGER Co + SONS INC by (signature) [signature]

LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX: N, NW, NE, W, E, SW, SE, S, X, 1 Mile

ELEVATION:

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
0	3	TOPSOIL	120		STOP
3	10	01 BROWN CLAY			
10	16	23 SANDROCK			
16	26	01 BLUE CLAY			
26	35	23 SANDROCK W/CLAY			
35	49	01 BLUE CLAY			
49	54	23 SANDROCK			
54	59	01 BLUE CLAY			
59	75	23 SANDROCK			
75	90	01 BLUE CLAY			
90	120	23 SANDROCK			

Depth(s) Groundwater Encountered 1 30 ft. 2 ..... ft. 3 ..... ft. 4 ..... ft. (Use a second sheet if needed)

INSTRUCTIONS: Use typewriter or ball point pen, *please press firmly* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.

USE TYPEWRITER OR BALL POINT PEN-PRESS FIRMLY, PRINT CLEARLY.

WATER WELL RECORD
KSA 82a-1201-1215

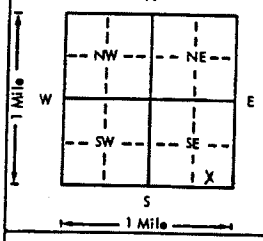
Kansas Department of Health and Environment-Division of Environment
(Water well Contractors)
Topeka, Kansas 66620

1. Location of well: County: REPUBLIC | Fraction: SW1/4 SE1/4 SE1/4 | Section number: 15 | Township number: T 4 S | Range number: R 1 E (W)

2. Distance and direction from nearest town or city: 1 E 1 S
Street address of well location if in city: AGENDA

3. Owner of well: BILL PACKARD
R.R. or street: RR
City, state, zip code: AGENDA KAN'S 66-930

4. Locate with "X" in section below: Sketch map:



5. Type and color of material		From	To
TOPSOIL		0	3
BROWN CLAY		3	27
SANDY CLAY		27	31
BROWN CLAY		31	41
RED CLAY	01	41	45
SANDROCK	23	45	51
RED CLAY	01	51	56
SANDROCK	23	56	63
BLUE CLAY		63	70
RED CLAY	01	70	101
STOP		101	

(Use a second sheet if needed)

6. Bore hole dia. 5 in. Completion date 5-3-78
Well depth 101 ft.

7. ___ Cable tool X Rotary ___ Driven ___ Dug
___ Hollow rod ___ Jetted ___ Bored ___ Reverse rotary

8. Use: X Domestic ___ Public supply ___ Industry
___ Irrigation ___ Air conditioning ___ Stock
___ Lawn ___ Oil field water ___ Other

9. Casing: Material PVC Height: Above or below
Threaded ___ Welded X Surface ___ in.
RMP ___ PVC X Weight ___ lbs./ft.
Dia. 5 in. to 101 ft. depth Wall Thickness: inches or
Dia. ___ in. to ___ ft. depth Gage No. SCH 40

10. Screen: Manufacturer's name KIMTECO
Type PVC Dia. 5"
Slot/gauze 10 Length 20'
Set between 75 ft. and 90 ft.
90 ft. and 100 ft.
Gravel pack? YES Size range of material #4

11. Static water level: mo./day/yr.
50 ft. below land surface Date 9-23-78

12. Pumping level below land surfaces:
___ ft. after 1 hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.
Estimated maximum yield 6 g.p.m.

13. Water sample submitted: mo./day/yr.
Yes X No Date

14. Well head completion:
___ Pitless adapter 12 Inches above grade

15. Well grouted? YES
With: X Neat cement ___ Bentonite ___ Concrete
Depth: From 3 ft. to 13 ft.

16. Nearest source of possible contamination:
ft. 400 Direction EAST Type LOTS
Well disinfected upon completion? X Yes ___ No

17. Pump: X Not installed
Manufacturer's name ___
Model number ___ HP ___ Volts ___
Length of drop pipe ___ ft. capacity ___ g.p.m.
Type:
___ Submersible ___ Turbine
___ Jet ___ Reciprocating
___ Centrifugal ___ Other

18. Elevation:
Topography:
___ Hill
___ Slope
X Upland
___ Valley

19. Remarks:

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DIVISION OF ENVIRONMENT

20. Water well contractor's certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Business name DARYL COX & SONS INC 359
Address CLIFTON, KANS 1-6-79
Signed ___ Date ___
Authorized representative

Forward the white, blue and pink copies to the Department of Health and Environment

Form WWC-5

T 4 S R 1 E Sec 15 1/4 1/4 1/4

M1-1023

WATER WELL RECORD Form WWC-5 KSA 82a-1212

LOCATION OF WATER WELL: County: Republic 157 | Fraction: SW ¼ SE ¼ SE ¼ | Section Number: 21 | Township Number: T 4 S | Range Number: R 1 E(W)

Distance and direction from nearest town or city street address of well if located within city?
[illegible], [illegible], Kansas

WATER WELL OWNER: Gerald Thompson
RR#, St. Address, Box # : Agenda, Kansas 66930
City, State, ZIP Code :

Board of Agriculture, Division of Water Resourc
Application Number:

LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX: N / NW / NE / W / E / SW / SE / S

4 DEPTH OF COMPLETED WELL: 70 ft. ELEVATION:
Depth(s) Groundwater Encountered 1 ft. 2. ft. 3. ft
WELL'S STATIC WATER LEVEL 45 ft. below land surface measured on mo/day/yr 4/7/1984
Pump test data: Well water was NA ft. after hours pumping gpr
Est. Yield 15 gpm; Well water was ft. after hours pumping gpr
Bore Hole Diameter 8 in. to 70 ft., and in. to ft
WELL WATER TO BE USED AS: 1 Domestic 3 Feedlot 5 Public water supply 6 Oil field water supply 8 Air conditioning 9 Dewatering 11 Injection well 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Lawn and garden only 10 Observation well
Was a chemical/bacteriological sample submitted to Department? Yes No: If yes, mo/day/yr sample was submitted
Water Well Disinfected? Yes No

TYPE OF BLANK CASING USED: 2 PVC | 1 Steel 3 RMP (SR) 4 ABS | 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass | 8 Concrete tile 9 Other (specify below)
CASING JOINTS: Glued Clamped | Welded | Threaded
Blank casing diameter 5 in. to 50 ft., Dia in. to ft., Dia in. to ft
Casing height above land surface 12 in., weight 3 lbs./ft. Wall thickness or gauge No. .256

TYPE OF SCREEN OR PERFORATION MATERIAL: 7 PVC | 1 Steel 3 Stainless steel 4 Galvanized steel | 5 Fiberglass 6 Concrete tile | 8 RMP (SR) 9 ABS | 10 Asbestos-cement 11 Other (specify) 12 None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE: 8 Saw cut | 1 Continuous slot 2 Louvered shutter | 3 Mill slot 4 Key punched | 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut | 9 Drilled holes 10 Other (specify) 11 None (open hole)
SCREEN-PERFORATED INTERVALS: From 50 ft. to 70 ft., From ft. to ft
From ft. to ft., From ft. to ft
GRAVEL PACK INTERVALS: From 14 ft. to 70 ft., From ft. to ft
From ft. to ft., From ft. to ft

GROUT MATERIAL: 1 Neat cement | 2 Cement grout 3 Bentonite 4 Other
Grout Intervals: From 0 ft. to 14 ft., From ft. to ft., From ft. to ft
What is the nearest source of possible contamination:
1 Septic tank | 4 Lateral lines 5 Cess pool 6 Seepage pit | 7 Pit privy 8 Sewage lagoon 9 Feedyard | 10 Livestock pens 11 Fuel storage 12 Fertilizer storage 13 Insecticide storage | 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below)
2 Sewer lines 3 Watertight sewer lines
Direction from well? North How many feet? 100

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
0	3	topsoil			
3	32	sandy clay			
32	46	sandrock			
46	52	brown clay			
52	60	sandrock			
60	64	brown clay			
64	70	sandrock			
70		stop			

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CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 4/7/1984 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 359 This Water Well Record was completed on (mo/day/yr) 4/9/1984
under the business name of Daryl Cox & Sons Inc. by (signature) Daryl Cox

INSTRUCTIONS: Use typewriter or ball point pen, *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Environmental Geology Section, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.