

# **Work Plan for a Limited CCC/USDA Investigation of the Current Carbon Tetrachloride Contamination in Groundwater at Navarre, Kansas**

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**Environmental Science Division**



**United States Department of Agriculture**

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# Work Plan for a Limited CCC/USDA Investigation of the Current Carbon Tetrachloride Contamination in Groundwater at Navarre, Kansas

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by  
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## Notation

AGEM	Applied Geosciences and Environmental Management
BGL	below ground level
°C	degree(s) Celsius
CCC	Commodity Credit Corporation
CPT	cone penetrometer
EPA	U.S. Environmental Protection Agency
ft	foot (feet)
gal	gallon(s)
hr	hour(s)
I.D.	inner diameter
IDW	investigation-derived waste
in.	inch(es)
KDHE	Kansas Department of Health and Environment
µg/L	microgram(s) per liter
MCL	maximum contaminant level
NCKC	North Central Kansas Cooperative
PVC	polyvinyl chloride
RWD#2	Dickinson County Rural Water District #2
USDA	U.S. Department of Agriculture
VI	vapor intrusion
VOC	volatile organic compound

## **Work Plan for a Limited CCC/USDA Investigation of the Current Carbon Tetrachloride Contamination in Groundwater at Navarre, Kansas**

### **1 Introduction and Background**

During private well testing in 1990-1991, carbon tetrachloride was identified in the groundwater at several locations in the town of Navarre, Kansas, at levels exceeding the Kansas Tier 2 level and U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) of 5.0 µg/L. Several subsequent investigations through 2006 evaluated the concentrations and distribution of carbon tetrachloride in groundwater. This work included the identification of the contaminant sources (Argonne 2007). The history of activities to address the contamination in soil and groundwater is summarized in Table 1.1. The most recent studies, conducted by the Kansas Department of Health and Environment (KDHE), include a brownfields investigation initiated in 2013 (Phase I) and continuing in early 2014 (Phase II), as well as private well testing.

On December 17, 2013, the KDHE (2013) sent a letter to the U.S. Department of Agriculture (USDA), Office of the General Counsel, and the attorney for the North Central Kansas Cooperative (NCKC) for the Navarre site. In the letter, the KDHE requested collaboration to delineate and remediate the groundwater contamination in Navarre, with the ultimate goal of site reclassification. Subsequent discussions identified the scope and direction of a potential joint effort to reevaluate the current subsurface concentrations and distribution of carbon tetrachloride in the groundwater, along with the potential threat of vapor intrusion (VI) that this contamination might pose to the community.

The result of the negotiations is that the Commodity Credit Corporation (CCC) of the USDA will conduct a limited groundwater investigation, and NCKC will be responsible for VI testing of potentially impacted homes to be identified through the CCC/USDA groundwater investigation.

In January 2014, the CCC/USDA collected split groundwater samples for volatile organic analysis during the NCKC's quarterly sampling of four monitoring wells (primarily for nitrate). In March 2014, as part of its brownfields investigation, the KDHE identified private wells in current use (KDHE 2014) at the Falk, Goracke, Haggerty, Hudson, and Steede residences and sampled the Hudson well. The results for these two events are in Figure 1.1 and Table 1.2.

TABLE 1.1 History of activities to address the contamination in soils and groundwater at Navarre.

Year	KDHE	Co-op	CCC/USDA
1990-1991	Private well testing		
1992	Preliminary assessment		Alternate water supply study Bottled water provided Phase I Investigation
1993			Point-of entry filtration units installed Phase II investigation
1995			Feasibility study
1997	Comprehensive investigation under State Water Plan		
2000			Papadopolus investigation
2001			RWD connection to town completed
2004	Consent order with co-op signed	Consent order with KDHE signed Work plan for carbon tetrachloride investigation Work plan for nitrate investigation	Received KDHE request to develop a monitoring proposal
2005		Field investigation for carbon tetrachloride and nitrate	
2006			Investigation of carbon tetrachloride sources
2007		Well MW-COOP installed	Groundwater level monitoring
2009		Soil excavation for nitrate Well MW-COOP2 installed Quarterly groundwater monitoring for nitrate begins	Observation of co-op nitrate excavation to support review of work plan.
2010		Soil sampling to guide further soil excavation Quarterly groundwater monitoring	
2011		Presumptive remedy for nitrate Quarterly groundwater monitoring	
2012		Quarterly groundwater monitoring	
2013	Brownfields Phase I targeted assessment	Quarterly groundwater monitoring	
2014	Brownfields Phase II assessment	Quarterly groundwater monitoring	Split groundwater sampling with co-op

Estimated total investment:

~\$210,000 (\$200,000 reimbursed through KARB)  
Based on public records

> \$3 million

Key to actions:



Related to carbon tetrachloride contamination



Related to nitrate contamination



Related to both carbon tetrachloride and nitrate contamination

TABLE 1.2 Analytical results for NCKC-CCC/USDA monitoring well sampling in January 2014 and KDHE private well sampling in March 2014.

Location	Sample	Sample Date	Sample Type <sup>a</sup>	Depth (ft BGL)	Concentration (µg/L)			Sample Description
					Carbon Tetrachloride	Chloroform	Methylene Chloride	
KDHE-1	NAKDHE1-W-36407	1/16/2014	N	35-55	ND <sup>b</sup>	ND	ND	Co-op sampling tech purged the well of 3 volumes with a bailer. Split samples collected from the bailer.
NW-1	NANV1-W-36408	1/16/2014	N	40-50	ND	ND	ND	Co-op sampling tech purged the well of 3 volumes with a bailer. Split samples collected from the bailer. Typographical error in sample identifier; correct location is NW-1, not NV-1.
MW-COOP	NACOO1-W-36404	1/16/2014	N	–	ND	ND	ND	Co-op sampling tech purged the well of 3 volumes with a bailer. Split samples collected from the bailer.
MW-COOP	NACOO1-W-36404DUP	1/16/2014	DUP-L	–	ND	ND	ND	Duplicate laboratory analysis.
MW-COOP2	NACOO2-W-36405	1/16/2014	N	–	6.5	1.3	ND	Co-op sampling tech purged the well of 3 volumes with a bailer. Split samples collected from the bailer.
QC	NAQCTB-W-36409	1/16/2014	TB	–	ND	ND	ND	Trip blank shipped to the AGEM Laboratory for VOCs analysis with water samples under chain of custody 116141.
HUDSON	Ron Hudson 1543 May St., Navarre <sup>c</sup>	3/20/2014	N	–	25	16	ND	Domestic well sample from Hudson residence collected by KDHE and analyzed at CAS Laboratory.

<sup>a</sup> Sample types: DUP-L, duplicate laboratory analysis; N, primary sample; TB, trip blank.

<sup>b</sup> ND, compound analyzed for but not detected at a level greater than or equal to the method detection limit (< 1 µg/L).

<sup>c</sup> Sample collected by the KDHE and analyzed at CAS Laboratory with a method detection limit < 0.5 µg/L.



FIGURE 1.1 Distribution of carbon tetrachloride in monitoring wells sampled by the NCKC and the CCC/USDA in January 2014 and in the private well sampled by the KDHE in March 2014.

## 2 Scope of the CCC/USDA Investigation

At present, 16 monitoring wells and 2 private (commercial) wells have been identified as potentially available for groundwater sampling. The locations of these wells — KDHE-1, KDHE-2, MW1, MW2, MW3, MW4, MW5, T1, L-1, L-2, L-3, NW-1, NW-2, NW-3, MW-COOP, MW-COOP2, COOP-1, and COOP-3 — are illustrated in Figure 2.1. Wells MW2 and L-2 are a neighboring pair, as are wells T1 and L-1. All four are proposed for sampling; wells MW2 and T1 have shallow screens (approximately 40-60 ft below ground level [BGL]), while wells L-1 and L-2 have deep screens (roughly 70-95 ft BGL). Available construction information for the wells proposed for sampling is summarized in Table 2.1.

To address concerns regarding potential carbon tetrachloride contamination in the numerous private wells originally in use at Navarre, in 1992-1993 the CCC/USDA provided bottled water and point-of-entry filtration units to the local residents. Subsequently, in 2001 the CCC/USDA provided connections for the residents to the Dickinson County Rural Water District #2 (RWD#2) public water supply.

The CCC/USDA proposes to undertake a phased investigation program to determine the current concentrations and areal distribution of carbon tetrachloride contamination in the groundwater at Navarre. The elements of this program, in two phases, are outlined below.

### 2.1 Phase I — Identify and Sample Existing Monitoring Wells and Selected Private Wells

The following activities are proposed for Phase I of the CCC/USDA study:

- Verify the location, depth, screened interval, etc. of monitoring wells that are accessible for sampling, in and adjacent to the investigation area. The results of the KDHE brownfields investigation will be considered, and access will be requested to any wells established as part of the KDHE investigation.
- Sample the existing monitoring well network to determine the current levels of carbon tetrachloride at these locations.

- Sample additional private wells (beyond the one sampled by the KDHE in March 2014 [Section 1]) as the investigation proceeds, as part of Phase I or in Phase II, if the wells are identified as beneficial in terms of plume delineation (see below).

## **2.2 Phase II — Conduct Additional Groundwater Sampling, Install Monitoring Wells as Necessary, and Initiate Groundwater Level Monitoring**

The following activities are proposed for Phase II of the CCC/USDA study:

- Identify the possible need for groundwater sampling and/or monitoring well installation at additional locations, to be determined on the basis of the results of Phase I sampling.
- Perform additional groundwater sampling by using the direct-push capability of the Argonne cone-penetrometer (CPT) vehicle to collect samples, either in continuous vertical profiles or selectively with depth.
- With the approval of the CCC/USDA and KDHE project managers, install and sample additional monitoring wells.
- Place recording water level pressure transducers in key wells to confirm the groundwater flow direction(s).

If required to achieve the subsurface penetration necessary, a conventional (sonic) drilling rig might be used, with the approval of the CCC/USDA and KDHE project managers, to conduct the proposed Phase II groundwater sampling and well installation tasks.

## **2.3 Anticipated Further Investigations by the NCKC**

The KDHE, CCC/USDA, and NCKC have agreed that NCKC will perform VI sampling at homes identified (on the basis of the CCC/USDA groundwater investigation) as potentially at risk for carbon tetrachloride VI under KDHE (2007) guidance for indoor air. The CCC/USDA's

current understanding is that NCKC proposes the following activities in support of the joint investigation:

- Review the results of the CCC/USDA groundwater sampling in Phase I and Phase II to evaluate the need for VI testing and identify locations to be tested.
- Prepare a draft work plan for KDHE review, documenting the proposed locations and methodology to be employed.
- Conduct VI testing at the specified locations.

TABLE 2.1 Construction details for wells proposed for sampling.

Well	Installation Date	Well Depth (ft BGL)	Screen Length (ft)	Screen Interval (ft BGL)	Filter Interval (ft BGL)	Casing Diameter (in.)	Registration Number
<i>Private (commercial) wells</i>							
COOP-1	–	–	–	–	–	–	–
COOP-3	–	–	–	–	–	–	–
<i>KDHE monitoring wells</i>							
KDHE-1	6/13/1991	55	20	35-55	–	2	11591
KDHE-2	6/12/1991	45	20	25-45	–	2	11592
<i>CCC/USDA monitoring wells</i>							
MW1	4/2/1993	59	15	43-58	40-59	2	316456
MW2	4/3/1993	60	15	42.8-57.8	38.5-60	2	316457
MW3	4/2/1993	60	15	44-59	41-60	2	316458
MW4	4/3/1993	60	15	45-60	41-60	2	316459
MW5	7/25/2006	88	10	78-88	77-88	1	392866
T1	3/30/1993	65	20	40-60	37-65	6	316460
L-1	3/4/1994	95	20	75-95	72-95	4	11595
L-2	3/4/1994	90	10	80-90	73-90	2	11594
L-3	3/4/1994	90	10	80-90	77.5-90	2	11593
<i>Monitoring wells installed during Papadopulos investigation</i>							
NW-1	10/25/2000	53	10	40-50	39-50	2	318194
NW-2	10/27/2000	48	10	35.5-45.5	34.5-45.5	2	318063
NW-3	10/26/2000	51	10	38-48	36-48	2	318064
<i>NCKC monitoring wells installed for nitrate presumptive remedy</i>							
MW-COOP	9/10/2007	50	10	40-50	38-50	2	407650
MW-COOP2	4/28/2009	45	10	35-45	33-45	2	425835

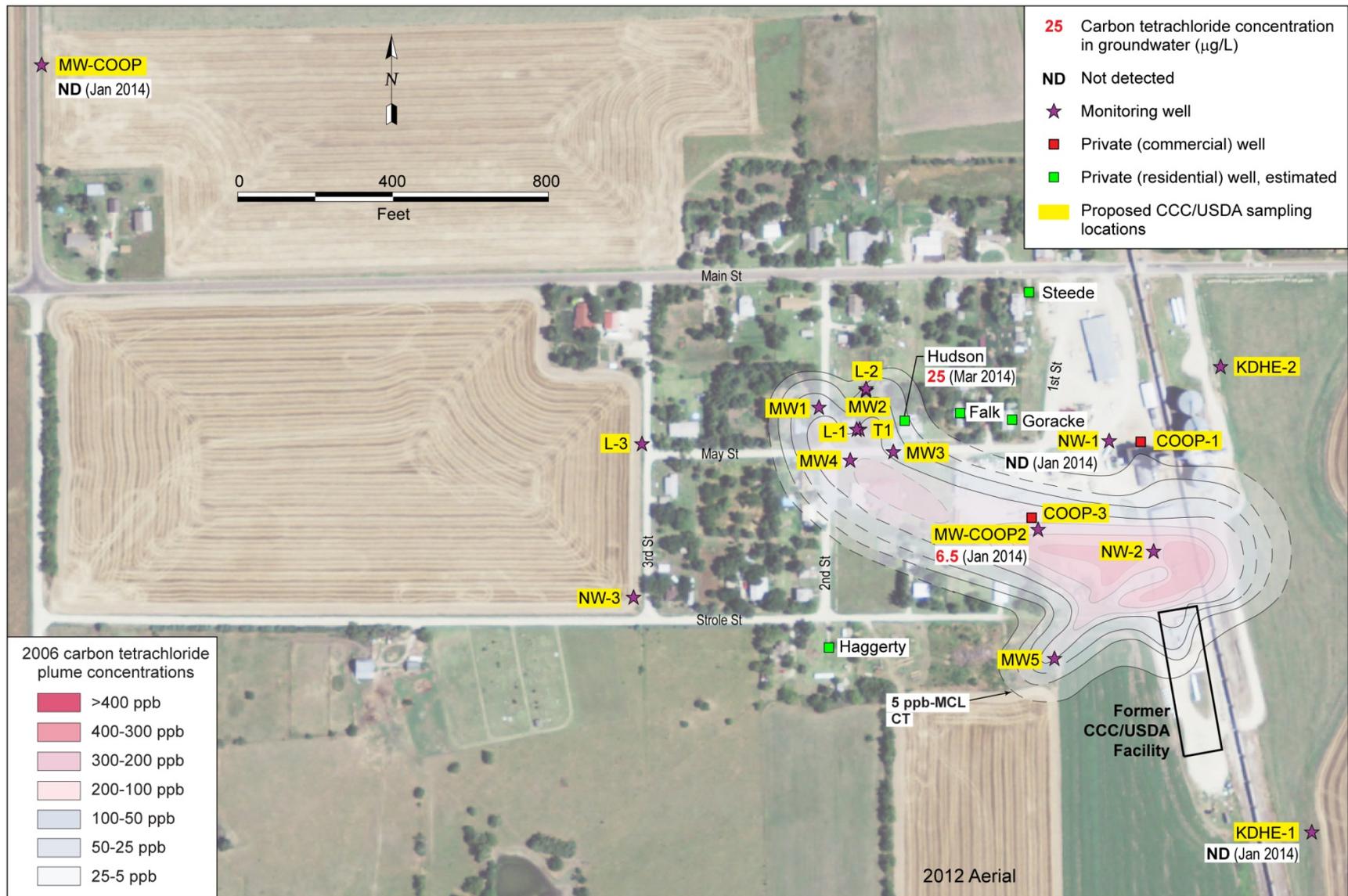


FIGURE 2.1 Wells proposed for sampling in the CCC/USDA limited investigation.

### **3 Investigation Methods for the CCC/USDA Work**

#### **3.1 Methods for Sampling of Existing Wells**

Water level measurement and sampling in existing wells will be conducted in accordance with the procedures described in the *Master Work Plan* (Argonne 2002), as follows:

1. The well number, the well owner's name, or both will be recorded.
2. If possible, the static groundwater level and then the total depth will be measured and documented for each well.
3. The groundwater from each well will be purged until field parameters of pH, temperature, and conductivity are stable. If possible, a minimum of three well volumes of water will be purged. The field parameters and volume purged will be documented. Each well will be purged before it is sampled.
4. The wells will be sampled after adequate recharge has occurred, but no more than 24 hr after purging.
5. Groundwater samples for analysis of volatile organic compounds (VOCs) will be collected in laboratory-approved containers and placed immediately in a cooler at 4°C. The samples will be shipped overnight to the Applied Geosciences and Environmental Management (AGEM) Laboratory at Argonne for off-site analysis.

#### **3.2 Methods for Groundwater Sampling and Monitoring Well Installation with the Cone Penetrometer**

If additional locations for investigative groundwater sampling are identified as a result of the Phase I studies, the CCC/USDA and Argonne will attempt to conduct the required activities by employing the direct-push capability of the Argonne CPT vehicle.

At each location investigated, depth intervals for groundwater sampling will be chosen in the field on the basis of available site-specific lithologic and hydrostratigraphic information. The groundwater sampling will be performed in accordance with the procedures described in the *Master Work Plan* (Argonne 2002), by first using the CPT rods to push a sacrificial tip and 0.5-in.-I.D. polyvinyl chloride (PVC) filter screen and riser to the desired maximum sampling depth. The rods will then be partially withdrawn to the desired minimum sampling depth, to expose the screen to the formation waters. Samples will be collected from the PVC casing by using a bailer.

All groundwater samples obtained through use of the CPT will be collected in laboratory-approved containers, immediately preserved at 4°C, and shipped overnight to the AGEM Laboratory at Argonne for rapid-turnaround (24-hr) analysis, to facilitate review of the investigation results by Argonne and by the CCC/USDA and KDHE project managers during the field program. The samples will be analyzed as described in Section 3.4.

The screen and riser used for CPT sampling at selected locations will be left in place temporarily, to permit the periodic measurement of static groundwater levels during the field program. These temporary observation points will be abandoned in accordance with KDHE requirements upon completion of the field investigation. At the discretion of the CCC/USDA and KDHE project managers — and if access is granted — permanent piezometers or monitoring wells may be installed at these locations in accordance with procedures described in the *Master Work Plan* (Argonne 2002).

### **3.3 Methods for Groundwater Sampling and Monitoring Well Installation with the Sonic Drilling Rig**

If subsurface conditions prevent successful use of the CPT for completion of the proposed investigation activities outlined in Section 2, a conventional (sonic) drilling rig will be used (with the approval of the CCC/USDA and KDHE project managers), to conduct the required groundwater sampling and for possible monitoring well installation.

### 3.3.1 Groundwater Sampling with the Sonic Drilling Rig

At each location investigated, an inner drill string with core barrel will be advanced — without drilling fluid — 10 ft at a time. Next, an outer sonic casing will be advanced. Some potable water may be used for lubrication; the amount of water added for each interval will be monitored. The inner barrel will then be pulled out, and the soil core will be extracted for lithologic confirmation. Subsequently, the stainless steel screen will be installed and set at the bottom of the borehole with the lead rod and a K-packer or other device that forms a seal between the screen and casing. The outer casing will then be vibrated back 5 ft or another desired interval, exposing the screen to the formation. An inflatable packer may be used to isolate the screened zone. After purging of the volume of water added during advancement of the outer casing, plus five times the volume of the isolated sampling zone (if possible), the groundwater sample will be collected by using a bailer.

All groundwater samples obtained by using the sonic drilling rig will be collected in laboratory-approved containers, immediately preserved at 4°C, and shipped overnight to the AGEM Laboratory at Argonne for rapid-turnaround (24-hr) analyses, to facilitate review of the investigation results by Argonne and by the CCC/USDA and KDHE project managers during the field program. The samples will be analyzed as described in Section 3.4.

### 3.3.2 Monitoring Well Installation with the Sonic Drilling Rig

Monitoring wells will be installed according to the general procedures in Section 6.4.3 of the *Master Work Plan* (Argonne 2002). The boreholes will be drilled by using a sonic rig. The wells will consist of 2-in. PVC casing installed in 8.25-in.-diameter boreholes. Screens will be 0.010-in. mill slot, PVC, at the appropriate length for the desired depth. A 10/20 (or #20) filter pack will be used. The filter pack will extend from 1 ft below the screen to 2 ft above the screened interval. A bentonite pellet seal 2-5 ft thick will be installed above the filter pack. A grout mixture of Portland cement with 5% bentonite will be placed, through a tremie pipe, in the annular space between the well casing and the borehole, from the top of bentonite seal to the ground surface.

All wells will be constructed in accordance with KDHE guidelines. Any variances required will be obtained from the appropriate agency prior to installation. All investigation-derived wastes (IDW) will be managed as described in Section 3.5. Surface completions will

consist of KDHE-approved flush mounts, as shown in the specifications for 2-in. casing in Figure F.4, Appendix F, of the *Master Work Plan* (Argonne 2002). After installation, each well will be pumped and developed as determined by the drilling engineer to be necessary.

### **3.4 Methods for Analysis of Groundwater Samples**

Groundwater samples will be analyzed at the AGEM Laboratory according to EPA Method 524.2 (EPA 1995).

Aliquots of a minimum of 10% of the total number of water samples collected will be sent directly from the field to TestAmerica Laboratories, Inc., South Burlington, Vermont, for verification analysis under the EPA's Contract Laboratory Program. An index of the EPA methods is online at <http://www.epa.gov/epahome/index>.

### **3.5 Methods for Handling and Disposal of Investigation-Derived Wastes**

The approach to handling and disposal of water IDW is as follows:

- Water IDW will be stored on-site in 55-gal drums or polyurethane containers. If acceptable to the KDHE, the wastewater will be aerated prior to sampling and analysis for VOCs.
- If analytical results for the wastewater indicate concentrations of carbon tetrachloride or chloroform below the EPA's MCL values, the water will be discharged on-site, away from known sensitive receptors. If the analytical results indicate concentrations above the MCLs, the water will be disposed of at a wastewater treatment facility approved by the KDHE.

### **3.6 Sampling and Reporting Schedule**

The proposed investigation is scheduled for 2014, with Phase I sampling in June; installation of new wells, if needed, in July; and Phase II sampling in August. The CCC/USDA

and Argonne will notify the KDHE and NCKC a minimum of two weeks before any proposed field activities begin.

A report will be completed and submitted to the KDHE after Argonne completes its quality review of the investigational data. The report will follow the guidelines for site monitoring established by KDHE Policy BER-RS-036 (KDHE 2005). Accordingly, the report will include, at a minimum, the following:

- A narrative of work conducted
- Maps depicting sample locations, groundwater flow direction(s), and contaminant levels
- Tables that include all analytical and field data
- Laboratory analytical data reports
- All relevant field documentation
- Quality assurance and quality control data

### **3.7 Quality Assurance and Quality Control**

Procedures necessary to maintain the quality of data will be implemented during all phases of the proposed investigation. Descriptions of the quality assurance and quality control methods are in Section 4 of the *Master Work Plan* (Argonne 2002).

### **3.8 Health and Safety**

A site-specific health and safety plan will be prepared, approved by the Argonne field safety coordinator, and brought to the site for reference during the investigation.

The general health and safety plan for use during this project is in Section 3 of the *Master Work Plan* (Argonne 2002). This plan addresses all anticipated safety issues for activities at the Navarre site. Specific emergency information for use at the site is in Table 3.1.

**Navarre has emergency 911 service.** All emergency calls, including police, fire, and ambulance calls, will be directed for an appropriate response from this number. No emergency medical facilities exist at Navarre. The nearest hospital with emergency medical facilities is in Abilene, Kansas. Driving directions to the hospital and a map showing the route are in Figure 3.1.

### 3.9 Argonne Contacts

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TABLE 3.1 Emergency information for the Navarre, Kansas, investigation.<sup>a</sup>

Resource	Telephone	Name
All emergencies	911 <sup>b</sup>	Dickinson County 911 Center
Hospital (nonemergency)	785-263-2100	Memorial Hospital <sup>c</sup> 511 NE 10th Street Abilene, Kansas
Police (nonemergency)	785-263-4041 785-263-3901	Dickinson County Sheriff State Police, Highway Patrol Department, Abilene, Kansas
Industrial hygiene	630-252-3310	Argonne-Industrial Hygiene (Cheryl Nelson)
Safety	605-574-2116	EVS Division <sup>d</sup> Field Safety Coordinator (Monte Brandner)
	630-252-4878	EVS Division <sup>d</sup> Environmental, Safety, and Health Coordinator (Bill Gasper)
Security	630-252-5737 630-252-5731	Argonne-Operations Security (workdays) (after hours and weekends)
Poison control	800-222-1222	Mid-America Poison Control Center
Utilities survey	800-344-7233 800-DIG-SAFE	Kansas One Call, Wichita, Kansas

<sup>a</sup> Post this table in the field operations base.

<sup>b</sup> 911 calls from cell phones can be routed to various 911 centers, depending on which tower picks up the call. Ask whether you have the **Dickinson County 911 Center** before you describe your problem. The call will be transferred if you have reached a different 911 center.

<sup>c</sup> A map showing the emergency route from Navarre to Memorial Hospital in Abilene is in Figure 3.1.

<sup>d</sup> Environmental Science Division at Argonne.

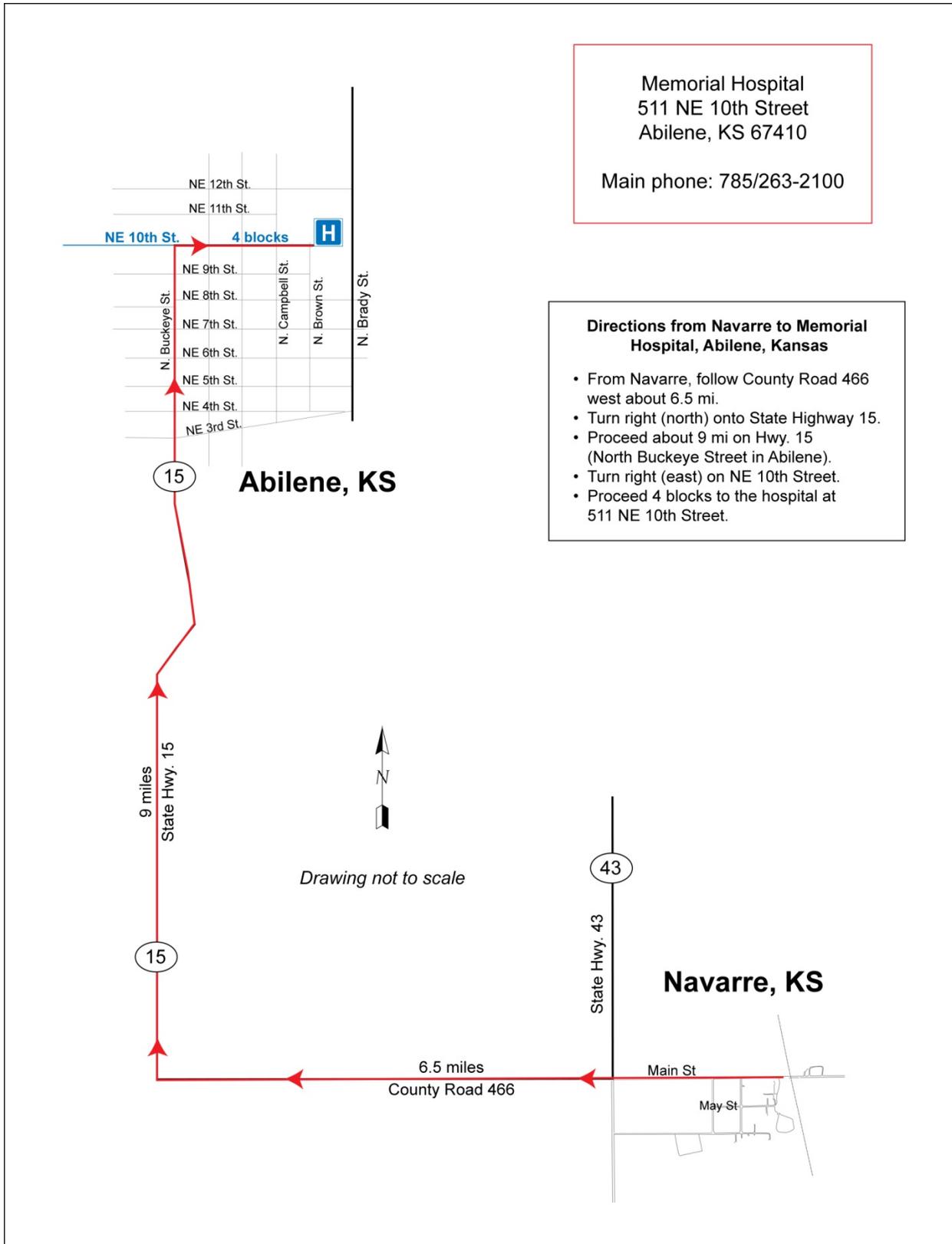


FIGURE 3.1 Emergency route from the Navarre site to Memorial Hospital in Abilene, Kansas.

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KDHE, 2013, letter from N.L. Ulrich (Legal Services, Kansas Department of Health and Environment, Topeka, Kansas), to C. Effland (Foulston Siefkin, LLP, Wichita, Kansas, representing the North Central Kansas Cooperative, Navarre, Kansas) and G.M. Fremerman (Senior Counsel, Office of the General Counsel, U.S. Department of Agriculture, Washington, D.C.), regarding carbon tetrachloride contamination at the Navarre, Kansas, site, December 17.

KDHE, 2014, letters from H. Burke (Bureau of Environmental Remediation, Kansas Department of Health and Environment, Topeka, Kansas), to Fred and Gaile Falk, Larry and Whitney Goracke, Tammy Haggerty, Ron and Sharon Hudson, Michael Steede, Fay Warders, and Sonia

Whitley (owners of properties in Navarre, Kansas), regarding connection to Dickinson County Rural Water District #2, March 7.



## **Environmental Science Division**

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