



THOMAS J. VILSACK, GOVERNOR
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LYLE W. ASELL, INTERIM DIRECTOR

October 25, 2000

Glenn Curtis
Iowa-Nebraska Remedial Program
U.S. Environmental Protection Agency
Region VII Laboratory
25 Funston Road
Kansas City, Kansas 66115

RE: Farmington Public Water Supply Site, Farmington, Iowa

Dear Mr. Curtis:

I am enclosing the Site Inspection (SI) report on the Farmington Public Water Supply site that is situated at 508 Walnut Street, Farmington, Iowa. Based on our scoring, which showed an overall score of 54.7, we believe this site deserves further consideration by the U.S. Environmental Protection Agency. Our investigation found that the nitrate levels in groundwater and in some private homes around the site exceeded EPA's Numeric Removal Action Levels for Contaminated Drinking Water Sites of 10,000 ug/L for nitrate, published by the Emergency Response Division in September 1994. The Iowa Department of Natural Resources would like to seek your consideration for a removal action at the Farmington Public Water Supply site. We believe such an action would greatly minimize the continued release of contaminants to the city's groundwater supply.

If you need more information, please contact me at 515-242-6346.

Sincerely,

Susan Dixon
Chief, Land Quality Bureau



POTENTIAL HAZARDOUS WASTE SITE
FINAL STRATEGY DETERMINATION

REGION | SITE NUMBER

File this form in the regional Hazardous Waste Log File and submit a copy to: U.S. Environmental Protection Agency; Site Tracking System; Hazardous Waste Enforcement Task Force (EN-335); 401 M St., SW; Washington, DC 20460.

I. SITE IDENTIFICATION

A. SITE NAME Farmington Public Water Supply	B. STREET 508 Walnut Street
C. CITY Farmington	D. STATE IA
	E. ZIP CODE 52626

II. FINAL DETERMINATION

Indicate the recommended action(s) and agency(ies) that should be involved by marking 'X' in the appropriate boxes.

RECOMMENDATION	MARK 'X'	ACTION AGENCY			
		EPA	STATE	LOCAL	PRIVATE
A. NO ACTION NEEDED					
B. REMEDIAL ACTION NEEDED, BUT NO RESOURCES AVAILABLE <i>(If yes, complete Section III.)</i>	X	X			X
C. REMEDIAL ACTION <i>(If yes, complete Section IV.)</i>					
D. ENFORCEMENT ACTION <i>(If yes, specify in Part E whether the case will be primarily managed by the EPA or the State and what type of enforcement action is anticipated.)</i>					

E. RATIONALE FOR FINAL STRATEGY DETERMINATION

Investigations revealed that the source of drinking water for the city is contaminated with nitrate and pesticides attributable to the site (former Denby Agri Service). There is a threat to human health from soil exposure.

F. IF A CASE DEVELOPMENT PLAN HAS BEEN PREPARED, SPECIFY THE DATE PREPARED (mo., day, & yr.)

G. IF AN ENFORCEMENT CASE HAS BEEN FILED, SPECIFY THE DATE FILED (mo., day, & yr.)

H. PREPARER INFORMATION

1. NAME Lambert A. Nrad	2. TELEPHONE NUMBER 515-281-4117	3. DATE (mo., day, & yr.) 10-13-00
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III. REMEDIAL ACTIONS TO BE TAKEN WHEN RESOURCES BECOME AVAILABLE

List all remedial actions, such as excavation, removal, etc. to be taken as soon as resources become available. See instructions for a list of Key Words for each of the actions to be used in the spaces below. Provide an estimate of the approximate cost of the remedy.

A. REMEDIAL ACTION	B. ESTIMATED COST	C. REMARKS
Soil Removal	\$	
Vertical Tank Removal	\$	
Fertilizer Bldg Removal	\$	
	\$	
	\$	
	\$	
	\$	
	\$	
D. TOTAL ESTIMATED COST	\$	

**PRELIMINARY ASSESSMENT/SITE INSPECTION
FARMINGTON PUBLIC WATER SUPPLY, FARMINGTON
VAN BUREN COUNTY, IOWA**

October 13, 2000

Prepared By:

**Lambert A. Nnadi
Iowa Department of Natural Resources
Des Moines, Iowa**

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Date: August 31, 2000

Prepared By: Lambert A. Nnadi
Iowa Department of Natural Resources
Des Moines, Iowa

Site: Farmington Public Water Supply
508 Walnut Street, Farmington
Van Buren County, Iowa

EPA ID No.:

INTRODUCTION

Under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Iowa Department of Natural Resources (IDNR) in agreement with the U.S. Environmental Protection Agency (EPA) conducted a combined a Preliminary Assessment and Site Inspection Report at the Farmington Public Water Supply site, Farmington in Van Buren county, Iowa. The purpose of the investigations was to collect information concerning the conditions at the Farmington site sufficient to assess the threat posed to human health and the environment and to determine the need for additional CERCLA/SARA or other appropriate action. The scope of these investigations included review of available information, a comprehensive target survey, onsite/offsite reconnaissance survey, soil and groundwater sampling and municipal and private well drinking water sampling.

SITE DESCRIPTION, OPERATIONAL HISTORY, AND WASTE CHARACTERISTICS

Location

The Farmington Public Waster Supply site is located at 508 Walnut Road, Farmington, in Van Buren County. The geographic coordinates are 91° 44' 14.4" W and 40° 38' 23.6" N (Figure 1). To reach the site, travel east on Hwy. 2 to Farmington. Continue on Hwy. 2 (Fourth Street) through the town until you reach Walnut Street. Make a left on Walnut Street. The site is located approximately a block and a half from the intersection of Hwy. 2 and Walnut Street.

Van Buren County is located in southeast Iowa. The average annual precipitation (1951-1980) in this part of the state is about 35.1 inches. The heaviest precipitation is in the form of rainfall, which occurs mostly between April and September. Snowfall accounts for about 2 inches of the precipitation (Reference 8).

The mean January and July temperatures are 21.2 and 74.3 °F, respectively. Extreme temperatures of over 100 °F may occur during the four months from May through August. Temperatures have dropped below freezing at least once during every month, except June, July and August (Reference 8).

Site Description

The site is approximately 2.5 acres in size. It begins at about 140 feet east from the intersection of Walnut and S. Fifth Street and continues to the intersection of Walnut and S. Seventh Street. It extends north a distance of 230 feet from Walnut Street.

Most of the site is gravel surface at 0-12 inch. Below the gravel is concrete of varying thickness down to four feet below ground surface. It is fairly level. There was no fence around the site during reconnaissance and sampling visits. However, Guy Simmons informed IDNR crew during the July 2000 soil-sampling trip that the city of Farmington recently required a privacy fence be installed around the property. According to Guy Simmons, a local company had agreed to donate the materials for the fence. A drainage ditch runs almost in a southerly direction (Reference 10).

There were four buildings at the site during the visits in May and July 2000. A house, owned by Guy Simmons, is situated at 509 Walnut Street. According to Guy Simmons, this house is at the previous location of the office of Denly Agri Service. About 56 feet north of the house is an old building previously used for mixing pesticides. The former pesticide mixing building measures 45 feet x 31 feet. A building formerly used for solid fertilizer mixing and storage is located west of Guy Simmons' house. The building measures approximately 92 feet x 34 feet. The building is dilapidated and most of it is open to the elements. Almost half of the roof has collapsed and the remainder is in danger of also collapsing. Portions of the cement floor in this former fertilizer building have deteriorated, exposing pockets of soil below. Between the former fertilizer building and Walnut Street is a retaining wall, approximately 55 feet long. There is a concrete pad east of the retaining wall. The fourth building is a little removed from the main site. The building is now called Sportsman's Motel. Estech Kaiser and subsequent operators at the site formerly used the building and the immediate area around it as a fertilizer and pesticide weigh station. Hunters and fishermen who visit the area rent the motel. Three vertical storage tanks are located about 66 feet north of Guy Simmons' house. These tanks are approximately ten feet in diameter. One of the tanks is about 35 feet tall and the remaining two tanks are about 50 feet tall (Reference 11, Appendix C).

During the PA/SI reconnaissance visit on May 25, 2000, metal scraps and white goods covered the site. The site was littered with old refrigerators, television sets, gas and electric ranges, clothes washers, water heaters, mowers, cars and some agricultural machinery. These goods were found both outside and inside the buildings at the site. Guy Simmons told me he was in the recycling business (Appendix C).

Operational History and Waste Characteristics

On February 11, 1998, the pesticide bureau of the Iowa Department of Agriculture and Land Stewardship (IDALS) received an anonymous complaint referral from the EPA, pertaining to an alleged mishandling, spillage, and improper storage, mixing and loading

of pesticides at the site. Initial investigations were conducted by IDALS. IDNR was later informed about the improper handling of these chemicals and took over the investigation. Information available to IDNR indicates that the site has been an agricultural facility since at least the 1960s. Kaiser Estech chemical division owned and operated the site until approximately 1979. It is our understanding that the chemical division of Kaiser has since been dissolved. Following Kaiser Estech's disengagement from the site, the ownership history of the facility looks something like this: Kaiser to Perkins, Perkins to Eating, Eating to Rex Eating. The more recent history involves Mr. Perkins and Mr. Burkett. Perkins and Burkett owned and operated the facility some time in the mid to late 1980s until approximately 1994. The partners reportedly had a disagreement and went into receivership. The property was eventually sold in an auction in February 1994 (Reference 6, Reference 10).

The IDALS documented that Denly Agri Service leased the property at 508 Walnut from Mr. Burkett between 1994 and 1997. Robert E. Denly owned Denly Agri Service business. In March 1998, Denly Agri Service moved to 201 South Seventh Street in Farmington and currently operates out of that location. Activities during the occupation of the site by Denly Agri Service included mixing pesticides for custom application on farmers' fields. According to IDALS, Denly Agri Service did not do any repackaging. They did provide two Freedom mini bulks to a private applicator. These mini bulks were filled at another site. Denly Agri Service custom applied Assure, Blazer, Extrazine, Harness Extra, Roundup Ultra and Synchrony. Labels were provided for other pesticides such as Accent, Concert, Cobra, Extrazine, Harness Extra, Roundup Ultra and Synchrony. Records also showed the company applied Butyrac, Lasso, Pursuit Plus, Manifest, Marksman and 2,4-D (Reference 3, Reference 6).

It appears that Denly Agri Service did not meet its financial obligations to its creditors. The company operated at 508 Walnut till late 1997 or early 1998. The property then reverted back to Mr. Burkett, who appears to be the current owner of the parts of the site not acquired by Guy Simmons. Guy Simmons who lives in a house on the property purchased part of this property. Denly Agri Service moved to another location in town. At the time Denly left the site he also left several piles of dry fertilizer on the ground in a storage building. Several fertilizer tanks were left with liquid fertilizer still in the tank. Garbage, junk and a large number of empty and/or half-empty pesticide and chemical containers were strewn everywhere. However, Mr. Denly claimed that he left those materials and equipment in the same condition as they were when he leased the property. But Mr. Burkett countered that the place was a worse mess when Denly moved to another location (Reference 3, Reference 6, Reference 9, Personal communication with Guy Simmons).

The IDALS issued a warning notice dated September 14, 1998 to Denly Agri Service that it might be in violation of Iowa Code Chapter 206.11 (3)(b) by using a registered pesticide in a manner inconsistent with its labeling. On December 14, 1999, the IDNR Water Supply Section issued a notice of violation to the city of Farmington Water Supply. The notice alleged lack of compliance with Maximum Contaminant Level for nitrate in drinking water. It alleged that the supply exceeded nitrate MCL in 19 of the 23

previous months. On December 20, 1999, the city of Farmington issued a statement to its residents informing them of the city's plan to be connected to the Rathbun Rural Water System. The notice also stated that the city was experiencing between 35 and 40% leakage rate in the water system (Reference 7).

It is believed that releases to soil and groundwater occurred through careless handling of chemicals and poor storage conditions.

WASTE/SOURCE SAMPLING

Idals Soil Sampling

On February 19, 1998, the Pesticide Bureau of Iowa Department of Agriculture and Land Stewardship collected two surface soil samples from Denly Agri Services and two sediment samples from a ditch by the site. The purpose of this sampling was to determine if there was any credibility to the allegation by an anonymous caller of pesticide and fertilizer release at Denly Agri Service (Reference 21).

IDNR Soil Sampling

IDNR soil sampling at the site was conducted on July 24 and 25, 2000. Figure 3 shows the locations of the samples. Sample collection information is presented below. At each sampling location, soil samples were collected from 0-6" and from 24-48", except at locations S-7 and S-13 where it was not possible to obtain the 24-48' samples because the Geoprobe could not penetrate the concrete at those spots. Table A describes the locations where samples were collected.

Table A. July 2000 Sampling Locations

Sample #	Location	Date	Time
S-1	West of the fertilizer building to examine what looked like degraded fertilizer granules.	7/25/00	1000
S-2	North of Walnut Street, an area with little or no vegetation and reportedly a runoff path.	7/24/00	1615
S-3	North of Walnut Street, area reportedly had very little vegetation for many years and also a runoff path.	7/24/00	1645
S-4	Concrete pad east of the retaining wall. Sample from broken & loose area in the pad.	7/24/00	1300
S-5	East of the fertilizer mixing building.	7/24/00	1130
S-6	The north end of the fertilizer building.	7/24/00	1100
S-7	Directly south of the door to the pesticide building.	7/24/00	1350
S-8	East of the shortest liquid fertilizer tanks.	7/24/00	1410
S-9	North of the on-site residential building.	7/24/00	1435
S-10	East of the on-site residential building.	7/24/00	1515
S-11	North part of a ditch located east of the property.	7/24/00	1530
S-12	South portion of the ditch located east of the property.	7/24/00	1545
S-13	Southeast of the pesticide building where a blue substance was observed on the ground near to the wall.	7/25/00	0950
S-14	Southwest of the pesticide building where drainage from overflow grates reported exited.	7/25/00	0930
S-15	North of property. Background sample.	7/24/00	1020
S-16	South of the concrete pad located in front of Sportman's Motel. Area was reportedly the fertilizer and pesticide weigh station.	7/25/00	1050

Soil Sampling Results

Table B summarizes the highest levels of contaminants detected at the site and the depths at which these levels were observed. More detailed analytical results are found in Appendix A.

Table B. Maximum Contaminant Levels in Soil, July 2000

Contaminant	Location	Soil depth	Concentration (mg/Kg)
<i>Fertilizers</i>			
Ammonia-N	S-1,	0-6"	5,200
	S-8	24-48"	5,200
Nitrate N	S-6	0-6"	2,500
<i>Chlorinated insecticides</i>			
Alpha-BHC			
Beta-BHC			
Delta-BHC			
Gamma-BHC (lindane)			
Heptachlor			
Aldrin	S-6	0-6"	4.6
Heptachlor epoxide			
Endosulfan I			
Endosulfan II			
Dieldrin	S-6	0-6"	1.8
4,4'-DDE			
Endrin			
4,4'-DDD			
4,4'-DDT			
Endosulfan sulfate			
Endrin aldehyde			
Chlordane			
Toxaphene			
<i>Common Iowa Herbicides</i>			
Atrazine	S-13	0-6"	0.83
Desethyl atrazine			
Desisopropyl atrazine			
Lasso (alachlor)	S-4	0-6"	4.2
Bladex (cynazine)	S-13	0-6"	1.6
Sencor (metribuzin)	S-8	0-6"	0.42
Dual (metolachlor)	S-14	0-6"	0.88
Acetochlor	S-14	0-6"	0.37
Treflan (trifluralin)	S-14	0-6"	1.8
Sutan (butylate)			
Simazine	S-4	0-6"	0.10
Pendimethaline (prowl)	S-3	0-6"	0.22

<i>Organophosphate & Carbamates Insecticides</i>			
Furadan (carbofuran)			
Counter (terbufos)			
Dyfonate (fonofos)			
Lorsban (chlorpyrifos)	S-14	0-6"	0.17
MoCap (ethoprop)			
Thimet (phorate)			
<i>Acid Herbicides</i>			
2,4-D			
2,4,5-TP (Silvex)			
Basagran (bentazone)	S-14	24-48	1.8
Tordon (picloram)			
Banvel (dicamba)	S-14	24-48	0.92

Conclusions

During the investigation, three potential on-going release source areas were identified. The first area was found at the west end of the former fertilizer building (Location S-1). Partially degraded granules of what appeared to be a form of ammonium fertilizer were found on the ground just behind the west wall of the building. Soil samples taken from 0-6 inch layer showed ammonia-N concentration of 5,200 mg/Kg. The second location was near the three liquid fertilizer tanks at the northeast corner of the site. Ammonia-N level in the 24-48 inch layer was 5,200 mg/Kg. A high nitrate level (2,500 mg/Kg) was detected at location S-6, just east of the fertilizer building. While the nitrate-N level is below IDNR statewide standard of 7,800 mg/Kg, the chemical could easily leach down into groundwater. Location S-14, just west of the former pesticide building, had most of the pesticide detects. Drainage from a sump in the pesticide building exited near this spot.

Among the banned or restricted chlorinated insecticides, aldrin and dieldrin were detected in the 0-6 inch layer at 4.6 and 1.8 mg/Kg, respectively. These levels are above IDNR statewide soil standard of 0.13 mg/Kg for both chemicals.

Several common Iowa herbicides were detected in soil, but none exceeded statewide standards. The USEPA currently does not have soil standards.

GROUNDWATER PATHWAY

Hydrogeology

The surface elevation at Farmington is 560 to 575 feet above mean sea level. The bedrock is 10-25 feet below land surface and the uppermost bedrock is Mississippian carbonate (Reference 2).

In Van Buren County there are four principal aquifers from which users obtain water supplies. The loose unconsolidated materials near the land surface comprise the surficial aquifer. Below the surficial aquifers are three major bedrock aquifers – the Mississippi aquifer, the Devonian aquifer and the Cambro-Ordovician aquifer. The Devonian aquifer is not used as a source of water supply in this county because it is highly mineralized (Reference 2).

Alluvial aquifer in the county consists mainly of sand and gravel transported and deposited by modern streams and makes up the floodplain and terraces in major valleys. Alluvial deposits are shallow, generally less than 50-60 feet and may be contaminated by percolating surface water. Farmington is located in the Des Moines River floodplain. Its primary water source is a 38-foot deep well in the alluvium. The static water level was measured at 26 feet. The alluvial deposits in this area are usually estimated to be capable of 20 to 100 gallons per minute, although higher rates are possible, especially further south along the Des Moines River in Lee County. Also present in the county is drift aquifer which is the thick layer of soil materials deposited over the bedrock by glacial ice which invaded the county at least twice in the last two million years (Reference 2, Reference 22).

There is a northwest-southeast trending buried bedrock valley approximately five miles east of Farmington. This buried channel aquifer is capable of yielding in the 20 to 30 gallon per minute (Reference 22).

In the southeastern portion of the county, bedrock depth varies from 0 to 1900 feet below ground surface. The surface bedrock varies from 0 to 150 feet below ground surface. The Mississippian aquifer is found at 0-200 feet. The elevation of the Mississippian bedrock is at about 550 feet in the area of Farmington. The upper part of the Mississippi aquifer is not present in the Farmington area. Thus, the lower Mississippian bedrock is the uppermost bedrock in the area. This aquifer lies directly below the alluvial aquifer in the Farmington area. The thickness is estimated at 225 to 250 feet. Water in the lower part of the Mississippian aquifer is generally of poorer quality than that found in the upper part. The lower Mississippian aquifer contains higher dissolved minerals than the upper part. Yields from the Mississippian aquifer are usually estimated to be less than 20 gpm (Reference 2, Reference 22).

The Devonian aquifer is found at 500-800 feet below ground surface. The elevation of the top of the Devonian at Farmington is estimated at 0 feet, with elevation of 50 to 100 feet above mean sea level near the town. The water in the Devonian aquifer is characterized as being unfit for human or animal consumption because of extreme amount of dissolved solids, primarily sodium-potassium, chloride and sulfate (Reference 2, Reference 22).

The Cambro-Ordovician aquifers occur at 1700-1900 feet below ground surface. The elevation of the top of the Cambro-Ordovician is 400 to 500 feet below sea level. The thickness of the unit is 650 to 700 feet with the Jordan sandstone at less than 60 feet. A few wells use the Cambro-Ordovician aquifers. Yields are estimated to be 500 to 1000

gallons per minute range. Water quality is fair. Because of the poor water quality of the lower Mississippian aquifer and Devonian aquifer and the great depth to the Cambro-Ordovician aquifer, the typical well in the Farmington area is in the alluvial sediments (Reference 2, Reference 22).

Receptors

The main target of the contaminants at the site is city well #3, which is, located about 50 feet south of the intersection of S. Fifth Street and B Street. It is approximately 500 feet cross-gradient from the site and it is only 31 feet deep. This well, in addition to city well #2, which is 51 feet deep, supplied the town of Farmington with drinking water until the city was cited for violation of the drinking water code for exceeding the MCL level for nitrate-nitrogen in the drinking water. The city of Farmington has a population of approximately 600 people. Some residents still rely on their private well supply according to the information gathered during a reconnaissance visit in May 2000. Information provided by the city of Farmington Water Department showed that there were six private wells still in use in the city. Five of these wells were down- or crossgradient of the site and were all within 0.3-mile radius of the site. (Reference 9, Reference 10, Reference 14).

Sample Locations

The city of Farmington collected water samples on a monthly basis from January 1998 to November 1999. Well #2 is located in the northeast part of town and well #3 is in the south central section of town. IDNR personnel collected water samples from city wells #2 and #3, the Des Moines River, and three private wells on June 23, 1998 for nitrate and, common pesticides analysis. Well #3 was sampled on August 26, 1998 for nitrate, common pesticides and acid pesticides. The June and August investigations were conducted to help define the extent of contamination of pesticides and nitrate within the city. Figure 4 shows the locations for the June 24 and August 26, 1998 samples.

Groundwater Field Investigation

The objective of the September 1998 field investigation was to determine the direction from which nitrate-contaminated groundwater was impacting well #3 and track the contamination to its sources.

Investigative Methods

To collect groundwater samples at depths below the water table (estimated at 20 to 30 feet below ground surface), IDNR personnel used a Geoprobe. The Geoprobe used in this investigation was a hydraulically operated direct push unit mounted in a large cargo van, which can push 3-foot long, 1-inch outside diameter hollow steel rods to depths over 50 feet. Groundwater samples were collected through a slotted section of rod at the desired depth.

Sample locations are shown in Figure 5. A total of twenty groundwater samples were collected from nineteen Geoprobe sampling locations. GP-1 through GP-9 were collected from locations around the area of city well #3 to try and determine the direction from which the contamination was entering the well field. Samples were also collected

from a test well ten feet to the northeast of well #3, and the 12-foot diameter, hand-dug well to the southwest of well #3 (Reference 11)

Two samples were collected at one location, GP-1, to determine if the nitrate contamination varied with depth. The first sample was collected from 19 to 21 feet below ground surface (GP-1/21') and the second sample was collected from 29 to bedrock at thirty-one feet in depth (GP-1/31'). Groundwater samples from GP-10 through GP-14 were collected to try to determine the nitrate source. GP-15 and GP-19 were located upgradient of the facility and GP-16 and GP-17 were completed downgradient along the south side of North Walnut Street, south of the dry fertilizer storage building, 100 feet and 50 feet, respectively, to the west of GP-14. Boring GP-18 was completed 100 feet to the east of GP-14, southeast of the dry fertilizer storage building to try to determine the eastern extent of contamination (Reference 11).

Guy Simmons, who resides in the former office building at 509 North Walnut, collected a water sample from a spring in a pasture to the east of Seventh Street for both nitrate and common pesticide analysis. For common Iowa pesticide analysis, groundwater samples were collected from GP-1 at 21 feet, GP-10, GP-13, and GP-14. An upgradient sample was collected at GP-15. Acid pesticide samples were collected from GP-1 at 21 feet, GP-14 and GP-15 locations.

Analytical Results

A high nitrate concentration was detected in the groundwater at GP-14, which indicated that a nitrate source might be from a nearby property. GP-15 was collected across the street from a dry fertilizer storage area at 508 Walnut. The dry fertilizer building is part of an inactive agricultural facility, which also includes a pesticide storage building, liquid fertilizer tanks and an office and storage building. GP-15 and GP-19 which were located upgradient of the facility showed low nitrate concentrations of 2.1 and 3.6 mg/L in the September 1998 sampling (Table D).

**Table C. Pesticide and Nitrate Water Sample Results
June 24 and August 26 1998 (Reference 11)**

Location	Contaminants					
	Atrazine	Cyanazine (Bladex)	Metolachlor (Dual)	Alachlor (Lasso)	Bentazon (Basagran)	Nitrate
PWS #2	0.13	<0.10	<0.10	<0.10	-	5.0
PWS #3 (6/23/98)	0.23	<0.10	<0.10	1.1	-	14
PWS #3 (8/26/98)	0.15	<0.10	<0.10	0.70	3.2	13.3
DSM River	3.4	0.69	1.60	<0.10	-	8.1
502 N. 3 rd	<0.10	<0.10	<0.10	<0.10	-	4.1
603 S. 4 th	0.18	0.22	0.78	6.2	-	29
Petty Place	0.35	<0.10	<0.10	0.59	-	10
Morris Huff	<0.10	<0.10	<0.10	<0.10	-	2.9
Tip Counts	<0.10	<0.10	<0.10	<0.10	-	2.4

	Atrazine	Cyanazine (Bladex)	Metolachlor (Dual)	Alachlor (Lasso)	Bentazon (Basagran)	Nitrate
MCL ^a	3	1	100	2	200	10

a- Maximum contaminant level, as established by the Environmental Protection Agency for drinking water supplies.

Results and MCLs are in micrograms per liter for all compounds except nitrate.

Results and MCLs are in milligrams per liter for nitrate.

Sample concentrations at or above contaminant's MCL are in bold.

Table D. Nitrate Results, September 1998 (Reference 11)

Sampling Locations	Concentration (mg/L)	MCL ^a
GP-1/21'	9.9	10
GP-1/31'	2.4	10
GP-2	1.6	10
GP-3	2.3	10
GP-4	2.2	10
GP-5	32	10
GP-6	19	10
GP-7	8.2	10
GP-8	0.6	10
GP-9	<0.1	10
GP-10	37	10
GP-11	3.9	10
GP-12	7.3	10
GP-13	15	10
GP-14	130	10
GP-15	2.1	10
GP-16	180	10
GP-17	220	10
GP-18	2.3	10
GP-19	3.6	10
Test well	2.2	10
12' Well	3.7	10
Spring	1.2	10
PWS #2	7.1	10
PWS #3	12	10

a- Maximum contaminant level, as established by the Environmental Protection Agency for drinking water supplies.

Results for samples above MCL are in bold.

The investigation results indicated that a possible source of nitrate contamination in groundwater might be the dry fertilizer building at 508 Walnut. Groundwater concentrations of nitrate were over 100 mg/L south of the site and less than 5 mg/L behind the agricultural facility and to the east and southeast. The nitrate contamination

appears to be a narrow plume, as the nitrate concentration decreases sharply east of the former dry fertilizer storage building and decrease steadily to the south-southwest.

Nitrate results from GP-1/31' and the city test well next to city well #3 indicate the concentrations are much lower near the bedrock surface than nearer the ground surface. The nitrate concentration was 9.9 g/L at 21' (groundwater was sampled at 19-21' bgs), and only 2.4 mg/L at 31'. (groundwater was sampled at 29-31 feet bgs). The nitrate concentration at the test well was 2.2 mg/L. According to Don Poole from the City of Farmington, the test well is slotted the last two feet above bedrock, at 29-31' bgs, which corresponds to DNR sampling interval at GP-1/31'.

Table E. Common Iowa Pesticide Results, September 1998 (Reference 11)

Sampling Location	GP-1/21'	GP-10	GP-13	GP-14	GP-15	Spring	
Common Pesticides							MCL ^a
Atrazine	0.19	0.35	0.41	1.1	<0.10	0.94	3
Cyanazine (Bladex)	<0.10	<0.10	<0.10	0.67	<0.10	1.10	1
Metolachlor (Dual)	<0.10	<0.10	<0.10	3.50	<0.10	<0.10	100
Alachlor (Lasso)	<0.10	<0.10	<0.10	10.0	<0.10	<0.10	2
Metribuzin (Sencor)	<0.10	<0.10	<0.10	0.77	<0.10	<0.20	100
Promoton	<0.10	<0.10	0.40	0.39	-	<0.10	100
Acid Pesticides							
2,4-D	<0.20			0.54	<0.20		20
Dicamba	<0.20			0.41	<0.20		20
Bentazon (Basagran)	1.20			52	<0.20		200
Amiben	<0.20			0.76	<0.20		100

a- Maximum Contaminant Level, as established by the Environmental Protection Agency for drinking water supplies.

Results are in micrograms per liter.

Sample concentrations above MCLs are in bold.

Common pesticide results also suggest a release from the site. The highest results were at GP-14 where several pesticides were detected. The pesticide concentrations decrease downgradient from the site and are not detected above MCLs at well #3. The pesticides, atrazine and cyanazine, were detected in the spring sample east of the site, with cyanazine levels above MCLs.

Conclusions

Based on the groundwater Geoprobe investigation in 1998, the nitrate concentrations detected in city well #3 are likely from the migration of contaminated groundwater entering from the north and west during pumping. The concentrations are lower at well #3 than nearby investigation results show because the city well is mixing groundwater-contaminated water with mostly uncontaminated water from the east, south and above the bedrock surface where nitrate concentrations are lower.

SURFACE WATER PATHWAY

Hydrology

The site is within the flood basin of the Des Moines River, which flows, in a northwest-southeast direction within the vicinity of the city of Farmington. The river flows to the west side of the town. It is approximately 0.3 miles west of the site. An intermittent stream flows in a southwesterly direction, about 0.25 miles south of the site. This stream joins the Des Moines River southwest of town. Just east of the site, between the residence of Guy Simmons and the Sportman's Motel is a shallow drainage ditch. This ditch will drain areas in the north portion of the site. Guy Simmons indicated that during a rainstorm, most of the runoff flows west, towards the Des Moines River. However, an observation of the topography shows a slight slope from both the east and the west. This might result in temporary ponding or flooding in the event of a heavy downpour.

Receptors

Runoff from the site would likely flow towards the Des Moines River (Figure 4, Figure 8). However there are no drinking water intakes within 15 downstream miles of the site. Most residents are now served by the municipal water system that is connected to the Rathbun Rural Water System. This is a temporary arrangement, until the city is able to eliminate the nitrate contamination in their drinking water supply wells. Residents that do not use the Rathbun Rural Water depend upon private wells for their water supply (Reference 14, Reference 15).

Sample Location

A water sample was collected from the Des Moines River on June 26, 1998 for nitrate and common pesticides. The Des Moines River water sample was taken from just south of the location where Hwy. 2 crosses the Des Moines River (Figure 4).

Analytical Results

The water sample collected from the Des Moines River in June 1998 showed nitrate level of 8.1 ug/L. The sample indicated the presence of atrazine at 3.4 ug/L, cyanazine (Bladex) at 0.6 ug/L and metolachlor (Dual) at 1.6 ug/L. The level of atrazine in the river water sample was slightly above the MCL of 3 ug/L. The other detects were below their MCLs (Table C).

Conclusions

The levels of nitrate and common pesticides, atrazine, dual and Bladex detected in the Des Moines River are fairly typical for the river at this time of year. They could be attributed to non-point pollution rather than the site. The sampling location was upstream of the probable point of entry of the drainage from the site. This sample may not be representative of the actual situation of the river within the 15 mile downstream segment from the probable point of entry of surface runoff from the former Denly Agri Service location.

SOIL EXPOSURE AND AIR PATHWAYS

Physical Conditions

During visits to the site, the IDNR observed that the former fertilizer building was exposed to the elements and the roof was crumbling. It is believed that prior to the purchase of a portion of the site by Guy Simmons in 1998, fertilizer and pesticide compounds were exposed to the elements. Also, a former worker informed the department that in the earlier days of operation by Kaiser Estech, the mixing of pesticide and fertilizer was done without a proper containment. The site is full of various types of old and discarded equipment, machinery, vehicles and appliances. Guy Simmons is salvaging some of these equipment. Most of the site is gravel surface. Concrete layer is found below the gravel surface. Thus, downward percolation of fertilizer, pesticide or other chemicals may not be retarded.

Soil and Air Targets

A residential building belonging to Guy Simmons is located on the site. Residences are also found in every direction of the site. The residences to the north and west are adjacent to the property. Two other residences to the south are within 40 feet of the site. Several other residences are situated within a quarter of a mile radius of the site. Figure 7 shows the population density of the city of Farmington. According to the 1990 census figures, the population of Farmington is about 655 (Reference 4).

Soil Sample Locations

Ten samples were collected the 0 to 6-inch depth in July 2000 to investigate the soil exposure pathway. The locations of these samples are shown in Figure 3. Additional samples were taken from 24 to 48 inch-depth to determine if downward migration has occurred. No air monitoring was conducted.

Results

Several chemicals were detected in the surface 0-6 inch layer. Ammonia-N and nitrate-N were detected at high levels in the surface and subsurface layers. The banned chlorinated insecticides, aldrin and dieldrin, were also detected in the 0-6 inch layer. Aldrin and dieldrin were not detected in the subsurface soil. These banned chemicals were detected in the southeast portion of the site. This area was reportedly a surface runoff path. Most of the common Iowa herbicides tested were only detected in the surface layer. The levels of common Iowa herbicides in the top soil were not very high (Table B). Acid herbicides were detected in both surface and subsurface layers.

Conclusions

The detection of the majority of the chemicals analyzed for in the surface 0-6 inch layer indicates a real threat of exposure to resident and nearby populations. Also, the detection of high nitrate levels in the subsurface soil is an indication of vertical leaching that is capable of impacting the surficial aquifer. The city of Farmington obtained its water supply from the surficial aquifer that was later found to be contaminated with nitrate nitrogen.

SUMMARY AND CONCLUSIONS

The Farmington Public Water Supply SI attempted to gather data necessary to evaluate the site as a potential NPL candidate. Waste and environmental samples were collected to and analyzed to characterize the types of chemicals present at the site and the potential pathways.

The Farmington PWS site had been used for several years in the formulation of different types of fertilizers and pesticides. During the formulation and handling, there had been releases of contaminants to soil and groundwater. It is believed that the contamination at the site resulted in the high nitrate levels found in the municipal water supply. After several months of noncompliance with MCL nitrate in its water, the city was eventually required to connect to the Rathbun Rural Water System. The city currently receives its water from Ft. Madison. The water is delivered to the city from Ft. Madison Water Works through Rathbun Rural Water Supply pipeline system.

The Hazard Ranking Score (HRS) gave an overall score of 54.7 for the site, which is greater than the 28.5 score required for possible listing in the NPL. Only two pathways were scored, the groundwater and soil exposure. The groundwater pathway score was 44.1 while the soil exposure pathway scored 100. The emphasis in the scoring of the site was on ammonia, nitrate and pesticide because the site was historically used in formulating insecticides, herbicides and fertilizers. The site is currently used as a salvage yard. The investigation did not include heavy metal analysis which could result from its as a salvage yard. While it is possible that some heavy metal contamination might have been detected, the result would not have affected the soil exposure score that received the maximum possible score of 100. Therefore, there was no effect on the overall score because heavy metals were not analyzed for during the SI.

Based on the overall score and the physical condition of the site, we recommend that removal be conducted. The former fertilizer building is in a dilapidated state. Leftover fertilizer materials from within and around this building are subject to leaching to groundwater. Soil removal around the vertical tanks would ensure lower ammonia and nitrate migration to groundwater. The banned insecticides, aldrin and dieldrin, appear to be still present along the surface runoff path. This runoff path was reportedly completely bare during the period that the site was used in formulating fertilizers and pesticides. Some portions along this runoff path are still bare. Soil removal would greatly eliminate the continuing release of chemicals that could be occurring to the surficial aquifer on

which the city of Farmington depended. The city has expressed interest in reusing the groundwater if contamination could be reduced or eliminated.

REFERENCES

1. Beste, C. E. 1983. *Herbicide Handbook*. Weed Science Society of America, Champaign, Illinois USA.
2. Iowa Geological Survey. 1989. *Groundwater Resources, Van Buren County*. Open File Report 80-89.
3. Eckermann, C. A. 1998. Letter from Iowa Department of Agriculture and Land Stewardship to Iowa Department of Natural Resources Regarding Denly Agri Service, Farmington. IDNR Files. CON 12-15: Farmington Public Water Supply.
4. Goudy, Willis and Burke, Sandra. 1995. *Population (1850-1990) and Population Estimates (1994) for Incorporated Places in Iowa*. Census Service.
5. Guenzi, W. D. (ed.). 1974. *Pesticides in Soil and Water*. Soil Science Society of America, Inc., Madison, Wisconsin, USA.
6. Howell, Rollin K. 1998. *Misuse Investigation. Report on Denly Agri Service, Farmington Prepared by the Pesticide Bureau, Iowa Department of Agriculture and Land Stewardship*. IDNR Files. CON 12-15: Farmington Public Supply.
7. Iowa Department of Agriculture and Land Stewardship. 1998. *Warning Notice to Robert Denly, Denly Agri Service Regarding for Misuse of Pesticide*. IDNR Files. CON 12-15: Farmington PWS.
8. Iowa Department of Economic Development. 1991. *Statistical Profile of Iowa*.
9. Iowa Geographic Information Council. 2000. *Iowa Geographic Information Systems*.
10. Iowa Department of Natural Resources. 2000. *Reconnaissance Trip to Former Denly Agri Service Site*. IDNR Files. CON 12-15: Farmington PWS.
11. Iowa Department of Natural Resources. 1998. *Investigative Report: Farmington Public Water Supply, Farmington, Iowa*. IDNR Files. CON 12-15: Farmington Public Water Supply.
12. United States Environmental Protection Agency. 1992. *Hazard Ranking System. Guidance Manual*.

13. Iowa Department of Natural Resources. 1999. Some Notes on the Ownership History of the Former Denly Agri Services facility. IDNR Files. CON 12-15: Farmington PWS.
14. Iowa Department of Natural Resources. 1999. Compliance Schedule Violations – Notice of Violation of Drinking Water Standards. IDNR Files. CON 11-1: Farmington PWS.
15. McClure Engineering Co., Consulting Engineers and Planners. 1998. Preliminary Engineering Study for Farmington Water Utility, Farmington, Iowa. IDNR Files. CON 11-1: Farmington Public Water Supply.
16. United States Department of Agriculture-Soil Conservation Service. 1962. Soil Survey of Van Buren County, Iowa.
17. United States Environmental Protection Agency. 1991. Guidance for Performing Preliminary Assessments under CERCLA. Office of Emergency and Remedial Response. Washington, DC.
18. United States Environmental Protection Agency. 1991. Guidance for Performing Site Inspections under CERCLA. Office of Emergency and Remedial Response. Washington, DC.
19. United States Environmental Protection Agency. SI Inspection Worksheets. Region I version 6/2/94.
20. University Hygienic Laboratory. 2000. Soil Sampling Results. Former Denly Agri Services Facility. IDNR Files. CON 12-15: Farmington PWS.
21. Iowa Department of Agriculture and Land Stewardship .1998. Pesticide Investigation File 98-0504. Results. IDNR Files. CON 12-15: Farmington PWS.
22. Iowa Department of Natural Resources – Geological Survey Bureau. 1998. Well Searches for UST Site Monitoring Reports. IDNR Files. CON 12-15: Farmington PWS.
23. Iowa Department of Natural Resources. 1998. Iowa Land Recycling Program and Response Action Standards.
24. United States Environmental Protection Agency. 1996. Superfund Chemical Data Matrix. Office of Solid Waste and Emergency Response, Washington, DC 20460.
25. United States Environmental Protection Agency. 1989. Risk Assessment Guidance for Superfund. Volume 1. Human Health Evaluation Manual. Interim Final.
26. Federal Register. 1990. 40 C.F.R. Part 300. Hazard Ranking System; Final Rule.

APPENDIX A

Soil Fertilizer and Pesticide Concentrations

Table A-1: Soil Ammonia and Nitrate Levels (mg/kg)

Location	Depth	Ammonia	Nitrate
S-1	0-6"	5,200	1,600
	24-48"	70	32
S-2	0-6"	-	23
	24-48"	25	63
S-3	0-6"	-	16
	24-48"	-	-
S-4	0-6"	19	130
	24-48"	420	160
S-5	0-6"	21	230
	24-48"	160	960
S-6	0-6"	18	2,500
	24-48"	77	690
S-7	0-6"	-	28
S-8	0-6"	290	300
	24-48"	5200	690
S-9	0-6"	-	-
	24-48"	-	-
S-10	0-6"	-	24
	24-48"	-	32
S-11	0-6"	-	-
	24-48"	-	-
S-12	0-6"	-	-
	24-48"	-	-
S-13	0-6"	41	1,300
S-14	0-6"	14	380
	24-48"	170	550
S-15	0-6"	28	97
	24-48"	-	-
S-16	0-6"	-	57
	24-48"	-	-

Table A-2: Chlorinated Hydrocarbon Insecticides

Sam ple #	Depth	Aldrin	alpha- BHC	beta- BHC	delta- BHC	gamma- BHC (Lindane)	DDD	DDE	DDT	Methoxy chlor
S-1	0-6"									
	24- 48"									
S-2	0-6"									
	24- 48"									
S-3	0-6"	0.14								
	24- 48"									
S-4	0-6"									
	24- 48"									
S-5	0-6"									
	24- 48"									
S-6	0-6"	4.6								
	24- 48"									
S-7	0-6"									
S-8	0-6"	0.068								
	24- 48"									
S-9	0-6"									
	24- 48"									
S-10	0-6"									
	24- 48"									
S-11	0-6"									
	24- 48"									
S-12	0-6"									
	24- 48"									
S-13	0-6"									
S-14	0-6"									
	24- 48"									
S-15	0-6"									
	24- 48"									
S-16	0-6"									
	24- 48"									

Table A-2 contd. (chlorinated hydrocarbon insecticides)

Sam ple #	Depth	Dieldrin	Endosul- fan I	Endo- sulfan II	Endosul- fan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	Hepta- chlor	Hepta- chlor epoxide
S-1	0-6"									
	24- 48"									
S-2	0-6"	0.17								
	24- 48"									
S-3	0-6"	0.54								
	24- 48"									
S-4	0-6"									
	24- 48"									
S-5	0-6"									
	24- 48"									
S-6	0-6"	1.8								
	24- 48"									
S-7	0-6"									
S-8	0-6"	0.61								
	24- 48"									
S-9	0-6"									
	24- 48"									
S-10	0-6"									
	24- 48"									
S-11	0-6"									
	24- 48"									
S-12	0-6"									
	24- 48"									
S-13	0-6"									
S-14	0-6"									
	24- 48"									
S-15	0-6"									
	24- 48"									
S-16	0-6"									
	24- 48"									

Table A-2 contd. (chlorinated hydrocarbon insecticides)

Sam- ple #	Depth	Chlor- dane	Toxa- phene							
S-1	0-6"									
	24- 48"									
S-2	0-6"	0.27								
	24- 48"									
S-3	0-6"	0.21								
	24- 48"									
S-4	0-6"									
	24- 48"									
S-5	0-6"									
	24- 48"									
S-6	0-6"	0.31								
	24- 48"									
S-7	0-6"									
S-8	0-6"									
	24- 48"									
S-9	0-6"									
	24- 48"									
S-10	0-6"									
	24- 48"									
S-11	0-6"									
	24- 48"									
S-12	0-6"									
	24- 48"									
S-13	0-6"									
S-14	0-6"									
	24- 48"									
S-15	0-6"									
	24- 48"									
S-16	0-6"									
	24- 48"									

Table A-3: Common Iowa Herbicides Levels in Soil

Sample #	Depth	Atrazine	Desethyl atrazine	Desisopropyl atrazine	Lasso (alachlor)	Bladex (cyanazine)	Sencor (metribuzine)	Dual (metolachlor)	Acetochlor	Treflan (trifluralin)	Sutan (butylate)
S-1	0-6"				0.14						
	24-48"										
S-2	0-6"				0.14			0.38			
	24-48"										
S-3	0-6"	0.1			0.92	0.19			0.30		
	24-48"										
S-4	0-6"	0.10			4.2	0.30					
	24-48"										
S-5	0-6"				0.13	0.11					
	24-48"										
S-6	0-6"										
	24-48"										
S-7	0-6"	0.31			0.27	0.81			0.23		
	24-48"										
S-8	0-6"				20		0.42			1.8	
	24-48"										
S-9	0-6"										
	24-48"										
S-10	0-6"				0.14	0.12					
	24-48"										
S-11	0-6"	0.43			1.9	0.32		0.44			
	24-48"										
S-12	0-6"				0.35						
	24-48"										
S-13	0-6"	0.83			0.45	1.6					
	24-48"										
S-14	0-6"	0.11			1.4	0.22		0.88	0.37	0.27	
	24-48"										
S-15	0-6"										
	24-48"										
S-16	0-6"										
	24-48"										

Table A-3: Common Iowa Herbicides Levels in Soil (Contd.)

Sample #	Depth	Simazine	Pendimethaline (Prowl)
S-1	0-6"		
	24-48"		
S-2	0-6"		1.10
	24-48"		
S-3	0-6"		0.22
	24-48"		
S-4	0-6"	0.10	
	24-48"		
S-5	0-6"		
	24-48"		
S-6	0-6"		
	24-48"		
S-7	0-6"		
	24-48"		
S-8	0-6"		
	24-48"		
S-9	0-6"		
	24-48"		

S-10	0-6"		
	24-48"		
S-11	0-6"		
	24-48"		
S-12	0-6"		
	24-48"		
S-13	0-6"		
S-14	0-6"		
	24-48"		
S-15	0-6"		
	24-48"		
S-16	0-6"		
	24-48"		

Table A-4: Organophosphate and carbamates Insecticide Soil Levels

Sample #	Depth	Furadan (carbo- furan)	Counter (terbufos)	Dyfonate (fonofos)	Lorsban (chlor- pyrifos)	MoCap (ethoprop)	Thimet (phorate)
S-1	0-6"						
	24-48"						
S-2	0-6"						
	24-48"						
S-3	0-6"						
	24-48"						
S-4	0-6"						
	24-48"						
S-5	0-6"						
	24-48"						
S-6	0-6"						
	24-48"						
S-7	0-6"						
	24-48"						
S-8	0-6"						
	24-48"						
S-9	0-6"						
	24-48"						
S-10	0-6"						
	24-48"						
S-11	0-6"						
	24-48"						
S-12	0-6"						
	24-48"						
S-13	0-6"						
S-14	0-6"				0.17		
	24-48"						
S-15	0-6"						
	24-48"						
S-16	0-6"						
	24-48"						

Table A-5: Acid Herbicides Soil Levels

Sample #	Depth	2,4-D	2,4,5-TP	Basagran (benta- zone)	Tordon (picloram)	Banvel (dicamba)	Pentachlo- rophenol
S-1	0-6"						1.8
	24-48"						
S-2	0-6"						
	24-48"						
S-3	0-6"						
	24-48"						
S-4	0-6"						
	24-48"						
S-5	0-6"						
	24-48"			0.21			
S-6	0-6"						
	24-48"						
S-7	0-6"						
S-8	0-6"						
	24-48"			0.33			
S-9	0-6"						
	24-48"						
S-10	0-6"						
	24-48"						
S-11	0-6"						
	24-48"						
S-12	0-6"						
	24-48"						
S-13	0-6"			4.1			
S-14	0-6"			0.42			
	24-48"			1.8		0.92	
S-15	0-6"						
	24-48"						

S-16	0-6"						
	24-48"						

APPENDIX B

Figures

APPENDIX C

Photographs of Site Conditions on May 25, 2000