

Summary of First-Year Operations and Performance of the Utica Aquifer and North Lake Basin Wetlands Restoration Project in October 2004–November 2005

prepared by
Environmental Science Division
Argonne National Laboratory



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by
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Notation

BGL	below ground level
CCC	Commodity Credit Corporation
°F	degree(s) Fahrenheit
ft	foot (feet)
gal	gallon(s)
gpm	gallon(s) per minute
GWEX	groundwater extraction
hr	hour(s)
µg/L	microgram(s) per liter
mph	mile(s) per hour
MW	monitoring well
NDEQ	Nebraska Department of Environmental Quality
NGPC	Nebraska Game and Parks Commission
NPDES	National Pollutant Discharge Elimination System
USDA	U.S. Department of Agriculture
VOC	volatile organic compound

Summary of First-Year Operations and Performance of the Utica Aquifer and North Lake Basin Wetlands Restoration Project in October 2004–November 2005

1 Introduction

This document summarizes the performance of the groundwater restoration systems installed by the Commodity Credit Corporation of the U.S. Department of Agriculture (CCC/USDA) at the former CCC/USDA grain storage facility in Utica, Nebraska, during the initial period of system operation, from October 29, 2004, until November 31, 2005.

In the project at Utica, the CCC/USDA is cooperating with multiple state and federal agencies to remove carbon tetrachloride contamination from a shallow aquifer underlying the town and to provide supplemental treated groundwater for use in the restoration of a nearby wetlands area. Argonne National Laboratory has assisted the CCC/USDA by providing technical oversight for the aquifer restoration effort and facilities during this review period.

This document presents overviews of the aquifer restoration facilities (Section 2) and system operations (Section 3), then describes groundwater production results (Section 4), groundwater treatment results (Section 5), and modifications and costs during the review period (Section 6). Section 7 summarizes the first year of operation.

2 Overview of the Aquifer Restoration Facilities at Utica

The principal components of the groundwater restoration systems at Utica are shown in Figure 2.1. The facilities consist of two main operating units, as described below. The facilities include four groundwater extraction (GWEX) wells. Table 2.1 summarizes construction details for these wells. The well registration forms are in Appendix A.

2.1 Wells GWEX1–GWEX3 and the Spray Irrigation Treatment Units

Extraction wells GWEX1–GWEX3, located in the northern portion of the town, are used to extract contaminated groundwater from the upgradient portion of the contaminant plume. The wells are linked by a distribution system that selectively carries untreated groundwater to either of two discharge points in the northern and southern subbasins of the North Lake Basin Wildlife Management Area (Figure 2.1). At each discharge point, the water is treated to remove carbon tetrachloride by using a custom spray irrigation treatment unit (Figure 2.2). The three extraction wells are operated simultaneously to maintain a critical operating pressure at each treatment unit.

Wells GWEX1–GWEX3 are operated intermittently during the year, subject to local weather conditions and in consultation with the Nebraska Game and Parks Commission (NGPC). NGPC owns most of the property occupied by the wetlands and has administrative and technical responsibility for management of the wildlife area.

TABLE 2.1 Summary of construction details for GWEX wells at Utica.

Well	Depth (ft BGL)			
	Depth	Screen Interval	Gravel Pack Interval	Casing Diameter (in.)
GWEX1	132	106–126	97–132	8
GWEX2	148	110–145	106–148	8
GWEX3	146	105–140	101–146	8
GWEX4	150	115–145	110–150	6

2.2 Well GWEX4 and the Conventional Air Stripper

Extraction well GWEX4 is located near the downgradient toe of the carbon tetrachloride plume and is operated continuously as a containment well. Groundwater produced from GWEX4 is treated by using a conventional (shallow-tray) air stripping technique, and the effluent is discharged to the surface for reinfiltration into the shallow Utica aquifer.

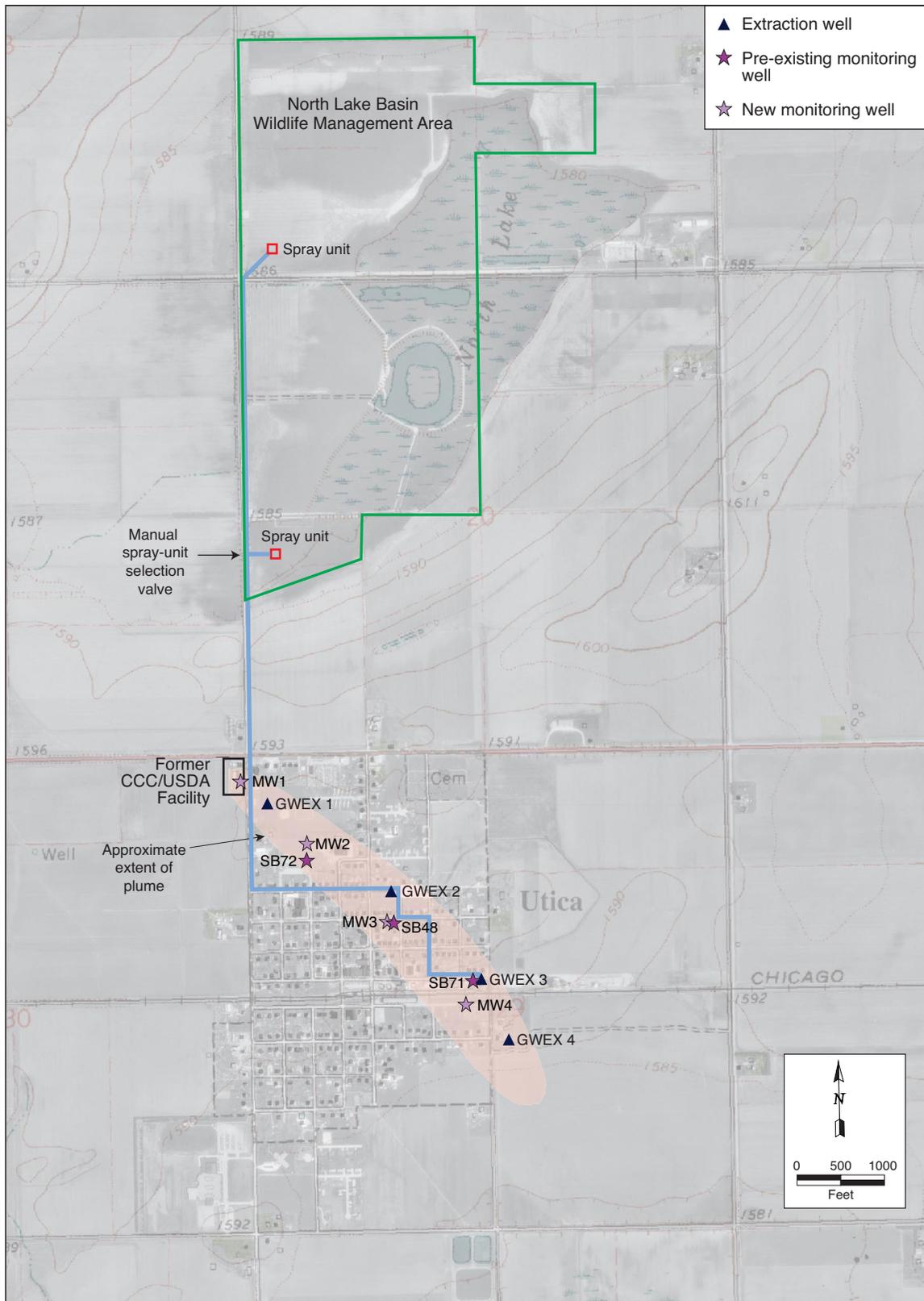


FIGURE 2.1 Locations of the restoration facilities, contaminant plume, and permanent monitoring wells at Utica.



FIGURE 2.2 Spray irrigation unit in operation at Utica.

3 Overview of System Operations

3.1 Operation of Wells GWEX1–GWEX3 and the Spray Irrigation Treatment Units

Routine operation of wells GWEX1–GWEX3 and the spray irrigation treatment units began on November 22, 2004. The wells were pumped intermittently, under automated control, during 11 of the 13 months during the review period. The daily operation of the spray treatment units is governed primarily by weather conditions; to ensure effective removal of the carbon tetrachloride and to prevent excessive drift of the resulting spray discharge, a minimum air temperature of 40°F and sustained winds of less than 15 mph are required for operation.

Wells GWEX1–GWEX3 and the treatment units were not operated in late May 2005 and all of June and July 2005, because heavy storms in early May caused rapid, widespread flooding throughout the Utica area and persistent high water levels in the North Lake Basin and on surrounding private properties. The pumping was curtailed at the request of the NGPC, in response to concerns expressed by the neighboring property owners regarding the continued flooding.

For reasons including apparent power supply fluctuations and outages, unexpected shutdowns of the wells and the spray treatment units occurred sporadically during the review period. Investigations to determine the quality of the electrical power supplied by the local utility company led to adjustments to the drive units for the well pumps that reduced the frequency of shutdowns. Occasional pumping interruptions have continued, however. Investigation into the cause(s) of these shutdowns were still in progress at the end of the review period.

Treated groundwater from the spray irrigation systems was selectively routed to both the north and south subbasins at the request of the NGPC. Groundwater was discharged exclusively to the north subbasin during the winter of 2004 and early spring of 2005, then to both subbasins during the remainder of the review period.

3.2 Operation of Well GWEX4 and the Conventional Air Stripper

Operation of well GWEX4 and the associated air stripper began on October 29, 2004. GWEX4 operated continuously during the review period, with only two brief interruptions of less than one day each. The interruptions were as follows:

- On August 12, 2005, the equipment was temporarily shut down to permit the local utility company to repair power supply connections to the well house.
- On October 26, 2005, the system was shut down for routine inspection and cleaning of the shallow-tray air stripping unit.

Treated groundwater from well GWEX4 is discharged to an open ditch that serves as part of Utica's storm drainage system. The ditch borders a county road leading eastward from the town, as well as an adjacent private farm property. During the review period, Argonne received no reports of drainage or other problems associated with discharge from GWEX4.

4 Groundwater Production Results

The volumes of groundwater extracted from the Utica aquifer, treated, and discharged are summarized in Table 4.1.

4.1 Production by Wells GWEX1–GWEX3

Wells GWEX1–GWEX3 are equipped with electronically controlled pump drive units linked to digital flow meters that automatically and continuously adjust the flow from each well to maintain user-specified pumping rates. The programmed flow rates for these wells were as follows:

- GWEX1, 50 gpm
- GWEX2, 180–200 gpm
- GWEX3, 125 gpm

The selected rates were achieved, within ± 1 gpm, throughout the review period.

Wells GWEX1–GWEX3 were pumped for approximately 1,560 hr during the review period and discharged approximately 34.6 million gallons (106 acre-feet) of treated water to the North Lake Basin wetlands. Approximately 64% of the total production was routed to the northern wetlands subbasin, at the request of the NGPC.

4.2 Production by Well GWEX4

Measured groundwater pumping rates (determined from an inline flow meter) at GWEX4 ranged from approximately 51 gpm to 64 gpm. Periodically, the rates were adjusted manually to compensate for a very slow decline in the flow rate from the well over time. The groundwater volumes pumped in any one complete month (Table 4.1) ranged from approximately 2.1 million gallons to 2.7 million gallons. A total of 31.7 million gallons (97.5 acre-feet) of groundwater was treated and discharged during the review period, at a net average pumping rate of approximately 56 gpm.

TABLE 4.1 GWEX operation and groundwater production data for the first year of restoration at Utica.^a

Month	Groundwater Produced by Wells GWEX1–GWEX3 ^b (gal)			Operating Time GWEX1–3 ^c (hr)	Volume Discharged to Wetlands (gal)		GWEX4 ^d	
	GWEX1	GWEX2	GWEX3		North	South	Groundwater Produced (gal)	Operating Time (days)
Oct 2004	– ^e	–	–	–	–	–	263,520	3
Nov 2004	130,800	470,880	327,000	43.6	928,680	–	2,687,040	30
Dec 2004	151,800	546,480	379,500	50.6	1,077,780	–	2,660,544	31
Jan 2005	21,000	75,600	52,500	7.0	149,100	–	2,544,480	31
Feb 2005	288,900	1,040,040	722,250	96.3	2,051,190	–	2,298,240	28
Mar 2005	585,300	2,107,080	1,463,250	195.1	4,155,630	–	2,620,368	31
Apr 2005	407,944	1,631,776	1,019,860	135.9	1,780,680	1,278,900	2,397,600	30
May 2005	243,933	975,733	609,833	81.3	–	1,829,500	2,410,560	31
Jun 2005	–	–	–	–	–	–	2,332,800	30
Jul 2005	–	–	–	–	–	–	2,332,800	31
Aug 2005	200,827	803,307	502,067	66.9	1,506,200	–	2,096,460	31
Sept 2005	899,880	3,599,520	2,249,700	300.0	3,644,514	3,104,586	2,273,000	30
Oct 2005	1,201,093	4,804,373	3,002,733	400.5	2,648,411	6,359,789	2,455,905	31
Nov 2005	546,267	2,185,067	1,365,667	182.1	4,097,000	–	2,379,375	31
TOTAL	4,677,744	18,239,856	11,694,360	1,559.3	22,039,185	12,572,775	31,752,692	399

^a Combined total production: 66,364,652 gal. Total production to wetlands: 34,611,960 gal.

^b Routine operation of GWEX1–GWEX3 and the spray irrigation treatment units began on November 22, 2004.

^c Wells GWEX1–GWEX3 operate simultaneously.

^d Routine operation of GWEX4 and the air stripping unit began on October 29, 2004.

^e Unit not in operation.

5 Groundwater Treatment Results

Treated groundwater at Utica is discharged under a National Pollutant Discharge Elimination System (NPDES) Permit, number NE0137456, issued by the Nebraska Department of Environmental Quality (NDEQ) on October 1, 2004.

To comply with the NPDES permit, samples of treated groundwater are collected monthly

- At the outlet of the air stripping unit at GWEX4 and
- From the spray discharge at each of the irrigation treatment units (during months of operation).

The samples are analyzed to determine the residual concentrations of carbon tetrachloride in the treated groundwater and the pH of the effluent. The results of these analyses are reported to the NDEQ quarterly.

The discharges of treated groundwater at Utica are considered by the NDEQ to contribute to the surface waters of the state. On this basis, NDEQ has specified the following compliance limits for the outfall from each treatment unit:

- A target maximum residual carbon tetrachloride concentration of 44.2 µg/L
- An acceptable pH range of 6.5 to 9.0

In conjunction with the compliance sampling, Argonne collects monthly samples of the untreated groundwater from each extraction well. The samples are analyzed for volatile organic compounds (VOCs) to enable estimation of the following:

- Carbon tetrachloride removal efficiencies for the treatment units
- Quantities of carbon tetrachloride removed from the contaminated aquifer

The results of the sampling and analyses during the review period are summarized in Tables 5.1 and 5.2.

5.1 Results for Wells GWEX1–GWEX3, with Treatment by Spray Irrigation

The concentrations of carbon tetrachloride found in the untreated groundwater from extractions wells GWEX2 and GWEX3 remained fairly stable and showed no clear trends throughout the first year of pumping (Table 5.1). Carbon tetrachloride concentrations in the produced water from GWEX2 ranged from 57 µg/L to 118 µg/L; the concentrations at GWEX3 ranged from 88 µg/L to 196 µg/L.

Well GWEX1, which is located in the upgradient portion of the identified plume, was constructed to intercept carbon tetrachloride contamination in the upper portion of the Utica aquifer, near the former CCC/USDA grain storage facility. Carbon tetrachloride was not detected in the untreated groundwater from GWEX1 in the first four months of its operation (November 2004–February 2005; Table 5.1); however, contamination began to appear at increasing levels in March–early May 2005, before pumping temporarily ceased during the summer months (see Section 3.1). The concentrations of carbon tetrachloride detected at this well have risen steadily since pumping began again in August 2005. A maximum carbon tetrachloride concentration of 74 µg/L was detected at GWEX1 in November 2005.

The groundwater produced from wells GWEX1–GWEX3 is combined into a single stream for conveyance to the wetlands via a common pipeline. This combined flow is also sampled monthly, as an indicator of the weighted average concentration of carbon tetrachloride in the untreated groundwater supplied to the spray irrigation treatment units. The measured concentrations in the combined flow showed minimal variation during the review period, ranging from 100 µg/L to 122 µg/L.

Treated groundwater sprayed from the irrigation units is collected for analysis at the following four locations at the treatment site during each sampling event:

- Beneath the center point of the “west” irrigation span
- Beneath the center point of the “center” irrigation span

TABLE 5.1 Analytical results for carbon tetrachloride in untreated groundwater samples and treated effluent samples.

Month	Carbon Tetrachloride Concentration (µg/L)													GWEX4 Untreated	Stripper Effluent
	GWEX1–GWEX3 Untreated				North Spray Unit Effluent				South Spray Unit Effluent						
	GWEX1	GWEX2	GWEX3	Mixed ^a	West ^b	Center ^b	East ^b	Max ^c	West ^b	Center ^b	East ^b	Max ^c			
Nov 2004	ND ^d	103	160	115	ND	2.3	ND	ND	– ^e	–	–	–	77–94 ^f	ND	
Dec 2004	ND	108–118	98	112	2.2	1.2	ND	1.6	–	–	–	–	88–95	ND	
Jan 2005	ND	90	175–196	103	1.9	1.6–1.7	1.6	1.3	–	–	–	–	74–88	ND	
Feb 2005	ND	104	133–142	101	2.0	7.2	5.6–6	ND	–	–	–	–	88–94	ND	
Mar 2005	2.5	135	118–143	111	1.5	ND–1.4	0.9 J ^g –1.6	ND	–	–	–	–	89–92	ND	
Apr 2005	20	83–87	120	100–102	1.8	0.4	0.7 J	1.2	4.0–4.2	0.4 J–0.5 J	0.8 J	5.1–5.3	87–91	ND	
May 2005	22	98–104	121	103	–	–	–	–	0.4 J	0.7 J	0.8 J	0.6 J–0.8 J	65–77	ND	
Jun 2005	–	–	–	–	–	–	–	–	–	–	–	–	65–68	ND	
Jul 2005	–	–	–	–	–	–	–	–	–	–	–	–	66–72	ND	
Aug 2005	6.4	97–100	144	117	0.8 J	6.1–6.2	0.8 J	ND	–	–	–	–	56–58	ND	
Sep 2005	37	108	170–183	115	0.7 J	0.7 J	0.3 J	0.3 J	1.8–1.9	0.2 J	0.4 J	ND	62–67	ND	
Oct 2005	51	57–61	88	101	1.4	0.4 J	1.6	1.8	1.2	0.3 J	0.5 J	0.5 J–0.6 J	55–57	ND	
Nov 2005	74	109–114	166	114–122	5.0	4.0	1.7	0.7 J	–	–	–	–	53	ND	

^a Analytical results for samples from the combined flows of GWEX1–GWEX3.

^b Samples of spray collected below the center point of the respective irrigation span.

^c Samples of spray collected at the estimated location of maximum spray outfall.

^d ND, not detected at a method detection limit of 0.1 µg/L.

^e Unit not in operation.

^f Ranges of values represent both primary samples and quality control replicates and duplicates.

^g Qualifier J indicates an estimated concentration below the quantitation limit of 1 µg/L for the purge-and-trap method.

TABLE 5.2 Values for pH in untreated groundwater samples and treated effluent samples.

Month	pH							
	GWEX1–GWEX3 Untreated				North Spray Unit ^b	South Spray Unit ^b	GWEX4 Untreated	Stripper Effluent
	GWEX1	GWEX2	GWEX3	Mixed ^a				
Nov 2004	NR ^c	NR	NR	NR	7.7	– ^d	6.28–6.67 ^e	7.76–8.06
Dec 2004	6.80	6.76	6.72	6.80	7.6	–	8.23	7.01
Jan 2005	6.89–7.27	6.86–7.13	7.23–7.24	7.35–7.53	7.82–7.84	–	6.74	7.82
Feb 2005	6.44–6.62	6.94–7.10	7.07	7.15–7.20	7.36–7.68	–	6.29	7.82
Mar 2005	7.16–7.30	7.10–7.21	7.05–7.21	7.23–7.25	7.98–7.99	–	6.46	7.85
Apr 2005	6.91–7.00	7.08–7.17	7.02–7.07	7.08–7.18	7.58	7.85	6.45–6.56	7.83–7.98
May 2005	7.10–7.15	7.09–7.12	7.11–7.22	7.20–7.24	–	7.82–7.90	6.55–6.65	7.93–8.14
Jun 2005	–	–	–	–	–	–	6.90–6.93	8.03–8.34
Jul 2005	–	–	–	–	–	–	6.92–6.95	8.34–8.35
Aug 2005	7.03–7.04	6.90–7.04	6.87–7.18	7.00–7.09	7.46–7.52	–	6.37–6.40	7.83–7.86
Sep 2005	6.93–6.96	6.90–6.96	7.06–7.09	6.77–6.81	7.60–7.73	7.70–7.82	6.28–6.37	7.58–7.69
Oct 2005	7.22	7.14	7.05	7.15	7.01–8.12	7.98–8.15	6.30–6.36	7.47–7.73
Nov 2005	7.04–7.11	6.98–6.99	6.97–6.99	6.73–6.87	8.01–8.18	–	6.59–6.78	8.03–8.24

^a Values for samples from the combined flows of GWEX1–GWEX3.

^b Average value for spray samples collected at one or more locations at the discharge site.

^c NR, not recorded.

^d Unit not in operation.

^e Ranges indicate pH values over the sampling period each month.

- Beneath the center point of the “east” irrigation span
- At a fourth location visually chosen to reflect the estimated site of maximum spray outfall (“max” value; position varying from month to month; based on prevailing wind and spray conditions at the time of sampling)

The results summarized in Table 5.1 show that, with only a few exceptions, the concentrations of all spray samples collected during the review period were below the maximum contaminant level of 5.0 µg/L promulgated by the U.S. Environmental Protection Agency for carbon tetrachloride in drinking water. The *maximum* carbon tetrachloride level identified for a single sample in spray discharged from the irrigation treatment units was 7.2 µg/L. The *average* concentration of carbon tetrachloride in the treated groundwater discharged to the wetlands was 1.45 µg/L. The concentrations of carbon tetrachloride in all spray samples were below the

maximum target concentration (44.2 µg/L) allowed under the NPDES permit, by roughly an order of magnitude.

The results of the groundwater and spray sample analyses suggest the following *minimum carbon tetrachloride removal efficiency values* for the spray irrigation treatment process:

- More than 94% (based on data for individual samples)
- Approximately 99% (based on the average concentration delivered to the wetlands during the review period)

The results of pH measurements recorded for samples of the treated spray discharge are presented in Table 5.2. In all cases, the observed pH levels (7.01 to 8.18) were within the acceptable range (6.5 to 9.0) specified under the NPDES permit.

5.2 Results for Well GWEX4, with Treatment by Air Stripping

Carbon tetrachloride concentrations in the untreated groundwater produced by GWEX4 were relatively stable (53 µg/L to 95 µg/L) during the review period; however, a possible trend of gradually decreasing levels is suggested in the data of Table 5.1. Carbon tetrachloride was not detected in the effluent from the air stripping unit throughout the review period, indicating a carbon tetrachloride removal efficiency of > 99% for this process. Measured pH levels in all samples of the air stripper effluent (7.01 to 8.35; Table 5.2) were within the acceptable range (6.5 to 9.0) specified under the NPDES permit.

5.3 Estimated Removal of Carbon Tetrachloride from the Utica Aquifer

The groundwater production and carbon tetrachloride concentration data presented in Tables 4.1 and 5.1, respectively, can be used to estimate the total quantity of carbon tetrachloride extracted by wells GWEX1–GWEX4 from October 29, 2004, to November 31, 2005. The results of these calculations, summarized in Table 5.3, indicate that approximately 23 kg (3.8 gal) of carbon tetrachloride was removed from the Utica aquifer during the review period.

TABLE 5.3 Estimation of carbon tetrachloride removed from the Utica aquifer.^a

Month	GWEX1–GWEX3				GWEX4			
	Groundwater Extracted		Carbon Tetrachloride		Groundwater Extracted		Carbon Tetrachloride	
	(gal)	(L)	Concentration ^b (µg/L)	Calculated Amount Removed (kg)	(gal)	(L)	Concentration (µg/L)	Calculated Amount Removed (kg)
Oct 2004	– ^c	–	–	–	263,520	997,687	85.5	0.1
Nov 2004	928,680	3,515,982.5	115	0.4	2,687,040	10,173,133	85.5	0.9
Dec 2004	1,077,780	4,080,475.1	112	0.5	2,660,544	10,072,820	91.5	0.9
Jan 2005	149,100	564,492.6	103	0.1	2,544,480	9,633,401	81.0	0.8
Feb 2005	2,051,190	7,765,805.3	101	0.8	2,298,240	8,701,137	91.0	0.8
Mar 2005	4,155,630	15,733,215	111	1.7	2,620,368	9,920,713	90.5	0.9
Apr 2005	3,059,580	11,583,570	101	1.2	2,397,600	9,077,314	89.0	0.8
May 2005	1,829,500	6,926,487	103	0.7	2,410,560	9,126,380	71.0	0.6
Jun 2005	–	–	–	–	2,332,800	8,831,981	67.0	0.6
Jul 2005	–	–	–	–	2,332,800	8,831,981	69.0	0.6
Aug 2005	1,506,200	5702473.2	117	0.7	2,096,460	7,937,198	57.0	0.5
Sept 2005	6,749,100	25552093	115	2.9	2,273,000	8,605,578	64.5	0.6
Oct 2005	9,008,200	34105045	101	3.4	2,455,905	9,298,056	56.0	0.5
Nov 2005	4,097,000	15511242	118	1.8	2,379,375	9,008,314	53.0	0.5
TOTAL				14.2				9.0

^a Total carbon tetrachloride removed from the aquifer: 23.2 kg.

^b Concentration in untreated "mixed" samples of the combined flow from wells GWEX1–GWEX3.

^c Unit not in operation.

6 Operation, Maintenance, and System Modifications

6.1 Wells GWEX1–GWEX3 and the Spray Irrigation Treatment Units

No repairs or maintenance were required on extraction wells GWEX1–GWEX3 during the review period.

Maintenance and repairs for the spray irrigation units and the groundwater delivery system included the following:

- Periodic field inspection of the units and all operating parameters.
- Replacement (under warranty) of numerous pneumatic valves, used to selectively control the operation of the spray heads. The valves were damaged by freezing during the initial setup of the irrigation units.
- Replacement of the electronic valve actuators used to control the irrigation span drain-back system. The actuators were damaged as a result of the basin flooding that took place in May 2005.
- Repair (under warranty) of the base station remote system computer, to correct damage resulting from a lightning strike through the telephone wiring. Additional surge protection was also installed.
- Adjustment of the pump motor variable frequency drives, to reduce their sensitivity to line power quality.
- Replacement of a malfunctioning manual pipeline valve that controls the flow of groundwater to the north spray unit.
- Ongoing investigation to diagnose the cause(s) of sporadic, unexpected shutdowns of the wells and treatment units.

Several modifications of the spray irrigation and groundwater delivery systems were made during the review period. These updates include the following:

- Replacement of the radio hardware required for remote control and monitoring of the spray irrigation units, to permit the use of government-specific radio frequencies.
- Redesign and reconstruction of the drain-back valve vault at the south spray irrigation site, to prevent water damage in the event of future flooding.

6.2 Well GWEX4 and the Air Stripping Unit

Well GWEX4 required no maintenance or repairs during the review period.

Maintenance of the shallow-tray air stripper was limited to the following:

- Periodic field inspection of the unit and all operating parameters.
- Replacement of a view port on one of the aeration trays.
- Routine cleaning of the unit after approximately one year of operation. Inspection of the unit at that time revealed minimal silting or buildup of precipitates; these were removed by pressure washing.

6.3 Installation and Sampling of Monitoring Wells

At the beginning of the aquifer restoration program, only three permanent monitoring wells at the Utica site could be used for the sampling of groundwater for VOCs analyses. Preexisting wells SB48, SB71, and SB72 (Figure 2.1) were constructed primarily for measurement of groundwater levels and do not penetrate the more contaminated zones of the groundwater column identified in detailed vertical-profile sampling (Argonne 2000). To improve monitoring coverage, four additional permanent monitoring wells (MW1–MW4; Figure 2.1) were installed at strategic locations along the plume migration pathway in August 2005. A

proposed fifth monitoring well (Figure 2.2 of Argonne 2004) was not installed because of access issues.

Table 6.1 summarizes construction data for the new and preexisting monitoring wells, as well as the results of groundwater sampling and analyses for VOCs to date. No clear trends in the patterns of carbon tetrachloride levels at the monitoring wells were apparent during the review period. Well registration forms for the new monitoring wells (installed in 2005) are in Appendix A.

TABLE 6.1 Well construction data and analytical results for carbon tetrachloride in groundwater samples from the permanent monitoring wells.

Well	Depth (ft BGL)		Carbon Tetrachloride ($\mu\text{g/L}$)					
	Total	Screened Interval	Nov 04	Jan 05	Feb 05	Mar 05	Aug 05	Oct 05
SB48	98.5	83.5–93.5	ND ^a	ND	ND	ND	– ^b	ND
SB71	94.2	84.0–94.0	1.3	1.2	1.0	ND	–	0.3 J ^c
SB72	122.3	82.6–112.6	5.5–5.7 ^d	4.3–6.2	5.1–5.6	1.9–3.4	–	3.6
MW1	105.0	85.0–100.0	–	–	–	–	38.0	79.0
MW2	115.0	90.0–110.0	–	–	–	–	8.6–8.8	9.3
MW3	125.0	100.0–120.0	–	–	–	–	57.0	36.0
MW4	125.0	100.0–120.0	–	–	–	–	34.0	33.0–34.0

^a ND, not detected at a method detection limit of 0.1 $\mu\text{g/L}$.

^b Well not sampled.

^c Qualifier J indicates an estimated concentration below the quantitation limit of 1 $\mu\text{g/L}$ for the purge-and-trap method.

^d Ranges of values include quality control samples.

6.4 First-Year Operating and Maintenance Costs

First-year operating and maintenance costs are summarized in Table 6.2. These costs include one-time expenses associated with installation of new monitoring wells. Other expenses were related to unexpected technical problems and spring flooding that necessitated modification and rebuilding of the actuator system to withstand future flooding. Costs in subsequent years are expected to be lower.

TABLE 6.2 Summary of first-year operating and maintenance costs for the Utica restoration project.

Item	Cost (\$)
General Management	18,127
Logistics Support	64,145
Remediation Monitoring	170,880
Monitoring Network Establishment	11,707
Technical Oversight	17,727
TOTAL	282,586

7 Summary

A combined total of approximately 66.4 million gallons of contaminated groundwater was extracted and treated during the first 13 months of operation of the aquifer restoration systems at Utica. Approximately 52% of the total volume treated (106 acre-feet) was used to supplement the natural water entering the North Lake Basin Wildlife Management Area.

Groundwater modeling studies performed by Argonne during the development of the aquifer restoration approach for Utica (Argonne 2000) indicated that, on average, the extraction of approximately 97 million gallons of groundwater per year would be required to achieve cleanup of the aquifer in approximately 10–15 years. The total actual groundwater produced during the review period represents approximately 68% of this average annual target.

Sampling and analysis of the effluent water from the air stripping and spray irrigation treatment units indicated that these systems functioned at a minimum efficiency of 94% during the review period. Carbon tetrachloride concentrations in all discharges of treated water at the site were below the permitted maximum target (44.2 $\mu\text{g/L}$) by roughly an order of magnitude.

Calculations based on the volumes and measured carbon tetrachloride concentrations of the groundwater extracted during the review period indicated that approximately 23 kg (3.8 gal) of carbon tetrachloride was removed from the Utica aquifer.

The costs incurred by Argonne for operating and maintenance of the aquifer restoration effort at Utica during the review period were approximately \$283,000.

8 References

Argonne, 2000, *Final Report: Stage I Investigations of the Agricultural/Environmental Enhancement Pilot Program, Utica, Nebraska*, prepared for the Commodity Credit Corporation, U.S. Department of Agriculture, by Argonne National Laboratory, Argonne, Illinois, January.

Argonne, 2004, *Final Monitoring Plan for the Utica Aquifer–North Lake Basin Restoration Project at Utica, Nebraska*, ANL/ER/TR-04/006, prepared for the Commodity Credit Corporation, U.S. Department of Agriculture, by Argonne National Laboratory, Argonne, Illinois, November.

Appendix A:
Well Registration Forms

GWEX-1

Mail to
DNR
PO Box 94676
Lincoln, NE 68509-4676
Phone (402)471-2363

GNEEX-1

05172005-160852 - WWRf (2)
Department of Natural Resources

January 2004
DNR Form 145

STATE OF NEBRASKA
DEPARTMENT OF NATURAL RESOURCES
WATER WELL REGISTRATION

FOR DEPARTMENT USE ONLY

Registration Date 5-17-2005 Sequence No. 160852 Registration No. 4133676
Owner Code No. 51127 Receipt No. R18031 UPPER BIG BLUE NRD

1. a. Well Owner's First Name _____ Last Name _____
b. Company Name USDA / FSA
c. Correspondent Name _____ Attention _____
Address Mail Stop 4725, Room 4725, South Building
City Washington State DC Zip 20024 Telephone _____
2. a. Contractor's License No. 19193 Contractor's Name Michael Magnin
Contractor's Email Address mmagnin@boartlongyear.com
b. Drilling Firm Name Boart Longyear
Address P.O. Box 355
City Little Falls State MN Zip 56345 Telephone 320-632-6552
Drilling Firm's Email Address sthalacker@boartlongyear.com
3. a. Well location NW 1/4 of the NW 1/4 of Section 29, Township 11 North, Range 1E W Seward County.
b. Natural Resources District Upper Big Blue
c. The well is 600 feet from the (N S) section line and 190 feet from the (E W) section line
(circle one) (circle one)
or Latitude Degree _____ Minute _____ Second _____
Longitude Degree _____ Minute _____ Second _____
d. Street address and subdivision, if applicable _____
Block _____ Lot _____
e. Location of water use, if applicable (give legal descriptions) S-29 T-11 Range 1E
f. If for irrigation, the land to be irrigated is 100 acres.
g. Well reference letter(s), if applicable GNEEX-1 HHSS PWSID _____
4. Permits
Management Area Permit Number G-097200 Surface Water Permit Number _____
Geothermal Permit Number _____ Industrial Permit Number _____
Municipal Permit Number _____ Transfer Out-Of-State Permit Number _____
Well Spacing Permit Number _____ Conduct Permit Number _____
HHSS _____ Other Permit Number _____
NDEQ _____
5. Purpose of well (indicate one) Aquaculture Commercial/Industrial Dewatering (over 90 days)
 Domestic Ground Heat Exchanger Groundwater Source Heat Pump Irrigation Injection
 Livestock Monitoring Observation Public Water Supply (with spacing (46-63F))
 Public Water Supply (without spacing) Recovery Other _____
(indicate use)
6. Wells in a Series.
a. Is this well a part of a series? Yes go to part b of this section No go to part 7 of this application
b. If one or more of the wells in the series is currently registered, give the well registration number G-097200
c. How many wells in the series are you registering at this time? 2
7. Replacement and abandoned well information.
a. Is this well a replacement well? Yes No
b. Registration number of abandoned well _____ If not registered, date abandoned well was constructed (m) ____ / (d) ____ / (y) ____
c. Replacement well is _____ feet from abandoned well. d. Abandoned well last operated (m) ____ / (d) ____ / (y) ____
e. Original well pump column size _____ inches. f. Completion of original well abandonment on (m) ____ / (d) ____ / (y) ____
g. Location of water use of abandoned well _____

AUG 02 2004
DEPARTMENT OF
NATURAL RESOURCES

RECEIVED

8. Pump Information.

- a. Is pump installed at this time Yes No
 Is pump installed by well owner in section 1? Yes No Is pump installed by contractor in section 2? Yes No
 If pump installed by pump installer, please fill out license number below
- b. Pump Installer's License No. _____ Pump Installer's Name _____
 Pump Installer's Email Address _____
 Pump Installer's Firm Name _____
 Pump Installer's Firm Address _____
 City _____ State _____ Zip _____ Telephone _____
 Pump Installer's Firm Email Address _____
- c. Pumping rate _____ gallons per minute Measured Estimated
 d. Drop pipe diameter _____ inches e. Length of drop pipe _____ feet
 f. Pumping equipment installed (m) _____ / (a) _____ / (b) _____ g. Pump Brand _____
 h. This well is designed and constructed to pump less than 50 gpm Yes No

9. Well Construction Information.

- a. Total well depth 132.0 feet. b. Static water level 82.0 feet.
 c. Pumping water level _____ feet. d. Well Construction began (month) 5 / (day) 18 / (year) 2004
 e. Well Construction completed (month) 5 / (day) 22 / (year) 2004 f. Bore hole diameter in inches Top 6.00 Bottom 16.00
 g. Casing and Screen Joints are Welded Glued Threaded Other _____

10. Well Construction (Casing & Screen)- c, d, e, & g measurements should be in inches to three decimal places

a		b	c	d	e	f	g	h
Placement Depth in Feet		Casing or Screen	Inside Diameter	Outside Diameter	Wall Thickness	Screen Slot Size	Type of Material	Trade Name
From	To							
0.0	106.0	Casing	7.981	8.625	3.220		Low Carbon	A53-B
106.0	126.0	Screen	7.900	8.700	0.040	0.020	Stainless	Johnson Screen
126.0	132.0	Casing	7.981	8.625	3.220		Low Carbon	A53-B

11. Grout and Gravel Pack

Placement Depth in Feet		Grout or Gravel Pack	Material Description
From	To		
0.0	94.0	Grout	Neat Cement
94.0	97.0	Bentonite	Baroid 3/8" Chips
97.0	132.0	Gravel Pack	12/20 Sand

12. Geologic Materials Logged

Depth in Feet		Description	Depth in Feet		Description
From	To		From	To	
0.0	132.0	Glacial Drift			

(Additional sheets may be submitted)

13. I am familiar with the information submitted on this registration, and to the best of my knowledge it is true.

 _____ 7-30-04 _____
 Water Well Contractor's Signature Date Well Owner's Signature Date
 if Contractor is unknown or Deceased

6799

MAR-15-2004 MON 12:36 PM UPPER BIG BLUE NRD-

FAX NO. 4023821849

P. 01

03212005-160852 PERF (3)

APPLICATION FOR A PERMIT TO CONSTRUCT A WATER WELL IN THE
UPPER BIG BLUE NATURAL RESOURCES DISTRICT

Department of Natural Resources
NRD USE ONLY
PERMIT No. UBB-1- 3484A
DATE RECEIVED 3-2-05

51127)

1. TYPE OF PERMIT REQUESTED: (Check appropriate item(s))

New Late Supplemental withdrawal (See Permit Restrictions - No. 6)

Is this application for a series of wells? YES NO. If YES, How many wells? 2

2. NAME AND ADDRESS OF LANDOWNER:

USDA/FSA
Mail Stop 4725, Rm 4725, South Building
1400 Independence Ave. SW; Washington, DC
Phone (202) 720 - 5104 20024

3. NAME AND ADDRESS OF WELL DRILLER:

Boart-Longyear Company
101 Alderson Street
Schofield, WI 54476
Phone (800) 236 - 4983

4. PURPOSED USE OF WELL: (Check one)

Domestic Industrial Irrigation Livestock Public Water Supply
 Other (specify) Groundwater Extraction

5. IDENTIFY THE LOCATION OF THE PROPOSED WELL: (See Permit Restrictions - Nos. 3 & 4)

Section 29 Township 11 North, Range 1 East W2SC Seward County.

State Registration No. _____ (Required for replacement well and late or supplemental permits).

The well will be located 600 feet from the North/South section line and will be 190 feet from the East/West section line.

6. REPLACEMENT AND ABANDONED INFORMATION: (See Permit Restrictions - No. 3)

Will this well replace a well that is or will be permanently abandoned? YES NO.

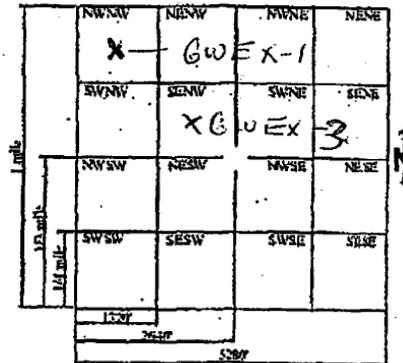
Date that the original well was last operated on 20

The replacement well will be _____ feet from the original well.

Will the replacement well provide water to the same tract of land as the original well? YES NO.

7. WELL AND LAND APPLICATION SKETCH:

The box at the right represents one square mile, (1 section). Indicate with an "X", the proposed location of the well(s), outline and cross-hatch the proposed water use area.



8. IRRIGATION OR OTHER LAND APPLICATION OF WATER:

How many acres will this well apply water to? Less than 100

Type of irrigation (water distribution) system is proposed?

Center pivot Gated pipe Other (specify) Stationary 3 Span

9. PREVIOUS IRRIGATION OR OTHER LAND APPLICATION:

Are any of the acres identified in question 8 served by another well now?

YES NO. If YES, How many acres? _____

What is the current distribution system? Center pivot Gated pipe

Other (specify) _____

10. GROUND WATER TRANSFER: (See Permit Restrictions - No. 5)

Is the proposed well to be used to transfer water outside of the legal description listed above? YES NO.

If YES, enter the legal description of the water use area. NWSW Quarter, Section 20, Township 11 North, Range 1 East W2SC
SWSW 17 11 1 East

11. COMMINGLED, COMBINED, CLUSTERED, OR JOINED WELLS: (See Permit Restrictions - No. 4)

Will the proposed well be connected to another well(s) or be used to supplement an existing water use from another well(s)? YES

NO. If YES, list the State Registration No(s), of other well(s) G-097200A MAR 21 2005

DEPARTMENT OF
NATURAL RESOURCES

Continue on other side

MAR-15-2004 MON 12:36 PM UPPER BIG BLUE NRD

FAX NO. 4023621849

P. 02

Well Identification: GWEX-1

12. SPECIFICATIONS OF INTENDED WELL AND PUMP:

Estimated pumping capacity: 50 gallons per minute. Estimated total well depth: 131 feet.
Well casing diameter: 8 inches. Pump column diameter: 2 inches.

13. ANNUAL WITHDRAWAL: (See Permit Restrictions - No. 6)

Is the total annual ground water withdrawal of all well(s) on this parcel of land estimated to be five hundred (500) acre feet or more? YES NO

If the existing well(s) on this parcel of land currently withdraw five hundred (500) acre feet or more annually, will the proposed well increase the total ground water withdrawal by two hundred and fifty (250) acre feet or more? YES NO

14. LANDOWNER CERTIFICATION: Please read permit restrictions listed below.

I, hereby, certify that I am familiar with the information contained in this application and, that to the best of my knowledge and belief, the information is complete and accurate. I understand and will comply with the permit restrictions and the District's rules and regulations related to the construction and operation of this well.

Date 3/24/04 Signature of Landowner Sandra Seiland (See Permit Restrictions - No. 1 & 2)

CONTRACTING OFFICER, USDA
This form must be completed in full and be accompanied by a non-refundable \$50.00 filing fee (\$250.00 for a late permit) payable to the Upper Big Blue NRD, 105 Lincoln Avenue, York, Nebraska 68467. An incomplete application will be returned for correction. A returned application must be resubmitted within 30 days or the filing fee is forfeited.

PERMIT RESTRICTIONS

1. This application must be signed by the landowner, his/her power of attorney or be accompanied by a notarized statement, signed by the landowner, authorizing the another person's signature.
2. This permit shall remain in force for one (1) year from the date approved.
3. If the well authorized by this permit has a capacity of more than fifty (50) gallons per minute, it must be constructed at least one thousand (1000) feet from any existing well with a capacity of more than fifty (50) gallons per minute that is under different ownership. If a well that is less than one thousand (1000) feet from a well under separate ownership is being replaced, the replacement well may not be more than fifty (50) feet closer to the well under separate ownership than the one it is replacing.
4. When water wells are commingled, combined, clustered, or joined and have a combined total capacity of more than fifty (50) gallons per minute, each water well shall comply with well spacing as provided in Restriction No. 3.
5. A well shall not be used to transfer ground water to a government survey section that is not adjacent to the tract of land in which the well is located. Transfers of ground water from the tract on which the well is located shall be limited to an acreage equal to the acreage in that tract unless such transfers occurred prior to July 1, 1990.
6. If the total proposed annual ground water withdrawal from this parcel of land exceeds five hundred (500) acre feet (163 million gallons) or if existing well(s) currently withdraw five hundred (500) acre feet or more and the proposed well will increase the total withdrawal by two hundred and fifty (250) acre feet (81.5 million gallons) or more, a hydrologic evaluation must be submitted with this application in accordance with District Rule 5, Ch. 5.
7. All wells permitted by the District on or after March 1, 2004 must be equipped with a flow meter prior to operation.

Ground Water Management Area rules and regulations are subject to change. A copy of District Rule 5 is available upon request. Prior to construction or operation, the permittee should contact the NRD office if he or she has any questions about the rules and regulations.

NRD USE ONLY	
COMMENTS:	
Date Approved <u>3/17/04</u>	NRD Representative <u>[Signature]</u>



UPPER BIG BLUE *J-733676*
Natural Resources District

105 N. Lincoln Avenue
York, Nebraska 68467
(402) 362-6601
Fax (402) 362-1849
www.upperbigblue.org

March 18, 2005

USDA/FSA
Mail Stop 4725
Room 4725 - South Building
1400 Independence Avenue
Washington, DC 20024

Subject: Late Recovery Wells Permit

Dear Sirs:

The NRD has approved the enclosed *late* well permit for the series of two wells, GWEX-1 and GWEX-3, located in Section 29-T11N-R1E, Seward County of the Upper Big Blue Natural Resources District Groundwater Management Area. It has been approved subject to all the restrictions listed on the permit and subject to the Management Area rules and regulations.

We will forward a copy of the well permit to the Nebraska Department of Natural Resources. If you have any questions feel free to call me at the NRD.

Sincerely,

Rod DeBuhr
Water Department Manager

:lsh

Copy - Scott Thalacker, Boart-Longyear, Little Falls, MN
Department of Natural Resources
File

RECEIVED

MAR 21 2005
DEPARTMENT OF
NATURAL RESOURCES

GWEX-2

Submit to:
Department of Natural Resources
301 Centennial Mall South
P.O. Box 94676
Lincoln, Nebraska 68509-4676

13302005-113572-MODF(2)
Department of Natural Resources
STATE OF NEBRASKA
DEPARTMENT OF NATURAL RESOURCES
WATER WELL REGISTRATION MODIFICATION

July 2002
DNR Form 667

FOR DEPARTMENT USE ONLY

Date Filed: 3-30-2005 Sequence No. 113572 Registration No. G-097200
Owner Code No. 51127 Receipt No. Upper Big Blue NRD

1. Well Owner(Required) USDA/FSA Work Telephone Number (202) 720-5104
Home Telephone Number ()
Address Mail Stop 4725, Rm 4725, South Building; 1400 Independence Ave., SW
City Washington, D State D.C. Zip Code 20250 + 0513

2. Contractor(Required) TCW Construction, Inc. Telephone Number (402) 475-5030
Address 141 M Street Pump Installer License No. 39448
City Lincoln State NE Zip Code 68508 +

3. Water Well Registration No. G-097200 (GWEX-2)
IDENTIFY WHAT NEEDS TO BE CORRECTED: Change use of well to recovery.

4. LOCATION OF WELL (Information in ITEMS 4A and 4B are required)
LIST LEGAL:
A. Well location: SE $\frac{1}{4}$ NW $\frac{1}{4}$ of Section 29 Township 11 North, Range 1 E 3 W Seward County.
B. The well is 1350 feet from the (N S) section line and 3400 feet from the (E W) section line.

5. LOCATION OF WELL
LIST LEGAL CORRECT LEGAL AND/OR FOOTAGE:
A. Well location: $\frac{1}{4}$ of Section Township North, Range E W County.
B. The well is feet from the (N S) section line and feet from the (E W) section line.
C. Latitude Degree: Minute: Second:
D. Longitude Degree: Minute: Second:
E. Street address and subdivision, if applicable
F. Block Lot

6. Number of acres irrigated:
A. Location of water use(given legal description)

7. Change of use(select from this category): Dewatering (over 90 days) Domestic Ground Heat Exchanger
 Ground Water Source Heat Pump Industrial Injection Irrigation Livestock
 Monitoring Observation Public Water Supply (with spacing (46-638)) Public Water Supply (without spacing)
 Recovery Other _____
(indicate use)
A. Well was used for: Monitoring C. New use is: Recovery
B. New gallons per minute: 200 D. Date of Change: 3/21/05

8. Wells in a Series.
A. Is this well a part of a series? Yes go to part b of this section
B. If one or more of the wells in the series is currently registered, give the well registration number (s):

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MAR 30 2005
DEPARTMENT OF
NATURAL RESOURCES

03/29/2005 12:41 2027284519

USDA FSA CEPD

PAGE 04/05

03/23/2005 18:47 FAX 4024765049

TCW CONSTRUCTION

003/004

G-097200

9. Replacement and abandoned well information.
- A. Is this well a replacement well? Yes No
- B. Registration number of abandoned well _____ If not registered, date abandoned well was constructed (m) ___ / (d) ___ / (y) ___
- C. Replacement well is _____ feet from abandoned well. D. Abandoned well last operated (m) ___ / (d) ___ / (y) ___
- E. Original well pump column size _____ inches. F. Completion of original well abandonment on (m) ___ / (d) ___ / (y) ___
- G. Location of water use of abandoned well _____

10. Well Construction Information.
- A. Total well depth _____ feet. B. Static water level _____ feet.
- C. Pumping water level _____ feet. D. Well Construction began (month) ___ / (day) ___ / (year) ___
- E. Well Construction completed (month) ___ / (day) ___ / (year) ___ F. Bore hole diameter in inches Top _____ Bottom _____
- G. Casing and Screen Joints are: Welded Glued Threaded Other _____

11. Well Construction (Casing & Screen)- c, d, e, & g measurements should be in inches to three decimal places

A		B	C	D	E	F	G	H
Placement Depth in Feet		Casing or Screen	Inside Diameter	Outside Diameter	Wall Thickness	Type of Material	Screen Slot Size	Trade Name
From	To							

12. Grout and Gravel Pack:

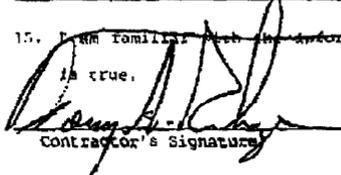
Placement Depth in Feet		Grout or Gravel Pack	Material Description
From	To		

13. Geologic Materials Logged

Depth in Feet	Description
From	To

14. REQUIRED: State Reason for Change: Well is now used to extract contaminated groundwater only. The well is removed from the Village's Public Water Supply system.

15. I am familiar with the information submitted on this registration, and to the best of my knowledge it is true.


Contractor's Signature

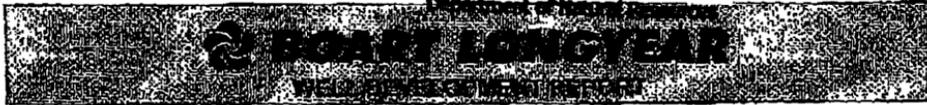
3/21/05
Date


Water Well Owner's Signature
Steve Gilmore

3/21/05
Date

03/29/2005 12:41 2027284619 USDA FSA CEPD PAGE 05/05
03/23/2005 16:47 FAX 4024755048 TCW CONSTRUCTION 004/004

03302005-113572-MISCF(1)



G-097200

WELL NAME Extraction #2 JOB NO# 3410-2122
WELL DIAMETER 8" LOCATION Utica, NE
(MEASUREMENTS BELOW FROM TOP OF CASING)
TOTAL DEPTH 148.28' DATE 5/25/2004
DEPTH TO WATER BEFORE DEVELOPMENT 84.34' DEVELOPED BY M. Hansen
DEPTH TO WATER AFTER DEVELOPMENT 84.68'

DESCRIPTION OF DEVELOPMENT METHOD

(Check One)

- SURGED W/BAILER & BAILED
- SURGED W/BAILER & PUMPED
- SURGED W/BLOCK & BAILED
- SURGED W/BLOCK & PUMPED
- OTHER _____

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MAR 30 2005
DEPARTMENT OF
NATURAL RESOURCES

CAN THIS WELL BE PURGED DRY? YES NO

VOLUME OF WATER IN FILTER PACK AND WELL CASING 166 Gallons
VOLUME OF WATER REMOVED FROM WELL 58,995 Gallons
CLARITY OF WATER BEFORE DEVELOPMENT Dark Brown, Muddy
CLARITY OF WATER AFTER DEVELOPMENT Clear
VOLUME OF WATER ADDED 300 Gallons
SOURCE OF WATER ADDED Utica Municipal
TIME SPENT FOR DEVELOPMENT _____ Minutes START: _____ A.M. END: _____ A.M.

COMMENTS:



Nebraska Department of Natural Resources
Data Bank
Database Through: Dec 9 2005
Processed: 12/9/2005 3:44:17 PM

REGISTERED GROUNDWATER WELLS DATA RETRIEVAL

Note:
Information on Public Water Supply Wells is not available through this interface. Contact the Department of Natural Resources (Data Bank) at 402-471-2363 for more information.

Criteria : RegistrationNumber - G-097200

1 Stations met this criteria.

Registration# Permit Number Well Log	Use Status	County Name NRD Name Well Location Footage Latitude Longitude	Completion Date Filing Date Abandoned Date Times Replaced	Acres Irrig Gallons/Min Static Level Pumping Level	Pump Col Dia Pump Depth Well Depth	Owner's Name and Address
G-097200 UBB-1-2314 Other Info Logs View as PDF	R A	Seward Upper Big Blue 11N 1E 29 SENW 1350S 3400W Map It 0	6/ 22/ 1998 7/24/1998 --- ---	--- --- 82 ft ---	--- --- 148 ft ---	United States Department of Agricultu 1400 Independence Avenue SW Room 47 Washington, DC 20250

Data copy of requested wells as Bar() delimited file.
Data copy of Geo Logs for requested wells as Bar() delimited file.
Data copy of Casing Screen for requested wells as Bar() delimited file.
Data copy of Grout Gravel for requested wells as Bar() delimited file.
Legend and Notes

**Nebraska Department of Natural Resources
Data Bank
Processed: 12/9/2005 3:46:15 PM**

2 Casing and Screen records available for Registration Number G-097200

FromDepth	ToDepth	CaseOrScreen	InsideDiam	OutsideDiam	CaseThickness	Material	ScrnSlotSize	ScreenTname
0	110	casing	8		0.375	Steel		
110	145	screen	8	8.875		Steel	0.035	Continuous

Nebraska Department of Natural Resources
Data Bank
Processed: 12/9/2005 3:47:01 PM

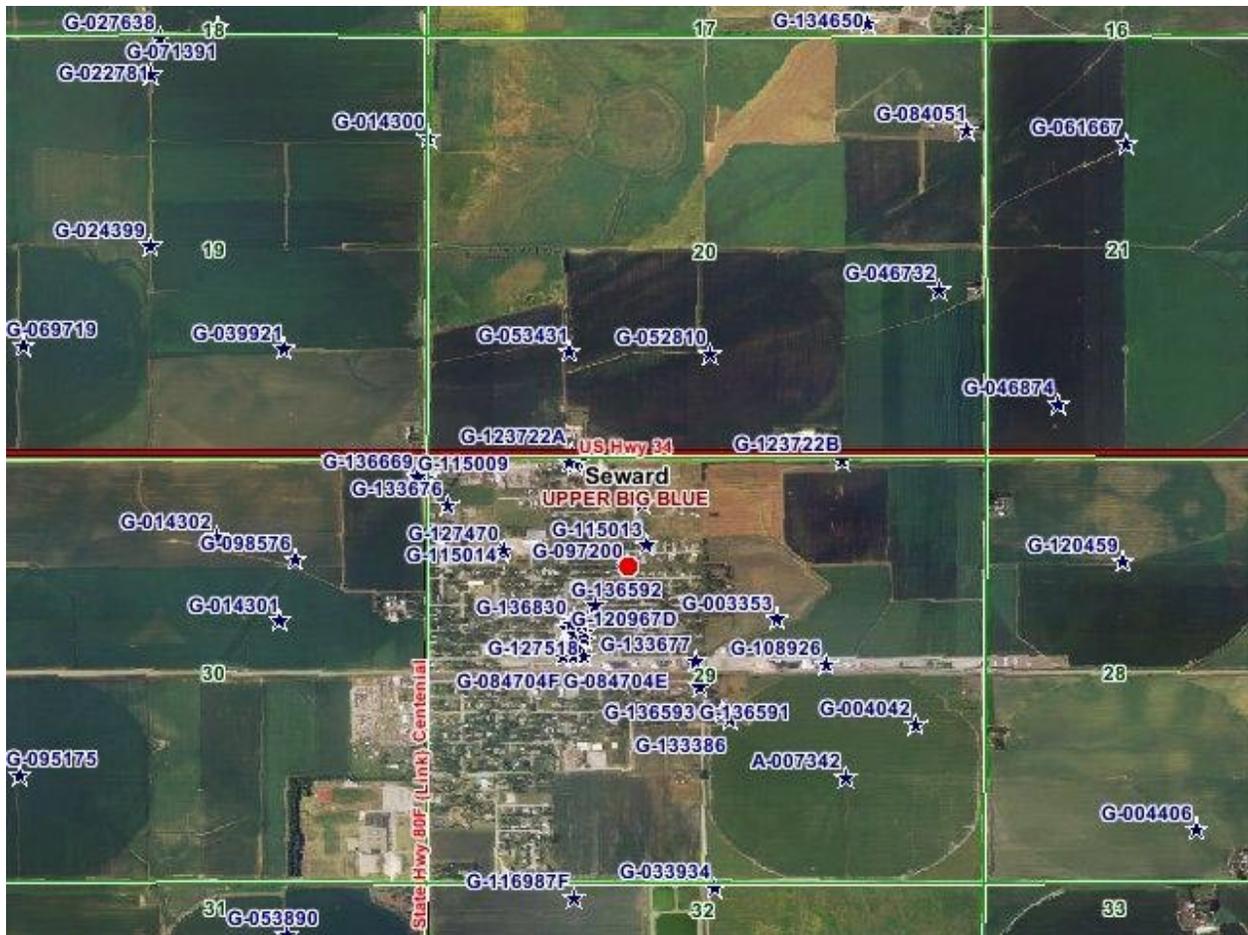
3 Grout Gravel information available for Registration Number G-097200

FromDepth	ToDepth	GroutOrGravel	Material
4	102	grout	Bentonite Neat Cement
102	106.8	grout	Bentonite Chips
106.8	148.3	gravel	

Nebraska Department of Natural Resources
Data Bank
Processed: 12/9/2005 3:48:11 PM

13 Logs Available for Registration Number G-097200, Well ID 113572

Depth		Description
From	To	
0	4	Dark Brown Organics
4	40	Brown Silty Clay
40	45	Sand & Gravel
45	50	Silty Sand with Some Gravel
50	86	Sand, Fine, Silty with Trace Clay & Manganese
86	101	Sand & Gravel
102	108	Sand, Fine
108	110	Sand & Gravel
110	132	Sand, Fine
132	136	Sand, Medium
136	148	Sand, Fine
148	150	Sand & Gray Clay
150	152	Gray Clay



GWEX-3

Mail to
DNR
PO Box 94676
Lincoln, NE 68509-4676
Phone (402)471-2363

G NEX-3

05172005-160853-WARF(2)
January 2004
DNR Form 145

STATE OF NEBRASKA
DEPARTMENT OF NATURAL RESOURCES
WATER WELL REGISTRATION

FOR DEPARTMENT USE ONLY

Registration Date 5-17-2005 Sequence No. 160853 Registration No. 11-133677
Owner Code No. 51127 Receipt No. 8180314-032 UPPER BIG BLUE NRD

1. a. Well Owner's First Name _____ Last Name _____
b. Company Name USDA / FSA
c. Correspondent Name _____ Attention _____
Address Mail Stop 4725, Room 4725, South Building
City Washington State DC Zip 20024 Telephone _____

2. a. Contractor's License No 19193 Contractor's Name Michael Magnin
Contractor's Email Address mmagnin@boardlongyear.com
b. Drilling Firm Name Boart Longyear
Address P.O. Box 355
City Little Falls State MN Zip 56345 Telephone 320-632-6552
Drilling Firm's Email Address sthalacker@boardlongyear.com

3. a. Well location SE ¼ of the NW ¼ of Section 29, Township 11 North, Range 1 E W Seward County.
b. Natural Resources District Upper Big Blue
c. The well is 2,550 feet from the (N S) section line and 2,550 feet from the (E W) section line
(circle one) (circle one)
or Latitude Degree _____ Minute _____ Second _____
Longitude Degree _____ Minute _____ Second _____
d. Street address and subdivision, if applicable _____
Block _____ Lot _____
e. Location of water use, if applicable (give legal descriptions) S29 T11 Range 0001E
f. If for irrigation, the land to be irrigated is 4.00 acres.
g. Well reference letter(s), if applicable G NEX-3 HHSS PWSID _____

4. Permits
Management Area Permit Number G-097200 Surface Water Permit Number _____
Geothermal Permit Number _____ Industrial Permit Number _____
Municipal Permit Number _____ Transfer Out-Of-State Permit Number _____
Well Spacing Permit Number _____ Conduct Permit Number _____
HHSS _____ Other Permit Number _____
NDEQ _____

5. Purpose of well (indicate one) Aquaculture Commercial/Industrial Dewatering (over 90 days)
 Domestic Ground Heat Exchanger Groundwater Source Heat Pump Irrigation Injection
 Livestock Monitoring Observation Public Water Supply (with spacing (46-638))
 Public Water Supply (without spacing) Recovery Other _____
(indicate use)

6. Wells in a Series.
a. Is this well a part of a series? Yes go to part b of this section No go to part 7 of this application
b. If one or more of the wells in the series is currently registered, give the well registration number G-097200
c. How many wells in the series are you registering at this time? 2

7. Replacement and abandoned well information.
a. Is this well a replacement well? Yes No
b. Registration number of abandoned well _____ If not registered, date abandoned well was constructed (m) ____ / (d) ____ / (y) ____
c. Replacement well is _____ feet from abandoned well. d. Abandoned well last operated (m) ____ / (d) ____ / (y) ____
e. Original well pump column size _____ inches. f. Completion of original well abandonment on (m) ____ / (d) ____ / (y) ____
g. Location of water use of abandoned well _____

RECEIVED
AUG 02 2004
DEPARTMENT OF
NATURAL RESOURCES

P-133677

8. Pump Information.

- a. Is pump installed at this time Yes No
 Is pump installed by well owner in section 1? Yes No Is pump installed by contractor in section 2? Yes No
 If pump installed by pump installer, please fill out license number below
- b. Pump Installer's License No. _____ Pump Installer's Name _____
 Pump Installer's Email Address _____
 Pump Installer's Firm Name _____
 Pump Installer's Firm Address _____
 City _____ State _____ Zip _____ Telephone _____
 Pump Installer's Firm Email Address _____
- c. Pumping rate _____ gallons per minute Measured Estimated
 d. Drop pipe diameter _____ inches e. Length of drop pipe _____ feet
 f. Pumping equipment installed (m) _____ / (d) _____ / (y) _____ g. Pump Brand _____
 h. This well is designed and constructed to pump less than 50 gpm Yes No

9. Well Construction Information.

- a. Total well depth 146.0 feet. b. Static water level 82.0 feet.
 c. Pumping water level _____ feet d. Well Construction began (month) 5 / (day) 22 / (year) 2004
 e. Well Construction completed (month) 5 / (day) 25 / (year) 2004 f. Bore hole diameter in inches Top 6.00 Bottom 16.00
 g. Casing and Screen Joints are Welded Glued Threaded Other _____

10. Well Construction (Casing & Screen)- c, d, e, & g measurements should be in inches to three decimal places

a		b	c	d	e	f	g	h
Placement Depth in Feet		Casing or Screen	Inside Diameter	Outside Diameter	Wall Thickness	Screen Slot Size	Type of Material	Trade Name
From	To							
0.0	105.0	Casing	7.981	8.625	3.220		Low Carbon	A53-B
105.0	140.0	Screen	7.900	8.700	0.040	0.020	Stainless	Johnson Screen
140.0	146.0	Casing	7.981	8.625	3.220		Low Carbon	A53-B

11. Grout and Gravel Pack

Placement Depth in Feet		Grout or Gravel Pack	Material Description
From	To		
0.0	97.0	Grout	Neat Cement
97.0	101.0	Bentonite	Baroid 3/8" Chips
101.0	146.0	Gravel Pack	12/20 Sand

12. Geologic Materials Logged

Depth in Feet		Description	Depth in Feet		Description
From	To		From	To	
0.0	146.0	Glacial Drift			

(Additional sheets may be submitted)

13. I am familiar with the information submitted on this registration, and to the best of my knowledge it is true.

[Signature] _____ 7-30-04 _____
 Water Well Contractor's Signature Date Well Owner's Signature Date
 if Contractor is unknown or Deceased

6799

MAR-15-2004 MON 12:36 PM UPPER BIG BLUE NRD

FAX NO. 4023621849

P. 01

05162005-160865-PERF (3)

Department of Natural Resources
APPLICATION FOR A PERMIT TO CONSTRUCT A WATER WELL IN THE
UPPER BIG BLUE NATURAL RESOURCES DISTRICT

1-133677

NRD USE ONLY
PERMIT No. UBB-1- 3484B
DATE RECEIVED 3-2-05

1. TYPE OF PERMIT REQUESTED: (Check appropriate item(s))

New Late Supplemental withdrawal (See Permit Restrictions - No. 6)

Is this application for a series of wells? YES NO. If YES, How many wells? 2

2. NAME AND ADDRESS OF LANDOWNER:

USDA/FSA

Mail Stop 4725, Rm 4725, South Building

1400 Independence Ave. SW; Washington, DC

Phone (202) 720 - 5104

20024

3. NAME AND ADDRESS OF WELL DRILLER:

Boart-Longyear Company

101 Alderson Street

Schofield, WI 54476

Phone (800) 236 - 4983

4. PURPOSED USE OF WELL: (Check one)

Domestic Industrial Irrigation Livestock Public Water Supply

Other (specify) Groundwater Extraction

5. IDENTIFY THE LOCATION OF THE PROPOSED WELL: (See Permit Restrictions - Nos. 3 & 4)

Section 29, Township 11 North, Range 1 East WEEK Seward County.

State Registration No. _____ (Required for replacement well and late or supplemental permits).

The well will be located 600 feet from the North/South section line and will be 190 feet from the East/West section line.

6. REPLACEMENT AND ABANDONED INFORMATION: (See Permit Restrictions - No. 3)

Will this well replace a well that is or will be permanently abandoned? YES NO.

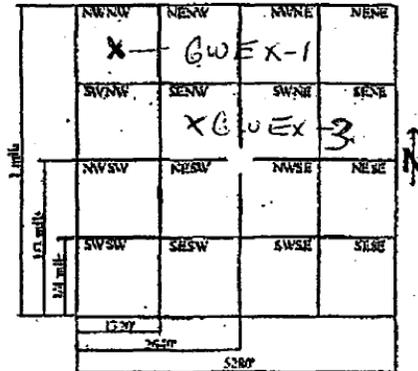
Date that the original well was last operated on _____ 20____.

The replacement well will be _____ feet from the original well.

Will the replacement well provide water to the same tract of land as the original well? YES NO.

7. WELL AND LAND APPLICATION SKETCH:

The box at the right represents one square mile, (1 section). Indicate with an "X", the proposed location of the well(s), outline and cross-hatch the proposed water use area.



8. IRRIGATION OR OTHER LAND APPLICATION OF WATER:

How many acres will this well apply water to? Less than 100

Type of irrigation (water distribution) system is proposed?

Center pivot Gated pipe Other (specify) Stationary 3 Span

9. PREVIOUS IRRIGATION OR OTHER LAND APPLICATION:

Are any of the acres identified in question 8 served by another well now?

YES NO. If YES, How many acres? _____

What is the current distribution system? Center pivot Gated pipe

Other (specify) _____

10. GROUND WATER TRANSFER: (See Permit Restrictions - No. 5)

Is the proposed well to be used to transfer water outside of the legal description listed above? YES NO.

If YES, enter the legal description of the water use area. NWSW Quarter, Section 20, Township 11 North, Range 1 East WEEK
SWSW 17 11 1 East

11. COMMINGLED, COMBINED, CLUSTERED, OR JOINED WELLS: (See Permit Restrictions - No. 4)

Will the proposed well be connected to another well(s) or be used to supplement an existing water use from another well(s)? YES

NO. If YES, list the State Registration No(s), of other well(s) G-097200 RECEIVED

Continue on other side

MAY 16 2005

DEPARTMENT OF
NATURAL RESOURCES

MAR-15-2004 MON 12:36 PM UPPER BIG BLUE NRD

FAX NO. 4023621849

P. 02

Well Identification: GWEX-1

12. SPECIFICATIONS OF INTENDED WELL AND PUMP

Estimated pumping capacity: 50 gallons per minute. Estimated total well depth: 131 feet.
Well casing diameter: 8 inches. Pump column diameter: 2 inches.

13. ANNUAL WITHDRAWAL: (See Permit Restrictions - No. 6)

Is the total annual ground water withdrawal of all well(s) on this parcel of land estimated to be five hundred (500) acre feet or more? YES NO

If the existing well(s) on this parcel of land currently withdraw five hundred (500) acre feet or more annually, will the proposed well increase the total ground water withdrawal by two hundred and fifty (250) acre feet or more? YES NO

14. LANDOWNER CERTIFICATION: Please read permit restrictions listed below.

I, hereby, certify that I am familiar with the information contained in this application and, that to the best of my knowledge and belief, the information is complete and accurate. I understand and will comply with the permit restrictions and the District's rules and regulations related to the construction and operation of this well.

Date 3/24/04 Signature of Landowner Sandra Siskind (See Permit Restrictions - No. 1 & 2)

CONTRACTING OFFICER, USDA
This form must be completed in full and be accompanied by a non-refundable \$50.00 filing fee (\$250.00 for a late permit) payable to the Upper Big Blue NRD, 105 Lincoln Avenue, York, Nebraska 68467. An incomplete application will be returned for correction. A returned application must be resubmitted within 30 days or the filing fee is forfeited.

PERMIT RESTRICTIONS

1. This application must be signed by the landowner, his/her power of attorney or be accompanied by a notarized statement, signed by the landowner, authorizing the another person's signature.
2. This permit shall remain in force for one (1) year from the date approved.
3. If the well authorized by this permit has a capacity of more than fifty (50) gallons per minute, it must be constructed at least one thousand (1000) feet from any existing well with a capacity of more than fifty (50) gallons per minute that is under different ownership. If a well that is less than one thousand (1000) feet from a well under separate ownership is being replaced, the replacement well may not be more than fifty (50) feet closer to the well under separate ownership than the one it is replacing.
4. When water wells are commingled, combined, clustered, or joined and have a combined total capacity of more than fifty (50) gallons per minute, each water well shall comply with well spacing as provided in Restriction No. 3.
5. A well shall not be used to transfer ground water to a government survey section that is not adjacent to the tract of land in which the well is located. Transfers of ground water from the tract on which the well is located shall be limited to an acreage equal to the acreage in that tract unless such transfers occurred prior to July 1, 1990.
6. If the total proposed annual ground water withdrawal from this parcel of land exceeds five hundred (500) acre feet (163 million gallons) or if existing well(s) currently withdraw five hundred (500) acre feet or more and the proposed well will increase the total withdrawal by two hundred and fifty (250) acre feet (81.5 million gallons) or more, a hydrologic evaluation must be submitted with this application in accordance with District Rule 5, Ch. 5.
7. All wells permitted by the District on or after March 1, 2004 must be equipped with a flow meter prior to operation.

Ground Water Management Area rules and regulations are subject to change. A copy of District Rule 5 is available upon request. Prior to construction or operation, the permittee should contact the NRD office if he or she has any questions about the rules and regulations.

NRD USE ONLY
COMMENTS:

Date Approved 3/17/05

NRD Representative



UPPER BIG BLUE
Natural Resources District

9-133677
105 N. Lincoln Avenue
York, Nebraska 68467
(402) 362-6601
Fax (402) 362-1849
www.upperbigblue.org

March 18, 2005

USDA/FSA
Mail Stop 4725
Room 4725 - South Building
1400 Independence Avenue
Washington, DC 20024

Subject: Late Recovery Wells Permit

Dear Sirs:

The NRD has approved the enclosed *late* well permit for the series of two wells, GWEX-1 and GWEX-3, located in Section 29-T11N-R1E, Seward County of the Upper Big Blue Natural Resources District Groundwater Management Area. It has been approved subject to all the restrictions listed on the permit and subject to the Management Area rules and regulations.

We will forward a copy of the well permit to the Nebraska Department of Natural Resources. If you have any questions feel free to call me at the NRD.

Sincerely,

Rod DeBuhr
Water Department Manager

:lsh

Copy - Scott Thalacker, Boart-Longyear, Little Falls, MN
Department of Natural Resources
File

RECEIVED

MAR 21 2005
DEPARTMENT OF
NATURAL RESOURCES

GWEX-4

STATE OF NEBRASKA
DEPARTMENT OF NATURAL RESOURCES
WATER WELL REGISTRATION

Fee Paid	\$110.00	DNR Cash Fund	\$18.50
HHSS Fee	\$70.00	HHSS-DNR Cash Fun	\$0.00
		Get Billing	10242

FOR DEPARTMENT USE ONLY							
NOL ID	111161076323351	NOL Status	Accepted	Well Status	A	Registration Code	G-133386
Owner ID	51127	NOL Date	04/27/2005	Call Up Code		Registration Date	04/27/2005
Seq Num	167373			Call Up Date			

04272005 - 167373 - WWRF

Page 1 of 2

1a Owner's Name _____

b Company Name USDA / FSA / CCC

c Correspondent Name _____ Attention Name _____

Address 1400 Independence Avenue SW, Room 4719

City: Washington State DC Zip Code 20250 - 0513 Phone 202 - 720-5295

2a HHSS Contractor Lic ID: 434900 Contractor's Name: Daniel L. Freese

Contractor's License No: 39452 Contractor's Email Address: dffreese@laynechristensen.com

b Drilling Firm Name Layne-Western, a division of Layne Christensen Co.

Address P.O. Box 597

City: Valley State NE Zip Code 68064 Phone 402 - 359-2042

Drilling Firms Email Address 1072@laynechristensen.com

3a Well Location NWSE of Section 29 Township 11 North, Range 1 E (E/W), Seward County

b Natural Resource District Upper Big Blue

c The well is 2041 feet from the S (N/S) section line and 2418 feet from the E (E/W) section line

GPS: or Latitude: 40 53' 34.00" Longitude: -097 20' 21.00"

d Street address or block, lot and subdivision, if applicable: _____ Block No _____ Lot _____

e Location of water use, if applicable (give legal descriptions) _____

f If for irrigation, the land to be irrigated is _____ Acres

g Well Reference letter(s), if applicable GWEX-4

4 Permits	Permits Number	Date	Permits	Permits Number	Date
Management Area Permit	<u>UBB-1-3505</u>	<u>04/21/2005</u>	Transfer Out-Of-State		
Surface Water			Well Spacing		
Geothermal			Conduct Water		
Industrial			Municipal		
Industrial Transfer Notice			Other		

5 Purpose of Well Recovery Other _____

Notes _____

6 Wells in a Series

a Is this well a part of a series?

b If one or more of the wells in the series is currently registered, give the well registration number _____

c How many wells in the series are you registering at this time? _____

7 Replacement and abandoned well information Replacement Number _____

a Is this well a replacement well?

b Registration number of abandoned well _____

If not registered, date abandoned well was constructed _____

c Replacement well is _____ feet from abandoned well.

d Abandoned well last operated _____

04272005 - 167373 -WWRF

Page 2 of 2

e Original well pump column size: inches. f Completion of original well abandonment on
g Location of water use of abandoned well

B Pump Information

a Is pump installed at this time?
Is pump installed by well owner in section 1? Is pump installed by contractor in section 2?
Else installed by pump installer.
b HHSS Installer's License ID.
Pump Installer's License No. Pump Installer's Name
Pump Installer's Email Address
Pump Installer's Firm Name
Pump Installer's Firm Address
City: State Zip Code -0000 Phone
Pump Installer's Firm Email Address
c Pumping Rate gallons per minute measured or estimated
d Drop pipe diameter inches e Length of drop pipe feet.
f Pumping equipment installed / / g Pump Brand
h This well will be used to pump less than 50 gpm

9 Well Construction Information

a Total well depth 150.0 feet. b Static Water Level feet.
c Pumping Water Level feet. d Well construction began: 10 / 31 / 1997
e Well construction completed: 11 / 01 / 1997 f Bore hole diameter in inches. Top 12.00 Bottom 12.00
g Casing and Screen Joints Welded Other

10 Well Construction (Casing and Screen)

From Depth	To Depth	Inside Diam	Outside Diam	Thickness	Screen Slot Siz	Material	Trade name	Ca
0.0	115.0	6.00	6.625	.313		steel		
115.0	145.0	6.00	6.625	.313	.020	SST	Houston	
145.0	150.0	6.00	6.625	.313	.000	SST	Houston	

11 Well Construction (Grout and Gravel)

NOL ID	From Depth	To Depth	Material
111161076323	0.0	105.0	cement
111161076323	105.0	110.0	bentonite chips
111161076323	110.0	150.0	Central Sand C Pack

12 Geolog Material Logged

NOL ID	From Depth	To Depth	Description
111161076323	0.0	4.0	dark brown organics
111161076323	4.0	40.0	brown silty clay
111161076323	40.0	45.0	sand and gravel
111161076323	45.0	50.0	silty sand with some gravel
111161076323	50.0	86.0	fine sand, silty with trace of clay
111161076323	86.0	101.0	sand and gravel
111161076323	101.0	108.0	fine sand
111161076323	108.0	110.0	sand and gravel
111161076323	110.0	132.0	fine sand
111161076323	132.0	136.0	medium sand
111161076323	136.0	148.0	fine sand
111161076323	148.0	150.0	sand and gray clay



APR-27-2005 WED 08:49 AM UPPER BIG BLUE NRD

FAX NO. 4023621849

P. 01

WELL ID: GWEX-4

APPLICATION FOR A PERMIT TO CONSTRUCT A WATER WELL IN THE
UPPER BIG BLUE NATURAL RESOURCES DISTRICT

9-133386

1. TYPE OF PERMIT REQUESTED: (Check appropriate item(s))

New Late Supplemental withdrawal (See Permit Restrictions - No. 6)
Is this application for a series of wells? YES NO. If YES, How many wells? _____

NRD USE ONLY
PERMIT No. UBB-1- 3505
DATE RECEIVED 4-1-05

2. NAME AND ADDRESS OF LANDOWNER:

USDA / FSA
1400 Independence Ave SW, Mail Stop 4725; Rm 4725
Washington, DC 20250-4725
Phone (202) 720 - 5104

3. NAME AND ADDRESS OF WELL DRILLER:

Layne-Western
PO Box 597
Valley, NE 68064-0597
Phone (402) 359 - 2042

4. PURPOSED USE OF WELL: (Check one) Domestic Industrial Irrigation Livestock Public Water Supply

Other (specify) Groundwater Extraction

5. IDENTIFY THE LOCATION OF THE PROPOSED WELL: (See Permit Restrictions - Nos. 3 & 4)

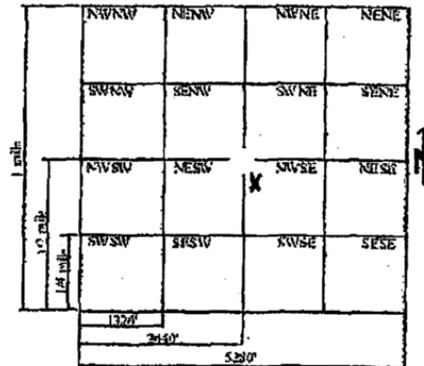
Section 29, Township 11 North, Range 1 East, ~~W&S~~ Seward County.
State Registration No. _____ (Required for replacement well and late or supplemental permits).
The well will be located 2041 feet from the ~~W&S~~ South section line and will be 2418 feet from the East ~~W&S~~ section line.

6. REPLACEMENT AND ABANDONED INFORMATION: (See Permit Restrictions - No. 3)

Will this well replace a well that is or will be permanently abandoned? YES NO.
Date that the original well was last operated on 20 _____
The replacement well will be _____ feet from the original well.
Will the replacement well provide water to the same tract of land as the original well? YES NO.

7. WELL AND LAND APPLICATION SKETCH:

The box at the right represents one square mile, (1 section). Indicate with an "X", the proposed location of the well(s), outline and cross-hatch the proposed water use area.



8. IRRIGATION OR OTHER LAND APPLICATION OF WATER:

How many acres will this well apply water to? _____
Type of Irrigation (water distribution) system is proposed?
 Center pivot Gated pipe Other (specify) _____

9. PREVIOUS IRRIGATION OR OTHER LAND APPLICATION:

Are any of the acres identified in question 8 served by another well now?
 YES NO. If YES, How many acres? _____
What is the current distribution system? Center pivot Gated pipe
 Other (specify) _____

10. GROUND WATER TRANSFER: (See Permit Restrictions - No. 5)

Is the proposed well to be used to transfer water outside of the legal description listed above? YES NO.
If YES, enter the legal description of the water use area. NW SW Quarter, Section 20, Township 11 North, Range 1E East
SW SW 17 11 1E East

11. COMMINGLED, COMBINED, CLUSTERED, OR JOINED WELLS: (See Permit Restrictions - No. 4)

Will the proposed well be connected to another well(s) or be used to supplement an existing water use from another well(s)? YES
 NO. If YES, list the State Registration No.(s) of other well(s) _____

Continue on other side

04272005-167373-Perf (2)
Department of Natural Resources

Received Time Apr. 27. 8:48AM



APR-27-2005 WED 09:57 AM UPPER BIG BLUE NRD

FAX NO. 4023621849

03/31/2005 08:12 2027204619

USDA FSA CEPD

P. 01
PAGE 05/05

03/30/2005 11:55 FAX 4024755049

ICW CONSTRUCTION

004/004

J-133386

WELL ID: GWEX-4

12. SPECIFICATIONS OF INTENDED WELL AND PUMP:

Estimated pumping capacity: 70 gallons per minute. Estimated total well depth: 150 feet.
Well casing diameter: 6 inches. Pump column diameter: 2 inches.

13. ANNUAL WITHDRAWAL: (See Permit Restrictions - No. 6)

Is the total annual ground water withdrawal of all well(s) on this parcel of land estimated to be five hundred (500) acre feet or more? YES NO

If the existing well(s) on this parcel of land currently withdraw five hundred (500) acre feet or more annually, will the proposed well increase the total ground water withdrawal by two hundred and fifty (250) acre feet or more? YES NO

14. LANDOWNER CERTIFICATION: Please read permit restrictions listed below.

I, hereby, certify that I am familiar with the information contained in this application and, that to the best of my knowledge and belief, the information is complete and accurate. I understand and will comply with the permit restrictions and the District's rules and regulations related to the construction and operation of this well.

Date 3/31/05 Signature of Landowner Steve Gilmore (See Permit Restrictions - No. 1 & 2)

This form must be completed in full and be accompanied by a non-refundable \$50.00 filing fee (\$250.00 for a late permit) payable to the Upper Big Blue NRD, 103 Lincoln Avenue, York, Nebraska 68467. An incomplete application will be returned for correction. A returned application must be resubmitted within 30 days or the filing fee is forfeited.

PERMIT RESTRICTIONS

1. This application must be signed by the landowner, his/her power of attorney or be accompanied by a notarized statement, signed by the landowner, authorizing the another person's signature.
2. This permit shall remain in force for one (1) year from the date approved.
3. If the well authorized by this permit has a capacity of more than fifty (50) gallons per minute, it must be constructed at least one thousand (1000) feet from any existing well with a capacity of more than fifty (50) gallons per minute that is under different ownership. If a well that is less than one thousand (1000) feet from a well under separate ownership is being replaced, the replacement well may not be more than fifty (50) feet closer to the well under separate ownership than the one it is replacing.
4. When water wells are commingled, combined, clustered, or joined and have a combined total capacity of more than fifty (50) gallons per minute, each water well shall comply with well spacing as provided in Restriction No. 3.
5. A well shall not be used to transfer ground water to a government survey section that is not adjacent to the tract of land in which the well is located. Transfers of ground water from the tract on which the well is located shall be limited to an acreage equal to the acreage in that tract unless such transfer occurred prior to July 1, 1990.
6. If the total proposed annual ground water withdrawal from this parcel of land exceeds five hundred (500) acre feet (153 million gallons) or if existing well(s) currently withdraw five hundred (500) acre feet or more and the proposed well will increase the total withdrawal by two hundred and fifty (250) acre feet (81.5 million gallons) or more, a hydrologic evaluation must be submitted with this application in accordance with District Rule 5, Ch. 5.
7. All wells permitted by the District on or after March 1, 2004 must be equipped with a flow meter prior to operation.

Ground Water Management Area rules and regulations are subject to change. A copy of District Rule 5 is available upon request. Prior to construction or operation, the permittee should contact the NRD office if he or she has any questions about the rules and regulations.

NRD USE ONLY COMMENTS:	
Date Approved <u>4-21-05</u>	NRD Representative <u>Maria Klausnick</u>

March 2004

APR 27 2005
DEPARTMENT OF
NATURAL RESOURCES

Received Time Apr. 27. 9:56AM

To: dlfreese@laynechristensen.com; 1072@laynechristensen.com

Re: Well Registered

04272005-167373-COR(1)

April 27, 2005

CONTRACTOR: Daniel L. Freese

CONTRACTORS FIRM:

Layne-Western, a division of Layne Christensen Co.

P.O. Box 597

Valley, NE 68064

LOCATION OF WELL:

NW1/4SE1/4 of Section 29

Township 11 North, Range 1 E

Seward County

OWNER: USDA / FSA / CCC

NOL ID: 111161076323351

SEQUENCE NUMBER: 167373

The above well has been registered with the Nebraska Department of Natural Resources. Its registration number is G-133386. The registered well information can be reviewed at the Department website: <http://dnrdata.dnr.state.ne.us/wellssql>

We thank you for your cooperation. If you have any questions or comments, please let us know.

Sincerely,

Christine Southwick

Staff Assistant, Ground Water

Nebraska Department of Natural Resources

Lincoln, NE 68509

(402) 471-4084

MW1

Mail to
DNR
PO Box 94676
Lincoln, NE 68509-4676
Phone (402)471-2363

January 2004
DNR Form 145

STATE OF NEBRASKA
DEPARTMENT OF NATURAL RESOURCES
WATER WELL REGISTRATION

FOR DEPARTMENT USE ONLY

Registration Date 10-3-2005 Sequence No. 170488 Registration No. G-136669
Owner Code No. 51127 Receipt No. UPPER BIG BLUE NRD

1. a. Well Owner's First Name _____ Last Name _____
b. Company Name USDA/CC
c. Correspondent Name Steve Gilmore Attention _____
Address Stop 0513 - Room 4725 1400 Independence Ave SW
City Washington, DC State _____ Zip 20250 Telephone 202-720-5104

2. a. Contractor's License No. 19193 Contractor's Name Mike Magnin
Contractor's Email Address mmagnin@baartloaque.com
b. Drilling Firm Name Baart Longyear
Address 101 Alderson Street
City Schofield State WI Zip 54476 Telephone 715-359-7090
Drilling Firm's Email Address _____

3. a. Well location NE 1/4 of the NE 1/4 of Section 30, Township 11 North, Range 1 E W Seward County.
b. Natural Resources District Upper Big Blue
c. The well is 249 feet from the (N) section line and 95 feet from the (E) W section line
(circle one) (circle one)
or Latitude Degree 40° Minute 54' Second 3.96"
Longitude Degree 97° Minute 20' Second 59.64"
d. Street address and subdivision, if applicable _____
Block _____ Lot _____
e. Location of water use, if applicable (give legal descriptions) _____
f. If for irrigation, the land to be irrigated is _____ acres.
g. Well reference letter(s), if applicable MW1 HHSS PWSID _____

4. Permits
Management Area Permit Number _____ Surface Water Permit Number _____
Geothermal Permit Number _____ Industrial Permit Number _____
Municipal Permit Number _____ Transfer Out-Of-State Permit Number _____
Well Spacing Permit Number _____ Conduct Permit Number _____
HHSS _____ Other Permit Number _____
NDEQ _____

5. Purpose of well (indicate one) Aquaculture Commercial/Industrial Dewatering (over 90 days)
 Domestic Ground Heat Exchanger Groundwater Source Heat Pump Irrigation Injection
 Livestock Monitoring Observation Public Water Supply (with spacing (46-638))
 Public Water Supply (without spacing) Recovery Other _____
(indicate use)

6. Wells in a Series.
a. Is this well a part of a series? Yes go to part b of this section No go to part 7 of this application
b. If one or more of the wells in the series is currently registered, give the well registration number _____
c. How many wells in the series are you registering at this time? _____

7. Replacement and abandoned well information.
a. Is this well a replacement well? Yes No
b. Registration number of abandoned well _____ If not registered, date abandoned well was constructed (m)____/(d)____/(y)____
c. Replacement well is _____ feet from abandoned well. d. Abandoned well last operated (m)____/(d)____/(y)____
e. Original well pump column size _____ inches. f. Completion of original well abandonment on (m)____/(d)____/(y)____
g. Location of water use of abandoned well _____

8. Pump Information.

- a. Is pump installed at this time Yes No
 Is pump installed by well owner in section 1? Yes No Is pump installed by contractor in section 2? Yes No
 If pump installed by pump installer, please fill out license number below
- b. Pump Installer's License No. _____ Pump Installer's Name _____
 Pump Installer's Email Address _____
 Pump Installer's Firm Name _____
 Pump Installer's Firm Address _____
 City _____ State _____ Zip _____ Telephone _____
 Pump Installer's Firm Email Address _____
- c. Pumping rate _____ gallons per minute Measured Estimated
 d. Drop pipe diameter _____ inches e. Length of drop pipe _____ feet
 f. Pumping equipment installed (m) _____ / (d) _____ / (v) _____ g. Pump Brand _____
 h. This well is designed and constructed to pump less than 50 gpm Yes No

9. Well Construction Information.

- a. Total well depth 105.0' feet. b. Static water level 87.0' feet.
 c. Pumping water level _____ feet d. Well Construction began (month) 8 / (day) 10 / (year) 05
 e. Well Construction completed (month) _____ / (day) _____ / (year) _____ f. Bore hole diameter in inches Top 6" Bottom 6"
 g. Casing and Screen Joints are Welded Glued Threaded Other _____

10. Well Construction (Casing & Screen)- c, d, e, & g measurements should be in inches to three decimal places

a Placement Depth in Feet		b Casing or Screen	c Inside Diameter	d Outside Diameter	e Wall Thickness	f Screen Slot Size	g Type of Material	h Trade Name
From	To							
0	85.0'	Casing	2.067	2.375	.154		PVC	Boart Longyear
85.0'	105.0'	20.0' screen	2.067	2.375	.154	.010	PVC	Boart Longyear

11. Grout and Gravel Pack

Placement Depth in Feet		Grout or Gravel Pack	Material Description
From	To		
0	79.0'	Bentonite Grout	Baroid Aggs Guard Grout 30% Solids
79.0	83.0	Bentonite Chips	Baroid 3/8 Holeplug
83.0	108.0	Sand #20	Red Flint Sand & Gravel #20 well slot Sand

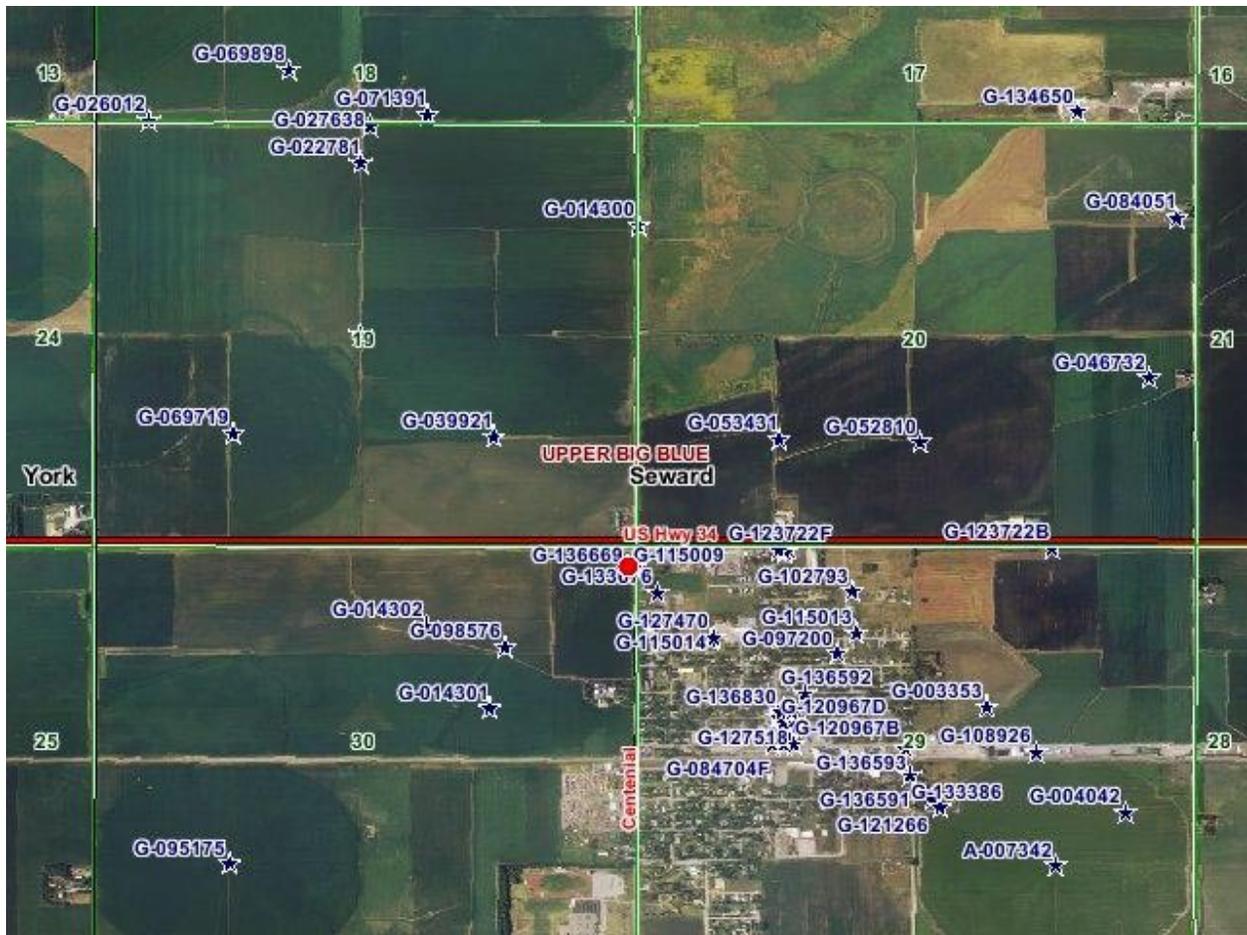
12. Geologic Materials Logged

Depth in Feet		Description	Depth in Feet		Description
From	To		From	To	
0	5'	Gravel			
5'	49.0'	Brown Silty Clay			
49.0	109.0	Brown medium to fine Sand			

(Additional sheets may be submitted)

13. I am familiar with the information submitted on this registration, and to the best of my knowledge it is true.

Michael M. [Signature] 8/26/05 _____
 Water Well Contractor's Signature Date Well Owner's Signature Date
 if Contractor is unknown or Deceased



MW2

Mail to
DNR
PO Box 94676
Lincoln, NE 68509-4676
Phone (402)471-2363

January 2004
DNR Form 145

STATE OF NEBRASKA
DEPARTMENT OF NATURAL RESOURCES
WATER WELL REGISTRATION

FOR DEPARTMENT USE ONLY

Registration Date 10-3-2005 Sequence No. 170489 Registration No. G-136591
Owner Code No. 51127 Receipt No. UPPER BIG BLUE NRD

1. a. Well Owner's First Name _____ Last Name _____
b. Company Name USDA/CCC
c. Correspondent Name Steve Gilmore Attention _____
Address Stop 0513-Room 4725 1400 Independence Ave SW
City Washington, DC State _____ Zip _____ Telephone _____

2. a. Contractor's License No. 1993 Contractor's Name Mike Magain
Contractor's Email Address mmagain@boartlongyear.com
b. Drilling Firm Name Boart Longyear
Address 101 Alderson Street
City Sichotfield State WV Zip 54452 Telephone 715-359-7090
Drilling Firm's Email Address _____

3. a. Well location NE 1/4 of the SW 1/4 of Section 29, Township 11 North, Range 1 E W Seward County.
b. Natural Resources District Upper Big Blue
c. The well is 2451 feet from the (N) section line and 2592 feet from the (E) section line
(circle one) (circle one)
or Latitude Degree 40° Minute 53' Second 38.04"
Longitude Degree 97 Minute 20' Second 24.72"
d. Street address and subdivision, if applicable _____
Block _____ Lot _____
e. Location of water use, if applicable (give legal descriptions) _____
f. If for irrigation, the land to be irrigated is _____ acres.
g. Well reference letter(s), if applicable MW-2 HHSS PWSID _____

4. Permits
Management Area Permit Number _____ Surface Water Permit Number _____
Geothermal Permit Number _____ Industrial Permit Number _____
Municipal Permit Number _____ Transfer Out-Of-State Permit Number _____
Well Spacing Permit Number _____ Conduct Permit Number _____
HHSS _____ Other Permit Number _____
NDEQ _____

5. Purpose of well (indicate one) Aquaculture Commercial/Industrial Dewatering (over 90 days)
 Domestic Ground Heat Exchanger Groundwater Source Heat Pump Irrigation Injection
 Livestock Monitoring Observation Public Water Supply (with spacing (46-638))
 Public Water Supply (without spacing) Recovery Other _____
(indicate use)

6. Wells in a Series.
a. Is this well a part of a series? Yes go to part b of this section No go to part 7 of this application
b. If one or more of the wells in the series is currently registered, give the well registration number _____
c. How many wells in the series are you registering at this time? _____

7. Replacement and abandoned well information.
a. Is this well a replacement well? Yes No
b. Registration number of abandoned well _____ If not registered, date abandoned well was constructed (m)____/(d)____/(y)____
c. Replacement well is _____ feet from abandoned well. d. Abandoned well last operated (m)____/(d)____/(y)____
e. Original well pump column size _____ inches. f. Completion of original well abandonment on (m)____/(d)____/(y)____
g. Location of water use of abandoned well _____

8. Pump Information.

- a. Is pump installed at this time Yes No
 Is pump installed by well owner in section 1? Yes No Is pump installed by contractor in section 2? Yes No
 If pump installed by pump installer, please fill out license number below
- b. Pump Installer's License No. _____ Pump Installer's Name _____
 Pump Installer's Email Address _____
 Pump Installer's Firm Name _____
 Pump Installer's Firm Address _____
 City _____ State _____ Zip _____ Telephone _____
 Pump Installer's Firm Email Address _____
- c. Pumping rate _____ gallons per minute Measured Estimated
 d. Drop pipe diameter _____ inches e. Length of drop pipe _____ feet
 f. Pumping equipment installed (m)____/(d)____/(y)____ g. Pump Brand _____
 h. This well is designed and constructed to pump less than 50 gpm Yes No

9. Well Construction Information.

- a. Total well depth 117.0' feet. b. Static water level 87.0 feet.
 c. Pumping water level _____ feet. d. Well Construction began (month) 8 / (day) 9 / (year) 05
 e. Well Construction completed (month) 8 / (day) 9 / (year) 05 f. Bore hole diameter in inches Top 6 Bottom 6
 g. Casing and Screen Joints are Welded Glued Threaded Other _____

10. Well Construction (Casing & Screen)- c, d, e, & g measurements should be in inches to three decimal places

a		b	c	d	e	f	g	h
Placement Depth in Feet		Casing or Screen	Inside Diameter	Outside Diameter	Wall Thickness	Screen Slot Size	Type of Material	Trade Name
From	To							
0	90.0'	Casing	2.067	2.375	.154		PVC	Boart Longyear
90.0'	115.0'	2.5.0' Screen	2.067	2.375	.154	.010	PVC	Boart Longyear

11. Grout and Gravel Pack

Placement Depth in Feet		Grout or Gravel Pack	Material Description
From	To		
0	85.0'	Bentonite Grout	Baroid Aqua Guard Grout 30% Solids
85.0'	88.0'	Bentonite Chips	Baroid 3/8 Holeplug
88.0'	117.0'	Sand #20	Red Flint Sand & Gravel #20 well slot sand

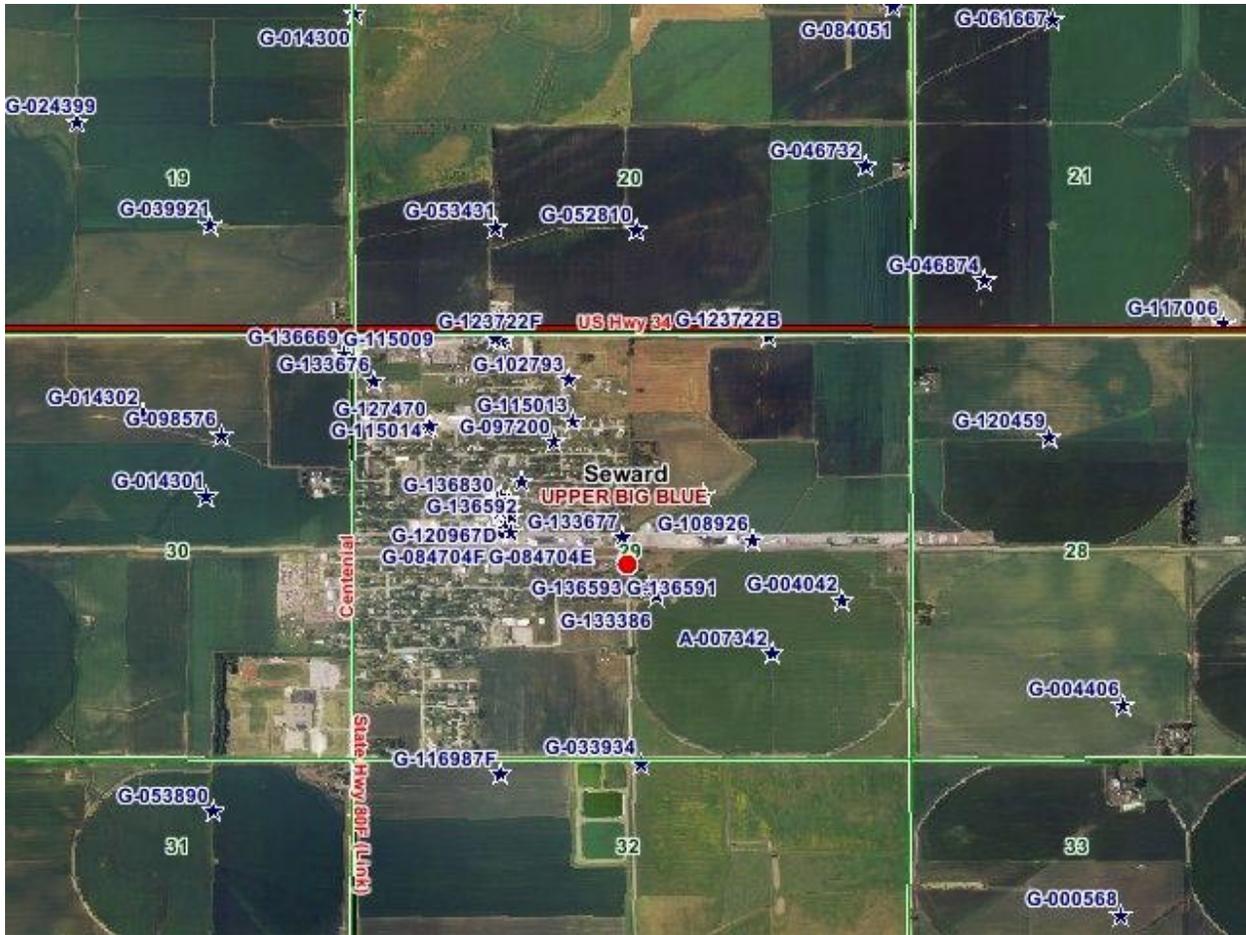
12. Geologic Materials Logged

Depth in Feet		Description	Depth in Feet		Description
From	To		From	To	
0	.5'	Top Soil			
.5'	32.0'	Gray Silty Clay			
32.0	117.0	Brown Fine-Medium Sand			

(Additional sheets may be submitted)

13. I am familiar with the information submitted on this registration, and to the best of my knowledge it is true.

M. J. [Signature] 8/26/05 _____
 Water Well Contractor's Signature Date Well Owner's Signature Date
 if Contractor is unknown or Deceased



MW3

Mail to
DNR
PO Box 94676
Lincoln, NE 68509-4676
Phone (402)471-2363

January 2004
DNR Form 145

STATE OF NEBRASKA
DEPARTMENT OF NATURAL RESOURCES
WATER WELL REGISTRATION

FOR DEPARTMENT USE ONLY

Registration Date 10-3-2005 Sequence No. 170490 Registration No. G-136592
Owner Code No. 51127 Receipt No. UPPER BIG BLUE NRD

1. a. Well Owner's First Name _____ Last Name _____
b. Company Name USDA/CCC
c. Correspondent Name Steve Gilmore Attention _____
Address Stop 0513 - Room 4725 1400 Independence Ave SW
City Washington, DC State _____ Zip 20250 Telephone 202-720-5104
2. a. Contractor's License No. 19193 Contractor's Name Mike Maguin
Contractor's Email Address mmaguin@bncflongyear.com
b. Drilling Firm Name Bonit Longyear
Address 101 Aderson Street
City Schotfield State WI Zip 54476 Telephone 715-359-7090
Drilling Firm's Email Address _____
3. a. Well location SE 1/4 of the NW 1/4 of Section 29, Township 11 North, Range 1 E W Seward County.
b. Natural Resources District Upper Big Blue
c. The well is 1854 feet from the (N) (S) section line and 1594 feet from the (E) (W) section line
(circle one) (circle one)
or Latitude Degree 40° Minute 53' Second 48.12"
Longitude Degree 97° Minute 20' Second 37.68"
d. Street address and subdivision, if applicable _____
Block _____ Lot _____
e. Location of water use, if applicable (give legal descriptions) _____
f. If for irrigation, the land to be irrigated is _____ acres.
g. Well reference letter(s), if applicable MW-3 HHSS PWSID _____
4. Permits
Management Area Permit Number _____ Surface Water Permit Number _____
Geothermal Permit Number _____ Industrial Permit Number _____
Municipal Permit Number _____ Transfer Out-Of-State Permit Number _____
Well Spacing Permit Number _____ Conduct Permit Number _____
HHSS _____ Other Permit Number _____
NDEQ _____
5. Purpose of well (indicate one) Aquaculture Commercial/Industrial Dewatering (over 90 days)
 Domestic Ground Heat Exchanger Groundwater Source Heat Pump Irrigation Injection
 Livestock Monitoring Observation Public Water Supply (with spacing (46-638))
 Public Water Supply (without spacing) Recovery Other _____
(indicate use)
6. Wells in a Series.
a. Is this well a part of a series? Yes go to part b of this section No go to part 7 of this application
b. If one or more of the wells in the series is currently registered, give the well registration number _____
c. How many wells in the series are you registering at this time? _____
7. Replacement and abandoned well information.
a. Is this well a replacement well? Yes No
b. Registration number of abandoned well _____ If not registered, date abandoned well was constructed (m) / (d) / (y) _____
c. Replacement well is _____ feet from abandoned well. d. Abandoned well last operated (m) / (d) / (y) _____
e. Original well pump column size _____ inches. f. Completion of original well abandonment on (m) / (d) / (y) _____
g. Location of water use of abandoned well _____

8. Pump Information.

- a. Is pump installed at this time Yes No
 Is pump installed by well owner in section 1? Yes No Is pump installed by contractor in section 2? Yes No
 If pump installed by pump installer, please fill out license number below
- b. Pump Installer's License No. _____ Pump Installer's Name _____
 Pump Installer's Email Address _____
 Pump Installer's Firm Name _____
 Pump Installer's Firm Address _____
 City _____ State _____ Zip _____ Telephone _____
 Pump Installer's Firm Email Address _____
- c. Pumping rate _____ gallons per minute Measured Estimated
 d. Drop pipe diameter _____ inches e. Length of drop pipe _____ feet
 f. Pumping equipment installed (m) _____ / (d) _____ / (y) _____ g. Pump Brand _____
 h. This well is designed and constructed to pump less than 50 gpm Yes No

9. Well Construction Information.

- a. Total well depth 125.0' feet. b. Static water level 87.0' feet.
 c. Pumping water level _____ feet d. Well Construction began (month) 8 / (day) 11 / (year) 05
 e. Well Construction completed (month) _____ / (day) _____ / (year) _____ f. Bore hole diameter in inches Top 6" Bottom 6"
 g. Casing and Screen Joints are Welded Glued Threaded Other _____

10. Well Construction (Casing & Screen)- c, d, e, & g measurements should be in inches to three decimal places

a		b	c	d	e	f	g	h
Placement Depth in Feet		Casing or Screen	Inside Diameter	Outside Diameter	Wall Thickness	Screen Slot Size	Type of Material	Trade Name
From	To							
0	100.0'	Casing	2.067	2.375	.154		PVC	Boart Longyear
100.0'	125.0'	25.0 screen	2.067	2.375	.154	.010	PVC	Boart Longyear

11. Grout and Gravel Pack

Placement Depth in Feet		Grout or Gravel Pack	Material Description
From	To		
0	93.0'	Bentonite Grout	Baroid Aqua Guard Grout 30% Solids
93.0'	98.0'	Bentonite Chips	Baroid 79 Holeplug
98.0	128.0'	Sand #20	Red Flint Sand + Gravel #20 well slot Sand

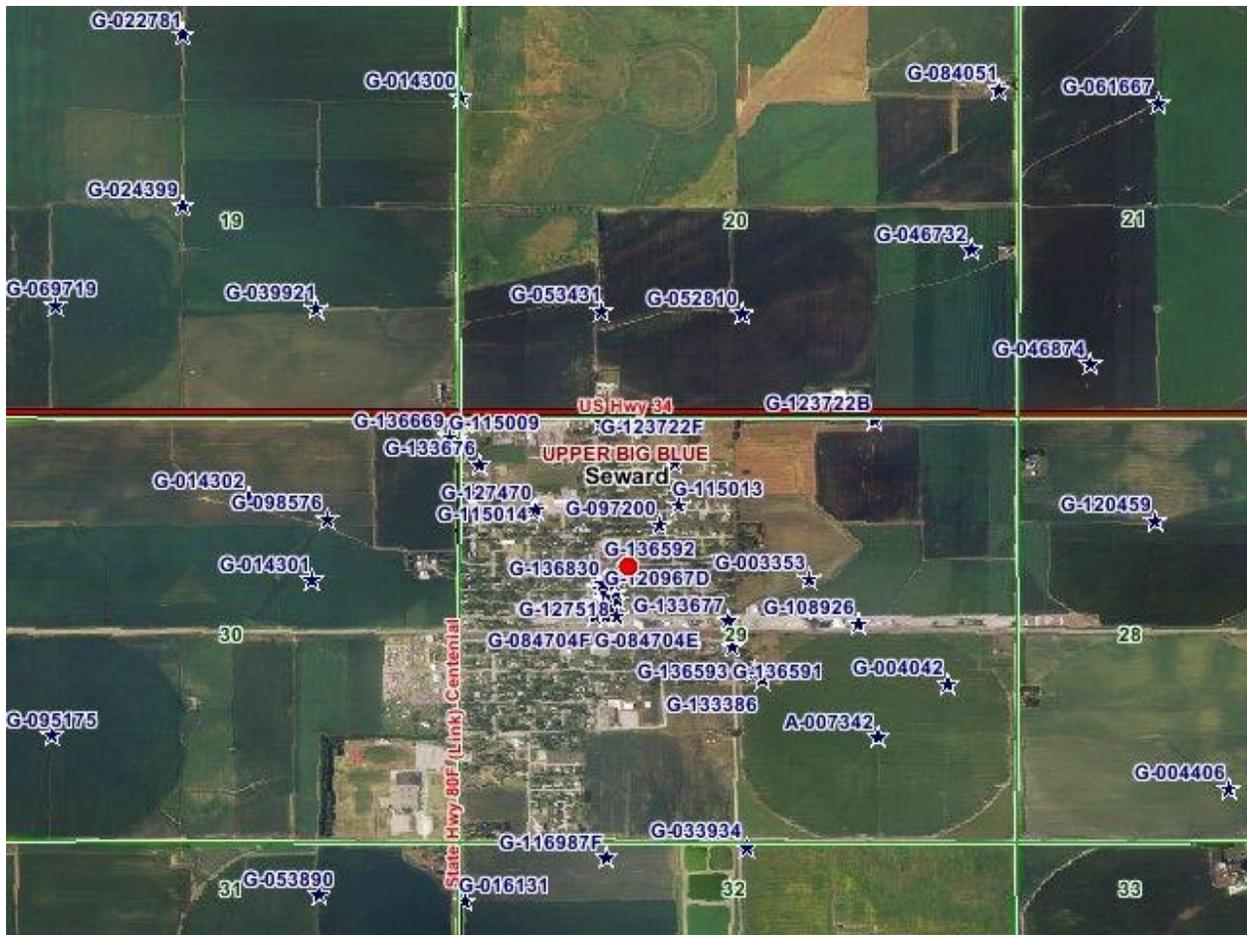
12. Geologic Materials Logged

Depth in Feet		Description	Depth in Feet		Description
From	To		From	To	
0	.5'	Topsoil			
.5	44.0'	Brown Silty Clay			
44.0'	128.0'	Brown Fine to Medium Sand			

(Additional sheets may be submitted)

13. I am familiar with the information submitted on this registration, and to the best of my knowledge it is true.

Richard M... 8/26/05 _____
 Water Well Contractor's Signature Date Well Owner's Signature Date
 if Contractor is unknown or Deceased



MW4

Mail to
DNR
PO Box 94676
Lincoln, NE 68509-4676
Phone (402)471-2363

January 2004
DNR Form 145

STATE OF NEBRASKA
DEPARTMENT OF NATURAL RESOURCES
WATER WELL REGISTRATION

FOR DEPARTMENT USE ONLY

Registration Date 10-3-2005 Sequence No. 170491 Registration No. G-136593
Owner Code No. 51127 Receipt No. _____ UPPER BIG BLUE NRD

1. a. Well Owner's First Name _____ Last Name _____
b. Company Name USDA/FSA/CEPD
c. Correspondent Name Steve Gilmore Attention _____
Address Stop 0513 - Room 4725 1400 Independence Ave. SW
City Washington DC State _____ Zip 20250 Telephone 202-770-5104

2. a. Contractor's License No. 19193 Contractor's Name Mike Magnin
Contractor's Email Address mmagnin@boortlongyear.com
b. Drilling Firm Name Boort Longyear
Address 101 Alderson Street
City Schubert State WI Zip 54476 Telephone _____
Drilling Firm's Email Address _____

3. a. Well location NE 1/4 of the SW 1/4 of Section 29, Township 11 North, Range 1 W Seward County.
b. Natural Resources District Upper Big Blue
c. The well is 2451 feet from the (N S) section line and 2597 feet from the (E W) section line
(circle one) (circle one)
or Latitude Degree 40° Minute 53' Second 38.04"
Longitude Degree 97° Minute 20' Second 24.72"
d. Street address and subdivision, if applicable _____
Block _____ Lot _____
e. Location of water use, if applicable (give legal descriptions) _____
f. If for irrigation, the land to be irrigated is _____ acres.
g. Well reference letter(s), if applicable MW-4 HHSS PWSID _____

4. Permits
Management Area Permit Number _____ Surface Water Permit Number _____
Geothermal Permit Number _____ Industrial Permit Number _____
Municipal Permit Number _____ Transfer Out-Of-State Permit Number _____
Well Spacing Permit Number _____ Conduct Permit Number _____
HHSS _____ Other Permit Number _____
NDEQ _____

5. Purpose of well (indicate one) Aquaculture Commercial/Industrial Dewatering (over 90 days)
 Domestic Ground Heat Exchanger Groundwater Source Heat Pump Irrigation Injection
 Livestock Monitoring Observation Public Water Supply (with spacing (46-638))
 Public Water Supply (without spacing) Recovery Other _____
(indicate use)

6. Wells in a Series.
a. Is this well a part of a series? Yes go to part b of this section No go to part 7 of this application
b. If one or more of the wells in the series is currently registered, give the well registration number _____
c. How many wells in the series are you registering at this time? _____

7. Replacement and abandoned well information.
a. Is this well a replacement well? Yes No
b. Registration number of abandoned well _____ If not registered, date abandoned well was constructed (m)____/(d)____/(y)____
c. Replacement well is _____ feet from abandoned well. d. Abandoned well last operated (m)____/(d)____/(y)____
e. Original well pump column size _____ inches. f. Completion of original well abandonment on (m)____/(d)____/(y)____
g. Location of water use of abandoned well _____

8. Pump Information.

- a. Is pump installed at this time Yes No
 Is pump installed by well owner in section 1? Yes No Is pump installed by contractor in section 2? Yes No
 If pump installed by pump installer, please fill out license number below
- b. Pump Installer's License No. _____ Pump Installer's Name _____
 Pump Installer's Email Address _____
 Pump Installer's Firm Name _____
 Pump Installer's Firm Address _____
 City _____ State _____ Zip _____ Telephone _____
 Pump Installer's Firm Email Address _____
- c. Pumping rate _____ gallons per minute Measured Estimated
 d. Drop pipe diameter _____ inches e. Length of drop pipe _____ feet
 f. Pumping equipment installed (m)____/(d)____/(y)____ g. Pump Brand _____
 h. This well is designed and constructed to pump less than 50 gpm Yes No

9. Well Construction Information.

- a. Total well depth 125.0' feet. b. Static water level 82.0 feet
 c. Pumping water level _____ feet d. Well Construction began (month) 8 / (day) 12 / (year) 05
 e. Well Construction completed (month) 8 / (day) 12 / (year) 05 f. Bore hole diameter in inches Top 6" Bottom 6"
 g. Casing and Screen Joints are Welded Glued Threaded Other _____

10. Well Construction (Casing & Screen)- c, d, e, & g measurements should be in inches to three decimal places

a		b	c	d	e	f	g	h
Placement Depth in Feet		Casing or Screen	Inside Diameter	Outside Diameter	Wall Thickness	Screen Slot Size	Type of Material	Trade Name
From	To							
0	100.0'	Casing	2.067	2.375	.154		PVC	Boart Longyear
100.0'	125.0'	250' screen	2.067	2.375	.154	.010	PVC	Boart Longyear

11. Grout and Gravel Pack

Placement Depth in Feet		Grout or Gravel Pack	Material Description
From	To		
0	94.0'	Bentonite Grout	Basoid Aqua Guard Grout 30% Solids
94.0'	98.0'	Bentonite Chips	Basoid 3/4 Holepak
98.0'	128.0'	Sand # 20	Red Flat Sand + Gravel # 20 well Slot Sand

12. Geologic Materials Logged

Depth in Feet		Description	Depth in Feet		Description
From	To		From	To	
0	5'	Gravel			
5'	40.0'	Brown Silty Clay			
40.0'	128.0'	Brown Fine to Medium Sand			

(Additional sheets may be submitted)

13. I am familiar with the information submitted on this registration, and to the best of my knowledge it is true.

Michael J. [Signature] 8/26/05 _____
 Water Well Contractor's Signature Date Well Owner's Signature Date
 if Contractor is unknown or Deceased

