

Regular Board of Directors Meeting
Friday, February 10, 2023 1:30 PM
Lower Platte North NRD Office
P.O. Box 126
Wahoo, NE 68066

1. Call to Order

NOTE: The agenda is on file at the LPNNRD office and may be changed up to 24 hours prior to the meeting as scheduled.

1.A. Meeting Notice

1.B. Inform Public on Location of Copy of “Open Meeting Act”

1.C. Pledge of Allegiance

2. Roll Call

2.A. Introductions

3. Approval of Agenda

Are there any additions or corrections to the agenda?

4. Comments - Advisors/Guests

4.A. Guest Comments

4.B. NRCS Report

4.C. NARD Report

4.D. NRC Report

4.E. Managers Report

4.F. Education Program

5. Approval of Minutes

Are there any additions or corrections to the Minutes? If not they will be approved on the consent agenda.

6. Report of Standing Committees

6.A. Executive Committee - Action as Required

6.A.1. UNFINISHED BUSINESS

6.A.2. MEETINGS

6.A.2.a. Pending

6.A.2.a.1. Director Retreat

The Director's Retreat will be held March 9th in Fremont. Please let staff know any topics you would like on the agenda.

6.A.2.a.2. NARD Washington DC Trip

The Annual NARD Washington DC Meeting is being held March 18-22, 2023. Registration deadline is February 28th. We typically send two staff and two directors to this out-of-state meeting.

6.A.2.b. Reports

6.A.2.b.1. Legislative Conference

The NARD Legislative Conference was held January 25-25 at the Embassy Suites in Lincoln. Directors Hillger, Saeger, Thompson, McKnight and Engel attended.

6.A.2.b.2. GMDA Winter Conference

Birkel, Meduna, Andersen, Chapman and Benal attended the GMDA Winter Conference January 22-25.

6.A.3. MANAGEMENT ITEMS

6.A.3.a. Directors Absence

Attached find an absence request from Bob Meduna for the November Board Meeting.

6.A.3.b. LPNNRD Sub-Committee Discussion

Discussion is requested on committee assignments and committee size

6.A.3.c. Monthly Education Program

6.A.3.d. New Office Building Update

No updates at this time. Any available updates will be provided at the February board meeting.

6.A.3.e. February Board Meeting - Date

The NACD Annual Meeting is being held February 11-15 in New Orleans, which falls over our Monthly Board Meeting. Do we want to move the Board Meeting to Thursday, February 9th so Gottschalk can attend? The February Board Meeting will be held Friday, February 10th at 1:30 p.m.

6.A.3.f. Public Notice of Board Meetings

At the recent NARD legislative conference, Gottschalk attended a breakout session discussing the Open Meetings laws. It was pointed out there is some ambiguity regarding the statute requiring public notice...Do to this fact, we will begin advertising each of our monthly board meetings in a local newspaper in addition to publishing on our LPNNRD website.

6.A.3.g. Sub-District 3 Director Vacancy

Attached find a public notice that will be published in the North Bend Eagle and Fremont Tribune notifying the public of the vacancy in Sub-District 3. A subdistrict map is also attached.

6.A.3.h. LPNNRD Policy Review Process

With the potential of Gottschalk being absent from the February board meeting, we are delaying the start of our systematic review of all LPNNRD policies. The plan is to review several policies at each board meeting, re-write as needed and have new policies ready for approval at each of the following meetings.

6.A.4. EQUIPMENT

6.A.5. PERSONNEL

6.A.5.a. Potential Position Opening

GM has been notified of the potential that one of our staff members might be leaving for another position.

6.A.5.b. Open NRD Technician Position

Management has been working with NRCS preparing to advertise the open NRD Technician position.

6.A.5.c. Assistant Manager 6 Month Review

Gottschalk and Chapman have met to conduct his 6 month review. Ryan is doing an amazing job and has stepped in seamlessly for Tom over the past five months. Discussion is requested regarding a potential salary increase as discussed at the time of Ryan's hiring.

6.A.5.d. Workers Compensation

On January 5th Butler County Field Office Secretary, was walking to the post office to mail the letters and slipped on the ice. She has been off work since the fall and is attending Physical Therapy and will have a MRI on Monday, February 6th.

6.A.6. FINANCE

6.A.6.a. Approval of Financial Reports

Attached find the December financial statement. Grant will be available to discuss the financial report.

6.A.6.b. Approval of Managers Time and Expense Sheets

Attached find Gottschalk's time sheets.

6.A.6.c. Accounts over 90 Days

6.B. Operations Committee - Action as Required

6.B.1. NOMINATIONS FOR CHAIR AND VICE CHAIR

The Committee needs to nominate and elect an Operations Committee Chair and Vice Chair. Mark is not eligible as he is the Board Treasurer.

The chair will run the committee meetings and participate on the Executive Committee. The vice Chair will substitute in the absence of the Chair.

Seier nominated Pollard for Chair and Johnson for Vice-Chair, seconded by Saalfeld. The vote was unanimously in favor.

6.B.2. UNFINISHED BUSINESS

Nothing to consider for unfinished business.

6.B.3. WILD NE AND OTHER PROGRAMS

Nothing to report.

6.B.4. OPERATION & MAINTENANCE & OTHER ITEMS

The O & M crew burned multiple tree piles at Czechland Lake and one at Wanahoo, and also continued cutting trees on recreation areas.

6.B.4.a. Wanahoo Stilling Basin - (FEMA)

The final three panels were poured on Friday, January 27. The baffle plate may arrive in February for installation and grading and seeding will take place after the thaw. See Eric Suings reports via email for all the construction information.

Attached is the invoice from Houston Engineering and a pay application #2 for M.E. Collins that came in before the last Board meeting and was paid. Also attached is Change Order 002 dealing with the extra cost of \$45,506 for overgrinding of the RCC Apron Floor and \$5,048.56 for steel reinforcement along with some deducts totaling \$46,448.24. A Technical Memorandum is attached for an explanation.

Also, find pay application #3 for Collins w/out Change Order 002 (\$247,298.97) and with CO 002 (\$292,798.07) attached.

Change Order No. 001 for the Baffle Plate Replacement was approved for \$44,358.91 following the last Board meeting. Baffle plate fabrication may take 4-5 weeks. The substantial completion date was also moved to March 7, 2023. The final completion date is April 28, 2023.

Ethan Miller and Eric Suing were present at the Committee meeting.

6.B.4.b. Cottonwood 21-A Dam Assessment

NRCS informed staff at the NARD Legislative Conference that funding was approved for the rehab of Cottonwood 21-A but, with the Federal deficit at its ceiling, there may be cuts. We will wait to hear from or meet with NRCS to figure out the next step in the process.

6.B.4.c. Wanahoo Relief Well Cleaning

Last summer, the District cleaned 7 of 29 listed relief wells on Wanahoo at a cost of \$63,600. This year Olsson's has 10 listed to be cleaned. The cleaning process for the 29 wells is over a 4 year period. (See Attachments) Do we want to obtain a bid from Rieschick Drilling Co. for 10 or lower the number to be cleaned? The staff would prefer to stay with Rieschick since they have onsite experience. Last year we had four interested well drillers but only received two bids.

The Committee directed staff to negotiate with Rieschick Drilling on a long term (3 year) contract for the remaining 22 wells with the understanding that there would be some inflationary cost increase. If an agreement is arranged, then we would ask for a motion to proceed.

6.B.4.d. NRD Owned Thomas Lakes Lots

Representatives of the Thomas Lakes Homeowners Association will be present to explain their regulations for unusable lots and to answer questions. A map is attached.

Their listed rules, regulations, and covenants for these lots are to be maintained as to trash debris and overgrowth, Not be used for any overnight camping with a tent, No temporary storage buildings or sheds, No vehicle storage including campers or trailers, No fencing or other restrictive barriers, and No livestock boarding.

After much information and discussion on how the HOA takes care of the four north lots (on high ground) and uses them as public green space, the committee made a motion to have staff re-write an agreement with the HOA to continue this practice and not sell the six lots. Staff would like to reconsider selling the two south lots on the Clear Creek Levee as the District is responsible for O & M on the levee, which should not be used as public green space.

6.B.4.e. Sand/Duck Dam 15 Land Locked Issue

This landlocked item was previously mentioned at our December meetings. Jason Scott (was present), the owner of an 8.5 acre land locked parcel at Sand/Duck Creek Dam 15 (aerial attached) has a solution to cross the creek, rather than attempting to obtain an ingress/egress easement from his neighbors (Ourada's). Attached is a photo of a UTV bridge made by Geneva Welding. The estimated cost of the bridge is \$4,800. Mr. Scott's total estimate for the bridge and installation is \$8,000. He is asking the District for cost-share assistance on the project.

Funds can be used from the Bank Stabilization budget.

6.B.4.f. Dams Exceeding Planned Service Life

NRCS sent out a notice to the District last year that we have 20 dams exceeding their planned Service Life of 50 years (attached). Lower Platte North has 43 flood control dams, of which 3 are High Hazard and 7 are Significant Hazard. This is information to keep in mind regarding possible rehab costs in the future.

The Dept. of Natural Resources Dam Safety inspects High Hazard dams once a year, Significant Hazard every 3 years and the rest every 5. The District O & M staff inspects and does maintenance on our dams once a year unless there's a high precipitation event in their respective watershed.

6.B.5. ROCK AND JETTY

We don't have any applications or pay request at this time.

6.B.6. LAKE WANAHOO

2023 Planning and Future Additions Update:

Staff has asked JEO to submit a new design and construction estimate for a fish cleaning station to be located on the west side of the park, near the boat ramp. We will also start plans for a general store to be located near the fish cleaning station. Partnerships, and or management, are still to be determined.

The City of Wahoo is waiting for the ground to thaw before they bore an electric line to run power for the new light at the education building parking lot.

6.B.6.a. Lake Wanhoo Permit Sales

For the month of December, the District received \$6,185.00 in annual park permit revenue. The year by year break down of annual permit sales is listed below.

Month	Monthly Total	YTD
December 2022	\$6,185.00	\$6,185.00
December 2021	\$5,045.00	\$5,045.00
November 2020	\$4,725.00	\$4,725.00
November 2019	\$4,470.00	\$4,470.00
November 2018	\$4,585.00	\$4,585.00

6.B.6.b. Lake Wanhoo Camping Revenue

For the month of December, the District received \$2,276.95 in camping revenue. The year by year comparison is listed below.

Month	Month Total	YTD
December 2022	\$2,276.95	\$131,245.06
November 2021	\$2,438.00	\$118,152.11
November 2020	\$1,485.97	\$134,027.78
October 2019	\$1,160.56	\$93,334.36

6.B.6.c. Clint Johannes Education Building

During the month of January, the building was rented 10 times with 1 NRD event. Revenue for the month was \$955.00.

6.B.7. INFORMATION AND EDUCATION

6.B.7.a. Information

6.B.7.a.1. Radio & eAds

January's KTIC Radio spot is attached - featuring the upcoming Nitrogen Certification classes for producers. February's spot is also attached - featuring

the 2023 Wanahoo permits.

January's Wahoo Newspaper E-ad is attached - featuring the 2023 Wanahoo permits. This will continue through February.

6.B.7.a.2. Analytics

The LPNNRD Facebook/Twitter pages, and the website are the fastest and low-cost ways to get information out to the public. Tracking analytics are a way to see if people are seeing the information and what ways seem to be most effective. If you are on Facebook or Twitter, please like, follow, share, or retweet the Lower Platte North NRD posts!

*Total reach/impressions show how many people saw the post/tweet.
Engagements include likes, comments, shares/retweets and link clicks.*

	Total Reach	Engagements	Followers
	3,663	100	1,427
	5,758	163	1,421
	10,355	198	1,413

--	--	--	--

	Total impressions	Engagements	Followers
	1,954	95	391
	2,570	102	388
	2,862	126	383

Top Posts on Facebook and Twitter:

- Reverse Osmosis grant through NDEE
- Upcoming Nitrogen Certification Classes
- Promoting Tree Sales
- LPNNRD "Why does and 85-Year-Old plant a tree?" video
- January's Coffee Lakeside flyer

	Users	Traffic Channel	Top Pages	Devices
	1,614	Organic 67.9% Direct 20.8% Referral 8.3% Social 3%	Lake Wanhoo Home Forestry Czechland Lake Nitrogen Certification	Mobile 50.87% Desktop 47.15% Tablet 1.98%
	1,156	Organic 62.7% Direct 22.9% Referral 8.7% Social 5.7%	Home Lake Wanhoo Forestry Downloads Contact	Mobile 49.39% Desktop 48.62% Tablet 1.99%
	988	Organic 62.3% Direct 27.6% Referral 6.9% Social 3.2%	Home Lake Wanhoo Czechland Lake Staff Downloads	Mobile 50.40% Desktop 47.27% Tablet 2.33%

Traffic channels: organic traffic means they use a search engine then choose an option that includes lpnnrd.org, direct traffic means they type in lpnnrd.org directly (or have it bookmarked), and referral traffic is any other traffic not from a search engine or social (such as a link from another site).

Social clicks: from 46 Facebook, from 4 Twitter.

Referral clicks: 48 from NARD, 12 from Visit Nebraska, 11 from NGPC, 1 from the ad on Wahoo Newspaper's site.

6.B.7.a.3. Winter Viaduct

The Winter issue of the LPNNRD's Viaduct is en route to local

newspapers and will be distributed by mid-February. The newsletter is inserted in the following newspapers:

Wahoo/Ashland/Waverly Market Weekly
Fremont Tribune
North Bend Eagle
David City Banner-Press
Schulyer Sun
Columbus Area Choice (3 rural routes)
Humphrey Democrat
Albion News

Total of 22,095 delivered copies, and 365 online subscribers.

6.B.7.a.4. News Channel Nebraska

The I&E video was featured on News Channel Nebraska during January. The cost was \$475. Attached are the times the video and our logo aired. The total amount of the video and logo aired was 200 times.

6.B.7.a.5. Shell Creek Watershed Supplies Request

Attached is a list of items the Shell Creek Watershed testing group would like to have purchased for the 2023 testing season. The amount totals \$1,609.75.

6.B.7.b. Education

6.B.7.b.1. Past Events

- **January 12th:** Coffee Lakeside -11 adults and 1 child attended. We talked about animals that hoard.
- **January 20th:** St. Wenc Pre-K Classroom visit. 24 students learned about wild vs domestic animals.
- **January 23rd:** I&E Meeting and Project Learning Tree Training at Morrill Hall

Slow month with Christmas Break and students in and out of school. Survival club was supposed to be on the 19th; due to a snow day, it was pushed to Friday, February 3rd.

6.B.7.b.2. Upcoming Events

- **February 3rd:** Survival club with Wahoo M.S. - Intro to Hiking and how to read maps.
- **February 7th:** 1st, 2nd, and 5th grade Classes at Lindsay Holy Family Elementary. Animal adaptations, seed dispersal, and food chains/ecosystems.
- **February 8th-9th:** Nebraska Environmental Education Conference at Mahoney State Park.
- **February 11th-15th:** National Association of Conservation Districts in New Orleans.

- **February 16th:** Coffee Lakeside: The power of nature-based play: Why people of all ages need to spend time outdoors.
- **February 21st:** All 4 fifth grade classes at wahoo: Biodiversity: Let's talk prairies.
- **February 23rd:** David City Aquinas 6th graders: Importance of Pollinators.

Reschedule a survival club and book a St. Wenc Pre-k visit.

6.B.7.b.3. New Projector for the Education Building

The current projector at the Clint Johannes Education Building projects presentations at a low quality. Diode Technologies has given us a proposal for a BenQ 1080p 5,000 Lumen Projector to replace it. The new projector will cost \$3,059.00. Below is the breakdown of costs:

- Misc Parts: \$134.95
- Project management: \$25.20
- Shipping & Tariff: \$80.97
- Sales Tax: \$0.00

Total cost: \$3,300.12 Installation is included.

6.B.8. RURAL WATER SYSTEMS

Elliott has been working on the annual NDEE update/reporting for Emergency Contact Plans, Sample Site Plans, for both RWDs.

We have also started the RWDs vulnerability assessments and are working with the Nebraska Rural Water Association (NeRWA) through the process.

The new Lead Service Line Inventory (LSLI) guidance has been received and the RWD has begun the initial steps. All public water systems (PWS) are now required to complete the LSLI for their respective systems and are to be filed with EPA by the end of 2024. Information for inventories can be difficult as there is minimal data about old, residential service lines.

6.B.8.a. Colon System

Routine monthly sampling completed, meters read and bills mailed 1/31.

6.B.8.b. Bruno System

Routine monthly sampling completed, meters read and bills mailed 1/31.

6.B.8.c. Other

6.C. Water Committee - Action as Required

6.C.1. UNFINISHED BUSINESS

6.C.2. Election of Committee Chair and Vice-Chair.

Bob Hilger was nominated for Chairman.

Bill Saeger was nominated to be Vice-Chair.

6.C.3. REGULATORY

6.C.3.a. GROUND WATER MANAGEMENT AREA

6.C.3.a.1. Variance Request in the Hydrologically Connected Area
(Limited Development Area)

6.C.3.a.2. Variance Requests in the Non-Hydrologically Connected
Area (Normal Development Area)

6.C.3.a.3. Variance Requests in the Restricted Development Areas

6.C.3.a.4. Well Permit Program

6.C.3.a.4.A. Norman Kavan Jr. Secondary Well Application

Norman Kavan Jr. submitted an application for a second well in
S32-T16N-R8E Saunders County, Todd Valley. The current well,
G-052570, irrigates two pivots totaling 178.3 acres (see attached
map). The new well will irrigate approximately 100 acres

6.C.3.a.4.B. SUPPLEMENTAL WELL PERMIT - UNL

The University of Nebraska applied for a second well in the NE SW
Section 18-14N-9E, Saunders County. This well will assist Well G-
087929. This agenda item was not acted on at the November Water
Committee Meeting and December Board Meeting, until more
information was provided.

Information attached with UNL personnel at Committee meeting to
discuss.

6.C.3.a.4.C. City of Schuyler Public Water Supply Well Applications
Schuyler Department of Utilities has submitted two applications for
new Public Water Supply wells. These wells will replace the
capacity lost from the two wells they decommissioned south of
town due to contamination issues.

6.C.3.a.4.D. Well Permits Approved

Wells Permits Approved: #

Landowner	Number of Wells	Number of New Irrigated Acres
UNL	1	0

The total number of approved permits for 2022 is #

Location of Approved Well Permits for 2022: Correct as of #####

County	Irrigation - New	Irrigation - Replacement
Butler		
Colfax		
Dodge		
Boone		
Madison		
Platte		
Saunders		
Total		

6.C.3.a.4.E. Variance Soil Scoring Update

Staff met with NRCS soil specialists to discuss the way soil classification is used in LPNNRD Variance Scoring. Staff showed the Committee new soil classification information which would be utilized for the 2023 scoring process.

Attachment.

6.C.3.a.4.F. TRANSFER OF ACRES - DUANE JOHNSON

Attached is Duane Johnson Irrigation Transfer Request.

With the adoption of the most recent data available, the Duane Johnson transfer to the NE 1/4 of S25-14-7E, Saunders County was reranked and has met the minimum threshold of 300 points for application consideration. Mr. Johnson has applied for, and been approved, to irrigate 35 acres in the NW 1/4 of S25-14-7E.

Motion from November Board Meeting:

Approval of the transfer for Duane and Kelli Johnson from Annette Rogers for the NRD certified acres of 65.51 with the stipulation that

the West Pivot can be developed and the East Pivot on hold until staff can re-evaluate the scoring system for the soil type with a NRCS soil scientist before the Board Meeting.

6.C.3.a.4.G. Hydrogeologic Assessment Database

LPN received two RFQs and will be making a recommendation at the Committee Meeting.

The Selection Committee of LPN staff reviewed the proposals of LRE and HDR. Both firms are very capable of doing the project with excellent RFQs. The Selection Committee recommends LRE to conduct the Hydrological Assessment Database. This project is for a maximum of \$56,000, of which 60% will be funded through a WSF grant.

6.C.3.a.4.H. Cost Share Programs

6.C.3.a.4.H.1. Flow Meter Maintenance Program

Topic: District Approved flow meter list

Discussion: In the Lower Platte North Natural Resource District there are 4500+ irrigation wells. Currently, less than 1200 irrigation wells are metered. Overall, irrigation accounts for over 90% of the total water that is pumped in the state. The LPNNRD district has 4 aquifer regions which then are split into 26 separate subareas. Each have their own unique geology, soil types, and aquifer characteristics. Therefore, the variability of pumping amounts that is documented and recorded in our data set may not be comparable from area to area.

Meters that are installed must be installed correctly and totalize in acre inches. If they are totalizing in gallons there is the potential that the meter can rollover, which could be unknown to the producer and staff.

Current brands of meters that are on the district approved list:
Propeller/Turbine style meters only

McCrometer- propeller meter (currently have mechanical & digital screens allowed)- digital screens require batteries

Geyser- propeller meter- mechanical register only

Sparling- they do make a mechanical style totalizer, but the only Sparling meters that are installed in our district thus far have a digital totalizer that requires batteries.

ARAD Group-for different applications such as SDI (Sub-surface drip irrigation)

What needs to be answered moving forward?

Are we going to allow Propeller meters with a digital totalizer or not allow them?

We have already removed the electromagnetic meters all together from the district approved list because they need power to record and because of the unknown makeup of water quality/chemistry around the district that could potentially skew the data that is recorded by this sort of meter. For example, the build up of iron.

Propeller meters also have a digital totalizer option. If the batteries fail then the flow will not be recorded. Mechanical meters with a mechanical totalizer, if operating correctly, do not need external/battery power to record. In other words, if the committee so chooses, we would need a motion to remove or adjust our district approved list if we decide to remove the propeller digital/electronic record keeping meters. **Propeller style meters with a mechanical totalizer would then be the only meters allowed.**

ARAD group meters, which is a turbine style meter with a digital totalizer. These meters are used primarily in smaller water line applications such as an SDI system. Most of the time, these meters are sheltered and not directly exposed to the elements of hot and cold.

6.C.3.a.4.I. Bellwood Phase 2 Area

2022 is the twentieth year for this Phase 2 Area.

	Nitrate-nitrogen Range	Percent Nitrate-nitrogen 0 to 8.0 ppm	Percent Nitrate-nitrogen 8.01 to 10.00 ppm	Percent Nitrate-nitrogen 10.01 to 15 ppm	Percent Nitrate-nitrogen greater than 15 ppm
	0 to 25 ppm	46.3% (44 of 95)	8.4% (8 of 95)	45.3% (43 of 95)	
	0 to 25 ppm	47% (44 of 94)	15% (14 of 94)	38% (36 of 94)	
	0 to 24 ppm	41% (29 of 71)	14% (10 of 71)	45% (32 of 71)	
	0 to 31 ppm	48% (48 of 100)	9% (9 of 100)	43% (43 of 100)	

	0 to 28 ppm	53.75% (43 of 80)	7.5% (6 of 80)	38.75% (31 of 80)	
	0 to 22 ppm	45.5% (41 of 90)	15.5% (14 of 90)	39% (35 of 90)	
	0 to 35.7 ppm	48.65% (54 of 111)	11.71% (13 of 111)	39.64% (44 of 111)	
	0 to 26.6 ppm	51% (56 of 110)	6% (7 of 110)	43% (47 of 110)	
	0 to 28.9 ppm	57% (61 of 107)	9% (10 of 107)	34% (36 of 107)	
	0 to 25.8 ppm	50% (53 of 107)	9% (10 of 107)	14% (44 of 107)	26%
	0 to 22.3 ppm	51% (55 of 108)	13% (14 of 108)	18% (39 of 108)	20%
	0 to 32.3 ppm	43% (31 of 72)	8% (6 of 72)	14% (35 of 72)	33%
	0 to 35.1 ppm	34% (25 of 74)	11% (8 of 74)	26% (41 of 74)	26%
	0 to 23.5 ppm	36% (27 of 74)	15% (11 of 74)	19% (36 of 74)	22%
	0 to 30.9 ppm	40% (25 of 63)	11% (7 of 63)	22% (31 of 63)	28%
	0 to 24.5 ppm	46% (22 of 48)	10% (5 of 48)	28% (21 of 48)	22%

	0 to 20.5 ppm	33.33% (20 of 60)	13.33% (8 of 60)	35% (21 of 60)	18.33% (11 of 60)
	0.12 to 27.7	40.6% (26 of 64)	15.6% (10 of 64)	25% (16 of 64)	18.8% (12 of 64)
	0.13 to 23.0	43.75% (28 of 64)	12.50% (8 of 64)	26.56% (17 of 64)	17.19% (11 of 64)

6.C.3.a.4.J. Richland - Schuyler Phase 3 Area

2021 is the seventh year of this Phase 3 Area. This Phase 3 area went into effect September 1, 2015. The 55 sections of this area first went into a Phase 2 Area in 2004. The ten sections that were in Phase 2 are now in Phase 3. As such, the 2020, 2021 and 2022 numbers (at bottom of table) are for 65 sections.

Year	Nitrate-nitrogen Range	Percent Nitrate-nitrogen 0 to 8.0 ppm
2004	0 to 47 ppm	30% (42 of 139)
2005	0 to 120 ppm	31.3% (74 of 236)
2006	0 to 53 ppm	28% (50 of 181)
2007	0 to 99 ppm	32% (75 of 231)
2008	0 to 46 ppm	28% (53 of 190)
2009	0 to 57 ppm	33% (72 of 216)
2010	0 to 57.5 ppm	31% (70 of 229)
2011	0 to 65.8 ppm	28% (67 of 241)
2012	0 to 52.6 ppm	29% (70 of 241)
2013	0 to 94.0 ppm	25% (63 of 252)
2014	0 to 101.0 ppm	27% (68 of 251)
2015	0 to 53.3 ppm	23% (55 of 238)
2016	0 to 50.5 ppm	25% (58 of 228)
2017	0 to 53.4 ppm	25% (60 of 238)
2018	0 to 56.9 ppm	26.5% (50 of 189)
2019	0 to 39.4 ppm	25% (53 of 209)

2020	0 to 50.8 ppm	26% (69 of 261)
2021	0 to 43.0	25.5% (67 of 263)
2022	0 to 58.5	23.0% (57 of 248)

6.C.3.a.4.K. LPNNRD Operator Certification

Staff and UNL have hosted 3 classes with around 100 total in attendance.

Upcoming classes:

Thursday - Feb 2 at Columbus Ag Park starting at 1 pm

Thursday - Feb 9 at ENREC (Mead), coordinated with the Cover Crop/Soil Health Program

Wednesday - Feb 15 at Lindsay Village Hall at 1 pm

Tuesday - Feb 21 at David City Fairgrounds at 1 pm

Monday - Feb 27 at Fremont Extension Office at 10 am.

6.C.3.a.4.L. Lower Platte River Basin Water Management Plan Coalition (LPRBC)

The Coalition involves 7 NRDs and NeDNR that is part of the Lower Platte River Basin. An annual report is due every year on March 1, with emphasis in the report on depletions in each District.

6.C.3.a.4.M. Voluntary Integrated Water Management Plan - LPNNRD

6.C.3.a.5. CHEMIGATION

For 2022 we have xxx renewals and xx new permit applications for a current total of xxx. Inspections for xx renewal permits have been completed.

Chemigation renewals are due June 1 with forms going out around the first of March.

6.C.3.a.6. GROUND WATER ENERGY LEVELS

6.C.3.a.7. GROUND WATER QUALITY SAMPLING

6.C.3.a.8. LIVESTOCK WASTE PERMITS

The LPNNRD has received # 0 livestock permit applications from DEQ since the last Water Committee meeting.

The Board did pass a motion to stay neutral on livestock facilities and the NRD's responsibility is with the permitting of high capacity wells. Manure application is usually treated as any commercial fertilizer, which soil sampling and manure analysis should be conducted and handled by NDEE.

Name	Livestock	Type of Permit

Description of permit application

6.C.4. GROUND WATER PROGRAMS

6.C.4.a. DECOMMISSIONED WELL PROGRAM

6.C.4.a.1. Well Estimates

new wells has been reviewed and approved for decommissioning since the last Committee meeting.

Well Owner	Type of Well	Cost Share Estimate	County

6.C.4.a.2. Plugged Wells

wells have been plugged, reviewed, and ready for cost share payment approval this month.

Well Owner	Type of Well	Cost Share Payment	
LaRose Preister (Tom Preister)	Irrigation	\$1,565.72	

6.C.4.b. Groundwater Management Plan

It was discussed at previous committee meetings to update the 1995 GW Management Plan. It was proposed for 2 directors and staff to review and discuss the approach to re-writing the plan.
1995 plan is attached.

The committee and staff will review the plan and discuss it at the next Committee meeting.

6.C.4.c. LOWER PLATTE NORTH NRD GROUND WATER STUDIES

6.C.4.c.1. Phase Area Update

A public informational session is planned for Tuesday, February 28, from 6-8 pm at the St Benedict Center, north of Schuyler. The purpose of this program is for producers and their wives to learn about the issues in the Schuyler Richland Nitrate Management Area. If LPN decides to proceed with a Phase 4 area, this area would be a smaller area within the current Phase 3 area. By the LPN Groundwater Rules and Regulations, certain criteria need to be met and the total area does not meet these criteria.

The plan for this session is to have stations with different information similar to an open house. This will allow people to visit the area of interest and have discussions with the staff, board members and UNL personnel. A short presentation will be given to the whole group explaining the purpose and criteria for moving to Phase 4.

Confirm informational stations:

- GW Rules and Regulation
 - Phase 4 Criteria
 - Potential Boundaries
- Cost-share information
 - WSF Grant BMPs
 - Domestic Water Sampling
- Irrigation Management
 - Over irrigation and leaching
- Nitrate and Health
 - UNMC study
- Vadose and Water Sampling Results
 - Vadose information 2019-20
 - Istotope information

- Other water sampling results

Other potential discussions could include cover-crops projects, manure and nitrogen management. Other topics that should be included?

6.C.4.c.2. Eastern Nebraska Water Resources Assessment (ENWRA)

6.C.4.c.3. Lower Platte River Consortium

The Consortium members are Papio NRD, LPSNRD, LPNNRD, MUD, LWS and NeDNR. A drought plan was developed from 2018-2020 and is now in the process of looking at mitigation projects. Attached are the projects that were considered initially. At the meeting on January 17, the discussion was on LWS developing a well field near the Missouri River and an augmentation project near the Platte and Elkhorn Rivers.

Notes from Caitlin Kingsley - NeDNR

Thank you to everyone who participated in our meeting on January 17, 2023. To recap, we continued the drought projects discussion and planned another round of spring press releases. Action items include:

- In March, NeDNR will initiate press release development and gauge interest in participating in the accompanying podcast episode.
- NeDNR will revisit the Sherman Reservoir release calculations
- LPNNRD will get an update from JEO regarding the Fremont dewatering project.

Our next scheduled meeting is our ILCA meeting at 10 a.m. on April 4, 2023. NeDNR will host this meeting to facilitate the podcast recording afterwards.

6.C.4.d. NEW MONITORING WELLS

6.C.4.e. GMDA Winter Conference

Staff and directors attended the Winter Conference on St Simons Island, Georgia. Topics included groundwater modeling, NWRA report, Agricultural Water Management, Climate Change, Groundwater Innovation, Groundwater Management in the States, Legal Considerations for Groundwater Management.

Notes from the topics at the conference:

- A couple of states require a water conservation plan before issuing a well permit.
- Dispute over boundary between Georgia and Tennessee
 - The City of Atlanta uses surface water for drinking water, so it could affect them if Tennessee gets to move the boundary.
- USDA recharge Project
 - Project that takes excess water from the Mississippi Delta and moves it further inland.
- Student interns to assist in projects

- Make a wish list and make sure the project is not time-sensitive.
- Water lawsuits
 - Residential areas might not be regulated under WOTUS.
- Federal Grants
 - BOR has money to spend
 - Water Smart Grants can be for \$3,000,000 but require a 50% match. The first deadline is March 28, 2023.
- Past and Future Climate of US
 - When graphing temperature and moisture, be sure to review the number of years analyzed.
 - Food waste increases methane gases.
 - Need to look at the economics of water conservation.
 - The 100th Meridian line that goes through Nebraska has a correlation with the humid eastern United States and the arid Western plains.

Thanks for allowing staff and directors to attend. Some of the more valuable information is obtained when networking with other states.

6.C.5. SURFACE WATER PROGRAMS

6.C.5.a. USGS STREAM FLOW GAUGING SITES

A joint agreement with USGS for approval to continue with the stream gages on the Platte River and Shell Creek, along with a groundwater monitoring well. The stream gage site at Leshara is an agreement through the Alliance. The total cost for the 3 sites shown below is \$34,870 with LPN share at \$18,190. This has been a continuous partnership with USGS for numerous years.

Joint Share Sites with USGS:

- Shell Creek near Columbus
- Wahoo Creek near Ashland
- Groundwater Station near Mead

6.C.6. Phoenix Database

An update on the database that is utilized by the Groundwater Department. The Committee did not review because of time.

6.C.7. OTHER

Currently, the GW Committee Meeting is Wednesday night at 6 pm. Do we want the same time of week and day?

6.C.7.a. COMMENTS FROM THE PUBLIC

6.D. Projects Committee - Action as Required

6.D.1. COMMITTEE CHAIR & VICE CHAIR ELECTIONS

Director Sabatka nominated Director Olson for Projects Committee Chair appointment. Appointment passed with all in favor.

Director Sabatka nominated Director Yosten for Projects Committee Vice Chair appointment. Appointment passed with all in favor.

6.D.2. SWCP

6.D.2.a. SWCP Tree Planting Applications

Attached are three applications for tree planting cost-share.

Derek Simonds - 230 trees - \$431.25

Jordan Larsen - 200 trees - \$375.00

Seth McGinn - 800 trees - \$1,500.00

6.D.2.b. SWCP Policy

Attached is the NRD's current SWCP Policy and DNR's updated practice payment cost-list. Historically the NRD has utilized the cost-list for our SWCP payment calculations. Please review and be ready to approve at March 13 Board meeting.

6.D.2.c. SWCP Cancellations

6.D.2.d. Wahoo Creek Cost Share Approvals

6.D.3. WATERSHEDS

6.D.3.a. Shell Creek Watershed

6.D.3.a.1. Shell Creek Implementation - 319/NET

The SCWIG group met on January 17th in Columbus with lots of discussion focused on guiding the urban portions of project over the next 3 years.

Our next meeting is scheduled for February 21st, 9:00 am, at the Columbus NRCS office.

Attached is a publication correlating BMPs installed in Shell Creek Watershed with peak stream flows.

The group is requesting to send up to 6 students to the National Soil and Water Conservation Society (SWCS) meeting in Des Moines, August 6-9 to present their volunteer monitoring work. SWCS has agreed to comp conference registration costs for 2 students. Grant funds can be used to defray travel costs.

6.D.3.a.2. Shell Creek Student Testing Supplies

Director Saier submitted a materials order (attached) for the upcoming summer testing. All costs are reimbursable through upcoming 319 grant. Total cost for supplies:

\$1,609.75

6.D.3.b. Wahoo Creek Watershed

6.D.3.b.1. Wahoo Creek Dam Site Planning Update

The RFP for Real Estate Services is available on our website and advertised in the January 19th, 26th, and February 2nd Wahoo

paper. Proposals are due February 7th, 2023 at 12:00 noon. Proposals will be digitally delivered to the projects committee on the afternoon of the 7th. Should the committee wish to conduct interviews, firms are on notice to be available on the 8th, 9th, or 10th. The projects committee will need to meet before the board meeting on Monday, February 13 in order to make a recommendation to the board.

Attached from Olsson are the current Progress Report and Invoices. Of note: first three (26AB and 27) have passed the 90% design milestone and will be submitted to NRCS 2/3. We have a sharedrive set up for all pertinent design/documents.

A motion will be needed at Board Meeting to approve hiring Great Plains Appraisal, Inc. of Lincoln and have staff negotiate a contract for General Manager signature.

6.D.3.b.1.A.Olsson Design Update and Invoice

Olsson progress report and invoices are attached.

6.D.3.b.1.B.NeDNR Agreement JEDI Funds

Staff have a meeting with NeDNR and NRCS on February 23rd to discuss federal and nonfederal funding sources.

Easement issue is still being discussed.

6.D.3.b.2. Wahoo Creek Watershed Water Quality Plan - 319

6.D.3.c. Skull/Bone Creek

Stakeholder meeting scheduled for January 18th in Abby was postponed due to phony blizzard. A new date has not been set at this time.

6.D.4. JOINT WATER MANAGEMENT ADVISORY BOARD (JWMAB)

6.D.4.a. East Fremont/Elkhorn Township Drainage - FEMA HMPG

6.D.4.b. West Fremont - FEMA BRIC

6.D.4.c. Rawhide Creek Watershed - NRCS WFPO

On January 30 representatives from NRD, Dodge County, City of Fremont, and JEO met for an update on the planning for the Rawhide WFPO plan. JEO presented an updated economic assessment (costs estimate attached) and advised that the planned alternative for County Rd S ditch improvements should be removed from plan due to lower than expected BCA. The flood damage reductions tied to this alternative only positively impacted ~85 acres of ag land, and a planned total cost of over \$5 million. JEO plans to proceed with geotechnical surveys (e.g. soil borings) once field conditions allow. A landowner list has been developed for all potentially impacted parcels and plans are for notification letters to be sent out mid-February.

JEO plans to have DRAFT plan submitted to national (NRCS) for review in September. After plan is approved the JWMAB will need to apply for design/construction funding. The JWMAB will be responsible for all land

rights and permitting costs associated with the project. Currently there is no interlocal agreement to spell out how those costs would be divided.

6.D.5. HAZARD MITIGATION PLAN UPDATE

We will be discussing funding opportunities for water sources for rural fire protection on February 3rd with the Nebraska Forest Service and JEO. It will be a hybrid inperson/zoom meeting. If you are interested in attending, please let staff know.

6.D.6. MORSE BLUFF LEVEE

6.D.7. WOLFE JETTY

6.D.8. LESHARA DRAINAGE IMPROVEMENT

The Village of Leshara submitted a request #2 (attached) for \$428.17 leaving a balance of \$60,680.66 of the \$62,000 approved at the July 2021 board meeting.

6.D.9. VILLAGE OF LINDSAY POND REQUEST

The Village of Lindsay has formally requested cost-share assistance, up to \$50,000, for the village pond rehabilitation project. See attachment for letter, plan drawing and engineers estimate.

Representatives from JEO (Village consultant) and Lindsay will be present.

6.D.10. EROSION AND SEDIMENT RULES AND REGULATIONS

6.D.11. OTHER

6.D.12. ADJOURNMENT

7. Additional Action Items

7.A. Expansion of Irrigated Acres - SQS #2

Todd Mauer has submitted an application to expand irrigated acres within SQS #2 without increasing the 27-inch rolling allocation. Todd is asking for an additional 42 acres on the SW1/4 S18-19N-1E, Platte County. If Mauer increases to 177 acres, his allocation would be reduced to a 20.21-acre inch/3-year rolling allocation from well G-053124. His 3-year average was 5.14 with a 2022 use of 5.58. Mauer is also planting rye on this field. This has been allowed by other producers in the past years. Maps are attached.

A Board Motion Needed -

To approve Todd Mauer's application to expand irrigated acres within SQS#2 for SW1/4 S18-19N-1E, Platte County with his new allocation being 20.21-acre inch/3-year rolling allocation from Well G-053124.

8. Approval of Bills Pending

9. Consent Agenda Adoption

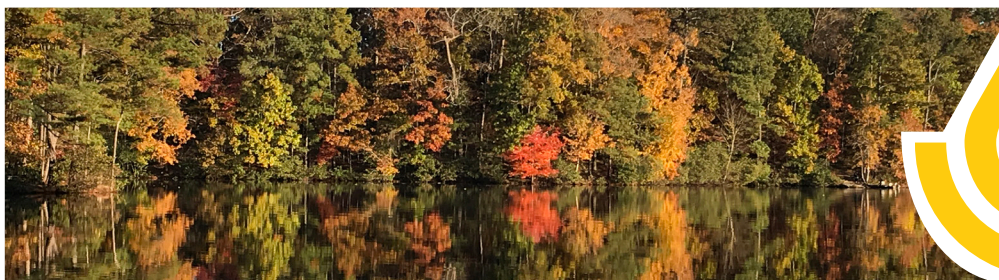
10. Comments from Directors/Guests

11. Meeting Establishment/Adjournment

NOTE: The agenda is on file at the LPNNRD office and may be changed up to 24 hours prior to the meeting as scheduled.

Conservation Update

Report to LPNNRD Manager



District Conservationist: Mark Walkenhorst

Fremont: District Secretary, Jessica Marty
Resource Conservationist, Mike Boardman
Soil Conservationist, Ryan Jenkin

Wahoo: District Secretary, Marla Milliken
Resource Conservationist, Jami Thoene
Soil Conservationist, Peyton Harsin
Soil Conservationist, Don Treptow
Soil Conservation Technician, Pearl Smith-Mayar
Josh Charles, Civil Engineering Technician
Pheasants Forever Biologist, Eil Sanders
Contract Technician: Ashley Keeler
Contract Technician, Megan Pernicek
Compliance Specialist, Becky Pieper



David City: District Secretary, Kim Piitz
Resource Conservationist: Thomas Cowan
Contract Technician, Cierra Fischer
Soil Conservationist, Ben Barlean

Schuyler: District Secretary, Kris Miller
Resource Conservationist: Jenna Kampschnieder
Soil Conservationist, VACANT

Columbus: District Secretary, Jeri Rosno
Resource Conservationist: VACANT
Program Assistant: Melissa Foreman
WRP team 6 coordinator: VACANT

The Lower Platte North NRD (LPNNRD) and USDA Natural Resources Conservation Service will be holding the **2023 LPNNRD Local Working Group meeting** to discuss natural resource conservation program priorities for the upcoming year. The meeting is open to the public and will be held on Tuesday – February 28th, 2023, from 1:00 – 4:00 pm. at the Lower Platte North Headquarters, located at 511 Commercial Park Road in Wahoo NE 68066. Individuals may attend virtually by joining us on Zoom. To request an invitation to attend via Zoom, please contact the Lower Platte North NRD office at (402) 443-4675 in order to request an invitation.

USDA's Natural Resources Conservation Service (NRCS) will use the investments provided through **IRA-funded conservation programs** to support farmers and ranchers in adopting and expanding climate-smart activities and systems. The Inflation Reduction Act provided unprecedented funding levels for several of the existing programs that NRCS implements. The increased funding levels begin in fiscal year 2023 and rapidly build over four years, totaling these additional amounts:

\$8.45 billion – Environmental Quality Incentives Program

\$3.25 billion – Conservation Stewardship Program

\$4.95 billion – Regional Conservation Partnership Program

\$1.4 billion – Agricultural Conservation Easement Program

\$1 billion – Conservation Technical Assistance

NRCS is identifying strategies on how to maximize, target, monitor, and quantify improvements to soil carbon, reductions in nitrogen losses, and the reduction, capture, avoidance, or sequestration of carbon dioxide, methane or nitrous oxide emissions associated with agricultural production. NRCS is also seeking ideas for how to further streamline and improve program delivery to increase efficiencies and expand program access for producers, especially underserved producers.

EQIP Program Updates; Received over 160 applications in the five county area for 2023. At this time 14 applications have been preapprove. Staff is working on getting these applications obligated to contracts. These initial preapprovals are for State Pool funds dealing with beginning farmers, source water, social disadvantage and urban and small scale applications. Additional preapprovals will be forthcoming at the end of February/early March that will deal with our local funds that address soil erosion, soil quality, irrigation and grassland resource concerns.

Natural
Resources
Conservation
Service



Employees from the Dodge County USDA Service Center (L-R) Kim Nansel - FSA county executive director, Mike Boardman - NRCS resource conservationist, and Ryan Jenkins - NRCS soil conservationist, shared information at the January Fremont Corn Expo.



Manager's Report – February 10, 2023

- Today's board meeting and all future LPNNRD board meetings will continue to be "in person" meetings. We continue to provide a Zoom link to all our board meetings, however directors are now required to be in attendance to vote. All directors attending via Zoom will continue to have the ability to participate in discussion.
- Several staff and directors attended the 2023 NARD Legislative Conference in Lincoln this past month. During the conference our district was recognized by the State NRCS office for receiving word our Wahoo Creek Watershed Plan had been approved and signed by NRCS Chief Terry Cosby and for our work with NRCS on their dam assessment and rehabilitation program. Our Cottonwood 21A dam site received funding for the initial assessment and has now been approved for the needed repairs. The legislative conference also allows NRD from across the state to provide input on proposed legislative bills and caucus on our wish to support, monitor or oppose bills relating to our scope of work.
- I have had several phone and face-to-face meetings with Senator Bruce Bostelman regarding our Wahoo Creek Watershed funding and in particular, our plan to place perpetual easements on properties rather than purchasing land for the 10 planned sites. We are continuing to work with the Senator's office, Nebraska DNR Director Riley and the Governor's office to allow for these easements and proceed into final design and land rights on all sites.
- Staff and I have been working closely with M.E. Collins and Houston/Fyra on completion of the basin apron project below Lake Wanahoo. Concrete has all been poured and we are now awaiting fabrication of the baffle plate. Once this plate is installed we should finally be finished with this project.
- I will be working with the City of Wahoo and Great Plains Appraisal, Inc this month to secure the needed easements for the City's planned sewer extension project which affects portions of LPN's property located on the South and North sides of the Lake Wanahoo dam.
- Many of you have heard, Chris Poole, our GIS/Grants Department head has accepted a GIS position with the USACE and his last day will be February 24th. We will all greatly miss Chris and his unique skill set but wish him the very best as he advances his professional career. My hope is within a few weeks of Chris working with USACE he will have the power and influence to authorize the Corps \$114,000+ payment to us closing out our Sand Creek Project once and for all!

Have a great month and STAY SAFE!

-Eric Gottschalk – General Manager, Lower Platte North NRD

LOWER PLATTE NORTH NRD MINUTES
BOARD MEETING
January 9, 2023

The regular monthly meeting of the Lower Platte North NRD Board of Directors was called to order at 1:30 p.m. at the NRD Office, Wahoo, NE on Monday, January 9, 2023.

1. NOTICE OF MEETING

The agenda and supporting documents are available on the district's website – www.lpnrd.org. A copy of the Nebraska Open Meetings Law has been posted on the NRD's website.

The advanced notice of our January 9, 2023, board meeting was posted on the Lower Platte North NRD website.

Chair Pollard informed those present that a copy of the "Open Meetings Act" is posted for public viewing.

Pledge of Allegiance

2. ROLL CALL - INTRODUCTIONS

DIRECTORS PRESENT AND CONSTITUTING A QUORUM:

Bailey	Birkel	Engel
Hilger	Johnson, Duane	Johnson, Jerry
Kavan	Lawrence	Meduna
McKnight	Olson	Pollard
Saalfeld	Sabatka	Saeger
Seier	Yosten	Thompson

DIRECTORS ABSENT

Saalfeld

STAFF AND GUESTS:

Gottschalk	Breunig	Engel
Heimann	Andersen	Chapman
Lausterer	Sabatka	Abbott (Zoom)
Elliott (Zoom)		

At this time, the Oath of Office was administered to Directors Engel, Johnson, and McKnight.

3. APPROVAL OF AGENDA

4. COMMENTS - ADVISORS/GUESTS/DIRECTORS

a. Guest Comments

b. NRCS Report

Jami Thoene was present to give the NRCS Report.

c. NARD Report

Bob Hilger gave the NARD report.

d. NRC Report - None

e. Manager Report

Gottschalk reviewed his written report.

f. Education Program – None

g. Report from Nominating Sub-Committee

Director Birkel reported that the Nominating Sub-Committee met and would be bring forth one candidate for each of the elected positions.

Pollard opened the floor for nominations for LPNNRD Chairman.

Birkel on behalf of the nominating committee nominated Thompson for Chair.

Pollard asked if there were any nominations from the floor. With no further nominations Birkel made the motion, seconded by Bailey, that nominations cease, and a unanimous ballot be cast for Kelly Thompson
Motion carried.

AYE: Bailey, Birkel, Engel, Hilger, D. Johnson, J. Johnson, Kavan, Lawrence, Meduna, McKnight,
Olson, Pollard, Sabatka, Saeger, Seier, Yosten

NAY: Thompson

At this time newly elected Chair Thompson took over. Thompson thanked Pollard for his leadership the last two years.

Thompson opened the floor for nominations for LPNNRD Vice-Chair.

Birkel on behalf of the nominating committee nominated Sabatka for Vice-Chair.

Thompson asked if there were any nominations from the floor. With no further nominations Pollard made the motion, seconded by Meduna, that nominations cease, and a unanimous ballot be cast for Ryan Sabatka.
Motion carried.

AYE: Bailey, Birkel, Engel, Hilger, D. Johnson, J. Johnson, Kavan, Lawrence, Meduna, McKnight,
Olson, Pollard, Saeger, Seier, Yosten, Thompson

NAY: Sabatka

Thompson opened the floor for nominations for LPNNRD Secretary.

Birkel on behalf of the nominating committee nominated Meduna for Secretary.

Thompson asked if there were any nominations from the floor. With no further nominations Lawrence made the motion, seconded by J. Johnson, that nominations cease, and a unanimous ballot be cast for Bob Meduna.
Motion carried.

AYE: Bailey, Birkel, Engel, Hilger, D. Johnson, J. Johnson, Kavan, Lawrence, McKnight,
Olson, Pollard, Sabatka, Saeger, Seier, Yosten, Thompson

NAY: Meduna

Thompson opened the floor for nominations for LPNNRD Treasurer.

Birkel on behalf of the nominating committee nominated Seier for Treasurer.

Thompson asked if there were any nominations from the floor. With no further nominations Olson made the motion, seconded by Birkel, that nominations cease, and a unanimous ballot be cast for Mark Seier. Motion carried.

AYE: Bailey, Birkel, Engel, Hilger, D. Johnson, J. Johnson, Kavan, Lawrence, Meduna, McKnight, Olson, Pollard, Sabatka, Saeger, Yosten, Thompson

NAY: Seier

Thompson opened the floor for nominations for NARD Representative and NARD Alternate and Nebraska Land Trust Representative and alternate.

Birkel on behalf of the nominating committee nominated Hilger for NARD Representative, Saalfeld as NARD alternate and McKnight for Land Trust Representative and Saeger for Land Trust Alternate.

Thompson asked if there were any nominations from the floor. With no further nominations Sabatka made the motion, seconded by Seier, that nominations cease, and a unanimous ballot be cast Bob Hilger, Dave Saalfeld, Thomas McKnight and Bill Saeger. Motion carried all members present voting aye.

5. APPROVAL OF MINUTES

Sabatka made the motion, seconded by J. Johnson, to approve the minutes from the December 12, 2022, Board Meeting. Motion carried on consent agenda.

6. REPORT OF STANDING COMMITTEES

A. EXECUTIVE COMMITTEE REPORT

1. UNFINISHED BUSINESS - None

2. Meetings

a. Pending

1. NARD Legislative Conference – Update Given

b. Reports – None

3. Management Items

a. Director Absences – None

b. Monthly Education Program – Update Given

c. Report of Nominating Sub-Committee – Taken Earlier

d. LPNNRD Office Update

JEO has provided a proposed agreement for professional services as we move forward with our new office project. Corey Brodersen and his team were present to answer questions as we proceed to the next phase. Pollard made the motion, seconded by Seier, to authorize Chair Thompson to sign Agreement

between LPNNRD and JEO Architecture, Inc. to provide Design, Bidding and Construction Admin Services for the LPNNRD new office facility. Motion carried.

AYE: Bailey, Engel, J. Johnson, Lawrence, McKnight, Olson, Pollard, Sabatka, Saeger, Seier, Thompson

NAY: Birkel, Hilger, D. Johnson, Kavan, Meduna, Yosten

e. Retainer Agreement – Bromm, Lindahl, Freeman-Caddy & Lausterer

J. Johnson, made the motion, seconded by Lawrence, to authorize Chair Thompson to sign the retainer agreement with Bromm, Lindahl, Freeman-Caddy & Lausterer effective January1, 2023 to January 2024. Motion carried all members present voting aye.

f. DNR Surface Water Full Relinquishment – Update Given

g. Director Vacancy

Pollard made the motion, seconded by McKnight, to declare a vacancy in Sub-District #3 and have Chair Thompson appoint a search committee. Motion carried all members present voting aye.

4. Personnel - None

5. Equipment - None

6. Finance

a. Approval of Financial Reports

Sabatka made the motion, seconded by J. Johnson, to approve the November financial Reports as presented. Motion carried on consent agenda.

b. Approval of Managers Expenses

Sabatka made the motion, seconded by J. Johnson, to approve Manager Gottschalk's time and expense sheets as attached to the Executive Committee Minutes. Motion carried on consent agenda.

c. Accounts Over 90 Days - Update Given

Sabatka made the motion, seconded by J. Johnson, that the January LPNNRD Executive Committee Minutes be received and placed on file. Motion carried on consent agenda.

B. OPERATIONS COMMITTEE REPORT

1. UNFINISHED BUSINESS - None

2. WILD NE AND OTHER PROGRAMS - None

3. OPERATION AND MAINTENANCE & OTHER ITEMS

a. Wanahoo Dam Stilling Basin (FEMA)

Sabatka made the motion, seconded by Saeger, to authorize Operations Committee and Board Chair to negotiate the Wanahoo Apron Change Order #1 with FYRA/Houston Engineering for the removal and replacement of the baffle plate at cost up to \$45,758.48 and extend the substantial completion date to 2/28/23. Motion carried all members present voting aye.

- b. NRD Owned Thomas Lake Lots – Update Given**
 - c. Ron Morrissey Irrigation Letter – Update Given**
 - d. Grass Drill Rental Saunders County - Update Given**
 - 4. ROCK AND JETTY – None**
 - 5. LAKE WANAHOO**
 - a. Lake Wanahoo Permit Sales - Update Given**
 - b. Lake Wanahoo Camping Revenue – Update Given**
 - c. Clint Johannes Education Building Rentals – Update Given**
 - 6. INFORMATION & EDUCATION**
 - a. Information**
 - 1. Radio and eAds – Update Given**
 - 2. Analytics – Update Given**
 - 3. News Channel Nebraska – Update Given**
 - b. Education – Update Given**
 - 1. Past Events - Update Given**
 - 2. Future Events – Update Given**
 - 7. RURAL WATER SYSTEMS**
 - a. Colon – Update Given**
 - b. Bruno – Update Given**
 - c. Other – None**

Sabatka made the motion, seconded by J. Johnson, that the January LPNNRD Operations Committee Minutes be received and placed on file. Motion carried on consent agenda.

C. WATER COMMITTEE REPORT

1. UNFINISHED BUSINESS

2. REGULATORY

a. GROUNDWATER MANGEMENT AREA

1. Well Permit Program – Update Given

a. Well Permits Approved

2. Phase Area Update

Lawrence made the motion, seconded by Meduna, to approve extensive water sampling by staff in

Summer of 2023 within Schuyler-Richland Water Quality Management Area with consideration for boundary and next steps for a Phase 4 Management Area after results are analyzed. Motion carried all members present voting aye.

3. Richland Schuyler Phase 3 Area – Update Given

4. Bellwood Phase 2 Area – Update Given

5. LPNNRD Operator Certification – Update Given

6. Groundwater Management Plan – Update Given

7. Cost-Share Programs

a. Soil Moisture Sensors

Sabatka made the motion, seconded by J. Johnson, to approve payment to Brian Sanderson for \$750 for Soil Moisture Sensor Incentive Program. Motion carried on consent agenda.

b. Flow Meter Maintenance Program – Update Given

b. Ground Water Sampling - Update Given

c. Livestock Waste Permits – Update Given

3. GROUND WATER PROGRAMS

a. Decommissioned Well Program

1. Well Estimates – Update Given

2. Plugged Wells

Sabatka made the motion, seconded by J. Johnson, to approve payment of \$737.44 to David Proskovec, Butler County for decommissioning an irrigation well. Motion carried on consent agenda.

b. Lower Platte North NRD Ground Water Studies

1. Eastern Nebraska Water Resources Assessment (ENWRA) – Update Given

2. Lower Platte River Consortium – Update Given

4. SURFACE WATER PROGRAMS - None

5. OTHER

a. Comments from the Public – None

Sabatka made the motion, seconded by J. Johnson, that the January LPNNRD Water Committee Minutes be received and placed on file. Motion carried on consent agenda.

D. PROJECTS COMMITTEE REPORT

1. UNFINISHED BUSINESS – NONE

2. SWCP

- a. SWCP Application Approvals – None
- b. SWCP Payments - None
- c. SWCP Cancellations – None
- d. Wahoo Creek Cost-Share Payment Approvals – None

3. WATERSHEDS

- a. Shell Creek Watershed
 - 1. Shell Creek Implementation – 319 – Update Given
- b. Wahoo Creek Watershed
 - 1. Wahoo Creek Dam Site Planning Update
Sabatka made the motion, seconded by J. Johnson, to proceed with an RFP for a consultant to handle land rights for the Wahoo Creek Dam Sites. Motion carried on consent agenda.
 - a. Olsson Design Update and Invoice – Update Given
 - b. NeDNR Agreement with JEDI Funds – Update Given
 - 2. Wahoo Creek Watershed Water Quality Plan – 319 – Update Given
- c. Skull & Bone Creek – Update Given

4. JOINT WATER MANAGEMENT ADVISORY BOARD

- a. East Fremont/Elkhorn Township Drainage – FEMA HMPG – Update Given
- b. West Fremont – FEMA BRIC – Update Given
- c. Rawhide Creek Watershed – NRCS WFPO – Update Given
- d. North Bend Drainage Ditch Repair – Update Given

5. HAZARD MITIGATION PLAN – Update Given

6. MORSE BLUFF LEVEE – UPDATE GIVEN

7. WOLFE JETTY – UPDATE GIVEN

8. LESHARA DRAINAGE IMPROVEMENT – UPDATE GIVEN

9. LOWER PLATTE RIVER CORRIDOR ALLIANCE – UPDATE GIVEN

10. EROSION AND SEDIMENT RULES AND REGULATIONS – UPDATE GIVEN

11. PLATTE CENTER – ELM CREEK – UPDATE GIVEN

12. TRAILS

Sabatka made the motion, seconded by J. Johnson, to submit a letter of support for the proposed Rail with Trail Project. Motion carried on consent agenda.

13. OTHER – Keiser Impoundment

Sabatka made the motion, seconded by Yosten, that the January LPNNRD Projects Committee Minutes be received and placed on file. Motion carried on consent agenda.

7. ADDITIONAL ACTION ITEMS - NONE

8. BILLS TO BE APPROVED

Yosten made the motion, seconded by Pollard, that all bills be approved, and warrants be drawn in payment of the same. Motion carried all members present voting aye.

9. CONSENT AGENDA ADOPTION

Sabatka made the motion, seconded by J. Johnson, to approve the January Consent Agenda. Motion carried all members present voting aye.

10. COMMENTS FROM DIRECTORS/GUESTS

11. MEETING ESTABLISHMENT AND ADJOURNMENT

The February Board of Directors Meeting will be held on Monday, February 13, 2023, 1:30 p.m. Meeting adjourned at 4:10 pm.

Discussion on all agenda items that have “Update Given” can be found in corresponding Committee Minutes.

The undersigned, the duly elected and acting Secretary of the Lower Platte North Natural Resources District (the “District”), hereby certifies that the foregoing is a true and correct copy of the minutes of the Meeting of the Board of Directors of the District held on January 9, 2023, that all of the matters and subjects discussed at the meeting were contained in the agenda for the meeting, kept continually current and readily available for public inspection at the principal office of the District during normal business hours, and except for items of emergency nature, the agenda was not altered later than twenty-four (24) hours before the scheduled commencement of the meeting; that at least one copy of all reproducible material discussed at the meeting was available at the meeting for examination and copying by members of the public; that the above minutes were in written form and available for public inspection within ten working days or prior to the next convened meeting, whichever occurred earlier; and, that reasonable efforts were made to provide all news media requesting notification of the meeting and of the time and place of said meeting and the subjects to be discussed at said meeting.

Robert Meduna Jr., Secretary

NRDs Washington DC Meeting, March 18-22, 2023

Register before February 28th (no refunds after this date)

Mail this registration form with payment to: NARD 8100 S. 15th St. Ste B Lincoln, NE 68512

or register on-line <https://www.nrdnet.org/events/03-18-2023/nrds-annual-washington-dc-meeting-march-18-%E2%80%9322-2023>

District _____

Name/Title	\$575 Full Registration, Includes: Monday – Meetings, break services, lunch and group tour to Fort McHenry National Monument (birthplace of the American National Anthem) Baltimore, MD. Tour includes lunch at the hotel, charter bus transportation, tour ticket, and social at the restaurant before dinner. Tuesday – Meetings, break services and lunch. Wednesday – Nebraska Breakfast and meetings with Nebraska Delegation.	\$445 Meeting's only Registration, Includes: Monday – Meetings, break services, lunch. Tuesday – Meetings, break services and lunch. Wednesday – Nebraska Breakfast and meetings with Nebraska Delegation.	\$200 Extra ticket for Mon, March 20 th . Group tour to Fort McHenry National Monument (birthplace of the American National Anthem) Baltimore, MD. Tour includes lunch at the hotel, charter bus transportation, tour ticket, and social at the restaurant before dinner.	Subtotals
	Total payment submitted			

To: NRD Managers and NARD Board of Directors
From: NARD Staff
Date: February 1, 2023
Re: Washington DC Meeting

Make plans now to attend the NRDs Annual Washington DC meeting, March 18 – 22, 2023.

Hotel Reservations – February 15, 2023, deadline

Embassy Suites Hotel Washington D.C. Convention Center – 900 10th St. NW, Washington DC, 20001. We have a group rate of \$329 for single/double occupancy. Enjoy the complimentary, full cooked-to-order breakfast each morning in the Finn & Porter restaurant and start your evenings with the nightly Manager's Reception. Check-in time is 3:00 p.m. and check-out time is 12:00 p.m. Upon checking out, you will be responsible for paying any incidentals associated with your room. The room and tax will be billed to the NARD, and we'll bill your district upon returning to Nebraska.

Make your reservations by calling 1-800-774-1500, or use the dedicated website to book your hotel rooms online: <https://book.passkey.com/go/4995f0a7>.

Registration Options – February 28th DEADLINE, no refunds after this date.

Full Registration (\$575) Includes:

- **Monday** – Meetings, break services and group tour to Fort McHenry National Monument (the birthplace of the American National Anthem) Baltimore, MD. Tour includes lunch at the hotel, charter bus transportation, tour ticket, social and dinner.
- **Tuesday** – Meetings, break services and lunch.
- **Wednesday** – Nebraska Breakfast, Kennedy Caucus Room in the Russell Senate Office building, followed by meetings with Nebraska Delegation. *(Breakfast on your own at the Embassy Suites, or hot and cold breakfast items are available for purchase in the Southside Buffet located in the Dirksen building. The building will open at 7:30 a.m.)*

Meeting's only Registration (\$445) Includes:

- **Monday** – Meetings, break services and lunch.
- **Tuesday** – Meetings, break services and lunch.
- **Wednesday** – Nebraska Breakfast Kennedy Caucus Room in the Russell Senate Office building, followed by meetings with Nebraska Delegation. *(Breakfast on your own at the Embassy Suites, or hot and cold breakfast items are available for purchase in the Southside Buffet located in the Dirksen building. The building will open at 7:30 a.m.)*

Guest tour ticket (\$200) includes:

Monday group tour to Fort McHenry National Monument (the birthplace of the American National Anthem) Baltimore, MD. Tour includes lunch at the hotel, charter bus transportation, tour ticket, social and dinner.

Outline and tentative Agenda for the Washington DC Meeting, March 18 – 22, 2023

TENTATIVE SCHEDULE

March 18-19, Travel days

Monday, March 20th

8:30 a.m.	Meetings at Embassy Suites Hotel - Washington DC Convention Center, 900 10 th St. NW.
12:15	Grab and Go boxed lunch. Board bus for group tour.
12:30	Depart hotel.
1:45 – 4:45 p.m.	Time on your own at Fort McHenry.
5:15	Social followed by dinner at The Blackwall Barn and Lodge.
8:30	Arrive back at the Embassy Suites hotel.

Tuesday, March 21st

8:30 a.m. – 4:30 p.m.	Meetings at Embassy Suites - Washington D.C. Convention Center
-----------------------	--

Wednesday, March 22nd

6:30 a.m.	Breakfast on your own at the Embassy Suites
7:30	Nebraska Breakfast, Kennedy Caucus Room in the Russell Senate Office Building.

Every Wednesday morning while both the Senate and House of Representatives are in session, Nebraskans visiting Washington, D.C. are invited to meet with the Nebraska Delegation. The Nebraska Breakfast is held at the Kennedy Caucus Room in the Russell Senate Office Building. If you choose, hot and cold breakfast items are available for purchase in the Southside Buffet located in the Dirksen building. Guests are encouraged to arrive by 7:30 a.m.

9:30 a.m. – 12:00 p.m.	Meetings with Nebraska Congressional Delegation
------------------------	---

Some Tentative Agenda items we're working on, and speakers invited:

- Welcome – Kris Polly, Water Strategies
- Rural Broadband, American Bureau Federation
- Farm Bill | Inflation Reduction Act, NRCS
- Water Infrastructure Financing and Investment Act, US Army Corps of Engineers
- BRIC Program, FEMA
- Climate Smart Agriculture, NRCS
- WOTUS, National Cattlemen's Beef Association
- USFWS Partners for Fish & Wildlife Program
- EPA Issues
- NACD Update
- Watershed Programs, NRCS
- WaterSMART Initiative, NRCS and Bureau of Reclamation

Meduna

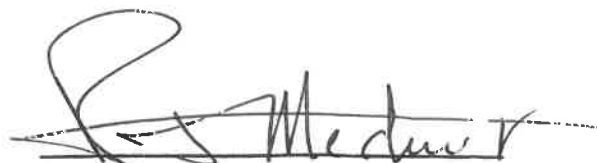
REQUEST FOR EXCUSE OF
ABSENCE FROM MEETING
(LB 569, 1985 LEGISLATURE)

Chairman, Board of Directors
Lower Platte North NRD
PO Box 126
Wahoo, NE 68066

I hereby request that the Board of Directors excuse my
absence at the Regular Meeting of the Board scheduled on
14th day of November, 2022, for
the following reason:

Pioneer Seed Meeting

Dated this 4 day of Jan, 2023.



Board Member
Lower Platte North NRD

January 25, 2023

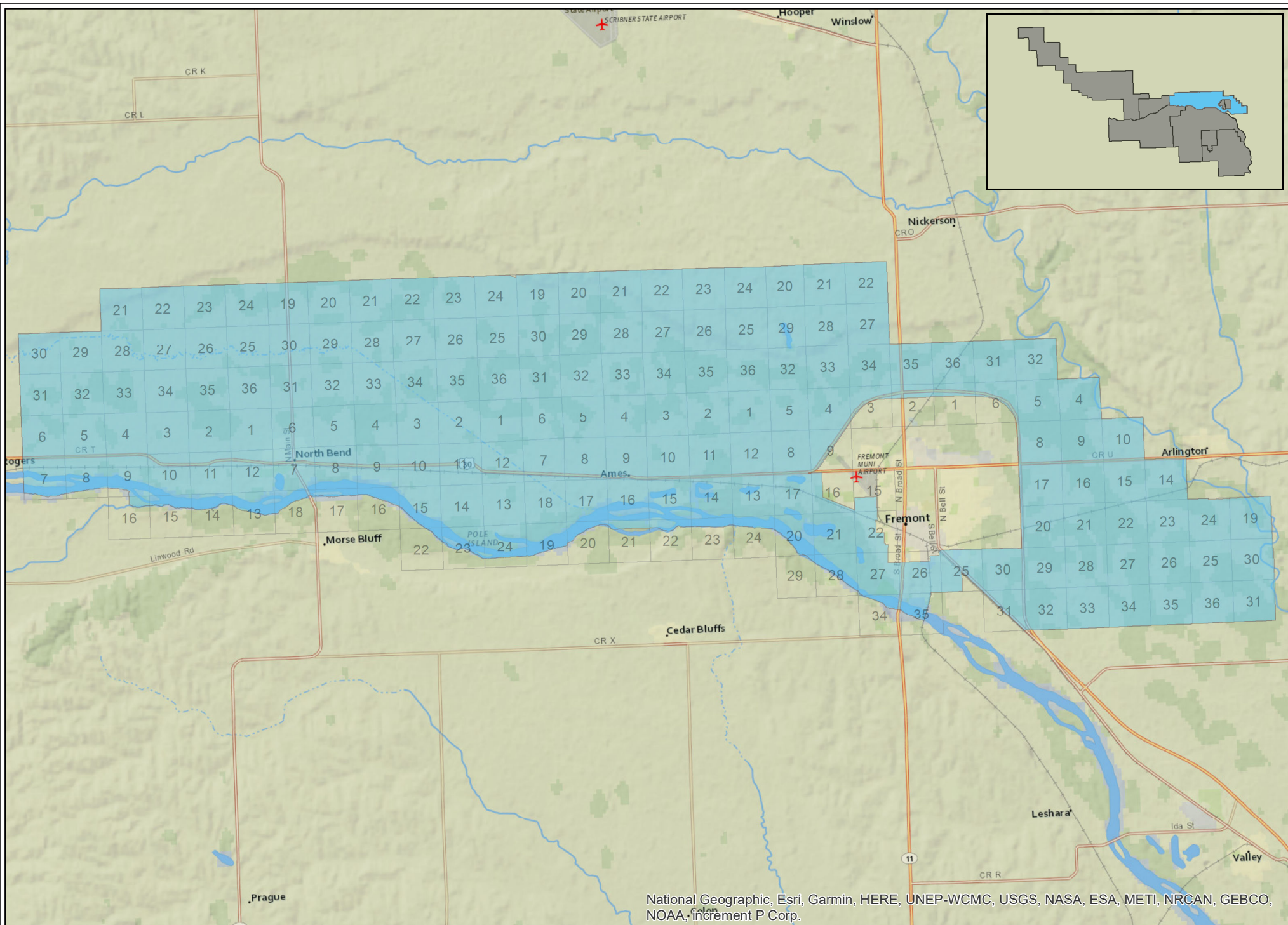
PUBLIC NOTICE

The Lower Platte North Natural Resources District has a Director vacancy in Sub-District 3 which includes portions of the following townships: Bohemia, Dodge, Union, Morse Bluff, Platte, Cotterell, North Cedar, Maple, Pohocco, Nickerson and Elkhorn. A map of the Lower Platte North NRD boundaries can be viewed at www.lpnrd.org or by calling the NRD Office at 402-443-4675.

Lower Platte North NRD is a political sub-division of the State and is governed by a 19-member board who are elected to four-year terms. The term of office for this position expires December 31, 2024. All applications are due in the District office by February 17, 2023. For further information contact Eric Gottschalk, General Manager, Lower Platte North NRD, PO Box 126, Wahoo, NE 68066, phone: 402-443-4675.

Please publish in the February 2, 9 and 16 issue of your newspaper.

Invoice the: Lower Platte North NRD
Box 126
Wahoo, NE 68066



- Subdistrict 3
- Other Districts

LPNRRD Subdistrict Three

Map shows LPNRRD Subdistrict
Boundaries as derived from
Census 2020 Blocks



Natural Resources Conservation Technician - Position Opening

The Lower Platte North Natural Resources District (LPNNRD) is accepting resumes for the position of NRD/NRCS Conservation Technician. This full-time position is stationed at the Saunders County NRCS office in Wahoo, NE. The primary responsibilities of this position are providing technical assistance to landowners and to assist with planning, design, and implementation of soil and water conservation practices within Saunders and Lancaster Counties. Resumes may be sent to: Eric Gottschalk, General Manager, Lower Platte North NRD, P.O. Box 126, Wahoo, NE 68066 or egottschalk@lpnnrd.org by 12:00 pm (Noon), March 3, 2023. The LPNNRD is an Equal Opportunity Employer.

Please publish in the February 16, 23, and March 2 issues of your newspaper.

Invoice: Lower Platte North NRD
 PO Box 126
 Wahoo, NE 68066

Natural Resources Conservation Technician – Lower Platte North NRD, Wahoo

Posting Date:
2/9/2023

Annual Salary: \$35-40k plus full benefits including health (full employee/partial family), dental, life insurance & retirement plan.

Job Location: Wahoo, Nebraska

Required: Send resume to: Eric Gottschalk, General Manager, Lower Platte North NRD, PO Box 126 Wahoo, NE 68066 or egottschalk@lpnnrd.org by 12:00 pm Noon, March 3rd, 2023.

Position Summary: The NRD/NRCS Conservation Technician works out of the Wahoo NRCS Field Office and supports the Natural Resources Conservation Service. This individual completes the design, layout, inspection and certification of soil and water conservation practices funded through the NRD's state and local cost-share programs in Saunders and Lancaster Counties, and completes the paperwork related to the installation of these practices.

Essential Functions (under guidance/training of NRCS Civil Engineering Technician):

1. Completes the design, layout, inspection, and certification of soil and water conservation practices funded through the NRD's state and local cost-share programs and completes paperwork related to installation of these practices.
2. Completes conservation planning and assembles cost estimates on applications for conservation practices.
3. Coordinates activities with the NRCS Technicians to ensure that NRD funded projects are completed in a timely manner.
4. Assist with the completion of erosion and sediment complaints received by the district. This includes coordinating the activities with the NRCS Technicians to ensure that complaints are completed within 20 working days.
5. Design, layout, inspect, and certify soil and water conservation practices funded through the Equal Quality Insurance Program (EQIP) and other federal cost share programs. Completes paperwork directly related to installation of these practices.
6. Provides assistance with special projects and programs of the District as directed by the NRD Manager and Assistant Manager.
7. Completes NRCS duties and/or reports as assigned by the NRCS District Conservationist.
8. Responsible for project follow-up and completing written reports as assigned.
9. Attends LPNNRD Projects Committee Meetings and occasional Board Meetings.
10. Performs other job related duties or special projects as assigned by the District Conservationist and NRD Management.

Preferred Talents:

1. Accurate and detailed
2. Self –directed and takes initiative
3. Organized

4. Effective communicator – written and verbal
5. Deadline driven
6. Problem solver

Qualifications:

1. Minimum of three years experience with conservation field activities. Required experience may be substituted with advanced education in appropriate area.
2. Basic math skills and proficient computer skills.
3. Applicable licenses in soil conservation preferred.
4. Valid driver's license and insurable in Nebraska.

Working Environment:

Primarily outdoor work with exposure to outdoor elements or hazards, including adverse conditions such as heat, cold, sun, dust, and pollen.

Lifting of up to 40 lbs. occasionally.

The Lower Platte North NRD is an equal opportunity employer.

Financial Statements and Accountant's Compilation Report

Lower Platte North Natural Resources District

December 31, 2022



CPAs & Consultants | Wealth Management





CPAs & Consultants | Wealth Management



ACCOUNTANT'S COMPILATION REPORT

The Board of Directors
Lower Platte North Natural Resources District
Wahoo, Nebraska

Management is responsible for the accompanying financial statements of the Lower Platte North Natural Resources District, which comprise the Statements of Net Position as of December 31, 2022, and the related Statements of Activities for the month and six months then ended in accordance with accounting principles generally accepted in the United States of America. We have performed a compilation engagement in accordance with Statements on Standards for Accounting and Review Services promulgated by the Accounting and Review Services Committee of the AICPA. We did not audit or review the financial statements, nor were we required to perform any procedures to verify the accuracy or the completeness of the information provided by management. We do not express an opinion, a conclusion, nor provide any form of assurance on these financial statements.

Management has elected to omit substantially all of the disclosures and statements of cash flows required by accounting principles generally accepted in the United States of America. If the omitted disclosures were included in the financial statements, they might influence the user's conclusions about the Organization's financial position, results of operations, and cash flows. Accordingly, the financial statements are not designed for those who are not informed about such matters.

The accompanying Statements of Activities – Actual vs. Budget are presented for purposes of additional analysis and is not a required part of the basic financial statements. Such information is the responsibility of management. The supplemental information, except the budget information, was subject to our compilation engagement. We have not audited or reviewed the supplementary information and do not express an opinion, a conclusion, nor provide any assurance on such information. The budget information presented in the Actual vs. Budget is of a nonaccounting nature and has not been subjected to our compilation engagement.

We are not independent with respect to the Lower Platte North Natural Resources District.

Lincoln, Nebraska

February 8, 2023

7140 Stephanie Lane | P.O. Box 23110 | Lincoln, NE | 68542-3110 | p: 402.423.4343 | f: 402.423.4346

1314 Andrews Drive | Norfolk, NE | 68701 | p: 402.379.9294 | f: 402.379.2338

1121 North 102nd Court | Suite 100 | Omaha, NE | 68114 | p: 402.895.5050 | f: 402.895.5723

Lower Platte North NRD Statements of Net Position

	Natural Resources District As of 12/31/2022	Rural Water-Bruno As of 12/31/2022	Rural Water-Colon As of 12/31/2022	All Districts As of 12/31/2022
Assets				
Current Assets				
Cash and Cash Equivalents				
101000 - Change Box	0.00	60.00	90.00	150.00
101200 - Change Box - Game & Parks	150.00	0.00	0.00	150.00
101300 - Change Box - Lake Wanahoo	600.00	0.00	0.00	600.00
102001 - Cash - Union Bank	151,624.29	0.00	0.00	151,624.29
103000 - Cash - County Treasurer	449,433.68	0.00	0.00	449,433.68
104000 - Cash - Education Building Res.	10,920.00	0.00	0.00	10,920.00
111100 - Investments - NRD - NPAIT	2,357.57	0.00	0.00	2,357.57
111105 - Union Bank STFIT	2,678,173.86	0.00	0.00	2,678,173.86
Total Cash and Cash Equivalents	3,293,259.40	60.00	90.00	3,293,409.40
Accounts Receivable, Net				
Accounts Receivable				
105000 - Accounts Receivable	2,408,868.44	2,792.22	7,235.38	2,418,896.04
105060 - Due from Bruno Water Fund	207,108.49	0.00	0.00	207,108.49
105070 - Due from Colon Water Fund	34,005.14	0.00	0.00	34,005.14
109000 - Taxes Receivable	3,016,845.50	0.00	0.00	3,016,845.50
Total Accounts Receivable	5,666,827.57	2,792.22	7,235.38	5,676,855.17
Total Accounts Receivable, Net	5,666,827.57	2,792.22	7,235.38	5,676,855.17
Inventory				
165503 - Rural Water Inventory	0.00	6,579.89	9,869.84	16,449.73
Total Inventory	0.00	6,579.89	9,869.84	16,449.73
Prepaid Expenses				
116000 - Prepaid Expenses	138,854.47	0.00	0.00	138,854.47
Total Prepaid Expenses	138,854.47	0.00	0.00	138,854.47
Other Current Assets				
111225 - Investments - Borrow Fund - NPAIT	111,131.44	0.00	0.00	111,131.44
111250 - Investments - Alliance GIS Project	7,668.39	0.00	0.00	7,668.39
111450 - Investments - Elkhorn River Breakout	136,821.99	0.00	0.00	136,821.99
111550 - Investments - Elkhorn Breakout	2,730.68	0.00	0.00	2,730.68
111600 - Investments - Wanahoo SRA	450,712.32	0.00	0.00	450,712.32
111650 - Investments - Colon Reserve NPAIT	0.00	0.00	8,615.19	8,615.19
Total Other Current Assets	709,064.82	0.00	8,615.19	717,680.01
Total Current Assets	9,808,006.26	9,432.11	25,810.41	9,843,248.78
Fixed Assets, Net of Depreciation				
Fixed Assets				
140210 - Water Line Capital Improvement	0.00	726,156.51	1,180,075.05	1,906,231.56
140226 - Colon Water Loan Fees	0.00	0.00	2,000.00	2,000.00
160000 - Conservation Property	123,971.00	0.00	0.00	123,971.00
161000 - Land	9,642,191.58	0.00	0.00	9,642,191.58
162000 - Infrastructure	27,753,695.98	0.00	0.00	27,753,695.98
162500 - Land Improvements	623,922.90	0.00	0.00	623,922.90
163000 - Buildings	1,085,367.14	0.00	0.00	1,085,367.14
165000 - Machinery & Equipment	138,998.61	0.00	0.00	138,998.61
165100 - Machinery & Equipment - O & M	190,238.38	0.00	0.00	190,238.38
165200 - Machinery & Equipment - Water	323,565.87	0.00	0.00	323,565.87
165300 - Machinery & Equipment - Projects	87,917.52	0.00	0.00	87,917.52
165400 - Machinery & Equipment - I & E	2,628.66	0.00	0.00	2,628.66
165505 - Rural Water Equipment	0.00	17,997.98	26,996.98	44,994.96
165507 - Lake Wanahoo Equipment	13,711.14	0.00	0.00	13,711.14
167000 - Auto and Truck	277,623.35	0.00	0.00	277,623.35
169000 - Equipment	15,057.27	0.00	0.00	15,057.27
169100 - Office Equipment	20,031.58	0.00	0.00	20,031.58
169200 - Computer Equipment	59,734.15	0.00	0.00	59,734.15

See Accountant's Compilation Report

Lower Platte North NRD **Statements of Net Position**

	Natural Resources District As of 12/31/2022	Rural Water-Bruno As of 12/31/2022	Rural Water-Colon As of 12/31/2022	All Districts As of 12/31/2022
169300 - GIS Equipment	13,422.53	0.00	0.00	13,422.53
169400 - Director's Computers	2,903.67	0.00	0.00	2,903.67
169500 - Master Data Base Water	315,525.00	0.00	0.00	315,525.00
169700 - GW Monitoring Equipment	28,504.55	0.00	0.00	28,504.55
Total Fixed Assets	40,719,010.88	744,154.49	1,209,072.03	42,672,237.40
Accumulated Depreciation				
140228 - Accum Depr - Colon Loan Fees	0.00	0.00	729.23	729.23
162900 - Accum Depr - Infra. & Land Imp.	3,948,161.82	0.00	0.00	3,948,161.82
164000 - Accum Depr - Buildings	523,640.13	0.00	0.00	523,640.13
165700 - Accum Depr - Water Line	0.00	138,313.48	259,499.72	397,813.20
166000 - Accum Depr - Machinery & Equipment	561,738.56	15,033.47	22,550.09	599,322.12
168000 - Accum Depr - Auto & Truck	228,737.58	0.00	0.00	228,737.58
169550 - Accum Depr - Master DB Water	80,905.65	0.00	0.00	80,905.65
170000 - Accum Depr - Office Equipment	91,815.46	0.00	0.00	91,815.46
Total Accumulated Depreciation	5,434,999.20	153,346.95	282,779.04	5,871,125.19
Total Property and Equipment	35,284,011.68	590,807.54	926,292.99	36,801,112.21
Total Assets	\$ 45,092,017.94	\$ 600,239.65	\$ 952,103.40	\$ 46,644,360.99
Liabilities and Fund Balance				
Liabilities				
Current Liabilities				
Accounts Payable				
201000 - Accounts Payable	152,461.47	1,273.66	2,021.45	155,756.58
201100 - Sewer Collections Payable	0.00	0.00	7,614.00	7,614.00
202060 - Due to General Fund	0.00	207,108.49	34,005.14	241,113.63
Total Accounts Payable	152,461.47	208,382.15	43,640.59	404,484.21
Accrued Liabilities				
200700 - Colon RW Accrued Interest	0.00	0.00	280.95	280.95
206001 - Accrued Compensated Absences	203,550.76	2,188.46	3,282.69	209,021.91
207305 - Lodging Tax Czechland	499.49	0.00	0.00	499.49
207306 - Sales Tax Payable Wanahoo	273.05	0.00	0.00	273.05
207307 - Lodging Tax Wanahoo	249.50	0.00	0.00	249.50
208302 - Flexible Spending	760.00	0.00	0.00	760.00
Total Accrued Liabilities	205,332.80	2,188.46	3,563.64	211,084.90
Other Current Liabilities				
204000 - Deposits	0.00	400.00	2,700.00	3,100.00
204500 - Deferred Income	10,246.18	0.00	0.00	10,246.18
204600 - Education Building Deposits	10,920.00	0.00	0.00	10,920.00
207300 - Sales Tax Payable	30.00	72.70	155.32	258.02
207304 - Sales Tax Payable Czechland	93.26	0.00	0.00	93.26
Total Other Current Liabilities	21,289.44	472.70	2,855.32	24,617.46
Total Current Liabilities	379,083.71	211,043.31	50,059.55	640,186.57
Long Term Liabilities				
Note Payable - Long Term				
200600 - Note Payable - Colon Rural Water	0.00	0.00	25,932.44	25,932.44
Total Long Term Note Payable	0.00	0.00	25,932.44	25,932.44
Total Long Term Liabilities	0.00	0.00	25,932.44	25,932.44
Total Liabilities	379,083.71	211,043.31	75,991.99	666,119.01
Fund Balances				

Lower Platte North NRD **Statements of Net Position**

	Natural Resources District As of 12/31/2022	Rural Water-Bruno As of 12/31/2022	Rural Water-Colon As of 12/31/2022	All Districts As of 12/31/2022
Net Assets	42,344,993.56	390,170.18	880,528.68	43,615,692.42
Change in Net Position	2,367,940.67	(973.84)	(4,417.27)	2,362,549.56
Total Fund Balances	44,712,934.23	389,196.34	876,111.41	45,978,241.98
Total Liabilities and Fund Balance	\$ 45,092,017.94	\$ 600,239.65	\$ 952,103.40	\$ 46,644,360.99

Lower Platte North NRD **Statements of Activities** **For the Month Ended**

	Natural Resources District Month Ending 12/31/2022	Rural Water-Bruno Month Ending 12/31/2022	Rural Water-Colon Month Ending 12/31/2022	All Districts Month Ending 12/31/2022
Income				
Federal Income				
303206 - Wahoo Creek 319 Grant	0.00	0.00	0.00	0.00
303207 - Shell Creek 319 Grant	0.00	0.00	0.00	0.00
303209 - Shell Creek Phase II 319 - NDEE	0.00	0.00	0.00	0.00
303210 - Shell Creek Phase II - 319 DEQ	0.00	0.00	0.00	0.00
303225 - Wahoo Creek WS PL566	38,986.87	0.00	0.00	38,986.87
303250 - Water Smart Grant	0.00	0.00	0.00	0.00
303400 - Sand and Duck 319	0.00	0.00	0.00	0.00
303475 - Cottonwood 319	0.00	0.00	0.00	0.00
303960 - Hazard Mitigation - Federal	0.00	0.00	0.00	0.00
303961 - FEMA - Flood Funds	88,628.59	0.00	0.00	88,628.59
303962 - NEMA - Flood Funds	0.00	0.00	0.00	0.00
303963 - FEMA - 428 Funds	0.00	0.00	0.00	0.00
303964 - Federal - NRCS	0.00	0.00	0.00	0.00
303965 - Federal Wanahoo - Stilling	0.00	0.00	0.00	0.00
Total Federal Income	\$ 127,615.46	\$ 0.00	\$ 0.00	\$ 127,615.46
State Income				
301203 - Motor Vehicle Pro-Rate	776.92	0.00	0.00	776.92
301315 - WSF and EA Application	5,901.26	0.00	0.00	5,901.26
301325 - JEDI Funding	5,075.51	0.00	0.00	5,075.51
304100 - Lake Wanahoo - Other	1,206.17	0.00	0.00	1,206.17
Total State Income	12,959.86	0.00	0.00	12,959.86
Local Income				
304105 - Education Building Rent	2,140.00	0.00	0.00	2,140.00
304112 - Dirt Sales - Wanahoo	373.63	0.00	0.00	373.63
Total Local Income	2,513.63	0.00	0.00	2,513.63
Rural Water Income				
304240 - Water Sales	0.00	2,878.80	3,999.55	6,878.35
304295 - Colon Sewer Fees	0.00	0.00	2,418.00	2,418.00
304261 - Other Revenue	0.00	1.78	125.50	127.28
Total Rural Water Income	0.00	2,880.58	6,543.05	9,423.63
Property Tax Income				
305100 - General Fund Property Taxes-Boone	92,767.14	0.00	0.00	92,767.14
305200 - General Fund Property Taxes-Butler	363,563.64	0.00	0.00	363,563.64
305300 - General Fund Property Taxes-Colfax	307,398.86	0.00	0.00	307,398.86
305400 - General Fund Property Taxes-Dodge	1,042,131.77	0.00	0.00	1,042,131.77
305500 - General Fund Property Taxes-Madison	46,165.47	0.00	0.00	46,165.47
305600 - General Fund Property Taxes-Platte	415,478.28	0.00	0.00	415,478.28
305700 - General Fund Property Taxes-Saunders	1,184,833.92	0.00	0.00	1,184,833.92
Total Property Tax Income	3,452,339.08	0.00	0.00	3,452,339.08
Investment Income				
311350 - Interest - NPAIT Elkhorn	9.15	0.00	0.00	9.15
311400 - Interest - NPAIT Wanahoo SRA	1,253.03	0.00	0.00	1,253.03
311500 - Interest - NPAIT NRD	7.96	0.00	0.00	7.96
311600 - Interest - STFIT NRD	9,143.19	0.00	0.00	9,143.19
311700 - Interest - UBT NRD	74.48	0.00	0.00	74.48
304350 - Colon RW Interest - NPAIT	0.00	0.00	28.96	28.96
Total Investment Income	10,487.81	0.00	28.96	10,516.77
Miscellaneous Income				
309100 - Sales - Trees	281.25	0.00	0.00	281.25
309350 - Sales - Well Permits	600.00	0.00	0.00	600.00
309400 - Sales - Other	75.00	0.00	0.00	75.00
309500 - Equipment Rent	217.20	0.00	0.00	217.20
310200 - Czechland Camping Fees	96.24	0.00	0.00	96.24
310201 - Wanahoo Park Permits	2,910.00	0.00	0.00	2,910.00
310202 - Lake Wanahoo Camping	2,276.95	0.00	0.00	2,276.95
313000 - Miscellaneous Income	6,009.28	0.00	0.00	6,009.28
315000 - RWD Administrative Fees	343.92	0.00	0.00	343.92
316000 - Employee/Director Reimb	(1,013.80)	0.00	0.00	(1,013.80)
Total Miscellaneous Income	11,796.04	0.00	0.00	11,796.04
Total Income	3,617,711.88	2,880.58	6,572.01	3,627,164.47

Expenses

**Lower Platte North NRD
Statements of Activities
For the Month Ended**

	Natural Resources District Month Ending 12/31/2022	Rural Water-Bruno Month Ending 12/31/2022	Rural Water-Colon Month Ending 12/31/2022	All Districts Month Ending 12/31/2022
Administration Expenses				
Dues & Membership				
410202 - Dues & Membership - NACD	148.00	0.00	0.00	148.00
410203 - Dues - NARD	2,610.25	0.00	0.00	2,610.25
410205 - Dues & Membership - Other	610.00	0.00	0.00	610.00
Total Dues & Membership	3,368.25	0.00	0.00	3,368.25
Fees and Licenses				
410302 - NRD Fees And Licenses	27,562.37	0.00	0.00	27,562.37
410304 - NRD Union Bank Fees	39.32	0.00	0.00	39.32
Total Fees and Licenses	27,601.69	0.00	0.00	27,601.69
Insurance				
410501 - Insurance-Auto	986.08	0.00	0.00	986.08
410502 - Insurance-Errors & Omissions	535.42	0.00	0.00	535.42
410504 - Insurance-Liability	5,141.17	0.00	0.00	5,141.17
410505 - Insurance-Property	1,648.08	0.00	0.00	1,648.08
Total Insurance	8,310.75	0.00	0.00	8,310.75
Interest Expense				
410600 - Interest Expense	0.00	0.00	93.65	93.65
Total Interest Expense	0.00	0.00	93.65	93.65
Legal Notices				
410701 - Legal Notices	71.68	0.00	0.00	71.68
Total Legal Notices	71.68	0.00	0.00	71.68
Maintenance Contracts				
410800 - Maintenance Contracts	354.46	0.00	0.00	354.46
Total Maintenance Contracts	354.46	0.00	0.00	354.46
Office Supply & Expense				
410902 - Office Supplies & Equip	36.49	0.00	0.00	36.49
410903 - Franklin Supplies	36.15	0.00	0.00	36.15
Total Office Supply & Expense	72.64	0.00	0.00	72.64
Computer Supply & Expense				
411003 - Computer Repairs & Parts	107.65	0.00	0.00	107.65
411004 - Computer Software	(2,053.41)	0.00	0.00	(2,053.41)
411006 - Email	131.99	0.00	0.00	131.99
411011 - Computers & Equipment	4,044.68	0.00	0.00	4,044.68
Total Computer Supply & Expense	2,230.91	0.00	0.00	2,230.91
Postage				
411200 - Postage	26.40	0.00	0.00	26.40
Total Postage	26.40	0.00	0.00	26.40
Professional Services				
411301 - Prof Serv-Accounting	6,750.00	0.00	0.00	6,750.00
411311 - Washington Expense	2,100.00	0.00	0.00	2,100.00
Total Professional Services	8,850.00	0.00	0.00	8,850.00
Telephone Expense				
411601 - Telephone - Cellular	890.89	0.00	0.00	890.89
411602 - Local Phone & Internet	172.80	0.00	0.00	172.80
411605 - Director iPad Cell Service	45.20	0.00	0.00	45.20
Total Telephone Expense	1,108.89	0.00	0.00	1,108.89
Utilities				
411700 - Utilities Expense	869.43	0.00	0.00	869.43
Total Utilities	869.43	0.00	0.00	869.43
Total Administration Expenses	52,865.10	0.00	93.65	52,958.75
Information & Education Expenses				
Education				
420106 - Miscellaneous Education Expense	13.78	0.00	0.00	13.78
420109 - Education Outreach	199.26	0.00	0.00	199.26
Total Education	213.04	0.00	0.00	213.04
Information				
420209 - Ktic Ad	217.00	0.00	0.00	217.00
420211 - E-Ads	140.00	0.00	0.00	140.00
Total Information	357.00	0.00	0.00	357.00
Other				
420401 - Art Supplies	35.92	0.00	0.00	35.92
420404 - Promotional Materials	925.91	0.00	0.00	925.91
420405 - Recognition Banquet & Awards	155.95	0.00	0.00	155.95

See Accountant's Compilation Report

Lower Platte North NRD
Statements of Activities
For the Month Ended

	Natural Resources District Month Ending 12/31/2022	Rural Water-Bruno Month Ending 12/31/2022	Rural Water-Colon Month Ending 12/31/2022	All Districts Month Ending 12/31/2022
420410 - Continuing Ed - I&E Dept	(14.40)	0.00	0.00	(14.40)
Total Other	1,103.38	0.00	0.00	1,103.38
Total Information & Education Expenses	1,673.42	0.00	0.00	1,673.42
Operation & Maintenance				
Auto and Truck				
430101 - Auto & Truck Gas	731.15	0.00	0.00	731.15
430102 - Auto & Truck R&M	86.97	0.00	0.00	86.97
Total Auto and Truck	818.12	0.00	0.00	818.12
Building Maintenance				
430201 - Bldg Maintenance	547.42	0.00	0.00	547.42
430202 - Office Cleaning	460.00	0.00	0.00	460.00
430203 - Garbage Maintenance	85.30	0.00	0.00	85.30
Total Building Maintenance	1,092.72	0.00	0.00	1,092.72
Operation and Maintenance				
430401 - Czechland & Homestead	645.54	0.00	0.00	645.54
430402 - Equipment Upkeep	617.31	0.00	0.00	617.31
430403 - Operation & Maintenance	204.13	0.00	0.00	204.13
430406 - Wanahoo Park Operation	1,955.00	0.00	0.00	1,955.00
430407 - Monitoring Wanahoo Dam	1,869.35	0.00	0.00	1,869.35
430408 - Wanahoo Rec Mgmt	2,142.08	0.00	0.00	2,142.08
430409 - Lake Wanahoo Education Building	470.73	0.00	0.00	470.73
Total Operation and Maintenance	7,904.14	0.00	0.00	7,904.14
Steam Bank Stabilization				
430602 - Stream Bank - Platte/Elkhorn Rivers	2,777.27	0.00	0.00	2,777.27
Total Steam Bank Stabilization	2,777.27	0.00	0.00	2,777.27
Other				
430804 - O&M One-Call Services	3.20	0.00	0.00	3.20
Total Other	3.20	0.00	0.00	3.20
Total Operation & Maintenance	12,595.45	0.00	0.00	12,595.45
Personnel Expenses				
Director Expense				
440101 - Director Meeting Expense	102.55	0.00	0.00	102.55
440102 - Director Mileage Expense	2,686.88	0.00	0.00	2,686.88
440104 - Computer Stipend	1,432.50	0.00	0.00	1,432.50
Total Director Expense	4,221.93	0.00	0.00	4,221.93
Employee Benefits				
440301 - Dental Insurance	2,035.29	0.00	0.00	2,035.29
440302 - Health Insurance	35,014.60	0.00	0.00	35,014.60
440303 - Retirement Benefit - 414H	4,961.87	0.00	0.00	4,961.87
440306 - Workmans Comp Benefit	964.33	0.00	0.00	964.33
440307 - Employee Benefits - Other	736.04	0.00	0.00	736.04
Total Employee Benefits	43,712.13	0.00	0.00	43,712.13
Payroll Taxes				
440401 - FICA - ER	5,151.92	0.00	0.00	5,151.92
440402 - Medicare - ER	1,204.87	0.00	0.00	1,204.87
Total Payroll Taxes	6,356.79	0.00	0.00	6,356.79
Personnel Expense				
440501 - Personnel Meeting Exp	2,379.49	0.00	0.00	2,379.49
440504 - Personnel Uniform Exp	279.49	0.00	0.00	279.49
Total Personnel Expense	2,658.98	0.00	0.00	2,658.98
Salaries				
440601 - Salaries - Administration	18,454.52	0.00	0.00	18,454.52
440602 - Salaries - Clerical	2,170.22	0.00	0.00	2,170.22
440604 - Salaries - I & E	7,046.14	0.00	0.00	7,046.14
440605 - Salaries - Op & Maint	13,787.46	0.00	0.00	13,787.46
440606 - NRCS Support	11,219.68	0.00	0.00	11,219.68
440607 - Salaries - Projects	7,529.98	0.00	0.00	7,529.98
440608 - Salaries - Water	28,661.67	0.00	0.00	28,661.67
440616 - Lake Wanhoo Park Op.	2,115.00	0.00	0.00	2,115.00
Total Salaries	90,984.67	0.00	0.00	90,984.67
Total Personnel Expenses	147,934.50	0.00	0.00	147,934.50
Projects Expenses				
Inter-Governmental				
450110 - Platte Center Bank Stab. Phase LI	2,013.00	0.00	0.00	2,013.00

See Accountant's Compilation Report

**Lower Platte North NRD
Statements of Activities
For the Month Ended**

	Natural Resources District Month Ending 12/31/2022	Rural Water-Bruno Month Ending 12/31/2022	Rural Water-Colon Month Ending 12/31/2022	All Districts Month Ending 12/31/2022
Total Inter-Governmental	2,013.00	0.00	0.00	2,013.00
Other Projects				
450711 - Bailey Levee	891.17	0.00	0.00	891.17
Total Other Projects	891.17	0.00	0.00	891.17
Platte River Corridor Alliance				
411101 - PRCA - Administration	1,000.00	0.00	0.00	1,000.00
411129 - USGS Monitoring at Leshara	6,400.00	0.00	0.00	6,400.00
Total Platte River Corridor Alliance	7,400.00	0.00	0.00	7,400.00
Total Projects Expenses	10,304.17	0.00	0.00	10,304.17
Water Expenses				
Groundwater Management Plan				
460101 - GWMP - Cost - Share	101.00	0.00	0.00	101.00
460103 - GWMP - Nitrogen Classes	273.35	0.00	0.00	273.35
460110 - Basin Wide Water Plan	833.34	0.00	0.00	833.34
Total Groundwater Management Plan	1,207.69	0.00	0.00	1,207.69
Groundwater Programs				
460201 - Decommissioned Wells	2,147.48	0.00	0.00	2,147.48
460204 - GW Quality Program	79.00	0.00	0.00	79.00
460206 - Monitoring Wells	3,862.06	0.00	0.00	3,862.06
Total Groundwater Programs	6,088.54	0.00	0.00	6,088.54
Regulatory				
460301 - Chemigation	81.25	0.00	0.00	81.25
Total Regulatory	81.25	0.00	0.00	81.25
Special Projects				
460504 - ENWRA	2,783.33	0.00	0.00	2,783.33
Total Special Projects	2,783.33	0.00	0.00	2,783.33
Land Treatment				
450803 - Shell Creek Watershed Plan 319	1,044.21	0.00	0.00	1,044.21
Total Land Treatment	1,044.21	0.00	0.00	1,044.21
Total Water Expenses	11,205.02	0.00	0.00	11,205.02
Rural Water District Expenses				
570201 - Water Purchase	0.00	1,123.58	502.23	1,625.81
570204 - Testing	0.00	15.00	15.00	30.00
570208 - Lpnnrd Adm. Fee	0.00	143.94	199.98	343.92
570210 - Health/Life/Vision/LTD - ER	0.00	215.07	322.59	537.66
570211 - Dental - ER	0.00	22.79	34.19	56.98
570212 - 414H ER Contributions	0.00	59.64	89.46	149.10
570215 - ER Social Security Tax	0.00	93.15	122.98	216.13
570216 - ER Medicare Tax	0.00	21.78	28.76	50.54
570217 - Salaries	0.00	485.59	998.40	1,483.99
570219 - Fees And Licenses	0.00	17.13	25.68	42.81
570220 - Rural Water One-Call	0.00	0.00	1.60	1.60
570223 - Rural Water Gasoline	0.00	74.01	31.43	105.44
570308 - Colon Meter House Expense	0.00	0.00	109.16	109.16
570309 - Colon Sewer Collections	0.00	0.00	2,418.00	2,418.00
Total Rural Water District Expenses	0.00	2,271.68	4,899.46	7,171.14
Depreciation Expense				
Depreciation				
908000 - Depreciation Expense	40,945.91	705.35	1,474.07	43,125.33
908350 - Amortization Expense - Colon	0.00	0.00	4.17	4.17
Total Depreciation	40,945.91	705.35	1,478.24	43,129.50
Total Depreciation Expense	40,945.91	705.35	1,478.24	43,129.50
Total Expenses	277,523.57	2,977.03	6,471.35	286,971.95
Total Change in Net Position	\$ 3,340,188.31	\$ (96.45)	\$ 100.66	\$ 3,340,192.52

Lower Platte North NRD **Statements of Activities** **For the Periods Ended**

	Natural Resources District Year To Date 12/31/2022	Rural Water-Bruno Year To Date 12/31/2022	Rural Water-Colon Year To Date 12/31/2022	All Districts Year To Date 12/31/2022
Income				
Federal Income				
303206 - Wahoo Creek 319 Grant	(8,713.88)	0.00	0.00	(8,713.88)
303207 - Shell Creek 319 Grant	(19,285.16)	0.00	0.00	(19,285.16)
303209 - Shell Creek Phase II 319 - NDEE	0.00	0.00	0.00	0.00
303210 - Shell Creek Phase II - 319 DEQ	0.00	0.00	0.00	0.00
303225 - Wahoo Creek WS PL566	162,403.43	0.00	0.00	162,403.43
303250 - Water Smart Grant	0.00	0.00	0.00	0.00
303400 - Sand and Duck 319	0.00	0.00	0.00	0.00
303475 - Cottonwood 319	0.00	0.00	0.00	0.00
303960 - Hazard Mitigation - Federal	0.00	0.00	0.00	0.00
303961 - FEMA - Flood Funds	142,081.30	0.00	0.00	142,081.30
303962 - NEMA - Flood Funds	0.00	0.00	0.00	0.00
303963 - FEMA - 428 Funds	605.62	0.00	0.00	605.62
303964 - Federal - NRCS	0.00	0.00	0.00	0.00
303965 - Federal Wanahoo - Stilling	0.00	0.00	0.00	0.00
Total Federal Income	\$ 277,091.31	\$ 0.00	\$ 0.00	\$ 277,091.31
State Income				
301201 - Natural Resources WQ Fund	14,208.54	0.00	0.00	14,208.54
301202 - Decommissioned Wells	4,286.00	0.00	0.00	4,286.00
301203 - Motor Vehicle Pro-Rate	2,295.63	0.00	0.00	2,295.63
301315 - WSF and EA Application	59,605.18	0.00	0.00	59,605.18
301320 - Water Department - NET	(718.00)	0.00	0.00	(718.00)
301325 - JEDI Funding	58,741.45	0.00	0.00	58,741.45
301800 - State Grant - Whip/Ne Wild	502.10	0.00	0.00	502.10
301900 - State Grant - NE Buffer Strip	48,933.71	0.00	0.00	48,933.71
303211 - Shell Creek Phase II - Envir. Trust	(1,360.04)	0.00	0.00	(1,360.04)
304100 - Lake Wanahoo - Other	22,360.53	0.00	0.00	22,360.53
Total State Income	208,855.10	0.00	0.00	208,855.10
Local Income				
304105 - Education Building Rent	8,870.00	0.00	0.00	8,870.00
304112 - Dirt Sales - Wanahoo	1,272.84	0.00	0.00	1,272.84
304400 - Flow Meter Maint. Reimb.	20.00	0.00	0.00	20.00
304500 - JWMAB	29,640.00	0.00	0.00	29,640.00
Total Local Income	39,802.84	0.00	0.00	39,802.84
Rural Water Income				
304240 - Water Sales	0.00	27,920.55	28,529.80	56,450.35
304295 - Colon Sewer Fees	0.00	0.00	14,508.00	14,508.00
304261 - Other Revenue	0.00	35.94	1,483.92	1,519.86
Total Rural Water Income	0.00	27,956.49	44,521.72	72,478.21
Property Tax Income				
305100 - General Fund Property Taxes-Boone	99,730.19	0.00	0.00	99,730.19
305200 - General Fund Property Taxes-Butler	364,246.66	0.00	0.00	364,246.66
305300 - General Fund Property Taxes-Colfax	308,009.36	0.00	0.00	308,009.36
305400 - General Fund Property Taxes-Dodge	1,046,183.42	0.00	0.00	1,046,183.42
305500 - General Fund Property Taxes-Madison	46,391.40	0.00	0.00	46,391.40
305600 - General Fund Property Taxes-Platte	415,642.82	0.00	0.00	415,642.82
305700 - General Fund Property Taxes-Saunders	1,185,708.41	0.00	0.00	1,185,708.41
Total Property Tax Income	3,465,912.26	0.00	0.00	3,465,912.26
Investment Income				
311350 - Interest - NPAIT Elkhorn	35.99	0.00	0.00	35.99
311400 - Interest - NPAIT Wanahoo SRA	4,970.27	0.00	0.00	4,970.27
311450 - Interest Income-Elkhorn IPA	38.76	0.00	0.00	38.76
311500 - Interest - NPAIT NRD	31.15	0.00	0.00	31.15
311600 - Interest - STFIT NRD	41,047.05	0.00	0.00	41,047.05
311700 - Interest - UBT NRD	366.95	0.00	0.00	366.95
304350 - Colon RW Interest - NPAIT	0.00	0.00	113.61	113.61
Total Investment Income	46,490.17	0.00	113.61	46,603.78
Miscellaneous Income				
309100 - Sales - Trees	2,219.75	0.00	0.00	2,219.75
309350 - Sales - Well Permits	1,450.00	0.00	0.00	1,450.00
309360 - Sales - Sample Kits	3,370.00	0.00	0.00	3,370.00
309400 - Sales - Other	2,325.00	0.00	0.00	2,325.00
309500 - Equipment Rent	2,481.55	0.00	0.00	2,481.55

See Accountant's Compilation Report

**Lower Platte North NRD
Statements of Activities
For the Periods Ended**

	Natural Resources District Year To Date 12/31/2022	Rural Water-Bruno Year To Date 12/31/2022	Rural Water-Colon Year To Date 12/31/2022	All Districts Year To Date 12/31/2022
309600 - Game & Park Permit Sales	28.70	0.00	0.00	28.70
310000 - Chemigation Permits	2,075.00	0.00	0.00	2,075.00
310100 - Check Valve Sales	302.34	0.00	0.00	302.34
310200 - Czechland Camping Fees	6,191.10	0.00	0.00	6,191.10
310201 - Wanahoo Park Permits	30,094.78	0.00	0.00	30,094.78
310202 - Lake Wanahoo Camping	63,179.24	0.00	0.00	63,179.24
313000 - Miscellaneous Income	12,871.92	0.00	0.00	12,871.92
315000 - RWD Administrative Fees	2,822.53	0.00	0.00	2,822.53
316000 - Employee/Director Reimb	(799.22)	0.00	0.00	(799.22)
317000 - Loss Or Gain On Sale Of Assets	797.63	0.00	0.00	797.63
318000 - Special Project Income	212.00	0.00	0.00	212.00
Total Miscellaneous Income	129,622.32	0.00	0.00	129,622.32
Total Income	4,167,774.00	27,956.49	44,635.33	4,240,365.82
Expenses				
Administration Expenses				
Dues & Membership				
410202 - Dues & Membership - NACD	444.00	0.00	0.00	444.00
410203 - Dues - NARD	15,561.10	0.00	0.00	15,561.10
410204 - Dues - NWRA	1,950.00	0.00	0.00	1,950.00
410205 - Dues & Membership - Other	1,084.90	0.00	0.00	1,084.90
Total Dues & Membership	19,040.00	0.00	0.00	19,040.00
Fees and Licenses				
410302 - NRD Fees And Licenses	28,787.37	0.00	0.00	28,787.37
410304 - NRD Union Bank Fees	233.42	0.00	0.00	233.42
Total Fees and Licenses	29,020.79	0.00	0.00	29,020.79
Insurance				
410501 - Insurance-Auto	5,898.99	0.00	0.00	5,898.99
410502 - Insurance-Errors & Omissions	3,133.02	0.00	0.00	3,133.02
410504 - Insurance-Liability	32,957.77	0.00	0.00	32,957.77
410505 - Insurance-Property	9,540.24	0.00	0.00	9,540.24
Total Insurance	51,530.02	0.00	0.00	51,530.02
Interest Expense				
410600 - Interest Expense	0.00	0.00	561.79	561.79
Total Interest Expense	0.00	0.00	561.79	561.79
Legal Notices				
410701 - Legal Notices	863.82	0.00	0.00	863.82
Total Legal Notices	863.82	0.00	0.00	863.82
Maintenance Contracts				
410800 - Maintenance Contracts	2,194.44	0.00	0.00	2,194.44
Total Maintenance Contracts	2,194.44	0.00	0.00	2,194.44
Office Supply & Expense				
410901 - Copier Supplies	568.89	0.00	0.00	568.89
410902 - Office Supplies & Equip	1,142.24	0.00	0.00	1,142.24
410903 - Franklin Supplies	170.31	0.00	0.00	170.31
410904 - Letterhead, Envelopes & Forms	35.29	0.00	0.00	35.29
410905 - Reference Books	480.00	0.00	0.00	480.00
410906 - Office Expense - Other	917.96	0.00	0.00	917.96
Total Office Supply & Expense	3,314.69	0.00	0.00	3,314.69
Computer Supply & Expense				
411003 - Computer Repairs & Parts	574.51	0.00	0.00	574.51
411004 - Computer Software	442.22	0.00	0.00	442.22
411006 - Email	790.05	0.00	0.00	790.05
411011 - Computers & Equipment	5,714.26	0.00	0.00	5,714.26
Total Computer Supply & Expense	7,521.04	0.00	0.00	7,521.04
Postage				
411200 - Postage	1,070.90	0.00	0.00	1,070.90
Total Postage	1,070.90	0.00	0.00	1,070.90
Professional Services				
411301 - Prof Serv-Accounting	40,500.00	0.00	0.00	40,500.00
411302 - Prof Serv-Annual Audit	13,250.00	0.00	0.00	13,250.00
411304 - Prof Serv-Legal - General	3,015.00	0.00	0.00	3,015.00
411311 - Washington Expense	12,400.00	0.00	0.00	12,400.00
Total Professional Services	69,165.00	0.00	0.00	69,165.00
Rent Expense				

See Accountant's Compilation Report

Lower Platte North NRD
Statements of Activities
For the Periods Ended

	Natural Resources District Year To Date 12/31/2022	Rural Water-Bruno Year To Date 12/31/2022	Rural Water-Colon Year To Date 12/31/2022	All Districts Year To Date 12/31/2022
411400 - Rent Expense	568.44	0.00	0.00	568.44
Total Rent Expense	568.44	0.00	0.00	568.44
Telephone Expense				
411601 - Telephone - Cellular	6,399.47	0.00	0.00	6,399.47
411602 - Local Phone & Internet	3,790.33	0.00	0.00	3,790.33
411605 - Director iPad Cell Service	271.20	0.00	0.00	271.20
Total Telephone Expense	10,461.00	0.00	0.00	10,461.00
Utilities				
411700 - Utilities Expense	4,235.50	0.00	0.00	4,235.50
Total Utilities	4,235.50	0.00	0.00	4,235.50
Total Administration Expenses	198,985.64	0.00	561.79	199,547.43
Information & Education Expenses				
Education				
420103 - Land & Range Judging Contest	1,071.36	0.00	0.00	1,071.36
420104 - Outdoor Classrooms	112.87	0.00	0.00	112.87
420106 - Miscellaneous Education Expense	329.33	0.00	0.00	329.33
420109 - Education Outreach	1,722.65	0.00	0.00	1,722.65
Total Education	3,236.21	0.00	0.00	3,236.21
Information				
420201 - Annual Report/Viaduct	6,245.33	0.00	0.00	6,245.33
420203 - Expositions And Display	450.60	0.00	0.00	450.60
420208 - Miscellaneous	80.00	0.00	0.00	80.00
420209 - Ktic Ad	1,248.00	0.00	0.00	1,248.00
420211 - E-Ads	840.00	0.00	0.00	840.00
420212 - TV Promotion	950.00	0.00	0.00	950.00
Total Information	9,813.93	0.00	0.00	9,813.93
Other				
420401 - Art Supplies	85.84	0.00	0.00	85.84
420404 - Promotional Materials	2,873.47	0.00	0.00	2,873.47
420405 - Recognition Banquet & Awards	1,571.89	0.00	0.00	1,571.89
420410 - Continuing Ed - I&E Dept	192.00	0.00	0.00	192.00
Total Other	4,723.20	0.00	0.00	4,723.20
Total Information & Education Expenses	17,773.34	0.00	0.00	17,773.34
Operation & Maintenance				
Auto and Truck				
430101 - Auto & Truck Gas	12,904.80	0.00	0.00	12,904.80
430102 - Auto & Truck R&M	2,236.25	0.00	0.00	2,236.25
Total Auto and Truck	15,141.05	0.00	0.00	15,141.05
Building Maintenance				
430201 - Bldg Maintenance	853.50	0.00	0.00	853.50
430202 - Office Cleaning	2,990.00	0.00	0.00	2,990.00
430203 - Garbage Maintenance	561.78	0.00	0.00	561.78
Total Building Maintenance	4,405.28	0.00	0.00	4,405.28
Operation and Maintenance				
430401 - Czechland & Homestead	3,719.36	0.00	0.00	3,719.36
430402 - Equipment Upkeep	1,857.32	0.00	0.00	1,857.32
430403 - Operation & Maintenance	114,769.47	0.00	0.00	114,769.47
430406 - Wanahoo Park Operation	6,419.97	0.00	0.00	6,419.97
430407 - Monitoring Wanahoo Dam	8,887.71	0.00	0.00	8,887.71
430408 - Wanahoo Rec Mgmt	32,835.89	0.00	0.00	32,835.89
430409 - Lake Wanahoo Education Building	4,108.47	0.00	0.00	4,108.47
Total Operation and Maintenance	172,598.19	0.00	0.00	172,598.19
Steam Bank Stabilization				
430602 - Stream Bank - Platte/Elkhorn Rivers	2,777.27	0.00	0.00	2,777.27
Total Steam Bank Stabilization	2,777.27	0.00	0.00	2,777.27
Other				
430804 - O&M One-Call Services	11.83	0.00	0.00	11.83
Total Other	11.83	0.00	0.00	11.83
Total Operation & Maintenance	194,933.62	0.00	0.00	194,933.62
Personnel Expenses				
Director Expense				
440101 - Director Meeting Expense	1,758.21	0.00	0.00	1,758.21
440102 - Director Mileage Expense	6,370.01	0.00	0.00	6,370.01
440104 - Computer Stipend	2,632.50	0.00	0.00	2,632.50

See Accountant's Compilation Report

**Lower Platte North NRD
Statements of Activities
For the Periods Ended**

	Natural Resources District Year To Date 12/31/2022	Rural Water-Bruno Year To Date 12/31/2022	Rural Water-Colon Year To Date 12/31/2022	All Districts Year To Date 12/31/2022
Total Director Expense	10,760.72	0.00	0.00	10,760.72
Director Per Diem				
440200 - Director Per Diem	8,190.00	0.00	0.00	8,190.00
Total Director Per Diem	8,190.00	0.00	0.00	8,190.00
Employee Benefits				
440301 - Dental Insurance	11,052.14	0.00	0.00	11,052.14
440302 - Health Insurance	188,378.11	0.00	0.00	188,378.11
440303 - Retirement Benefit - 414H	31,971.32	0.00	0.00	31,971.32
440306 - Workmans Comp Benefit	5,926.74	0.00	0.00	5,926.74
440307 - Employee Benefits - Other	924.77	0.00	0.00	924.77
440309 - Flexible Spending Fee	56.00	0.00	0.00	56.00
Total Employee Benefits	238,309.08	0.00	0.00	238,309.08
Payroll Taxes				
440401 - FICA - ER	36,090.27	0.00	0.00	36,090.27
440402 - Medicare - ER	8,440.37	0.00	0.00	8,440.37
Total Payroll Taxes	44,530.64	0.00	0.00	44,530.64
Personnel Expense				
440501 - Personnel Meeting Exp	7,140.44	0.00	0.00	7,140.44
440502 - Personnel Mileage Exp	1,050.96	0.00	0.00	1,050.96
440503 - Safety Committee	315.55	0.00	0.00	315.55
440504 - Personnel Uniform Exp	1,357.13	0.00	0.00	1,357.13
Total Personnel Expense	9,864.08	0.00	0.00	9,864.08
Salaries				
440601 - Salaries - Administration	115,202.38	0.00	0.00	115,202.38
440602 - Salaries - Clerical	13,111.67	0.00	0.00	13,111.67
440603 - Employee Recognition Program	700.00	0.00	0.00	700.00
440604 - Salaries - I & E	42,605.68	0.00	0.00	42,605.68
440605 - Salaries - Op & Maint	84,960.41	0.00	0.00	84,960.41
440606 - NRCS Support	64,100.45	0.00	0.00	64,100.45
440607 - Salaries - Projects	51,831.92	0.00	0.00	51,831.92
440608 - Salaries - Water	174,059.01	0.00	0.00	174,059.01
440616 - Lake Wanhoo Park Op.	48,076.27	0.00	0.00	48,076.27
Total Salaries	594,647.79	0.00	0.00	594,647.79
Total Personnel Expenses	906,302.31	0.00	0.00	906,302.31
Projects Expenses				
Inter-Governmental				
450110 - Platte Center Bank Stab. Phase LI	2,013.00	0.00	0.00	2,013.00
450114 - Trails	10,000.00	0.00	0.00	10,000.00
450119 - JWMAB Dodge Co	32,985.00	0.00	0.00	32,985.00
Total Inter-Governmental	44,998.00	0.00	0.00	44,998.00
Other Projects				
450711 - Bailey Levee	891.17	0.00	0.00	891.17
Total Other Projects	891.17	0.00	0.00	891.17
Platte River Corridor Alliance				
411101 - PRCA - Administration	1,000.00	0.00	0.00	1,000.00
411129 - USGS Monitoring at Leshara	6,400.00	0.00	0.00	6,400.00
Total Platte River Corridor Alliance	7,400.00	0.00	0.00	7,400.00
Total Projects Expenses	53,289.17	0.00	0.00	53,289.17
Water Expenses				
Groundwater Management Plan				
460101 - GWMP - Cost - Share	6,568.50	0.00	0.00	6,568.50
460103 - GWMP - Nitrogen Classes	311.86	0.00	0.00	311.86
460110 - Basin Wide Water Plan	5,000.03	0.00	0.00	5,000.03
Total Groundwater Management Plan	11,880.39	0.00	0.00	11,880.39
Groundwater Programs				
460201 - Decommissioned Wells	4,955.39	0.00	0.00	4,955.39
460203 - GW Levels	17.38	0.00	0.00	17.38
460204 - GW Quality Program	11,096.86	0.00	0.00	11,096.86
460206 - Monitoring Wells	4,988.47	0.00	0.00	4,988.47
Total Groundwater Programs	21,058.10	0.00	0.00	21,058.10
Regulatory				
460301 - Chemigation	81.25	0.00	0.00	81.25
Total Regulatory	81.25	0.00	0.00	81.25
Surface Water Programs				

**Lower Platte North NRD
Statements of Activities
For the Periods Ended**

	Natural Resources District Year To Date 12/31/2022	Rural Water-Bruno Year To Date 12/31/2022	Rural Water-Colon Year To Date 12/31/2022	All Districts Year To Date 12/31/2022
460403 - Stream Flow	17,694.94	0.00	0.00	17,694.94
Total Surface Water Programs	17,694.94	0.00	0.00	17,694.94
Special Projects				
460504 - ENWRA	16,699.95	0.00	0.00	16,699.95
Total Special Projects	16,699.95	0.00	0.00	16,699.95
Land Treatment				
450201 - Ne Buffer Strip	48,933.71	0.00	0.00	48,933.71
450204 - Shell Creek	33,235.46	0.00	0.00	33,235.46
450207 - Nswcp Supplement	8,640.00	0.00	0.00	8,640.00
450803 - Shell Creek Watershed Plan 319	31,578.56	0.00	0.00	31,578.56
Total Land Treatment	122,387.73	0.00	0.00	122,387.73
Total Water Expenses	189,802.36	0.00	0.00	189,802.36
Rural Water District Expenses				
570201 - Water Purchase	0.00	15,623.13	6,197.38	21,820.51
570204 - Testing	0.00	765.00	90.00	855.00
570206 - Repair	0.00	11.10	6,244.51	6,255.61
570207 - Other Expenses	0.00	10.35	15.53	25.88
570208 - Lpnnrd Adm. Fee	0.00	1,396.03	1,426.50	2,822.53
570210 - Health/Life/Vision/LTD - ER	0.00	1,267.02	1,900.46	3,167.48
570211 - Dental - ER	0.00	137.63	206.48	344.11
570212 - 414H ER Contributions	0.00	384.84	577.27	962.11
570215 - ER Social Security Tax	0.00	527.55	721.67	1,249.22
570216 - ER Medicare Tax	0.00	123.36	168.78	292.14
570217 - Salaries	0.00	3,513.94	6,394.17	9,908.11
570219 - Fees And Licenses	0.00	119.90	179.77	299.67
570220 - Rural Water One-Call	0.00	4.26	21.01	25.27
570222 - RW Dues And Memberships	0.00	40.00	60.00	100.00
570223 - Rural Water Gasoline	0.00	751.33	333.01	1,084.34
570231 - Rural Water Equipment Upkeep	0.00	22.79	34.18	56.97
570308 - Colon Meter House Expense	0.00	0.00	542.65	542.65
570309 - Colon Sewer Collections	0.00	0.00	14,508.00	14,508.00
Total Rural Water District Expenses	0.00	24,698.23	39,621.37	64,319.60
Capital Expenditures - Small Items				
480105 - Capital Outlay Small Items (Equipment)	637.49	0.00	0.00	637.49
Total Capital Expenditures - Small Items	637.49	0.00	0.00	637.49
Depreciation Expense				
Depreciation				
908000 - Depreciation Expense	238,109.40	4,232.10	8,844.42	251,185.92
908350 - Amortization Expense - Colon	0.00	0.00	25.02	25.02
Total Depreciation	238,109.40	4,232.10	8,869.44	251,210.94
Total Depreciation Expense	238,109.40	4,232.10	8,869.44	251,210.94
Total Expenses	1,799,833.33	28,930.33	49,052.60	1,877,816.26
Total Change in Net Position	\$ 2,367,940.67	\$ (973.84)	\$ (4,417.27)	\$ 2,362,549.56

Lower Platte North NRD **Supplemental Schedule** Statements of Activities - Actual vs. Budget

	Year To Date December 31, 2022 Actual	Year Ending June 30, 2023 FY2023	\$ Difference Annual Budget	Percentage Annual Budget
Change in Net Position				
Income				
Federal Income				
303206 - Wahoo Creek 319 Grant	(8,713.88)	100,000.00	(108,713.88)	(8.71) %
303207 - Shell Creek 319 Grant	(19,285.16)	108,600.00	(127,885.16)	(17.76) %
303225 - Wahoo Creek WS PL566	162,403.43	499,610.00	(337,206.57)	32.51 %
303961 - FEMA - Flood Funds	142,081.30	1,600,000.00	(1,457,918.70)	8.88 %
303963 - FEMA - 428 Funds	605.62	392,500.00	(391,894.38)	0.15 %
303965 - Federal Wanahoo - Stilling	0.00	1,109,600.00	(1,109,600.00)	0.00 %
Total Federal Income	277,091.31	3,810,310.00	(3,533,218.69)	7.27 %
State Income				
301201 - Natural Resources WQ Fund	14,208.54	52,000.00	(37,791.46)	27.32 %
301202 - Decommissioned Wells	4,286.00	3,500.00	786.00	122.46 %
301203 - Motor Vehicle Pro-Rate	2,295.63	8,400.00	(6,104.37)	27.33 %
301303 - Sand Creek NRDF	0.00	20,000.00	(20,000.00)	0.00 %
301310 - Shell Creek NET	0.00	6,500.00	(6,500.00)	0.00 %
301315 - WSF and EA Application	59,605.18	0.00	59,605.18	0.00 %
301320 - Water Department - NET	(718.00)	0.00	(718.00)	0.00 %
301325 - JEDI Funding	58,741.45	333,498.00	(274,756.55)	17.61 %
301800 - State Grant - Whip/Ne Wild	502.10	0.00	502.10	0.00 %
301900 - State Grant - NE Buffer Strip	48,933.71	27,500.00	21,433.71	177.94 %
303211 - Shell Creek Phase II - Envir. Trust	(1,360.04)	0.00	(1,360.04)	0.00 %
303222 - Wahoo Creek WSF Design	0.00	133,031.00	(133,031.00)	0.00 %
304100 - Lake Wanahoo - Other	22,360.53	15,000.00	7,360.53	149.07 %
Total State Income	208,855.10	599,429.00	(390,573.90)	34.84 %
Local Income				
304105 - Education Building Rent	8,870.00	14,500.00	(5,630.00)	61.17 %
304112 - Dirt Sales - Wanahoo	1,272.84	15,000.00	(13,727.16)	8.49 %
304400 - Flow Meter Maint. Reimb.	20.00	1,000.00	(980.00)	2.00 %
304500 - JWMAB	29,640.00	14,940.00	14,700.00	198.39 %
304600 - Greater Wahoo Fdtn - Wanahoo Bldg	0.00	73,500.00	(73,500.00)	0.00 %
Total Local Income	39,802.84	118,940.00	(79,137.16)	33.46 %
Property Tax Income				
305100 - General Fund Property Taxes-Boone	99,730.19	116,000.00	(16,269.81)	85.97 %
305200 - General Fund Property Taxes-Butler	364,246.66	411,000.00	(46,753.34)	88.62 %
305300 - General Fund Property Taxes-Colfax	308,009.36	368,000.00	(59,990.64)	83.70 %
305400 - General Fund Property Taxes-Dodge	1,046,183.42	1,084,000.00	(37,816.58)	96.51 %
305500 - General Fund Property Taxes-Madison	46,391.40	76,500.00	(30,108.60)	60.64 %
305600 - General Fund Property Taxes-Platte	415,642.82	464,000.00	(48,357.18)	89.58 %
305700 - General Fund Property Taxes-Saunders	1,185,708.41	1,251,000.00	(65,291.59)	94.78 %
Total Property Tax Income	3,465,912.26	3,770,500.00	(304,587.74)	91.92 %
Investment Income				
311350 - Interest - NPAIT Elkhorn	35.99	3.81	32.18	944.62 %
311400 - Interest - NPAIT Wanahoo SRA	4,970.27	555.00	4,415.27	895.54 %
311450 - Interest Income-Elkhorn IPA	38.76	316.00	(277.24)	12.27 %
311500 - Interest - NPAIT NRD	31.15	3.50	27.65	890.00 %
311600 - Interest - STFIT NRD	41,047.05	4,750.00	36,297.05	864.15 %
311700 - Interest - UBT NRD	366.95	240.00	126.95	152.90 %
304350 - Colon RW Interest - NPAIT	0.00	12.00	(12.00)	0.00 %
Total Investment Income	46,490.17	5,880.31	40,609.86	790.61 %
Miscellaneous Income				
309100 - Sales - Trees	2,219.75	25,000.00	(22,780.25)	8.88 %
309350 - Sales - Well Permits	1,450.00	2,000.00	(550.00)	72.50 %
309360 - Sales - Sample Kits	3,370.00	3,500.00	(130.00)	96.29 %
309400 - Sales - Other	2,325.00	4,000.00	(1,675.00)	58.13 %
309500 - Equipment Rent	2,481.55	7,000.00	(4,518.45)	35.45 %
309600 - Game & Park Permit Sales	28.70	500.00	(471.30)	5.74 %
310000 - Chemigation Permits	2,075.00	25,000.00	(22,925.00)	8.30 %
310100 - Check Valve Sales	302.34	500.00	(197.66)	60.47 %
310200 - Czechland Camping Fees	6,191.10	14,000.00	(7,808.90)	44.22 %
310201 - Wanahoo Park Permits	30,094.78	110,000.00	(79,905.22)	27.36 %
310202 - Lake Wanahoo Camping	63,179.24	120,000.00	(56,820.76)	52.65 %
312000 - Salaries-Other NRD	0.00	76,000.00	(76,000.00)	0.00 %
313000 - Miscellaneous Income	12,871.92	15,000.00	(2,128.08)	85.81 %
315000 - RWD Administrative Fees	2,822.53	4,800.00	(1,977.47)	58.80 %

Lower Platte North NRD **Supplemental Schedule** Statements of Activities - Actual vs. Budget

	Year To Date December 31, 2022 Actual	Year Ending June 30, 2023 FY2023	\$ Difference Annual Budget	Percentage Annual Budget
316000 - Employee/Director Reimb	(799.22)	2,000.00	(2,799.22)	(39.96) %
317000 - Loss Or Gain On Sale Of Assets	797.63	100,000.00	(99,202.37)	0.80 %
318000 - Special Project Income	212.00	1,000.00	(788.00)	21.20 %
318500 - Change in COE Revenue	0.00	114,892.00	(114,892.00)	0.00 %
Total Miscellaneous Income	129,622.32	625,192.00	(495,569.68)	20.73 %
Total Income	4,167,774.00	8,930,251.31	(4,762,477.31)	46.67 %
Expenses				
Administration Expenses				
Bonds				
410100 - Bonds	0.00	100.00	(100.00)	0.00 %
Total Bonds	0.00	100.00	(100.00)	0.00 %
Dues & Membership				
410201 - Dues & Membership - Chamber	0.00	450.00	(450.00)	0.00 %
410202 - Dues & Membership - NACD	444.00	1,776.00	(1,332.00)	25.00 %
410203 - Dues - NARD	15,561.10	31,000.00	(15,438.90)	50.20 %
410204 - Dues - NWRA	1,950.00	1,950.00	0.00	100.00 %
410205 - Dues & Membership - Other	1,084.90	3,200.00	(2,115.10)	33.90 %
Total Dues & Membership	19,040.00	38,376.00	(19,336.00)	49.61 %
Fees and Licenses				
410302 - NRD Fees And Licenses	28,787.37	10,000.00	18,787.37	287.87 %
410304 - NRD Union Bank Fees	233.42	600.00	(366.58)	38.90 %
Total Fees and Licenses	29,020.79	10,600.00	18,420.79	273.78 %
GIS				
410401 - GIS Activities	0.00	2,000.00	(2,000.00)	0.00 %
Total GIS	0.00	2,000.00	(2,000.00)	0.00 %
Insurance				
410501 - Insurance-Auto	5,898.99	15,000.00	(9,101.01)	39.33 %
410502 - Insurance-Errors & Omissions	3,133.02	7,000.00	(3,866.98)	44.76 %
410504 - Insurance-Liability	32,957.77	66,000.00	(33,042.23)	49.94 %
410505 - Insurance-Property	9,540.24	20,000.00	(10,459.76)	47.70 %
Total Insurance	51,530.02	108,000.00	(56,469.98)	47.71 %
Legal Notices				
410701 - Legal Notices	863.82	2,500.00	(1,636.18)	34.55 %
410702 - Other Notices and Advertising	0.00	100.00	(100.00)	0.00 %
Total Legal Notices	863.82	2,600.00	(1,736.18)	33.22 %
Maintenance Contracts				
410800 - Maintenance Contracts	2,194.44	5,000.00	(2,805.56)	43.89 %
Total Maintenance Contracts	2,194.44	5,000.00	(2,805.56)	43.89 %
Office Supply & Expense				
410901 - Copier Supplies	568.89	750.00	(181.11)	75.85 %
410902 - Office Supplies & Equip	1,142.24	3,500.00	(2,357.76)	32.64 %
410903 - Franklin Supplies	170.31	500.00	(329.69)	34.06 %
410904 - Letterhead, Envelopes & Forms	35.29	2,000.00	(1,964.71)	1.76 %
410905 - Reference Books	480.00	1,000.00	(520.00)	48.00 %
410906 - Office Expense - Other	917.96	2,500.00	(1,582.04)	36.72 %
Total Office Supply & Expense	3,314.69	10,250.00	(6,935.31)	32.34 %
Computer Supply & Expense				
411002 - Computer Consultant	0.00	5,000.00	(5,000.00)	0.00 %
411003 - Computer Repairs & Parts	574.51	1,500.00	(925.49)	38.30 %
411004 - Computer Software	442.22	11,000.00	(10,557.78)	4.02 %
411005 - Computer Magazines/Video	0.00	100.00	(100.00)	0.00 %
411006 - Email	790.05	1,650.00	(859.95)	47.88 %
411011 - Computers & Equipment	5,714.26	11,000.00	(5,285.74)	51.95 %
411012 - Website Design & Hosting	0.00	300.00	(300.00)	0.00 %
Total Computer Supply & Expense	7,521.04	30,550.00	(23,028.96)	24.62 %
Postage				
411200 - Postage	1,070.90	5,000.00	(3,929.10)	21.42 %
Total Postage	1,070.90	5,000.00	(3,929.10)	21.42 %
Professional Services				
411301 - Prof Serv-Accounting	40,500.00	81,000.00	(40,500.00)	50.00 %
411302 - Prof Serv-Annual Audit	13,250.00	13,250.00	0.00	100.00 %
411304 - Prof Serv-Legal - General	3,015.00	12,000.00	(8,985.00)	25.13 %
411305 - Prof Serv-Legal-Other	0.00	3,000.00	(3,000.00)	0.00 %
411307 - Prof Services-Other	0.00	3,000.00	(3,000.00)	0.00 %
411311 - Washington Expense	12,400.00	26,400.00	(14,000.00)	46.97 %
Total Professional Services	69,165.00	138,650.00	(69,485.00)	49.88 %

Lower Platte North NRD **Supplemental Schedule** Statements of Activities - Actual vs. Budget

	Year To Date December 31, 2022 Actual	Year Ending June 30, 2023 FY2023	\$ Difference Annual Budget	Percentage Annual Budget
Rent Expense				
411400 - Rent Expense	568.44	1,700.00	(1,131.56)	33.44 %
Total Rent Expense	568.44	1,700.00	(1,131.56)	33.44 %
Support to Organizations				
411501 - Locally Lead Conservation Groups	0.00	500.00	(500.00)	0.00 %
411502 - R C & D Organizations	0.00	500.00	(500.00)	0.00 %
Total Support to Organizations	0.00	1,000.00	(1,000.00)	0.00 %
Telephone Expense				
411601 - Telephone - Cellular	6,399.47	11,000.00	(4,600.53)	58.18 %
411602 - Local Phone & Internet	3,790.33	8,000.00	(4,209.67)	47.38 %
411605 - Director iPad Cell Service	271.20	600.00	(328.80)	45.20 %
Total Telephone Expense	10,461.00	19,600.00	(9,139.00)	53.37 %
Utilities				
411700 - Utilities Expense	4,235.50	13,000.00	(8,764.50)	32.58 %
Total Utilities	4,235.50	13,000.00	(8,764.50)	32.58 %
Total Administration Expenses	198,985.64	386,426.00	(187,440.36)	51.49 %
Information & Education Expenses				
Education				
420103 - Land & Range Judging Contest	1,071.36	1,000.00	71.36	107.14 %
420104 - Outdoor Classrooms	112.87	2,500.00	(2,387.13)	4.51 %
420106 - Miscellaneous Education Expense	329.33	500.00	(170.67)	65.87 %
420107 - Water Testing Event	0.00	500.00	(500.00)	0.00 %
420108 - Spring Conservation Sensation	0.00	3,500.00	(3,500.00)	0.00 %
420109 - Education Outreach	1,722.65	3,500.00	(1,777.35)	49.22 %
Total Education	3,236.21	11,500.00	(8,263.79)	28.14 %
Information				
420201 - Annual Report/Viaduct	6,245.33	13,000.00	(6,754.67)	48.04 %
420202 - Books And Pamphlets	0.00	500.00	(500.00)	0.00 %
420203 - Expositions And Display	450.60	2,000.00	(1,549.40)	22.53 %
420205 - Phrography, Cameras, Video	0.00	1,500.00	(1,500.00)	0.00 %
420206 - Soil & Water Stewardship Mat.	0.00	250.00	(250.00)	0.00 %
420208 - Miscellaneous	80.00	1,500.00	(1,420.00)	5.33 %
420209 - Ktic Ad	1,248.00	3,000.00	(1,752.00)	41.60 %
420211 - E-Ads	840.00	1,700.00	(860.00)	49.41 %
420212 - TV Promotion	950.00	3,500.00	(2,550.00)	27.14 %
420213 - Promotion Videos	0.00	3,000.00	(3,000.00)	0.00 %
Total Information	9,813.93	29,950.00	(20,136.07)	32.77 %
Scholarships and Grants				
420305 - Camp And Workshop Scholarships	0.00	1,500.00	(1,500.00)	0.00 %
420307 - Shell Crk Watershd Scholarship	0.00	3,000.00	(3,000.00)	0.00 %
Total Scholarships and Grants	0.00	4,500.00	(4,500.00)	0.00 %
Other				
420401 - Art Supplies	85.84	250.00	(164.16)	34.34 %
420402 - Cooperative Projects/Donations	0.00	500.00	(500.00)	0.00 %
420404 - Promotional Materials	2,873.47	4,000.00	(1,126.53)	71.84 %
420405 - Recognition Banquet & Awards	1,571.89	2,000.00	(428.11)	78.59 %
420407 - Cooperative Partnerships	0.00	1,000.00	(1,000.00)	0.00 %
420409 - N.American Envirothon	0.00	1,000.00	(1,000.00)	0.00 %
420410 - Continuing Ed - I&E Dept	192.00	200.00	(8.00)	96.00 %
Total Other	4,723.20	8,950.00	(4,226.80)	52.77 %
Total Information & Education Expenses	17,773.34	54,900.00	(37,126.66)	32.37 %
Operation & Maintenance				
Auto and Truck				
430101 - Auto & Truck Gas	12,904.80	28,000.00	(15,095.20)	46.09 %
430102 - Auto & Truck R&M	2,236.25	7,000.00	(4,763.75)	31.95 %
Total Auto and Truck	15,141.05	35,000.00	(19,858.95)	43.26 %
Building Maintenance				
430201 - Bldg Maintenance	853.50	3,500.00	(2,646.50)	24.39 %
430202 - Office Cleaning	2,990.00	6,100.00	(3,110.00)	49.02 %
430203 - Garbage Maintenance	561.78	1,200.00	(638.22)	46.82 %
Total Building Maintenance	4,405.28	10,800.00	(6,394.72)	40.79 %
Community Forestry Program				
430300 - Community Forestry	0.00	2,000.00	(2,000.00)	0.00 %
Total Community Forestry Program	0.00	2,000.00	(2,000.00)	0.00 %
Operation and Maintenance				
430401 - Czechland & Homestead	3,719.36	8,000.00	(4,280.64)	46.49 %

Lower Platte North NRD **Supplemental Schedule** Statements of Activities - Actual vs. Budget

	Year To Date December 31, 2022 Actual	Year Ending June 30, 2023 FY2023	\$ Difference Annual Budget	Percentage Annual Budget
430402 - Equipment Upkeep	1,857.32	14,000.00	(12,142.68)	13.27 %
430403 - Operation & Maintenance	114,769.47	85,000.00	29,769.47	135.02 %
430404 - Tree Supplies	0.00	250.00	(250.00)	0.00 %
430406 - Wanahoo Park Operation	6,419.97	50,000.00	(43,580.03)	12.84 %
430407 - Monitoring Wanahoo Dam	8,887.71	17,000.00	(8,112.29)	52.28 %
430408 - Wanahoo Rec Mgmt	32,835.89	60,000.00	(27,164.11)	54.73 %
430409 - Lake Wanahoo Education Building	4,108.47	10,000.00	(5,891.53)	41.08 %
Total Operation and Maintenance	172,598.19	244,250.00	(71,651.81)	70.66 %
Project Repairs				
430503 - Project Repairs - Other	0.00	1,000.00	(1,000.00)	0.00 %
430504 - Rawhide Channel Maintenance	0.00	2,000.00	(2,000.00)	0.00 %
Total Project Repairs	0.00	3,000.00	(3,000.00)	0.00 %
Steam Bank Stabilization				
430601 - Stream Bank - Perennial Streams	0.00	5,000.00	(5,000.00)	0.00 %
430602 - Stream Bank - Platte/Elkhorn Rivers	2,777.27	15,000.00	(12,222.73)	18.52 %
Total Steam Bank Stabilization	2,777.27	20,000.00	(17,222.73)	13.89 %
Wildlife Habitat Programs				
430701 - Wild Nebraska	0.00	1,000.00	(1,000.00)	0.00 %
Total Wildlife Habitat Programs	0.00	1,000.00	(1,000.00)	0.00 %
Other				
430801 - NRCS Flags	0.00	1,000.00	(1,000.00)	0.00 %
430802 - Stock For Resale - Trees	0.00	15,000.00	(15,000.00)	0.00 %
430803 - Lower Platte Weed Mgmt Area	0.00	30,000.00	(30,000.00)	0.00 %
430804 - O&M One-Call Services	11.83	50.00	(38.17)	23.66 %
430805 - IceJam Monitoring	0.00	500.00	(500.00)	0.00 %
Total Other	11.83	46,550.00	(46,538.17)	0.03 %
Total Operation & Maintenance	194,933.62	362,600.00	(167,666.38)	53.76 %
Personnel Expenses				
Director Expense				
440101 - Director Meeting Expense	1,758.21	18,000.00	(16,241.79)	9.77 %
440102 - Director Mileage Expense	6,370.01	15,000.00	(8,629.99)	42.47 %
440104 - Computer Stipend	2,632.50	5,700.00	(3,067.50)	46.18 %
Total Director Expense	10,760.72	38,700.00	(27,939.28)	27.81 %
Director Per Diem				
440200 - Director Per Diem	8,190.00	38,000.00	(29,810.00)	21.55 %
Total Director Per Diem	8,190.00	38,000.00	(29,810.00)	21.55 %
Employee Benefits				
440301 - Dental Insurance	11,052.14	24,000.00	(12,947.86)	46.05 %
440302 - Health Insurance	188,378.11	370,000.00	(181,621.89)	50.91 %
440303 - Retirement Benefit - 414H	31,971.32	75,000.00	(43,028.68)	42.63 %
440304 - Retirement Benefit - 457 Plan	0.00	4,000.00	(4,000.00)	0.00 %
440305 - Tuition Reimbursement	0.00	3,000.00	(3,000.00)	0.00 %
440306 - Workmans Comp Benefit	5,926.74	20,000.00	(14,073.26)	29.63 %
440307 - Employee Benefits - Other	924.77	2,500.00	(1,575.23)	36.99 %
440309 - Flexible Spending Fee	56.00	300.00	(244.00)	18.67 %
440311 - Unemployment Insurance Benefit	0.00	5,000.00	(5,000.00)	0.00 %
440312 - Accrued Compensated Absences	0.00	28,500.00	(28,500.00)	0.00 %
Total Employee Benefits	238,309.08	532,300.00	(293,990.92)	44.77 %
Payroll Taxes				
440401 - FICA - ER	36,090.27	75,000.00	(38,909.73)	48.12 %
440402 - Medicare - ER	8,440.37	18,000.00	(9,559.63)	46.89 %
Total Payroll Taxes	44,530.64	93,000.00	(48,469.36)	47.88 %
Personnel Expense				
440501 - Personnel Meeting Exp	7,140.44	25,000.00	(17,859.56)	28.56 %
440502 - Personnel Mileage Exp	1,050.96	3,500.00	(2,449.04)	30.03 %
440503 - Safety Committee	315.55	1,500.00	(1,184.45)	21.04 %
440504 - Personnel Uniform Exp	1,357.13	2,800.00	(1,442.87)	48.47 %
440505 - Personnel Exp-Other	0.00	2,500.00	(2,500.00)	0.00 %
Total Personnel Expense	9,864.08	35,300.00	(25,435.92)	27.94 %
Salaries				
440601 - Salaries - Administration	115,202.38	244,000.00	(128,797.62)	47.21 %
440602 - Salaries - Clerical	13,111.67	25,500.00	(12,388.33)	51.42 %
440603 - Employee Recognition Program	700.00	1,300.00	(600.00)	53.85 %
440604 - Salaries - I & E	42,605.68	90,000.00	(47,394.32)	47.34 %
440605 - Salaries - Op & Maint	84,960.41	186,000.00	(101,039.59)	45.68 %
440606 - NRCS Support	64,100.45	168,000.00	(103,899.55)	38.16 %

Lower Platte North NRD **Supplemental Schedule** Statements of Activities - Actual vs. Budget

	Year To Date December 31, 2022 Actual	Year Ending June 30, 2023 FY2023	\$ Difference Annual Budget	Percentage Annual Budget
440607 - Salaries - Projects	51,831.92	114,500.00	(62,668.08)	45.27 %
440608 - Salaries - Water	174,059.01	370,000.00	(195,940.99)	47.04 %
440611 - Salaries - Rural Water	0.00	5,000.00	(5,000.00)	0.00 %
440616 - Lake Wanhoo Park Op.	48,076.27	86,500.00	(38,423.73)	55.58 %
Total Salaries	594,647.79	1,290,800.00	(696,152.21)	46.07 %
Total Personnel Expenses	906,302.31	2,028,100.00	(1,121,797.69)	44.69 %
Projects Expenses				
Inter-Governmental				
450110 - Platte Center Bank Stab. Phase LI	2,013.00	10,000.00	(7,987.00)	20.13 %
450114 - Trails	10,000.00	15,000.00	(5,000.00)	66.67 %
450115 - Dike & Drainage Assistance	0.00	10,000.00	(10,000.00)	0.00 %
450117 - Woodcliff Bank Stabilization	0.00	55,000.00	(55,000.00)	0.00 %
450119 - JWMAB Dodge Co	32,985.00	171,000.00	(138,015.00)	19.29 %
Total Inter-Governmental	44,998.00	261,000.00	(216,002.00)	17.24 %
Special Projects				
450305 - Special Projects-Other	0.00	31,500.00	(31,500.00)	0.00 %
450309 - SA No-Till Conf/Shell Creek	0.00	1,000.00	(1,000.00)	0.00 %
Total Special Projects	0.00	32,500.00	(32,500.00)	0.00 %
Wanhoo				
450505 - Prof Serv-Legal - Wanhoo	0.00	5,000.00	(5,000.00)	0.00 %
450506 - Lake Level Mgmt Plan	0.00	50,000.00	(50,000.00)	0.00 %
450509 - Wanhoo - Other	0.00	5,000.00	(5,000.00)	0.00 %
Total Wanhoo	0.00	60,000.00	(60,000.00)	0.00 %
Other Projects				
450705 - Schuyler 205	0.00	13,000.00	(13,000.00)	0.00 %
450711 - Bailey Levee	891.17	31,000.00	(30,108.83)	2.87 %
Total Other Projects	891.17	44,000.00	(43,108.83)	2.03 %
Platte River Corridor Alliance				
411101 - PRCA - Administration	1,000.00	1,000.00	0.00	100.00 %
411129 - USGS Monitoring at Leshara	6,400.00	6,400.00	0.00	100.00 %
Total Platte River Corridor Alliance	7,400.00	7,400.00	0.00	100.00 %
Total Projects Expenses	53,289.17	404,900.00	(351,610.83)	13.16 %
Water Expenses				
Groundwater Management Plan				
460101 - GWMP - Cost - Share	6,568.50	10,000.00	(3,431.50)	65.69 %
460102 - GWMP - Information & Education	0.00	500.00	(500.00)	0.00 %
460103 - GWMP - Nitrogen Classes	311.86	2,000.00	(1,688.14)	15.59 %
460104 - GWMP - Permits	0.00	100.00	(100.00)	0.00 %
460110 - Basin Wide Water Plan	5,000.03	10,000.00	(4,999.97)	50.00 %
460111 - Flow Meter Maintenance	0.00	22,000.00	(22,000.00)	0.00 %
Total Groundwater Management Plan	11,880.39	44,600.00	(32,719.61)	26.64 %
Groundwater Programs				
460201 - Decommissioned Wells	4,955.39	19,000.00	(14,044.61)	26.08 %
460203 - GW Levels	17.38	1,000.00	(982.62)	1.74 %
460204 - GW Quality Program	11,096.86	15,000.00	(3,903.14)	73.98 %
460205 - Mead - NOP	0.00	100.00	(100.00)	0.00 %
460206 - Monitoring Wells	4,988.47	25,000.00	(20,011.53)	19.95 %
460209 - Groundwater Programs Other	0.00	3,000.00	(3,000.00)	0.00 %
460210 - GW Projects Sinking Fund	0.00	100,000.00	(100,000.00)	0.00 %
460212 - GW Monitoring Equip SQS#2	0.00	250.00	(250.00)	0.00 %
460213 - GW Memberships and Subscriptions	0.00	8,400.00	(8,400.00)	0.00 %
Total Groundwater Programs	21,058.10	171,750.00	(150,691.90)	12.26 %
Regulatory				
460301 - Chemigation	81.25	1,000.00	(918.75)	8.13 %
460302 - Irrigation Runoff	0.00	750.00	(750.00)	0.00 %
Total Regulatory	81.25	1,750.00	(1,668.75)	4.64 %
Surface Water Programs				
460403 - Stream Flow	17,694.94	17,635.00	59.94	100.34 %
Total Surface Water Programs	17,694.94	17,635.00	59.94	100.34 %
Special Projects				
460503 - Special Projects - Other	0.00	5,000.00	(5,000.00)	0.00 %
460504 - ENWRA	16,699.95	31,000.00	(14,300.05)	53.87 %
460520 - NET Grant	0.00	46,000.00	(46,000.00)	0.00 %
460521 - Lower Platte Consortium	0.00	250.00	(250.00)	0.00 %
Total Special Projects	16,699.95	82,250.00	(65,550.05)	20.30 %
Land Treatment				

Lower Platte North NRD
Supplemental Schedule
Statements of Activities - Actual vs. Budget

	Year To Date December 31, 2022 Actual	Year Ending June 30, 2023 FY2023	\$ Difference Annual Budget	Percentage Annual Budget
450201 - Ne Buffer Strip	48,933.71	27,000.00	21,933.71	181.24 %
450204 - Shell Creek	33,235.46	20,000.00	13,235.46	166.18 %
450206 - Emergency Terrace Repair	0.00	5,000.00	(5,000.00)	0.00 %
450207 - Nswcp Supplement	8,640.00	25,000.00	(16,360.00)	34.56 %
450211 - Trees	0.00	3,000.00	(3,000.00)	0.00 %
450803 - Shell Creek Watershed Plan 319	31,578.56	150,000.00	(118,421.44)	21.05 %
450807 - Wahoo Creek Phase II	0.00	150,000.00	(150,000.00)	0.00 %
450809 - Sand Creek Dams-Conservation	0.00	50,000.00	(50,000.00)	0.00 %
Total Land Treatment	122,387.73	430,000.00	(307,612.27)	28.46 %
Total Water Expenses	189,802.36	747,985.00	(558,182.64)	25.38 %
Total Expenses	1,561,086.44	3,984,911.00	(2,423,824.56)	39.17 %
Total Change in Net Position	2,606,687.56	4,945,340.31	(2,338,652.75)	52.71 %

Lower Platte North NRD
Supplemental Schedule
 Statements of Activities - Actual vs. Budget
 Rural Water District - Bruno

	Year To Date 12/31/2022 Actual	Year Ending June 30, 2023 FY2023	\$ Difference Annual Budget	Percentage Annual Budget
Change in Net Position				
Rural Water Income				
304240 - Water Sales	27,920.55	46,000.00	(18,079.45)	60.70 %
304261 - Other Revenue	35.94	2,000.00	(1,964.06)	1.80 %
Total Rural Water Income	27,956.49	48,000.00	(20,043.51)	58.24 %
Rural Water District Expenses				
570201 - Water Purchase	15,623.13	25,000.00	(9,376.87)	62.49 %
570204 - Testing	765.00	1,000.00	(235.00)	76.50 %
570206 - Repair	11.10	1,000.00	(988.90)	1.11 %
570207 - Other Expenses	10.35	700.00	(689.65)	1.48 %
570208 - Lpnnrd Adm. Fee	1,396.03	2,250.00	(853.97)	62.05 %
570210 - Health/Life/Vision/LTD - ER	1,267.02	3,000.00	(1,732.98)	42.23 %
570211 - Dental - ER	137.63	300.00	(162.37)	45.88 %
570212 - 414H ER Contributions	384.84	750.00	(365.16)	51.31 %
570215 - ER Social Security Tax	527.55	960.00	(432.45)	54.95 %
570216 - ER Medicare Tax	123.36	240.00	(116.64)	51.40 %
570217 - Salaries	3,513.94	10,000.00	(6,486.06)	35.14 %
570219 - Fees And Licenses	119.90	700.00	(580.10)	17.13 %
570220 - Rural Water One-Call	4.26	50.00	(45.74)	8.52 %
570221 - Rural Water Hand Tools & Supplies	0.00	250.00	(250.00)	0.00 %
570222 - RW Dues And Memberships	40.00	100.00	(60.00)	40.00 %
570223 - Rural Water Gasoline	751.33	1,000.00	(248.67)	75.13 %
570224 - Rural Water Personnel Meeting	0.00	450.00	(450.00)	0.00 %
570230 - Rural Water Equipment Rental	0.00	1,000.00	(1,000.00)	0.00 %
570231 - Rural Water Equipment Upkeep	22.79	1,250.00	(1,227.21)	1.82 %
Total Rural Water District Expenses	24,698.23	50,000.00	(25,301.77)	49.40 %
Total Change in Net Position	3,258.26	(2,000.00)	5,258.26	(162.91) %

Lower Platte North NRD
Supplemental Schedule
 Statements of Activities - Actual vs. Budget
 Rural Water District - Colon

	Year To Date 12/31/2022 Actual	Year Ending June 30, 2023 FY2023	\$ Difference Annual Budget	Percentage Annual Budget
Change in Net Position				
Rural Water Income				
304240 - Water Sales	28,529.80	52,000.00	(23,470.20)	54.87 %
304275 - Colon Hook Up Fees	0.00	3,000.00	(3,000.00)	0.00 %
304295 - Colon Sewer Fees	14,508.00	28,000.00	(13,492.00)	51.81 %
304261 - Other Revenue	1,483.92	3,000.00	(1,516.08)	49.46 %
Total Rural Water Income	44,521.72	86,000.00	(41,478.28)	51.77 %
Investment Income				
304350 - Colon RW Interest - NPAIT	113.61	0.00	113.61	0.00 %
Total Investment Income	113.61	0.00	113.61	0.00 %
Rural Water District Expenses				
570201 - Water Purchase	6,197.38	13,000.00	(6,802.62)	47.67 %
570204 - Testing	90.00	1,000.00	(910.00)	9.00 %
570206 - Repair	6,244.51	3,000.00	3,244.51	208.15 %
570207 - Other Expenses	15.53	1,000.00	(984.47)	1.55 %
570208 - Lpnnrd Adm. Fee	1,426.50	2,750.00	(1,323.50)	51.87 %
570210 - Health/Life/Vision/LTD - ER	1,900.46	4,500.00	(2,599.54)	42.23 %
570211 - Dental - ER	206.48	450.00	(243.52)	45.88 %
570212 - 414H ER Contributions	577.27	1,200.00	(622.73)	48.11 %
570215 - ER Social Security Tax	721.67	1,440.00	(718.33)	50.12 %
570216 - ER Medicare Tax	168.78	360.00	(191.22)	46.88 %
570217 - Salaries	6,394.17	17,000.00	(10,605.83)	37.61 %
570219 - Fees And Licenses	179.77	900.00	(720.23)	19.97 %
570220 - Rural Water One-Call	21.01	75.00	(53.99)	28.01 %
570221 - Rural Water Hand Tools & Supplies	0.00	250.00	(250.00)	0.00 %
570222 - RW Dues And Memberships	60.00	100.00	(40.00)	60.00 %
570223 - Rural Water Gasoline	333.01	1,000.00	(666.99)	33.30 %
570224 - Rural Water Personnel Meeting	0.00	450.00	(450.00)	0.00 %
570230 - Rural Water Equipment Rental	0.00	1,500.00	(1,500.00)	0.00 %
570231 - Rural Water Equipment Upkeep	34.18	1,250.00	(1,215.82)	2.73 %
570305 - Colon - Annual Bond Payment	0.00	3,355.00	(3,355.00)	0.00 %
570308 - Colon Meter House Expense	542.65	1,200.00	(657.35)	45.22 %
570309 - Colon Sewer Collections	14,508.00	28,000.00	(13,492.00)	51.81 %
570330 - Colon RW Bad Debt Expense	0.00	1,000.00	(1,000.00)	0.00 %
Total Rural Water District Expenses	39,621.37	84,780.00	(45,158.63)	46.73 %
Total Change in Net Position	5,013.96	1,220.00	3,793.96	410.98 %

Lower Platte North NRD

Supplemental Schedule - Actual vs. Budget - Capital Expenses and Debt Service Payments

	Year To Date 12/31/2022 <i>Actual</i>	Year Ending 6/30/2023 <i>Budget</i>	\$ Difference Annual Budget	Percentage Annual Budget
Capital Improvements - Real Property				
Wahoo Creek Design RCPP (Olsson)	0.00	966,139.00	(966,139.00)	0.00%
Wahoo Creek Planning - FYRA - Watershed Plan	113,327.59	5,000.00	108,327.59	2266.55%
Wahoo Creek 7 Additional Dams	199,317.21	100,000.00	99,317.21	199.32%
Office Remodel/New Office Drawings	29,100.00	440,000.00	(410,900.00)	6.61%
Wanahoo Stilling Basin	189,441.72	1,168,000.00	(978,558.28)	0.00%
Wanahoo Fish Cleaning Station	0.00	65,000.00	(65,000.00)	0.00%
Wanahoo Marina/General Store	0.00	75,000.00	(75,000.00)	0.00%
Large Structure O&M Sinking Fund	0.00	400,000.00	(400,000.00)	0.00%
District Wide Flood Reduction Sinking Fund	0.00	400,000.00	(400,000.00)	0.00%
Other Capital Improvements - Real Property	0.00	0.00	0.00	0.00%
Total Capital Improvements - Real Property	531,186.52	3,619,139.00	(3,087,952.48)	14.68%
Capital Outlay				
Machinery & Equipment (Tractor, Bobcat, Wanahoo UTV, Trailer)	17,138.21	306,500.00	(289,361.79)	5.59%
Auto and Trucks (1 Ton Truck)	0.00	75,000.00	(75,000.00)	0.00%
Computer Equipment	0.00	10,000.00	(10,000.00)	0.00%
Phoenix Data Base	6,025.00	10,000.00	(3,975.00)	60.25%
Flow Meter	0.00	11,050.00	(11,050.00)	0.00%
Monitoring Wells - 4 Additional	12,360.00	25,000.00	(12,640.00)	49.44%
Other Capital Outlay - Equipment	0.00	1,200.00	(1,200.00)	0.00%
Total Capital Outlay	35,523.21	438,750.00	(403,226.79)	8.10%
Debt Service Payments				
Colon RW Note	3,355.00	3,355.00	0.00	100.00%
Total Debt Service Payments	3,355.00	3,355.00	0.00	100.00%
 Grand Total All Expenses w/o Depreciation	 2,195,470.77	 8,180,935.00	 (5,985,464.23)	 26.84%

Week #2

Lower Platte North NRD Time Sheet

Name Eric Gottschalk

Period Covered 12/24/22 to 12/30/22

You must enter "pm" for times after 12:59 or the form will not calculate correctly!

	Date	Start Time	Stop Time	Work Hours	Other Hours	Duties Performed	Miles	Meals	Other Exp.
Sat	12/24								
Sun	12/25								
Mon	12/26				8.00	Christmas Holiday			
Tues	12/27	8:00 am 2:00 pm	1:00 pm 4:45 pm	7.75		Mail, e-mails, 2023 District planning Wanahoo envelopes			
Wed	12/28	7:45 am 12:30 pm	12:00 pm 4:30 pm	8.25		Wahoo Creek, Clear Creek, District Management, Office party			
Thurs	12/29	7:45 am	11:00 am	3.25	6.00	Committee prep, District Management			
Fri	12/30				8.00	Office Closed			
Week #2 Totals				19.25	22		0	\$0.00	\$0.00
Totals Week #1				30.75	8		0	\$0.00	\$0.00
Two Week Totals				50	30		0	\$0.00	\$0.00

Annual Leave & Sick Leave

	Previous Balance	Earned This Pay Period	Used This Pay Period	New Balance
Annual Leave	240.00	8.00	6.00	242.00 240
Sick Leave	810.75	4.00	0.00	814.75

90.75 Hrs
Turned In

RESET FORM

This will delete ALL data on form, including name, AL/SL values and Program Areas labels.

#	Program Areas	Hours
11	Administration	26.50
14	District Management	32.00
15	Personnel	
31	I&E Administration	
41	O&M Administration	
51	Projects Administration	
61	Water Administration	
71	Rural Water Administration	
52	Conservation Program	
Holiday		16.00
1	Annual Leave	5.50
2	Sick Leave	
Other		

Total: 80

Week #1**Lower Platte North NRD Time Sheet**Name Eric GottschalkPeriod Covered 12/17/22 to 12/23/22*You must enter "pm" for times after 12:59 or the form will not calculate correctly!*

	Date	Start Time	Stop Time	Work Hours	Other Hours	Duties Performed	Miles	Meals	Other Exp.
Sat	12/17								
Sun	12/18								
Mon	12/19	7:30 am 2:00 pm	1:00 pm 5:30 pm	9.00		Leadership Team meeting, District management, Personnel			
Tues	12/20	7:45 am 1:45 pm	1:00 pm 4:30 pm	8.00		Water dept. policy, Wahoo Creek structures, mail			
Wed	12/21	7:45 am 1:00 pm	12:30 pm 5:00 pm	8.75		Annual budget review, Personnel, JEO - new office meeting Viaduct			
Thurs	12/22	7:45 am	12:45 pm	5.00		Wahoo Creek planning, Clear Creek Thomas Lakes lots discussions, I&E discussions			
Fri	12/23				8.00	Office Closed			
Week #1 Totals				30.75	8		0	\$0.00	\$0.00

Supervisor _____ Manager  Assistant Manager _____ Treasurer _____

Date _____ Date 1/3/23 Date _____ Date _____

I CERTIFY THAT THE ABOVE INFORMATION IS CORRECT

Signature of person filing form

Date 1/3/23**Expenses**

Mileage x 0.625	\$ 0.00
Meals	\$0.00
Other Exp.	\$0.00
Total	\$ 0.00

Week #1
Lower Platte North NRD Time Sheet

 Name Eric Gottschalk

 Period Covered 12/31/22 to 1/6/23

You must enter "pm" for times after 12:59 or the form will not calculate correctly!

	Date	Start Time	Stop Time	Work Hours	Other Hours	Duties Performed	Miles	Meals	Other Exp.
Sat	12/31								
Sun	1/1								
Mon	1/2				8.00	New Year's Day			
Tues	1/3	8:00 am 12:45 pm	9:15 am 5:00 pm	5.50		Committee prep, Personnel, District management Funeral - Prague Mike McGinn visitation			
Wed	1/4	7:15 am 2:00 pm	1:00 pm 8:15 pm	12.00		Projects Committee, Operations Committee, Exec. Committee, Committee follow-up, Water Committee, mail			
Thurs	1/5	7:45 am 1:30 pm	12:45 pm 4:45 pm	8.25		Committee meeting follow-up, Wanahoo basin change order, Water Dept. Nitrate issues discussions,			
Fri	1/6	7:45 am 12:45 pm	11:45 am 4:15 pm	7.50		Board meeting prep, Wanahoo basin repair review, bills, director per diem,			
Week #1 Totals				33.25	8		0	\$0.00	\$0.00

 Supervisor _____ Manager  Assistant Manager _____ Treasurer _____

 Date _____ Date 1/7/23 Date _____ Date _____

I CERTIFY THAT THE ABOVE INFORMATION IS CORRECT


 Signature of person filing form


 Date

Expenses

Mileage x 0.655	\$ 0.00
Meals	\$0.00
Other Exp.	\$0.00
Total	\$ 0.00

Week #2

Lower Platte North NRD Time Sheet

Name Eric Gottschalk

Period Covered 1/7/23 to 1/13/23

You must enter "pm" for times after 12:59 or the form will not calculate correctly!

	Date	Start Time	Stop Time	Work Hours	Other Hours	Duties Performed	Miles	Meals	Other Exp.
Sat	1/7								
Sun	1/8								
Mon	1/9	7:30 am	5:00 pm	9.50		Leadership Team meeting, Board meeting prep, New Director orientation, Board Meeting			
Tues	1/10	7:45 am 1:30 pm	12:45 pm 3:30 pm	7.00		Staff meeting, Board meeting follow-up, Houston/Fyra phone meetings, Wanahoo stilling basin repair issues, Change order, I&E meeting			
Wed	1/11	7:45 am 1:30 pm	1:00 pm 4:45 pm	8.50		Board meeting follow-up, District management, Wanahoo apron repair			
Thurs	1/12	7:45 am 1:00 pm	12:15 pm 5:00 pm	8.50		District management, Lower Platte River Basin Coalition meeting, Personnel mail, Viaduct			
Fri	1/13	8:00 am 2:30 pm	11:45 am 4:30 pm	5.75		Wahoo Creek Watershed, I&E - Viaduct information District Management			
Week #2 Totals				39.25	0		0	\$0.00	\$0.00
Totals Week #1				33.25	8		0	\$0.00	\$0.00
Two Week Totals				72.5	8		0	\$0.00	\$0.00

Annual Leave & Sick Leave

	Previous Balance	Earned This Pay Period	Used This Pay Period	New Balance
Annual Leave	240.00	8.00	0.00	248.00
Sick Leave	720.00	4.00	0.00	724.00

RESET FORM

This will delete ALL data on form, including name, AL/SL values and Program Areas labels.

#	Program Areas	Hours
11	Administration	28.00
14	District Management	35.00
15	Personnel	7.00
31	I&E Administration	2.00
41	O&M Administration	
51	Projects Administration	
61	Water Administration	
71	Rural Water Administration	
52	Conservation Program	
Holiday		8.00
1	Annual Leave	0.00
2	Sick Leave	0.00
Other		

Total: 80

Week #1
Lower Platte North NRD Time Sheet

 Name Eric Gottschalk

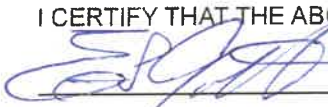
 Period Covered 1/14/23 to 1/20/23
You must enter "pm" for times after 12:59 or the form will not calculate correctly!

	Date	Start Time	Stop Time	Work Hours	Other Hours	Duties Performed	Miles	Meals	Other Exp.
Sat	1/14								
Sun	1/15								
Mon	1/16				8.00	Martin Luther King Holiday			
Tues	1/17	7:45 am 1:45 pm	1:00 pm 5:00 pm	8.50		Mail, Wahoo Creek planning, Wanahoo envelopes,			
Wed	1/18	8:30 am 2:00 pm	12:45 pm 5:00 pm	7.25		District Management, Phone call with Senator Bostelman, Skull/Bone planning,			
Thurs	1/19	7:45 am 1:30 pm	11:45 am 5:00 pm	7.50		Wahoo Creek Watershed funding, NE DOT - Round-a-bout communications, Wanahoo Budget review, District Budget review			
Fri	1/20	7:30 am	11:30 am	4.00		Personnel, District Management,			
Week #1 Totals				27.25	8		0	\$0.00	\$0.00

 Supervisor _____ Manager  Assistant Manager _____ Treasurer _____

 Date _____ Date 1/31/23 Date _____ Date _____

I CERTIFY THAT THE ABOVE INFORMATION IS CORRECT


 Signature of person filing form

1/31/23
 Date

Expenses

Mileage x 0.655	\$ 0.00
Meals	\$0.00
Other Exp.	\$0.00
Total	\$ 0.00

Week #2

Lower Platte North NRD Time Sheet

Name Eric Gottschalk

Period Covered 1/21/23 to 1/27/23

You must enter "pm" for times after 12:59 or the form will not calculate correctly!

	Date	Start Time	Stop Time	Work Hours	Other Hours	Duties Performed	Miles	Meals	Other Exp.
Sat	1/21								
Sun	1/22								
Mon	1/23	7:30 am 12:00 pm	11:45 am 7:45 pm	12.00		Leadership Team meeting, Wanahoo apron site meeting, NARD Managers Meeting - Lincoln			
Tues	1/24	7:15 am 12:45 pm	12:00 pm 7:15 pm	11.25		NARD Legislative Conference Bostelman - Wahoo Creek Tom Riley - Wahoo Creek			
Wed	1/25	7:15 am	5:30 pm	10.25		NARD Legislative Conference Mail, office catch-up			
Thurs	1/26	7:45 am	12:00 pm	4.25		Paperwork, Personnel, District Management, Wahoo Creek Watershed			
Fri	1/27				7.00	7.0 Annual leave			
Week #2 Totals				37.75	7		0	\$0.00	\$0.00
Totals Week #1				27.25	8		0	\$0.00	\$0.00
Two Week Totals				65	15		0	\$0.00	\$0.00

Annual Leave & Sick Leave

	Previous Balance	Earned This Pay Period	Used This Pay Period	New Balance
Annual Leave	240.00	8.00	7.00	241.00
Sick Leave	720.00	4.00	0.00	724.00

RESET FORM

This will delete ALL data on form, including name, AL/SL values and Program Areas labels.

#	Program Areas	Hours
11	Administration	38.00
14	District Management	30.00
15	Personnel	5.00
31	I&E Administration	
41	O&M Administration	
51	Projects Administration	
61	Water Administration	
71	Rural Water Administration	
52	Conservation Program	
Holiday		
1	Annual Leave	7.00
2	Sick Leave	
Other		

Total: 80

Lower Platte North Natural Resources District
Accounts Receivable Aging Summary as of 12/31/22

Accounts Receivable acct 105000

Customer	Invoice/Purpose	Current	0-30 Days	31-60 Days	61 and Over	Totals
Bruno/David City RW Customers	Multiple	2792.22	0.00	0.00	0.00	2,792.22
Colon RW Customers	Multiple	7235.38	0.00	0.00	0.00	7,235.38
Department of Natural Resources	FYRA - Wahoo Creek WS Plan/EA & WSF	0.00	0.00	0.00	9,155.50	9,155.50
	Olsson - Water Sustainability Fund	0.00	4,708.64	1,153.18	95,885.29	101,747.11
	Olsson - Wahoo Creek WS Plan - 3 Dam Sites	5,901.26	0.00	0.00	0.00	5,901.26
FEMA	FYRA - Lake Wanhoo Spilling Basin	3,531.00	2,966.16	16,440.94	221,258.63	244,196.73
	Valley Corp - Spilling Basin Rehab	0.00	0.00	0.00	1,261,963.55	1,261,963.55
	General Excavating - Wanhoo Spilling Basin Rehab	0.00	0.00	0.00	13,923.75	13,923.75
	ME Collins - Wanhoo Spilling Basin Rehab	85,097.59	0.00	0.00	0.00	85,097.59
	Rezac Seed - Spilling Basin Rehab	0.00	0.00	0.00	225.09	225.09
	Bobcat of Omaha - 428 Funds	0.00	0.00	0.00	25,953.05	25,953.05
	O&M - Ty's Outdoor Power	0.00	0.00	0.00	864.48	864.48
	TelePole Prunner - Ty's Outdoor Power	0.00	0.00	605.62	0.00	605.62
JEDI	Olsson - Wahoo Creek WS & 7 Dam Sites Phase II	1,141.33	420.49	49,337.57	0.00	50,899.39
	Olsson - Wahoo Creek WS - 3 Dam Sites	3,934.18	0.00	0.00	0.00	3,934.18
	Olsson - Wahoo Creek WS Planning - Prof Svc	0.00	3,139.10	768.78	0.00	3,907.88
JWMAB	Dodge Co - Fremont - PMRNRD	0.00	0.00	0.00	4,980.00	4,980.00
NDEE	Wahoo Creek 319 - Sabatka/K Sousek	0.00	0.00	0.00	5,499.00	5,499.00
	Shell Creek 319 - Sprunk	0.00	0.00	0.00	0.00	0.00
NRCS WFPO	Olsson Assoc - Wahoo Creek WS & Dam Sites Phase II	38,986.87	37,374.91	29,319.35	369,370.80	475,051.93
NRD Employees	Flu Shot Reimbursement - Gottschalk/Oakland	70.00	0.00	0.00	0.00	70.00
USACE	Sand Creek/Wanhoo project close-out (detail below)	0.00	0.00	0.00	114,892.33	114,892.33
		148,689.83	48,609.30	97,625.44	2,123,971.47	2,418,896.04

GL

NE Dept of Natural Resources and USACE - reclassified from long-term to current receivable as of 6/30/22, included in schedule above

Customer	Invoice	Current	0-30 Days	31-60 Days	61 and Over	Totals
USACE (Sand Creek/Wanhoo)	008226-6/30/09				2,882,995.86	
	008367-11/30/09				220.61	
	008458-2/12/10				2,704.21	
	008594-6/30/10				52.33	
	008599-6/30/10				96,983.55	
	008601-6/30/10				679,317.44	
	008658-9/30/10				15,599.03	
	008659-9/30/10				1,072,522.57	
	008927-2/24/12				6,647.42	
	008928-2/24/12				159,389.53	
	009055-6/30/12				25,096.93	
	009067-7/31/12				49.73	
	009070-8/31/12				2,177.50	
	009078-9/30/12				352,072.83	
	009098-10/31/12				202,769.01	
	009297-12/31/13				48.75	
	009368-4/30/14				41,115.11	
	5/31/20 - Sand Creek Project Adjustment				(620,046.54)	
	1/21/21 - Deposit US Treasury - Wanhoo COE A/R				(747.30)	
	2/28/21 - To close out Long Term A/P				(4,694,072.08)	
	2/28/21 - Adjust to Final Refund Due Amount				(110,004.16)	114,892.33
	Totals	0.00	0.00	0.00	114,892.33	114,892.33

Contractor's Application for Payment No. 2

Application Period: 12/07/2022 Through 01/05/2023		Application Date: 1/5/2023
To: Lower Platte North Natural Resources District (Owner)	From: ME Collins Contracting Co., Inc. (Contractor)	Via (Engineer): Houston Engineering
Project: Lake Wanahoo Apron Overlay	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.: 022-22-01

**Application For Payment
Change Order Summary**

Approved Change Orders			
Number	Additions	Deductions	
			1. ORIGINAL CONTRACT PRICE <u>\$452,487.40</u>
			2. Net change by Change Order <u> </u>
			3. Current Contract Price (Line 1 ± 2) <u>\$452,487.40</u>
			4. TOTAL COMPLETED AND STORED TO DATE
			(Column F total on Progress Estimates) <u>\$168,030.00</u>
			5. RETAINAGE:
			a. 10% X \$ 168,030.00 Work Completed <u>\$16,803.00</u>
			b. 10% X \$ 23,000.00 Stored Material <u>\$2,300.00</u>
			c. Total Retainage (Line 5.a + Line 5.b) <u>\$19,103.00</u>
			6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c) <u>\$148,927.00</u>
			7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application) <u>\$113,463.45</u>
			8. AMOUNT DUE THIS APPLICATION <u>\$35,463.55</u>
			9. BALANCE TO FINISH, PLUS RETAINAGE
			(Column H total on Progress Estimates + Line 5.c above) <u>\$303,560.40</u>
TOTALS			
NET CHANGE BY			
CHANGE ORDERS			

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:
 (1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;
 (2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and
 (3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor Signature

By:  Date: **1-5-23**

Payment of: \$ \$35,463.55
(Line 8 or other - attach explanation of the other amount)

is recommended by: Houston Engineering 1/5/2023
(Engineer) (Date)

Payment of: \$
(Line 8 or other - attach explanation of the other amount)

is approved by:
(Owner) (Date)

Approved by:
Funding or Financing Entity (if applicable) (Date)

Progress Estimate

Contractor's Application

For (Contract): Lake Wanhoo Apron Overlay										Application Number: 2				
Application Period: 12/07/2022 Through 01/05/2023										Application Date: 1/5/2023				
A					B	C1	C2	C3	D	E	F	G	H	
Item			Contract Information			Estimated Quantity Installed this Pay Application Period	Previous Quantity Installed	Total Quantity Installed	Value of Work Installed to Date	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F / B)	Balance to Finish (B - F)	
Bid Item No.	Description		Item Quantity	Units	Unit Price	Total Value of Item (\$)								
1.001	MOBILIZATION		1	LS	\$ 41,632.00	\$ 41,632.00		0.5	0.5	\$20,816.00	\$20,816.00	50.0%	\$20,816.00	
1.002	WATER HANDLING		1	LS	\$ 14,433.00	\$ 14,433.00		1	1	\$14,433.00	\$14,433.00	100.0%		
1.003	RCC GRINDING/REMOVAL		114	CT	\$ 746.00	\$ 85,044.00		114	114	\$85,044.00	\$85,044.00	100.0%		
1.004	BASIN CLEANING AND PREPARATION		1	LS	\$ 11,555.00	\$ 11,555.00	0.5	0.5	1	\$11,555.00	\$11,555.00	100.0%		
1.005	SET ANCHORS		169	EA	\$ 78.00	\$ 13,182.00	169		169	\$13,182.00	\$13,182.00	100.0%		
1.006	CLASS 6000 CONCRETE		227	CY	\$ 596.78	\$ 135,469.06							\$135,469.06	
1.007	FIBER REINFORCEMENT - ALTERNATIVE B		10215	LBS	\$ 6.00	\$ 61,290.00				\$23,000.00	\$23,000.00	37.5%	\$38,290.00	
1.008	STEEL REINFORCEMENT - ALTERNATIVE B		14737.2	LBS	\$ 2.20	\$ 32,421.84							\$32,421.84	
1.009	LONGITUDINAL/TRANSVERSE JOINTS (INCLUDING WATERSTOPS)		228.2	LF	\$ 30.00	\$ 6,846.00							\$6,846.00	
1.010	PERIMETER WATERSTOPS		314.7	LF	\$ 135.00	\$ 42,484.50							\$42,484.50	
1.011	SEEDING		1	LS	\$8,130.00	\$ 8,130.00							\$8,130.00	
Totals						\$ 452,487.40				\$ 145,030.00	\$23,000.00	\$168,030.00	37.13%	\$ 284,457.40

Stored Material Summary

Contractor's Application

[illegible]

INVOICE

**Remit to:**

1401 21st Ave N, Fargo, ND 58102

Phone: 701.237.5065

Fed Tax ID: 45-0314557

Interest of 1%/month applied to past due invoices

Lower Platte North NRD

511 Commercial Park Road

Wahoo, NE 68066

Invoice Number: 63124

Date: January 04, 2023

Project Number: 022-22-01

P.O. Number: x

Lower Platte North NRD Wahahoo Apron Overlay**For Professional Services Rendered Through: December 31, 2022**

Task 3 Final Design			
	Hours	Rate	Billed
Project Engineer Miller, Ethan D.	17.25	160.00	\$2,760.00
Phase subtotal			\$2,760.00
Task 6 Construction Phase			
	Hours	Rate	Billed
Engineer 6 Keller, Wesley J.	1.50	166.00	\$249.00
Engineer Intern Suing, Eric R.	58.00	135.00	\$7,830.00
Principal Engineer Sotak, Michael K.	1.75	240.00	\$420.00
Project Engineer Miller, Ethan D.	4.25	160.00	\$680.00
Senior H&H Engineer Gregalunas, Robert J.	.50	220.00	\$110.00
PROJECT EXPENSES			
			Billed
Unit - Company Truck Mileage (OMA)			\$746.67
Unit - Survey Equipment (OMA)			\$62.50
Phase subtotal			\$10,098.17

Invoice Total \$12,858.17

Make all checks payable to:
Houston Engineering, Inc.
1401 21st Ave N
Fargo, ND 58102

Invoice Summary

Description	Contracted Fee	Previously Billed	This Invoice	Total To Date	% Complete
Task 1 Project Management	\$11,600.00	\$6,707.50	\$0.00	\$6,707.50	57.82%
Task 2 Site Testing/Investigation	\$6,740.00	\$4,404.56	\$0.00	\$4,404.56	65.35%
Task 3 Final Design	\$53,370.00	\$48,288.50	\$2,760.00	\$51,048.50	95.65%
Task 4 Permitting	\$5,240.00	\$0.00	\$0.00	\$0.00	0.00%
Task 5 Bid Phase	\$8,720.00	\$8,501.63	\$0.00	\$8,501.63	97.50%
Task 6 Construction Phase	\$78,770.00	\$8,076.08	\$10,098.17	\$18,174.25	23.07%
Total	\$164,440.00	\$75,978.27	\$12,858.17	\$88,836.44	54.02%

Aging Summary

Invoice	Date	0 - 30	31 - 60	61-90	Over 90	Balance
Total						

Make all checks payable to:
Houston Engineering, Inc.
1401 21st Ave N
Fargo, ND 58102



Wanahoo Apron Overlay
Invoice Task Summaries
December 7 thru December 31, 2022

Task 1 - Project Management

Project management duties during this invoicing period include internal efforts for processing the previous invoice.

Task 2 – Site Testing/Investigation

No work was performed this invoicing period.

Task 3 – Final Design

During this invoicing period modifications were developed for repairs of the site baffle plates.

Task 4 – Permitting

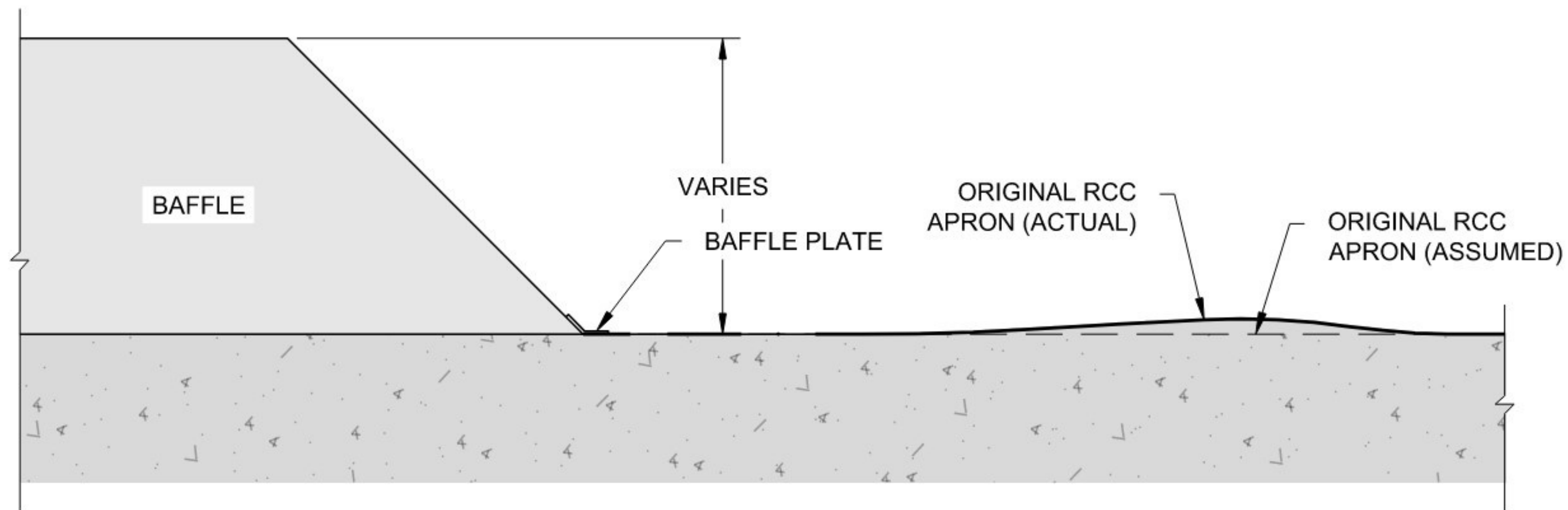
No work was performed this invoicing period.

Task 5 – Bid Phase

No work was performed this invoicing period.

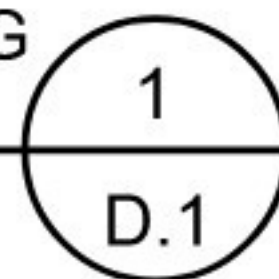
Task 6 – Construction Phase

During this invoicing period contractor submittals and payment applications were processed and construction was observed.



CONDITIONS OF RCC APRON DURING BAFFLE CONSTRUCTION

NO SCALE



Technical Memorandum

To: Lower Platte North NRD
Federal Emergency Management Agency (FEMA)
From: Houston Engineering
Re: Lake Wanahoo Apron Repairs – Quantity Overage
Date: 3 February 2023

1 INTRODUCTION

FYRA Engineering is providing engineering services for repairs to the stilling basin apron at the Doug Bereuter Dam at Lake Wanahoo in Wahoo, Nebraska. The dam is operated and maintained by the Lower Platte North Natural Resource District (NRD). Funding for repairs was obtained from FEMA under Public Assistance-Damage Recovery for damage sustained in the record 2019 bomb cyclone event.

2 BACKGROUND

Construction of the Wanahoo Dam was completed in the Fall of 2010. Emergency repairs to the stilling basin end sill were performed in 2021 to mitigate damages incurred during the 2019 flood. During construction of the 2021 repairs, when the water was drained from the stilling basin area, damages to the apron floor were observed that were not initially visible. The apron floor originally consisted of a 6-foot-thick roller compacted concrete (RCC) monolithic apron, which sits below a flip bucket designed to dissipate energy from the triple reinforced concrete box culvert principal spillway. Damage to the apron consisted of delamination of the RCC to depths of approximately 1-foot. The rationale for the incurred damages include:

- Reduced interface bonding between lifts of the RCC due to high temperature and dry conditions during construction.
- Freeze thaw cycles following loss of the end sill after the 2019 flood event.
- Hydraulic forces from the flip bucket spillway combined with loss of the end sill.

3 DAMAGE ASSESSMENT

To determine the extents of the damages to the RCC apron, a contractor was hired in the spring of 2022 to drain the basin and remove and discard the delaminated concrete. An extensive survey was then performed to log the damaged conditions and elevation of the RCC apron. Elevations across the apron varied between 1176ft and 1177ft (NAVD 88), as depicted in **Figure 3.1**.

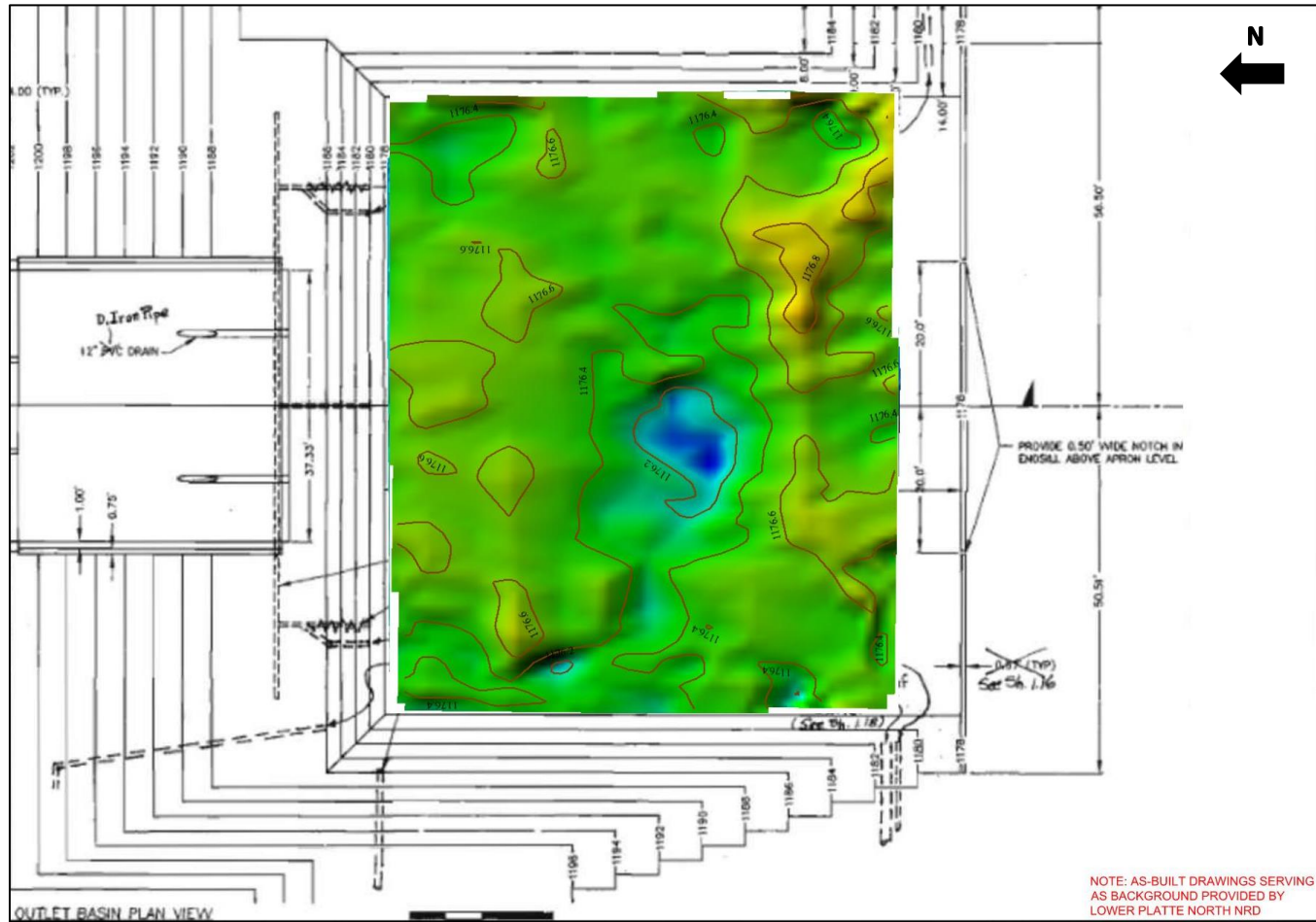


Figure 3.1 – Lake Wanahoo Scour Depth Map After Removals

4 DESIGN

4.1 Applied Loading

Due to budgetary and time constraints, a CFD model could not be completed to ascertain forces across the apron as a result of the flip bucket during significant runoff events. Without a CFD or physical model, laboratory studies performed by the Bureau of Reclamation (Frizell 2007 and Johnson 1976) were referenced to determine the maximum design loading acting upon the apron. Structural repair methods and design were determined based on guidance provided in Bureau of Reclamation Design Standard No. 14 (DS 14) and American Concrete Institute (ACI) Codes 318, 350, and 355.4. A complete summary of the method used to determine the applied loading can be found by referring to Technical Memo - Lake Wanahoo Apron Design (September 2022).

4.2 Structural Design

In accordance with guidelines published by the Bureau of Reclamation (DS 14), the Wanahoo apron will be repaired by applying a 12" fiber reinforced concrete overlay that is anchored to the underlying RCC apron with a series of steel anchors. The anchors and overlay will act to resist the hydraulic forces applied to the structure and prevent future delamination of the RCC Apron. A complete summary of the structural design can be found by referring to Technical Memo - Lake Wanahoo Apron Design (September 2022).

5 CONSTRUCTION

Construction of the designed modifications began in November of 2022. Once water was drained from the apron the contractor proceeded with grinding the RCC to provide a level base for the twelve inches fiber reinforced concrete overlay. The project was bid based on grinding depths ranging between zero and twelve inches, at an average of six inches across the basin. The grinding depths were estimated by comparing the surface developed during our assessment ([Section 3](#)) to a base elevation of 1176ft. This base elevation was set twelve inches below the baffle plates installed in 2021 as part of the end sill repairs. No direct surveys were taken of the baffle plates during the damage assessment, so the base elevation of the baffle plates was deduced. As-built documents note that the basin was poured to an elevation of 1176.5ft (NAVD 88), whereas our survey indicated the apron was poured up to an elevation of 1177ft (NAVD 88). The surveyed elevation of 1177ft was used to proceed with the design and quantity estimates. No additional survey was performed to confirm this elevation, as the basin was flooded and siltation had settled throughout the apron.

After completion of the grinding and prior to pouring the overlay, the contractor informed Houston Engineering that they estimated grinding depths averaging between nine and ten inches. An additional survey was performed at this time, which confirmed that the baffle plates were set at 1176.7ft, requiring grinding to extend to a depth of 1175.7ft.

6 SUMMARY

In order to recoup costs for the additional work, the contractor is requesting a payment of \$45,506.00, which is equivalent to the unit price multiplied by the overage in quantities. A summary of this overage, as well as further additions and subtractions needed to perform work to date, can be reviewed by referring to **Table 5.1**.

Table 5.1 – Summary of Deductions & Subtractions to Lake Wanahoo Apron Repair Project to Date

ITEM #	ITEM DESCRIPTION	UNIT	CHANGE IN QUANTITY	UNIT COST	TOTAL
1.003	RCC GRINDING/REMOVAL	CY	61	\$ 746.00	\$ 45,506.00
1.006	CLASS 6000 CONCRETE	CY	-6	\$ 596.78	\$ (3,461.32)
1.008	STEEL REINFORCEMENT - ALTERNATIVE B	LBS	2295	\$ 2.20	\$ 5,048.56
1.009	LONGITUDINAL/TRANSVERSE JOINTS (INCLUDING WATERSTOPS)	LF	-3	\$ 30.00	\$ (78.00)
1.010	PERIMETER WATERSTOPS	LF	-4.2	\$ 135.00	\$ (567.00)
				TOTAL	\$ 46,448.24

7 REFERENCES

Bureau of Reclamation Design Standard No. 14 (DS 14), August 2014. *Appurtenant Structures for Dams (Spillways and Outlet Works) Design Standard*.

Frizell, K.W., 2007. (Frizell 2007) *Uplift and Crack Flow Resulting from High Velocity Discharges over Open Offset Joints*. Report DSO-07-07, Bureau of Reclamation Dam Safety Technology Development Program.

Johnson, P. L. 1976 (Johnson 1976) *“Research into Uplift on Steep Chute Lateral Linings”*, USBR, Denver, Colorado.

Miller, Ethan and Gregalunas, Bob (September 2022) *“TM -Lake Wanahoo Apron Design”*, FYRA Engineering, Omaha, Nebraska.

**Contractor's Application for Payment No.**

3

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE		Application Period: 01/05/2023 Through 01/30/2023	Application Date: 1/30/2023
To: Lower Platte North Natural Resources District (Owner)	From : ME Collins Contracting Co., Inc. (Contractor)	Via (Engineer): Houston Engineering	
Project: Lake Wanahoo Apron Overlay	Contract:		
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.: 022-22-01	

Application For Payment

Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
001	\$44,358.91	
TOTALS	\$44,358.91	
NET CHANGE BY CHANGE ORDERS		\$44,358.91

1. ORIGINAL CONTRACT PRICE	\$452,487.40
2. Net change by Change Order	\$44,358.91
3. Current Contract Price (Line 1 + 2)	\$496,846.31
4. TOTAL COMPLETED AND STORED TO DATE (Column F total on Progress Estimates)	\$440,251.08
5. RETAINAGE:	
a. 10% X <u>\$ 440,251.08</u> Work Completed	\$44,025.11
b. 10% X <u>\$ -</u> Stored Material	
c. Total Retainage (Line 5.a + Line 5.b)	\$44,025.11
6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c)	\$396,225.97
7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)	\$148,927.00
8. AMOUNT DUE THIS APPLICATION	\$247,298.97
9. BALANCE TO FINISH, PLUS RETAINAGE (Column H total on Progress Estimates + Line 5.c above)	\$100,620.34

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:

(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;

(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and

(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor Signature

By:	Date:
-----	-------

Payment of: \$ 247,298.97
(Line 8 or other - attach explanation of the other amount)

is recommended by: Houston Engineering 1/31/2023
(Engineer) (Date)

Payment of: \$ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ (Owner) _____ (Date)

Approved by: _____
Funding or Financing Entity (if applicable) (Date)

Progress Estimate

Contractor's Application

For (Contract): Lake Wanhoo Apron Overlay										Application Number: 3			
Application Period: 01/05/2023 Through 01/30/2023										Application Date: 1/30/2023			
A					B	C1	C2	C3	D	E	F	G	H
Item			Contract Information			Estimated Quantity Installed this Pay Application Period	Previous Quantity Installed	Total Quantity Installed	Value of Work Installed to Date	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F / B)	Balance to Finish (B - F)
Bid Item No.	Description	Item Quantity	Units	Unit Price	Total Value of Item (\$)								
1.001	MOBILIZATION	1	LS	\$ 41,632.00	\$ 41,632.00	0.5	0.5	1	\$41,632.00		\$41,632.00	100.0%	
1.002	WATER HANDLING	1	LS	\$ 14,433.00	\$ 14,433.00		1	1	\$14,433.00		\$14,433.00	100.0%	
1.003	RCC GRINDING/REMOVAL	114	CY	\$ 746.00	\$ 85,044.00		114	114	\$85,044.00		\$85,044.00	100.0%	
1.004	BASIN CLEANING AND PREPARATION	1	LS	\$ 11,555.00	\$ 11,555.00		1	1	\$11,555.00		\$11,555.00	100.0%	
1.005	SET ANCHORS	169	EA	\$ 78.00	\$ 13,182.00		169	169	\$13,182.00		\$13,182.00	100.0%	
1.006	CLASS 6000 CONCRETE	227	CY	\$ 596.78	\$ 135,469.06	221.2		221.2	\$132,007.74		\$132,007.74	97.4%	\$3,461.32
1.007	FIBER REINFORCEMENT - ALTERNATIVE B	10215	LBS	\$ 6.00	\$ 61,290.00	10215		10215	\$61,290.00		\$61,290.00	100.0%	
1.008	STEEL REINFORCEMENT - ALTERNATIVE B	14737.2	LBS	\$ 2.20	\$ 32,421.84	14737		14737	\$32,421.84		\$32,421.84	100.0%	
1.009	LONGITUDINAL/TRANSVERSE JOINTS (INCLUDING WATERSTOPS)	228.2	LF	\$ 30.00	\$ 6,846.00	225.6		225.6	\$6,768.00		\$6,768.00	98.9%	\$78.00
1.010	PERIMETER WATERSTOPS	314.7	LF	\$ 135.00	\$ 42,484.50	310.5		310.5	\$41,917.50		\$41,917.50	98.7%	\$567.00
1.011	SEEDING	1	LS	\$8,130.00	\$ 8,130.00								\$8,130.00
1.012	RE-MOBILIZATION	1	LS	\$ 11,200.00	\$ 11,200.00								\$11,200.00
1.013	BAFFLE PLATE REMOVAL AND REPLACEMENT	86.5	LF	\$383.34	\$ 33,158.91								\$33,158.91
Totals					\$ 496,846.31				\$440,251.08		\$440,251.08	88.61%	\$ 56,595.23

Stored Material Summary

Contractor's Application

[illegible]

**Contractor's Application for Payment No.**

3

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE		Application Period: 01/05/2023 Through 01/30/2023	Application Date: 1/30/2023
To: Lower Platte North Natural Resources District (Owner)	From : ME Collins Contracting Co., Inc. (Contractor)	Via (Engineer): Houston Engineering	
Project: Lake Wanahoo Apron Overlay	Contract:		
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.: 022-22-01	

Application For Payment

Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
001	\$44,358.91	
002	\$46,448.24	
TOTALS	\$90,807.15	
NET CHANGE BY CHANGE ORDERS		\$90,807.15

1. ORIGINAL CONTRACT PRICE	\$452,487.40
2. Net change by Change Order	\$90,807.15
3. Current Contract Price (Line 1 + 2)	\$543,294.55
4. TOTAL COMPLETED AND STORED TO DATE (Column F total on Progress Estimates)	\$490,805.64
5. RETAINAGE*:	
a. 10% X <u>\$ 490,805.64</u> Work Completed	\$49,080.56
b. 10% X <u>\$ -</u> Stored Material	
c. Total Retainage (Line 5.a + Line 5.b)	\$49,080.56
6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c)	\$441,725.07
7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)	\$148,927.00
8. AMOUNT DUE THIS APPLICATION	\$292,798.07
9. BALANCE TO FINISH, PLUS RETAINAGE (Column H total on Progress Estimates + Line 5.c above)	\$101,569.48

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:

(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;

(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and

(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor Signature

By:	Date:
-----	-------

Payment of: \$ 292,798.07
(Line 8 or other - attach explanation of the other amount)

is recommended by: Houston Engineering 1/31/2023
(Engineer) (Date)

Payment of: \$ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ (Owner) _____ (Date)

Approved by: _____
Funding or Financing Entity (if applicable) (Date)

Progress Estimate

Contractor's Application

For (Contract): Lake Wanhoo Apron Overlay										Application Number: 3			
Application Period: 01/05/2023 Through 01/30/2023										Application Date: 1/30/2023			
A					B	C1	C2	C3	D	E	F	G	H
Item			Contract Information			Estimated Quantity Installed this Pay Application Period	Previous Quantity Installed	Total Quantity Installed	Value of Work Installed to Date	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F / B)	Balance to Finish (B - F)
Bid Item No.	Description	Item Quantity	Units	Unit Price	Total Value of Item (\$)								
1.001	MOBILIZATION	1	LS	\$ 41,632.00	\$ 41,632.00	0.5	0.5	1	\$41,632.00		\$41,632.00	100.0%	
1.002	WATER HANDLING	1	LS	\$ 14,433.00	\$ 14,433.00		1	1	\$14,433.00		\$14,433.00	100.0%	
1.003	RCC GRINDING/REMOVAL	175	CY	\$ 746.00	\$ 130,550.00	61	114	175	\$130,550.00		\$130,550.00	100.0%	
1.004	BASIN CLEANING AND PREPARATION	1	LS	\$ 11,555.00	\$ 11,555.00		1	1	\$11,555.00		\$11,555.00	100.0%	
1.005	SET ANCHORS	169	EA	\$ 78.00	\$ 13,182.00		169	169	\$13,182.00		\$13,182.00	100.0%	
1.006	CLASS 6000 CONCRETE	221.2	CY	\$ 596.78	\$ 132,007.74	221.2		221.2	\$132,007.74		\$132,007.74	100.0%	
1.007	FIBER REINFORCEMENT - ALTERNATIVE B	10215	LBS	\$ 6.00	\$ 61,290.00	10215		10215	\$61,290.00		\$61,290.00	100.0%	
1.008	STEEL REINFORCEMENT - ALTERNATIVE B	17032	LBS	\$ 2.20	\$ 37,470.40	17032		17032	\$37,470.40		\$37,470.40	100.0%	
1.009	LONGITUDINAL/TRANSVERSE JOINTS (INCLUDING WATERSTOPS)	225.6	LF	\$ 30.00	\$ 6,768.00	225.6		225.6	\$6,768.00		\$6,768.00	100.0%	
1.010	PERIMETER WATERSTOPS	310.5	LF	\$ 135.00	\$ 41,917.50	310.5		310.5	\$41,917.50		\$41,917.50	100.0%	
1.011	SEEDING	1	LS	\$8,130.00	\$ 8,130.00								\$8,130.00
1.012	RE-MOBILIZATION	1	LS	\$ 11,200.00	\$ 11,200.00								\$11,200.00
1.013	BAFFLE PLATE REMOVAL AND REPLACEMENT	86.5	LF	\$383.34	\$ 33,158.91								\$33,158.91
Totals					\$ 543,294.55				\$490,805.64		\$490,805.64	90.34%	\$ 52,488.91

Stored Material Summary

Contractor's Application

[illegible]

Table 1. Pressure Relief Well Results

Well #	Date	2020 Velocity (ft/s)	Date	2013 Velocity (ft/s)	Date	2012 Velocity (ft/s)	2020 Efficiency (%)	
							Versus 2013	Versus 2012
12	10.14.20	0.1	5.28.13	0.21	6.22.12	0.36	48	28
13	10.14.20	0.4	5.28.13	0.48	6.22.12	0.66	83	61
14	10.14.20	0.27	5.24.13	0.33	6.22.12	0.45	82	60
15	10.14.20	0.26	5.24.13	0.37	6.22.12	0.9	70	29
16	10.14.20	0.28	5.24.13	0.51	6.22.12	0.59	55	47
17	10.12.20	0.24	5.24.13	0.35	6.22.12	0.44	69	55
18	10.12.20	0.27	5.24.13	0.35	6.19.12	0.45	77	60
19	10.12.20	0.31	5.24.13	0.4	6.19.12	0.47	78	66
20	10.12.20	0.09	5.24.13	0.16	6.19.12	0.25	56	36
21	10.9.20	0.98	5.24.13	0.36	6.19.12	0.51	272	192
22	10.9.20	0.44	5.24.13	0.32	6.19.12	0.35	138	126
22A	10.9.20	NA	5.24.13	0.55	6.19.12	0.61	NA	NA
23	10.9.20	0.97	5.24.13	0.78	6.19.12	0.89	124	109
24	10.9.20	0.74	5.24.13	0.76	6.19.12	0.84	97	88
25	10.9.20	0.3	5.23.13	0.4	6.19.12	0.53	75	57
26	10.9.20	0.6	5.23.13	0.36	6.19.12	0.43	167	140
27	10.9.20	0.37	5.23.13	0.44	6.19.12	0.55	84	67
28	10.8.20	0.25	5.22.13	0.15	6.19.12	0.37	167	68
29	10.8.20	0.26	No Flow	NA	6.18.12	0.09	NA	289
30	10.8.20	0.64	No Flow	NA	No Flow	NA	NA	NA
31	10.8.20	0.29	5.22.13	0.78	6.18.12	2.71	37	11
32	10.7.20	0.5	5.22.13	0.67	6.18.12	2.21	75	23
33	10.6.20	0.07	10.16.13	0.47	6.18.12	0.05	15	140
34	10.6.20	0.05	5.22.13	0.6	6.18.12	0.55	8	9
35	10.7.20	0.06	5.22.13	0.56	6.18.12	0.66	11	9
36	10.7.20	0.26	5.22.13	0.46	6.18.12	0.58	57	45
37	10.7.20	0.47	5.21.13	0.28	6.18.12	0.68	168	69
38	10.12.20	0.14	5.21.13	0.23	6.18.12	0.26	61	54
39	10.12.20	0.21	No Flow	NA	6.18.12	0.03	NA	700

*NA indicates no velocity measurement was able to be performed

**2020 Efficiency is based on the ratio of 2020 velocity versus 2012 or 2013.

2022

2023

2024

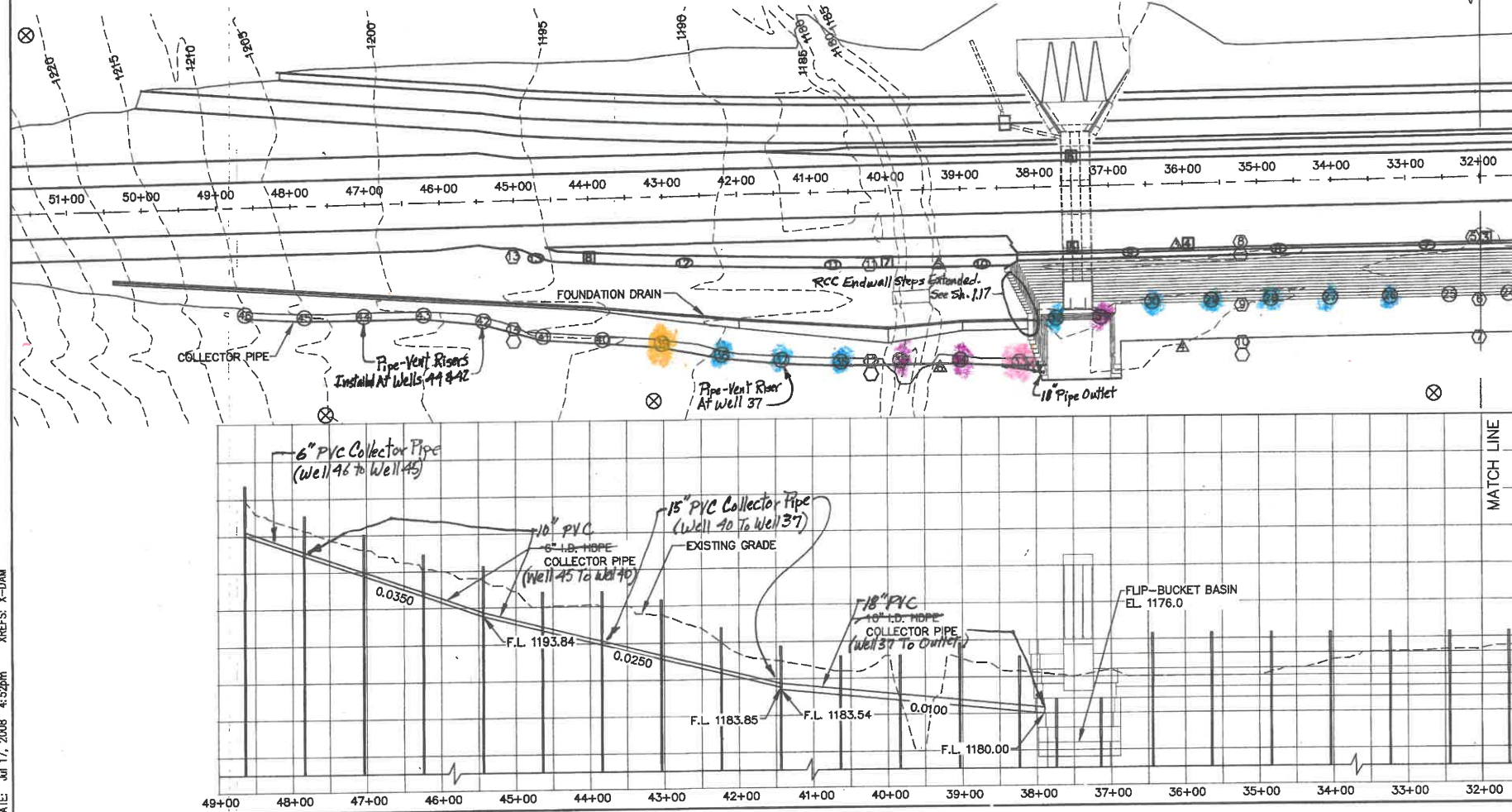
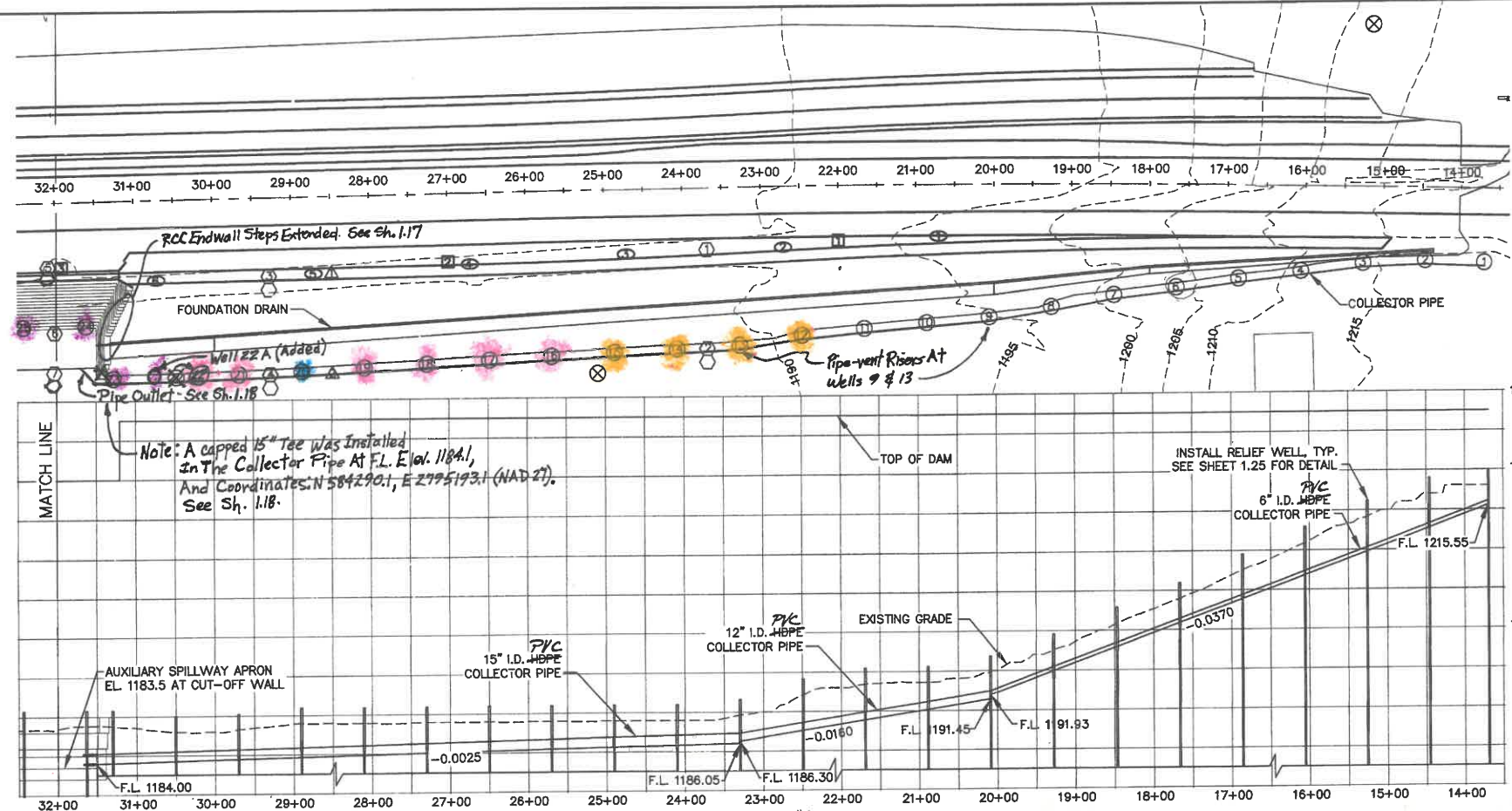
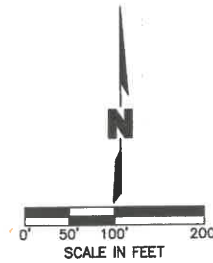
2025

4 years total

LEGEND

- SETTLEMENT PLATES
- MOVEMENT MARKERS
- INCLINOMETER CASINGS
- PRESSURE RELIEF WELLS
- PIEZOMETER
- DUAL-TIP PIEZOMETER
- EXISTING ARMY CORPS OF ENGINEERS-INSTALLED PIEZOMETERS

2012 7
2023 10
2024 7
2025 5



NUMBER	STATION	OFFSET	APPROX. EXISTING GROUND	APPROX. BASE DEPTH FROM EX. GROUND	*APPROX. SCREENED ELEV.
1	13+89	93.6' LT.	1218.6	95'	1196 - 1124
2	14+49	92.0' LT.	1217.3	95'	1199 TO 1124
3	15+29	96.6' LT.	1214.2	95'	1198 - 1118
4	16+09	107.6' LT.	1210.9	95'	1199 TO 1118
5	16+89	117.9' LT.	1207.5	95'	1196 TO 1115
6	17+89	129.4' LT.	1204.0	95'	1196 TO 1111
7	18+49	139.2' LT.	1200.8	85'	1186 TO 1116
8	19+29	154.2' LT.	1197.6	85'	1183 TO 1115
9	20+09	167.4' LT.	1195.0	85'	1181 TO 1112
10	20+89	174.0' LT.	1193.6	85'	1178 TO 1111
11	21+69	180.4' LT.	1193.5	85'	1177 TO 1111
12	22+49	188.2' LT.	1192.1	85'	1176 TO 1109
13	23+29	199.4' LT.	1189.4	85'	1176 TO 1106
14	24+09	203.1' LT.	1189.0	85'	1171 TO 1106
15	24+89	206.0' LT.	1189.0	80'	1179 TO 1111
16	25+69	208.8' LT.	1189.0	80'	1178 TO 1111
17	26+49	211.5' LT.	1189.0	80'	1177 TO 1111
18	27+29	214.6' LT.	1188.9	80'	1176 TO 1111
19	28+09	217.7' LT.	1188.8	80'	1176 TO 1111
20	28+89	220.4' LT.	1189.0	80'	1176 TO 1111
21	29+69	222.4' LT.	1188.2	80'	1175 TO 1110
22	30+49	224.1' LT.	1188.1	80'	1175 TO 1110
23	31+29	224.6' LT.	1188.8	80'	1175 TO 1111
24	31+63	152.8' LT.	1188.0	80'	1175 TO 1110
25	32+43	152.8' LT.	1188.0	80'	1175 TO 1110
26	33+23	152.8' LT.	1188.0	80'	1175 TO 1110
27	34+03	152.8' LT.	1188.0	80'	1175 TO 1110
28	34+83	152.8' LT.	1188.0	80'	1174 TO 1110
29	35+63	152.8' LT.	1188.0	80'	1174 TO 1110
30	36+43	152.8' LT.	1188.0	80'	1174 TO 1110
31	37+13	175.9' LT.	1180.0	80'	1173 TO 1102
32	37+73	175.9' LT.	1180.0	80'	1173 TO 1102
33	38+23	233.9' LT.	1185.8	80'	1173 TO 1108
34	39+03	229.1' LT.	1187.6	80'	1173 TO 1110
35	39+83	229.4' LT.	1186.0	80'	1173 TO 1108
36	40+63	228.0' LT.	1186.0	80'	1174 TO 1108
37	41+43	223.4' LT.	1187.4	85'	1175 TO 1104
38	42+23	214.4' LT.	1190.0	85'	1176 TO 1107
39	43+03	197.1' LT.	1193.8	85'	1175 TO 1111
40	43+83	190.0' LT.	1195.0	85'	1174 TO 1112
41	44+63	183.6' LT.	1195.0	95'	1177 TO 1111
42	45+43	160.3' LT.	1198.6	95'	1175 TO 1115
43	46+23	150.3' LT.	1200.3	95'	1175 TO 1115
44	47+03	149.8' LT.	1203.1	95'	1171 TO 1110
45	47+83	149.3' LT.	1205.7	95'	1170 TO 1113
46	48+63	143.7' LT.	1209.8	95'	1170 TO 1117

*BASED ON TEST BORINGS. ADJUSTMENT MAY BE NEEDED IF CLAYEY SAND OR POORLY GRADED SAND IS ENCOUNTERED AT DIFFERENT ELEVATION. SEE GEOTECHNICAL REPORT

OLSSON



REV. NO.	DATE	DESCRIPTION
1	March 2011	Complete. Revisions Noted.

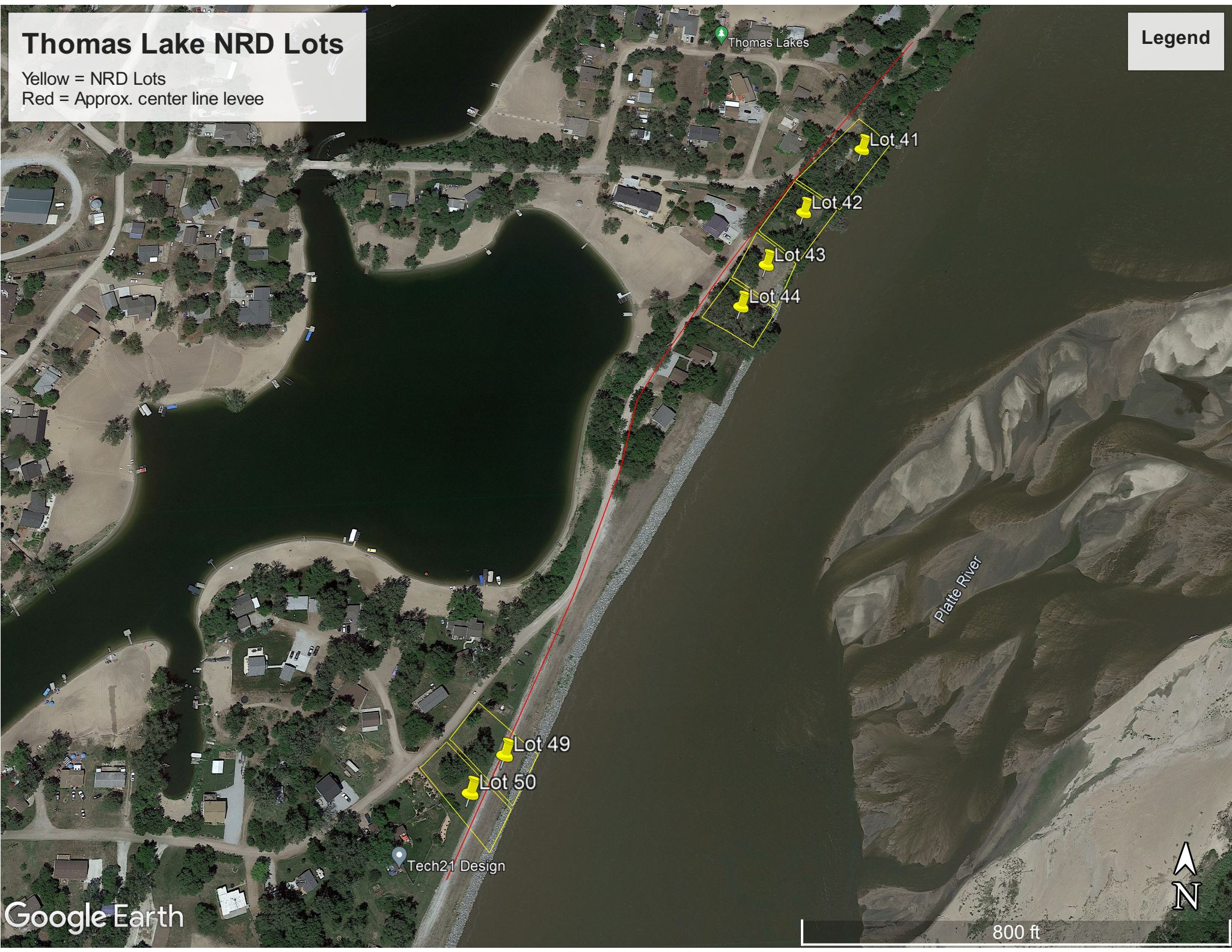
PRESSURE RELIEF WELLS AND INSTRUMENTS PLAN AND PROFILE

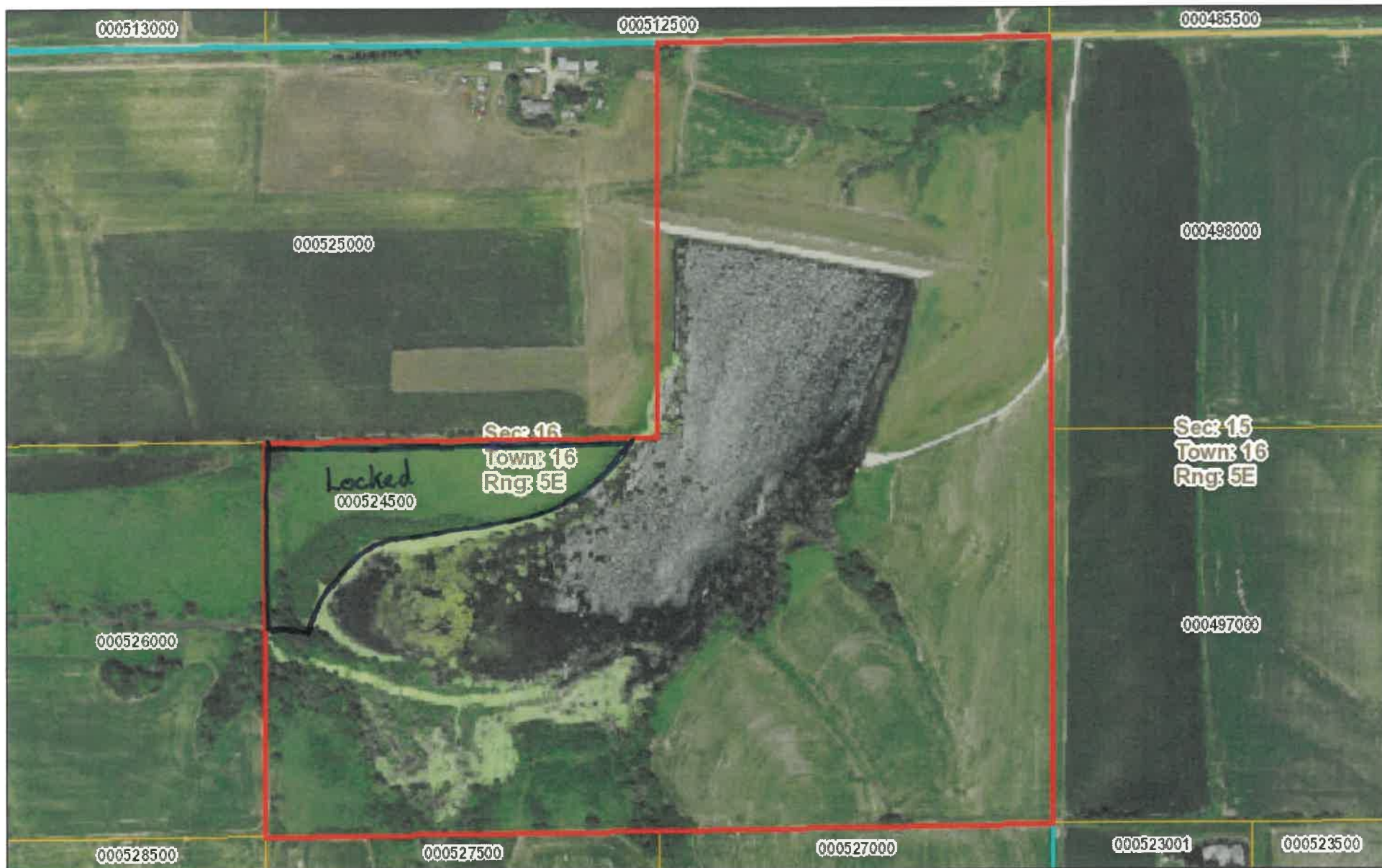
drawn by:
checked by:
approved by:
project no.:
drawing no.:
date:

Thomas Lake NRD Lots

Yellow = NRD Lots
Red = Approx. center line levee

Legend



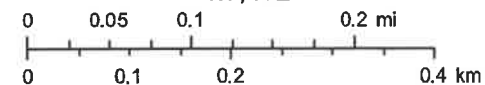


November 29, 2022

DISCLAIMER: This map is not intended for conveyances, nor is it a legal survey. The information is presented on a best-efforts basis, and should not be relied upon for making financial, survey, legal or other commitments.

-  Parcels
-  Sections

1:7,402





Attachment**Lower Platte North NRD – Structures exceeding planned Service Life:**

<i>Watershed and Structure:</i>	<i>NID No.:</i>	<i>Year Constructed:</i>	<i>Service Life:</i>	<i>Age as of 2021:</i>
Swedeburg B-2	NE00046	1954	50	67
Swedeburg B-2A	NE00047	1954	50	67
Swedeburg B-3	NE00045	1954	50	67
Swedeburg 2B-1	NE00049	1957	50	64
Swedeburg 2B-2F	NE00048	1957	50	64
Bellwood 3-A	NE00016	1965	50	56
Bellwood 4-K	NE00017	1965	50	56
Bellwood 5-G	NE00015	1965	50	56
Bellwood 3-C	NE00020	1966	50	55
Bellwood 5-J	NE00019	1966	50	55
Cottonwood Creek 42-A	NE00054	1967	50	54
Cottonwood Creek 6-D	NE00053	1967	50	54
Cottonwood Creek 6-C	NE00056	1968	50	53
Cottonwood Creek 8-D	NE00057	1968	50	53
Bellwood 4-L	NE00023	1969	50	52
Bellwood 6-E	NE00024	1969	50	52
Bellwood 5-H	NE00026	1970	50	51
Bellwood 6-F	NE00025	1970	50	51
Cottonwood Creek 23-A	NE00058	1970	50	51
Cottonwood Creek 41-A	NE00059	1970	50	51

Rediscover the Outdoors

2023 Lake Wanahoo

NRD Recreation Area Permits are now available! Stop by the office in Wahoo or order online at lpnnrd.org



LOWER PLATTE NORTH
Natural Resources District



News Channel Nebraska
214 N. 7th St. Suite 1
Norfolk, NE 68701
(402)-371-0100

News Channel Nebraska Invoice

Invoice ID: 23010151
Invoice Date: 1/31/2023
Account ID: 0552
Order ID: 0552-005
Account Rep: Ali Hupp

Amount Due: \$475.00

Amount Paid: _____

LOWER PLATTE NRD
PO BOX 126
WAHOO, NE 68066

Please remit payment to:
214 N. 7th St. Suite 1
Norfolk, NE 68701

Sponsor: Lower Platte NRD / News Sponsorship
News Sponsorship

Page 1

Date	Description	Times	Times	Times	Times	Times	Qty	Rate	Cost
1/1/2023	:30 Spot	06:10 AM					1	[Package]	[Package]
1/2/2023	:05 Bonus	09:06 AM	04:05 PM				2	[Package]	[Package]
1/2/2023	:05 Spot	01:07 PM	10:33 PM				2	[Package]	[Package]
1/2/2023	:30 Spot	07:58 AM	11:11 AM				2	[Package]	[Package]
1/3/2023	:05 Bonus	02:06 AM	04:09 PM				2	[Package]	[Package]
1/3/2023	:05 Spot	09:06 AM					1	[Package]	[Package]
1/3/2023	:30 Spot	10:43 PM					1	[Package]	[Package]
1/4/2023	:05 Bonus	02:06 AM	10:06 PM				2	[Package]	[Package]
1/4/2023	:05 Spot	12:31 PM	05:03 PM				2	[Package]	[Package]
1/4/2023	:30 Bonus	03:06 AM	11:45 AM				2	[Package]	[Package]
1/4/2023	:30 Spot	05:24 AM	07:44 AM	09:44 AM	10:43 AM	03:05 PM	5	[Package]	[Package]
1/5/2023	:05 Bonus	05:40 AM	11:08 AM				2	[Package]	[Package]
1/5/2023	:05 Spot	09:06 AM	10:06 PM				2	[Package]	[Package]
1/5/2023	:30 Bonus	02:24 AM	12:53 PM				2	[Package]	[Package]
1/5/2023	:30 Spot	04:16 AM	01:44 PM	03:44 PM	05:23 PM	11:45 PM	5	[Package]	[Package]
1/6/2023	:05 Bonus	03:28 AM	03:36 PM				2	[Package]	[Package]
1/6/2023	:05 Spot	06:33 AM	10:05 AM	02:09 PM			3	[Package]	[Package]
1/6/2023	:30 Bonus	02:48 AM					1	[Package]	[Package]
1/6/2023	:30 Spot	05:53 AM	07:53 AM	12:58 PM	04:42 PM		4	[Package]	[Package]
1/7/2023	:30 Spot	07:10 AM	08:50 PM				2	[Package]	[Package]
1/8/2023	:30 Spot	06:54 PM	09:05 PM				2	[Package]	[Package]
1/9/2023	:05 Bonus	11:06 AM	04:06 PM				2	[Package]	[Package]
1/9/2023	:05 Spot	07:31 AM	07:38 PM				2	[Package]	[Package]
1/9/2023	:30 Spot	09:57 AM					1	[Package]	[Package]
1/10/2023	:05 Bonus	02:31 AM	03:06 PM				2	[Package]	[Package]
1/10/2023	:05 Spot	12:06 PM	10:06 PM				2	[Package]	[Package]
1/10/2023	:30 Bonus	05:42 AM					1	[Package]	[Package]
1/10/2023	:30 Spot	04:56 AM	06:56 AM				2	[Package]	[Package]
1/11/2023	:05 Bonus	09:33 AM	10:05 PM				2	[Package]	[Package]
1/11/2023	:05 Spot	10:33 AM	03:05 PM				2	[Package]	[Package]
1/11/2023	:30 Bonus	03:48 AM	05:00 AM				2	[Package]	[Package]
1/11/2023	:30 Spot	02:46 AM	07:56 AM	11:17 AM	12:10 PM	05:56 PM	5	[Package]	[Package]
1/12/2023	:05 Bonus	06:32 AM	09:33 PM				2	[Package]	[Package]
1/12/2023	:05 Spot	01:05 PM	04:31 PM				2	[Package]	[Package]
1/12/2023	:30 Bonus	07:22 AM	09:54 AM				2	[Package]	[Package]
1/12/2023	:30 Spot	03:33 AM	05:36 AM	10:54 AM	12:15 PM	03:54 PM	5	[Package]	[Package]
1/13/2023	:05 Bonus	09:31 AM	10:45 PM				2	[Package]	[Package]
1/13/2023	:05 Spot	12:06 PM	04:00 PM				2	[Package]	[Package]
1/13/2023	:30 Bonus	02:36 AM					1	[Package]	[Package]
1/13/2023	:30 Spot	01:32 AM	03:42 AM	06:44 AM	11:20 AM	11:26 PM	5	[Package]	[Package]
1/14/2023	:30 Spot	07:17 AM	11:43 PM				2	[Package]	[Package]
1/15/2023	:30 Spot	05:42 PM	09:36 PM				2	[Package]	[Package]
1/16/2023	:05 Bonus	07:05 AM	07:14 PM				2	[Package]	[Package]

Continued

News Channel Nebraska Invoice

Invoice ID: 23010151

Invoice Date: 1/31/2023

Sponsor: Lower Platte NRD / News Sponsorship
News Sponsorship

Page 2

Date	Description	Times	Times	Times	Times	Times	Qty	Rate	Cost
1/16/2023	:05 Spot	10:06 AM	05:33 PM				2	[Package]	[Package]
1/16/2023	:30 Spot	06:12 AM					1	[Package]	[Package]
1/17/2023	:05 Bonus	09:05 AM	03:32 PM				2	[Package]	[Package]
1/17/2023	:05 Spot	02:05 PM	10:07 PM				2	[Package]	[Package]
1/17/2023	:30 Bonus	11:05 AM					1	[Package]	[Package]
1/17/2023	:30 Spot	02:12 AM					1	[Package]	[Package]
1/18/2023	:05 Bonus	03:11 AM	11:42 PM				2	[Package]	[Package]
1/18/2023	:05 Spot	11:06 AM	03:06 PM				2	[Package]	[Package]
1/18/2023	:30 Bonus	04:21 AM	10:14 PM				2	[Package]	[Package]
1/18/2023	:30 Spot	05:55 AM	06:45 AM	09:10 AM	10:16 AM	06:11 PM	5	[Package]	[Package]
1/19/2023	:05 Bonus	05:35 AM	11:30 PM				2	[Package]	[Package]
1/19/2023	:05 Spot	12:03 PM	05:09 PM				2	[Package]	[Package]
1/19/2023	:30 Bonus	07:44 AM					1	[Package]	[Package]
1/19/2023	:30 Spot	04:23 AM	06:44 AM	10:45 AM	02:41 PM	03:53 PM	5	[Package]	[Package]
1/20/2023	:05 Bonus	04:01 AM	10:05 PM				2	[Package]	[Package]
1/20/2023	:05 Spot	02:06 PM	03:06 PM				2	[Package]	[Package]
1/20/2023	:30 Bonus	03:17 AM	11:44 PM				2	[Package]	[Package]
1/20/2023	:30 Spot	05:37 AM	07:12 AM	09:45 AM	10:55 AM	12:22 PM	5	[Package]	[Package]
1/21/2023	:30 Spot	05:35 PM	10:45 PM				2	[Package]	[Package]
1/22/2023	:30 Spot	05:45 PM	10:46 PM				2	[Package]	[Package]
1/23/2023	:05 Bonus	07:32 AM	10:06 PM				2	[Package]	[Package]
1/23/2023	:05 Spot	12:33 PM	05:10 PM				2	[Package]	[Package]
1/23/2023	:30 Spot	09:47 AM					1	[Package]	[Package]
1/24/2023	:05 Bonus	04:41 AM	10:06 PM				2	[Package]	[Package]
1/24/2023	:05 Spot	10:05 AM	03:06 PM				2	[Package]	[Package]
1/24/2023	:30 Spot	05:42 AM					1	[Package]	[Package]
1/25/2023	:05 Bonus	02:06 AM	09:06 AM				2	[Package]	[Package]
1/25/2023	:05 Spot	02:05 PM	05:35 PM				2	[Package]	[Package]
1/25/2023	:30 Bonus	03:48 AM	03:13 PM				2	[Package]	[Package]
1/25/2023	:30 Spot	04:15 AM	07:46 AM	11:16 AM	12:45 PM	10:47 PM	5	[Package]	[Package]
1/26/2023	:05 Bonus	04:05 PM	11:07 PM				2	[Package]	[Package]
1/26/2023	:05 Spot	09:06 AM	02:05 PM				2	[Package]	[Package]
1/26/2023	:30 Bonus	02:44 AM	03:14 AM	05:50 AM			3	[Package]	[Package]
1/26/2023	:30 Spot	04:51 AM	06:45 AM	12:43 PM	01:12 PM	03:20 PM	5	[Package]	[Package]
1/27/2023	:05 Bonus	03:07 AM	03:07 PM				2	[Package]	[Package]
1/27/2023	:05 Spot	12:33 PM	09:13 PM				2	[Package]	[Package]
1/27/2023	:30 Bonus	04:58 AM	01:15 PM				2	[Package]	[Package]
1/27/2023	:30 Spot	02:44 AM	07:53 AM	09:44 AM	10:54 AM	10:28 PM	5	[Package]	[Package]
1/28/2023	:30 Spot	07:10 AM	10:11 PM				2	[Package]	[Package]
1/29/2023	:30 Spot	05:42 PM	08:42 PM				2	[Package]	[Package]
1/30/2023	:05 Bonus	12:32 PM	07:35 PM				2	[Package]	[Package]
1/30/2023	:05 Spot	07:33 AM	03:03 PM				2	[Package]	[Package]
1/30/2023	:30 Spot	09:44 AM					1	[Package]	[Package]
1/31/2023	:05 Bonus	03:09 AM	11:06 AM				2	[Package]	[Package]
1/31/2023	:05 Spot	05:11 PM	07:20 PM				2	[Package]	[Package]
1/31/2023	:30 Spot	02:12 AM					1	[Package]	[Package]
1/31/2023	Package						1	475.00	475.00
200 Total Items								Total Cost:	\$475.00

Amount Due: **\$475.00**

Shell Creek Research Group

2023 Order Request

Newman Grove High School

Forestry Suppliers 205 West Rankin St Jackson, MS 39201 800-647-5368					
	Description	Item Number	Price	Quantity	Total
	Nitrate Test Kit	94834	\$66.95	4	\$267.80
	Phosphate Test Kit	94837	\$56.25	1	\$56.25
	pH Test Kit	94836	\$74.95	1	\$74.95
	Chest Waders	94507	\$122.25	1	\$122.25
	Chest Waders	94510	\$122.25	1	\$122.25
	1 ml pipettes	53891	\$7.25	5	\$36.25
Vernier 13979 SW Millikan Way Beaverton, OR 97005 1-888-837-6437 www.vernier.com					
	LabQuest 3	LABQ3	\$399.00	1	\$399.00
	Go Direct Optical Dissolved	GDX-ODO	\$359.00	1	\$359.00
	ODO Clamp	GDX-Clamp	\$14.00	1	\$14.00
	ODO Cap	GDX-ODO-CAP	\$79.00	2	\$158.00
				TOTAL	\$1,609.75

T16N R8E S31

T16N R8E S32

G-052570

T15N R07E S5

Date/Time	Output	Value	Unit
7/25/2021 10:16	Flow 1		0 gpm
7/25/2021 10:48	Flow 1	502	gpm
7/25/2021 11:04	Flow 1	502	gpm
7/25/2021 11:43	Flow 1	487	gpm
7/25/2021 12:00	Flow 1	487	gpm
7/25/2021 12:38	Flow 1	507	gpm
7/25/2021 15:06	Flow 1	442	gpm
7/25/2021 15:42	Flow 1	403	gpm
7/25/2021 16:52	Flow 1	482	gpm
7/25/2021 18:00	Flow 1	497	gpm
7/25/2021 18:45	Flow 1	542	gpm
7/25/2021 21:00	Flow 1	457	gpm
7/25/2021 21:48	Flow 1	532	gpm
7/26/2021 0:00	Flow 1	547	gpm
7/26/2021 0:45	Flow 1	542	gpm
7/26/2021 3:03	Flow 1	547	gpm
7/26/2021 3:44	Flow 1	542	gpm
7/26/2021 4:52	Flow 1	547	gpm
7/26/2021 6:12	Flow 1	532	gpm
7/26/2021 6:54	Flow 1	537	gpm
7/26/2021 9:08	Flow 1	552	gpm
7/26/2021 9:57	Flow 1	542	gpm
7/26/2021 12:07	Flow 1	552	gpm
7/26/2021 12:55	Flow 1	537	gpm
7/26/2021 15:14	Flow 1	542	gpm
7/26/2021 15:57	Flow 1	547	gpm
7/26/2021 17:03	Flow 1	542	gpm
7/26/2021 18:13	Flow 1	532	gpm
7/26/2021 19:04	Flow 1	542	gpm
7/26/2021 21:14	Flow 1	537	gpm
7/26/2021 22:06	Flow 1	542	gpm
7/27/2021 0:21	Flow 1	537	gpm
7/27/2021 1:08	Flow 1	547	gpm
7/27/2021 3:20	Flow 1	537	gpm
7/27/2021 4:06	Flow 1	537	gpm
7/27/2021 5:10	Flow 1	537	gpm
7/27/2021 6:25	Flow 1	512	gpm
7/27/2021 7:05	Flow 1	502	gpm
7/27/2021 9:24	Flow 1	482	gpm
7/27/2021 10:12	Flow 1	467	gpm
7/27/2021 12:33	Flow 1	423	gpm
7/27/2021 13:14	Flow 1	393	gpm
7/27/2021 15:33	Flow 1	393	gpm
7/27/2021 16:16	Flow 1	393	gpm
7/27/2021 17:18	Flow 1	393	gpm
7/27/2021 18:42	Flow 1	428	gpm

Flow meter log from full revolution of pivot during irrigation even from 7/25/2021 through 7/31/2021. Flows range from about 400 gpm with corner system fully retracted to about 550 gpm with corner system full extended. Average is 513 gpm.

Date/Time	Output	Value	Unit
7/27/2021 19:21	Flow 1	428	gpm
7/27/2021 21:47	Flow 1	452	gpm
7/27/2021 22:18	Flow 1	418	gpm
7/28/2021 0:45	Flow 1	527	gpm
7/28/2021 1:20	Flow 1	547	gpm
7/28/2021 3:52	Flow 1	527	gpm
7/28/2021 4:19	Flow 1	527	gpm
7/28/2021 5:34	Flow 1	537	gpm
7/28/2021 6:51	Flow 1	537	gpm
7/28/2021 7:26	Flow 1	542	gpm
7/28/2021 9:55	Flow 1	527	gpm
7/28/2021 10:29	Flow 1	542	gpm
7/28/2021 13:02	Flow 1	502	gpm
7/28/2021 13:30	Flow 1	522	gpm
7/28/2021 16:04	Flow 1	492	gpm
7/28/2021 16:37	Flow 1	492	gpm
7/28/2021 17:33	Flow 1	497	gpm
7/28/2021 19:10	Flow 1	527	gpm
7/28/2021 19:41	Flow 1	532	gpm
7/28/2021 22:14	Flow 1	547	gpm
7/28/2021 22:34	Flow 1	537	gpm
7/29/2021 1:09	Flow 1	532	gpm
7/29/2021 1:45	Flow 1	542	gpm
7/29/2021 4:19	Flow 1	547	gpm
7/29/2021 4:50	Flow 1	547	gpm
7/29/2021 5:43	Flow 1	537	gpm
7/29/2021 7:23	Flow 1	532	gpm
7/29/2021 7:46	Flow 1	542	gpm
7/29/2021 7:58	Flow 1	537	gpm
7/29/2021 10:27	Flow 1	547	gpm
7/29/2021 10:48	Flow 1	542	gpm
7/29/2021 13:23	Flow 1	537	gpm
7/29/2021 13:56	Flow 1	527	gpm
7/29/2021 16:27	Flow 1	537	gpm
7/29/2021 16:52	Flow 1	537	gpm
7/29/2021 17:52	Flow 1	542	gpm
7/29/2021 19:30	Flow 1	542	gpm
7/29/2021 19:58	Flow 1	492	gpm
7/29/2021 22:27	Flow 1	492	gpm
7/29/2021 22:59	Flow 1	457	gpm
7/30/2021 1:36	Flow 1	393	gpm
7/30/2021 2:05	Flow 1	393	gpm
7/30/2021 4:36	Flow 1	537	gpm
7/30/2021 5:05	Flow 1	532	gpm
7/30/2021 5:51	Flow 1	532	gpm
7/30/2021 7:38	Flow 1	537	gpm

Date/Time	Output	Value	Unit
7/30/2021 8:02	Flow 1	527	gpm
7/30/2021 10:43	Flow 1	537	gpm
7/30/2021 11:09	Flow 1	532	gpm
7/30/2021 13:44	Flow 1	542	gpm
7/30/2021 14:13	Flow 1	532	gpm
7/30/2021 16:38	Flow 1	537	gpm
7/30/2021 17:15	Flow 1	542	gpm
7/30/2021 17:58	Flow 1	547	gpm
7/30/2021 19:43	Flow 1	542	gpm
7/30/2021 20:15	Flow 1	542	gpm
7/30/2021 22:49	Flow 1	522	gpm
7/30/2021 23:21	Flow 1	527	gpm
7/31/2021 1:55	Flow 1	532	gpm
7/31/2021 2:23	Flow 1	527	gpm
7/31/2021 5:23	Flow 1	0	gpm

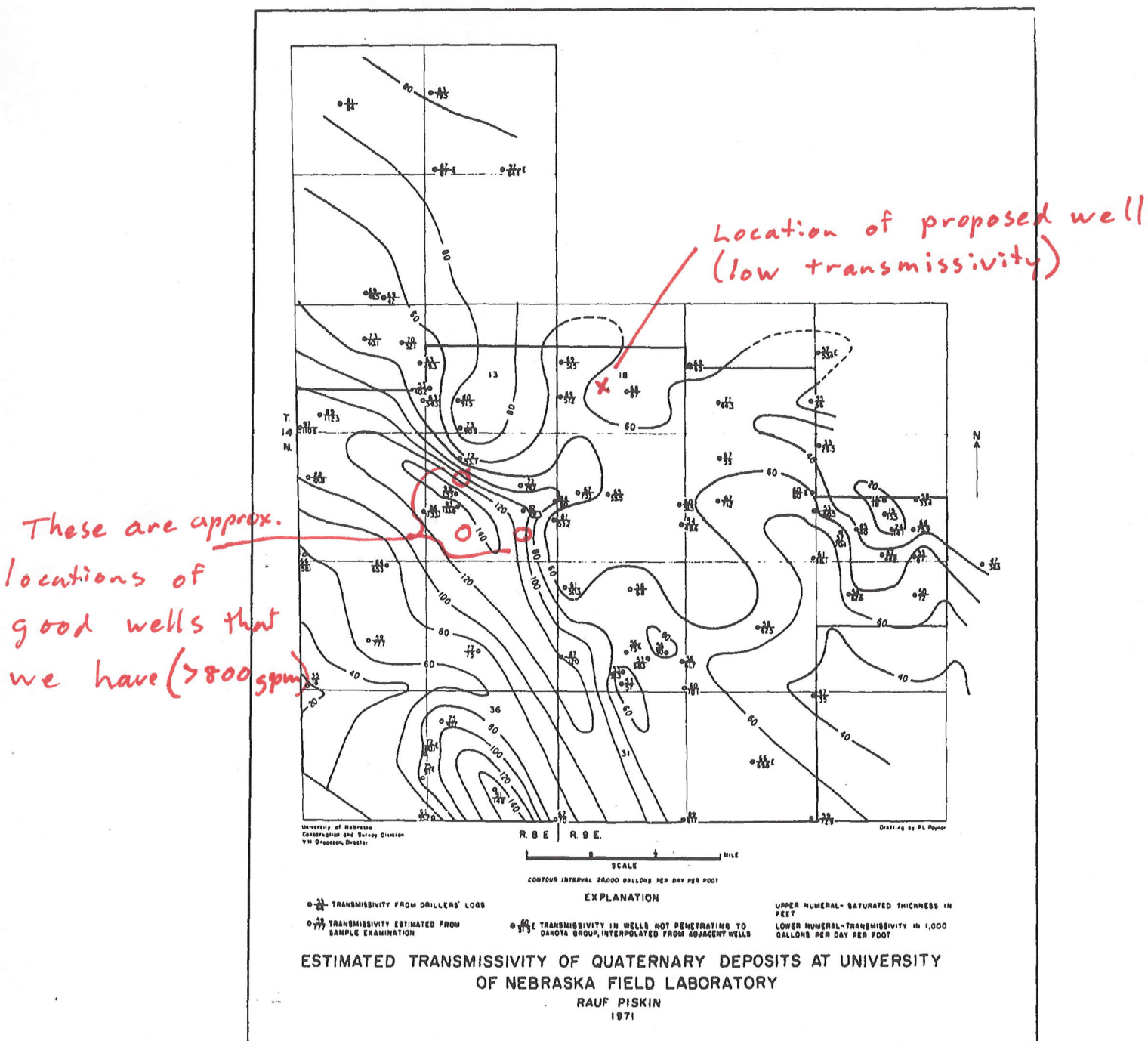


Figure 16.- Estimated transmissivity of Quaternary deposits at the University of Nebraska Field Laboratory.



12/9/2022

Lower Platte North NRD
PO Box 126
Wahoo, NE 68066

Dear Lower Platte North NRD Board,

The current well (G-087929) that supplies our center pivot on field we identify as 1863 produces a maximum rate of approximately 550 gpm. This center pivot is equipped with a swing-arm corner and an end-gun. System flow has to be substantially higher when the swing-arm is extended and end-gun is on. As a result, it has been necessary to size the nozzles on the pivot to have a maximum flow of 550 gpm and the system is operated with the end-gun always off. With that nozzle package, the average system flow during a complete revolution of the pivot has been about 513 gpm (see attached Flow Log). For this 161.2 acre field that equates to an average of 3.18 gallons/minute/acre.

Extension Publication "Center Pivot Irrigation Management Handbook" from University of Nebraska-Lincoln recommends a net system capacity for silty clay loam soils in eastern Nebraska to have a minimum 4.24 gallons/minute/acre. For this 161.2 acre field, that would be an average of 683 gpm over the course of the complete revolution. Due to the wide range of flow needed with a corner system with end-gun, I am estimating that we will need a peak flow of about 900 gpm when swing-arm is out and end-gun is on.

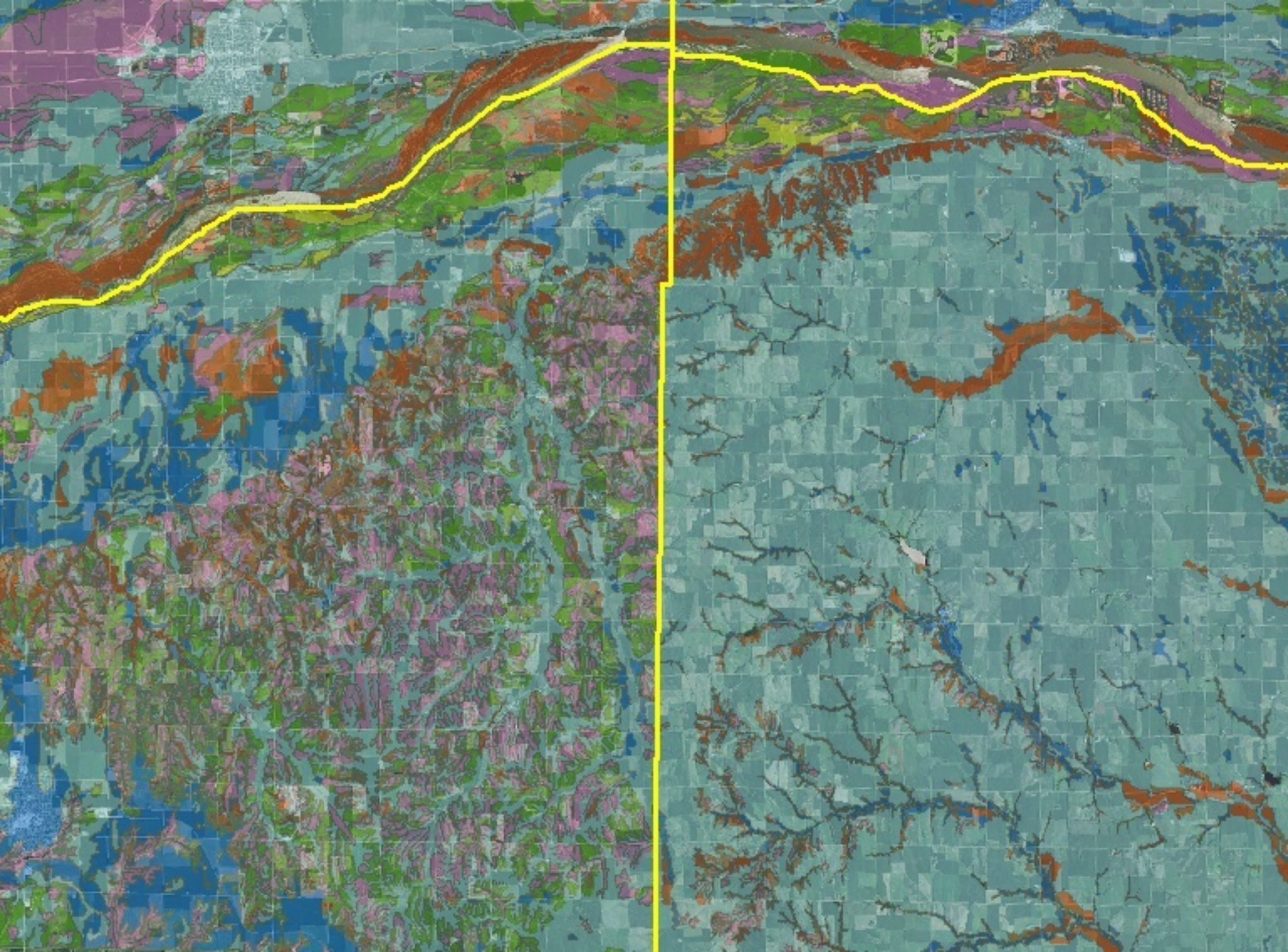
Abandoned wells that previously supplied this field (G-036211 and G-036211) produced low flow rates similar to the current well. An estimated transmissivity of quaternary deposits map (attached) created of the area predicts that well output for this field would be lower than other areas of our property. Based on these items, we don't believe we will be able to drill a single well capable of meeting 900 gpm. To increase capacity, we would like to install a supplemental well into this system.

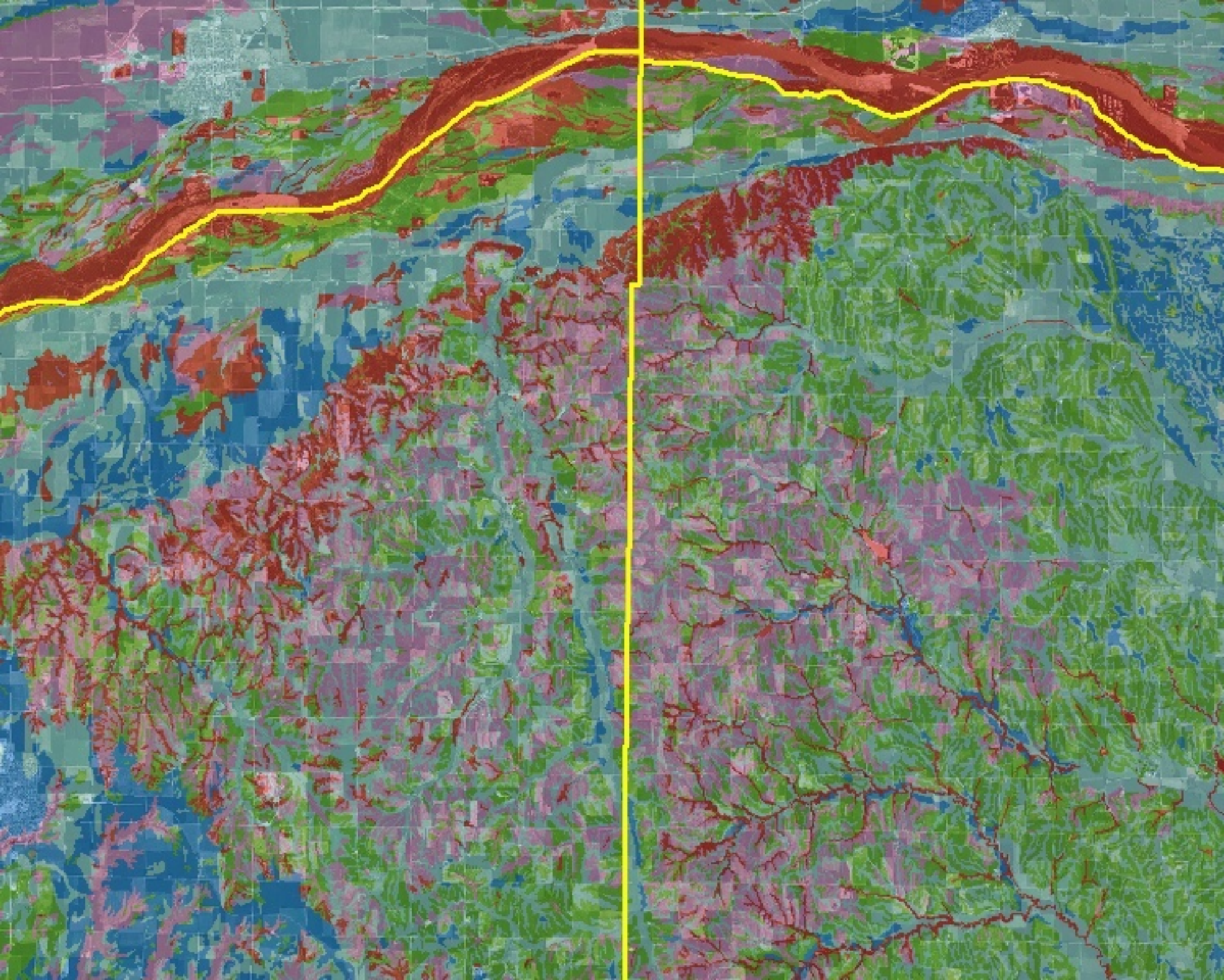
Having a reduced system capacity limits our ability to properly perform research. Crops grown on the field can become water-stressed to the point where it confounds the effect of other treatments in the field (e.g., various nitrogen rates, cover crops, etc.). Increasing system capacity will allow us to perform research on this field without having to worry about this issue.

Thank you for your consideration in this matter.

Sincerely yours,

Tyler Frederick
Assistant Farm Manager
ENREEC Farm Operations
University of Nebraska-Lincoln





Draft Changes				
Application Number	Applicant Name	Date:	1/30/23 2:15 PM	
TRANSFER (2)	Duane Johnson		Total Score->	279.7
Category	Divisions	Points Available	Percent of Application	Points Received
New Groundwater Consumptive Use	WF= 1.0			
	0 to 8 Acre Feet	100	100	100
	9 to 16 Acre Feet	80	0	0
	17 to 24 Acre Feet	60	0	0
	25 to 32 Acre Feet	40	0	0
	33 to 40 Acre Feet	20	0	0
	41+ Acre Feet	0	0	0
			Total ->	100
Land Class of field	WF= 1.0			
	No Land Impact	100	0	0
	Class 1	100	0	0
	Class 2	80	9	7.2
	Class 3	60	0	0
	Class 4	40	0	0
	Class 5	10	0	0
	Class 6-8/ not more than 20%	0	91	0
			Total ->	7.2
Stream Depletion Factor From DNR	WF= 1.25			
	10 to 20%	100	0	0
	21 to 30%	90	0	0
	31 to 40%	80	0	0
	41 to 50%	70	0	0
	51 to 60%	60	0	0
	61 to 70%	50	0	0
	71 to 80%	40	0	0
	81 to 90%	20	0	0
	>90%	10	100	12.5
			Total ->	12.5
Saturated Thickness	WF= 1.0			
	176 to 200 ft.	100	0	0
	151 to 175 ft.	90	0	0
	126 to 150 ft.	80	0	0
	101 to 125 ft.	70	0	0
	76 to 100 ft.	40	0	0
	51 to 75 ft.	20	0	0

Draft Changes				
Application Number	Applicant Name	Date:	1/30/23 2:16 PM	
TRANSFER (2)	Duane Johnson		Total Score->	351.9
Category	Divisions	Points Available	Percent of Application	Points Received
New Groundwater Consumptive Use	WF= 1.0			
	0 to 8 Acre Feet	100	100	100
	9 to 16 Acre Feet	80	0	0
	17 to 24 Acre Feet	60	0	0
	25 to 32 Acre Feet	40	0	0
	33 to 40 Acre Feet	20	0	0
	41+ Acre Feet	0	0	0
			Total ->	100
Land Class of field	WF= 1.0			
	No Land Impact	100	0	0
	Class 1	100	0	0
	Class 2	80	97	77.6
	Class 3	60	3	1.8
	Class 4	40	0	0
	Class 5	10	0	0
	Class 6-8/ not more than 20%	0	0	0
			Total ->	79.4
Stream Depletion Factor From DNR	WF= 1.25			
	10 to 20%	100	0	0
	21 to 30%	90	0	0
	31 to 40%	80	0	0
	41 to 50%	70	0	0
	51 to 60%	60	0	0
	61 to 70%	50	0	0
	71 to 80%	40	0	0
	81 to 90%	20	0	0
	>90%	10	100	12.5
			Total ->	12.5
Saturated Thickness	WF= 1.0			
	176 to 200 ft.	100	0	0
	151 to 175 ft.	90	0	0
	126 to 150 ft.	80	0	0
	101 to 125 ft.	70	0	0
	76 to 100 ft.	40	0	0
	51 to 75 ft.	20	0	0

An aerial photograph of a landscape, likely a wetland or marsh area, with various colored overlays. A large, irregular magenta boundary encloses most of the image. Within this boundary, there are two main colored regions: a light blue area on the left and a brown area on the right. The text 'T14N R7E S25' is printed in yellow in the brown area. The background shows a mix of green, blue, and brown textures, suggesting different land cover types like water, vegetation, and bare earth. A small white square is visible in the brown area, and a small red square is visible in the light blue area. The top of the image shows a road or canal with some structures.

T14N R7E S25

An aerial photograph of a landscape, likely a wetland or marsh, with a pink boundary line and a green shaded area. The pink boundary is a large, irregular polygon that covers most of the image. The green shaded area is a smaller, irregular shape within the pink boundary, located on the left side. The text "T14N R7E S25" is written in yellow in the center of the green area. The background is a light blue-grey color, possibly representing water or a different type of land cover. There are some white lines and shapes in the top left corner, possibly representing buildings or infrastructure.

T14N R7E S25

TRANSFER POLICY OF CERTIFIED IRRIGATED ACRES

May 10, 2022

TRANSFER APPLICATION INFORMATION

Lower Platte North Natural Resources District

PO Box 126, 511 Commercial Park Road

Wahoo, Nebraska 68066-0126

Phone (402) 443-4675

www.lpnrd.org

Landowner Receiving Irrigated Acres from Transfer: Please list name as it appears on the Title.

Landowner: Duane & Cheryl Johnson Phone#: (402) 443-8357
Address: 1388 Co. Rd. 12 Email: dc farms 9989@gmail.com
Contact if other than listed above:

Field Information: N 1/2 NE
25 Section 14 Township 7 Range E County Saunders

Do you intend to drill a well for these acres? Yes ☒ No ☐

Landowner Providing Irrigated Acres for Transfer: Please list name as it appears on the Title.

Landowner: Annette K. & Keith Rogers Phone#: (402) 625-2665
Address: 704 4th St. P.O. Box 86 Email: akrogers@windstream.net
Contact if other than listed above: Yutan, NE 68073
Field Information: SE NE & NE SE

11 Section 14 Township 9 Range E County Saunders

Explanation of Transfer Request: Include number of acres. Use additional pages if needed.

The Rogers 80 will be part of the solar farm south of Yutan and will be decommissioning their irrigation well and won't need the irrigated acres on the 80 for at least 30 years which is the length of the solar farm contract with a 5 year option after that.

Please include

- Aerial photo with the proposed field(s), well(s), pipeline(s).
- Irrigation plan for gaining property, if pivot model is available it must be submitted with the application.
- Copies of your trust, partnership and/or closely held business records should ownership be in any such form.

2013
I have 2 Valley 7000 4 tower pivots on the solar farm that I would be moving to this property they both have select 2 panels that are VKI ready and GPS.

TRANSFER POLICY OF CERTIFIED IRRIGATED ACRES

May 10, 2022

Application for the Transfer of Irrigated Acres between Landowners

This application is for the transfer of irrigated acres between landowners in the Lower Platte North Natural Resources District (LPNNRD). For acres to be transferred, the following conditions must be met (in addition to all others as requested by either District staff or the board of directors): The land must be Acre Certified; the relevant parties must have current Nitrogen and Water Certification or have a tenant with such certification; The originating certified irrigated parcel, as well as the gaining parcel, must be in LPNNRD. The originating landowner must provide proof, in the form of legible FSA maps and Form 578s, that the ground to be transferred was irrigated crop prior to the initiation of the request; The land to which the transfer will occur must pass LPNNRD inspection as quality irrigable ground; Once transferred the new irrigated parcel must be Acre Certified by LPNNRD; A fee, in the amount of \$300.00 to initiate the transfer request. Any deviations from these conditions are at the discretion of the Lower Platte North NRD's Board of Directors. Management Area rules and regulations and policies are subject to change without notice. Once these conditions are met, a title search, conducted by a title company selected by LPNNRD and billed to the landowner(s) of record as an additional cost will be performed. When all relevant information relating to this transfer is complete, a separate form will be generated authorizing the transfer of acres. Such form will be notarized; and filed, by LPNNRD with the Register of Deeds of the relevant county.

Transferor:

I, Annette K. Rogers do hereby request the transfer of 67 Certified Irrigated Acres from
Landowner Name
0003688500, a parcel I own, located in SENE & NESE 11-14-9 consisting of 67
Parcel I.D. Legal Description Certified Acres
Certified Irrigated Acres, leaving a balance of 0 Certified Irrigated Acres in this parcel.
Certified Acres

I acknowledge, that if the transfer is approved, I relinquish all rights to these irrigated acres. I further acknowledge that I am in compliance with all LPNNRD conditions relating to this transfer. Signature authorizes LPNNRD to access any federal records required to satisfy the transfer requirements. Signatory acknowledges that all titleholders of record understand and agree to the terms of the Irrigated Acre Transfer referred to herein.

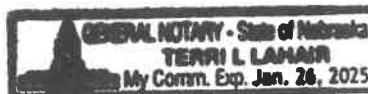
Annette K. Rogers 10/31/2022
Signature Transferor Date

Transferee:

I, Duane E. & Cheryl K. Johnson do hereby request the receipt of 67 irrigated acres, to be granted by
Landowner Name Number of Acres
LPNNRD, applied to 001725000, a parcel I own, located in N 1/2 NE 25-14-7
Parcel I.D. Legal Description

I acknowledge, that if approved, these irrigated acres shall become my property and that I must remain in compliance with all LPNNRD conditions relating to this transfer request or I may suffer the relinquishment of these transferred acres to LPNNRD. Signature authorizes LPNNRD to access any federal records required to satisfy the transfer requirements. Signatory acknowledges that all titleholders of record understand and agree to the terms of the Irrigated Acre Transfer referred to herein.

Duane E. Johnson 10/31/2022
Signature Transferee Date
TERRI L. LANAI
Notary Signature and Stamp



TRANSFER POLICY OF CERTIFIED IRRIGATED ACRES

May 10, 2022

I. Draft Policy to transfer certified irrigated acres

- A. All transfer applications require a non-refundable application fee of three hundred dollars (\$300.00).
- B. Approved transfer applications received prior to March 1st, if approved, will be effective that year. Applications received after March 1st, if approved, will not be effective until the following year.
- C. Transfers within the Lower Platte North Natural Resources District (District) must satisfy the following criteria:
 - 1. The originating certified irrigated parcel, as well as the gaining parcel, must be within LPNNRD.
 - 2. Relevant landowner, or their tenant, must have current Nitrogen and Water Certification.
 - 3. The submission of a completed application is required prior to any consideration of the transfer of irrigated acres. Applications will be provided by the District.
 - 4. Application must include:
 - a. Explanation of the proposed activities;
 - b. Aerial photo with the proposed field(s), well(s), pipeline(s);
 - c. Legal description and parcel IDs of affected properties;
 - d. Landowner(s) signature(s);
 - e. Irrigation plan for gaining property, if pivot model is available, it must be submitted with the application;
 - e. Copies of all trust documents and/or corporate records should title to either affected property be owned in trust, by a partnership or by a closely held business;
 - f. Notarization by Notary Public.
 - 5. Parcel is currently listed with the District and County Assessor as certified irrigated acres
 - 6. Transfers of irrigated acres from a parcel requires a title search. All applicable lien holders of the property from which the acres are being transferred from, must agree to the transfer. Fees associated with these actions will be billed to the landowner(s).
 - 7. Consideration will not be given to incomplete or incorrect applications until such time as the deficiencies are rectified.
 - 8. Review of the transfer application will be performed by staff and LPN Water Committee. Final approval will be conferred by approved board motion by the LPN Board of Directors.
 - 9. Transfers will not be granted in areas with a greater restricted development area than the parcel upon which the transfer originates.
 - 10. The gaining parcel must meet the minimum threshold of the variance process for the transfer to be approved.
 - 11. Transfers will be based, in part, on NeDNR Stream Depletion Factors, which will be reviewed on all applications.

TRANSFER POLICY OF CERTIFIED IRRIGATED ACRES

May 10, 2022

12. At District's request, applicant(s) will allow access to their property for the purposes of inspection by District personnel.

13. Once transferred, the irrigated acres become the property of the gaining parcel(s). The originating parcel(s) will be certified as dryland acres by the District. After 10 years, the original parcel will be eligible for a variance consideration to allow irrigation except in restricted development areas or as otherwise provided by District regulations.

14. The gaining parcel may not increase irrigated acres by more than the transferred amount.

15. Acres may only be transferred to or from a property once every 10 years.

16. A transfer will not be allowed to increase the number of irrigated acres within a designated wellhead protection area, without approval from the wellhead management area designated by the community and as approved by the District.

17. Management Area Rules and Regulations are subject to change. As per the Groundwater Management Area Rules & Regulations, any new irrigated acres or irrigation well developed after June 15, 2018, may be subject to additional restrictions as the Board of Directors deems appropriate.

18. Both landowners transfer paperwork will be sent to the Register of Deeds to reflect the transfer.

19. If the land in question is Highly Erodible Land (HEL) and has to follow an NRCS Conservation Plan in order for this transfer to occur, this will be noted on the form.

20. Once transferred the new irrigated parcel must be Acre Certified by LPNNRD.

21. The District retains the right to request an applicant provide any additional information and/or documentation deemed relevant by the District prior to its decision on a pending application.

D. The application for a transfer will be denied or conditioned to:

1. Ensure the consistency of the transfer with the purpose or purposes for which the management area was designated.
2. Prevent possible adverse effects on existing groundwater users or surface water appropriators.
3. Prevent possible conflict with any regulations or controls adopted by the District;
4. Ensure the proposed transfer to be a reasonable and beneficial use; or
5. For all other reasons needed reasonably necessary and appropriate by the District.

E. An approved transfer will not vest in any person the right to violate a District rule, regulation, or control in effect on the date of issuance, or to violate any rule, regulation, or control properly adopted after such date. It is the responsibility of the applicant to ensure compliance with other rules and regulations. Such violation could result in loss of an approved transfer.

F. An approved transfer will not vest in any person the right to violate any statute, state agency or other jurisdictional agency's rule, regulation, or control in effect on the date of issuance of the transfer or to violate any rule, regulation, or control properly adopted after such date. It is the responsibility of the applicant to ensure compliance with other rules and regulations. Such violation could result in loss of an approved transfer.



Invoice
27 Dec 21

DRILLING LOG

Date: 11-30-21

Owner: Duane Johnson

Driller: _____

Well Location: _____

Latitude 41 Minute 09 Second 36

Longitude 96 Minute 34 Second 13

PURPOSE OF WELL: Test Hole FR

Test Hole Depth 212' Well Depth _____

Test Hole Dia. 6" Bore Hole Dia _____

Loop Depth _____ # of Loops _____ Size _____

Casing Length _____ O.D. _____ "I.D. _____ "

Wall Thickness _____ " Type of Material _____

Trade Name _____ Screen Length _____ "

Screen O.D. _____ " I.D. _____ " Slot _____ Type _____

Gravel From _____ ' To _____ ' Pack Sand _____ ' to _____

Bentonite Seal from _____ ' to _____ ' to _____

Static Water Level _____ ' _____

Pumping Water Level _____ ' at _____ gpm

Estimated Capacity of well _____ gpm

middle of field

DEPTH IN FEET

FROM TO

MATERIAL DRILLED / COLOR

HARDNESS

0 10

Brown clay

10 11

Rocky

11 50

med Brown Sand

50 60

med to coarse Brown Sand

60 75

Med Green Sand & orange

75 80

yellow & orange clay

80 90

Fine Brown Sand

90 100

Tan & Gray clay

100 120

Fine Sandstone white

120 140

Blue shale

140 145

Fine white Sandstone

145 170

STRIPS OF Blue Shale & Sandstone

170 212

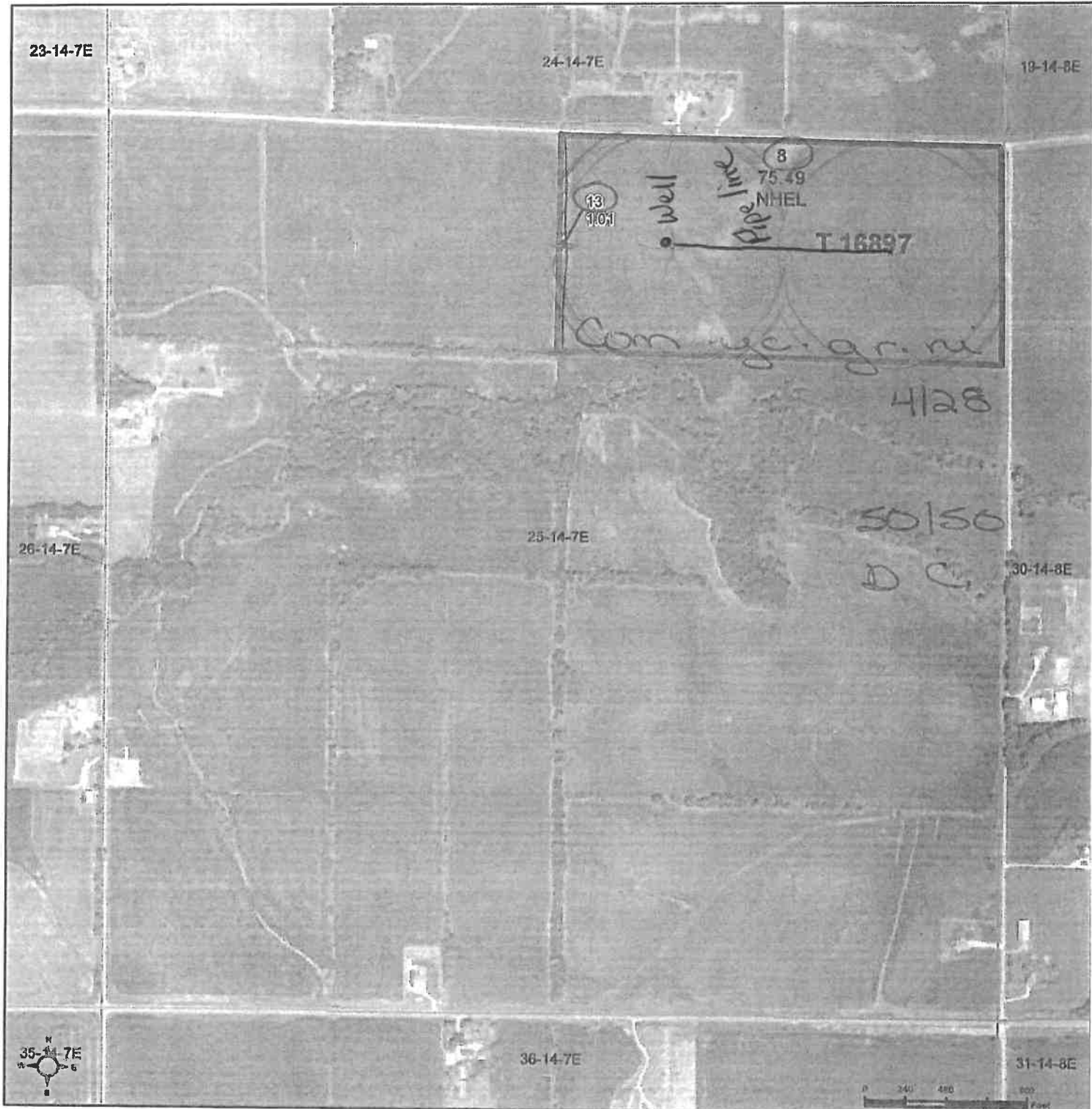
Sandstone with STRIPS OF white
Blue Shale, Fine Sandstone

212 Lime Stone



United States
Department of
Agriculture

Saunders County, Nebraska



Common Land Unit  Tract Boundary
 Non-Cropland
 Cropland
 PLSS

2020 NAIP Ortho Imagery

2023 Program Year

Map Created April 19, 2022

Farm 14558

Wetland Determination Identifiers

-  Restricted Use
-  Limited Restrictions
-  Exempt from Wetland Provisions

25-14-7E

United States Department of Agriculture (USDA) Farm Service Agency (FSA) maps are for FSA Program administration only. This map does not represent a legal survey or reflect actual ownership; rather it depicts the information provided directly from the producer and/or National Agricultural Imagery Program (NAIP) Imagery. The producer accepts the data 'as is' and assumes all risks associated with its use. USDA-FSA assumes no responsibility for actual or consequential damage incurred as a result of any user's reliance on this data outside FSA Programs. Wetland identifiers do not represent the size, shape, or specific determination of the area. Refer to your original determination (CPA-026 and attached maps) for exact boundaries and determinations or contact USDA Natural Resources Conservation Service (NRCS).

(This page is to be filled out by the contractor and must be complete for consideration.)

Certified Well Driller/Pump Installer Information:

Name Grosch Irrigation Phone 402-375-6437
 Address PO Box 270
 City Albion State NE Zip 68620

Legal Location: 1/4 SW 1/4 Section 25 Township 20 Range 3 (E/W)
 Is well registered: No Yes (attach registration form)
 Type: (circle one) Hand-dug Domestic Stock Irrigation
 Registration Number: G-034968 Year Drilled: 1970 Casing Material: concrete
 Total Depth: 236 ft. Static Water Level: 117 ft. Casing Diameter: 17 in.
 Obstructions(s) over well: None Windmill Well House Pump
 (please circle) Fences Stock Tank Concrete Pad Other

Comments:

Estimated Cost of Decommissioning		Number of Units	Price per Unit	Total
Action	Item			
Removal of Pump and obstruction		—	—	—
Disinfecting material	HTH	21 lbs	7	\$147 ✓
Fill Material	gravel - armor coat	13.3 cu. yds	\$41.07	\$546.23 ✓
Sealing material at water level	bentonite chips	12 bags	\$15	\$180 ✓
Sealing material at 3 - 8 feet level	bentonite chips	35 bags	\$15	\$525 ✓
Material to cap top of casing	native earth	—	—	—
Backhoe labor		2	\$95	\$190 ✓
General labor		4	\$90	\$360 ✓
Mileage		50	5.5	\$275 122.50
Miscellaneous costs (explain)				
Taxes				\$76.90 ✓

I hereby certify that the total charge of \$ 2300.13 is the same charge presented to the landowner and I will not refund any part of the same to the landowner and I will require full payment in cash. I further consent that the Lower Platte North NRD shall have the right to inspect my records to verify that proper procedures were followed. 2087.63 x .75 = 1565.72
1725.10 = 75%.

For LPNNRD Use Only		
Preplug inspection date by _____	Total cost of abandonment	\$ <u>1,565.72</u>
Postplug inspection date by _____	X 75% = Total NRD Funding	

Matt Grosch
 Signature of Contractor

11-15-22
 Date

Lower Platte North Natural Resource District

Abandoned Well Cost Share Program

Schedule of Reasonable Rates

The following schedule represents the maximum rates eligible for cost share assistance under the Lower Platte North N.R.D. cost share assistance program for cost associated with properly decommissioning of abandoned wells. If a specific cost is not listed in this schedule or special circumstances occur staff will review and decide upon its findings.

Action Rates as of: **Updated 5/9/2022 (Board meeting)**
-If the actual cost of the well decommissioning is \$500.00 or less then we WILL cost share 75% of the actual cost

Removal of pump and obstruction

Up to \$145.00 (Livestock & Domestic only)

Disinfecting material

Chlorine bleach Chlorine tablets

\$5.00 per gallon
\$15.00 per pound

*1 cubic yard =
2,835 lbs
1.42 ton*

Fill material

Gravel (flat rate per ton) Sand

\$36.00 per ton of gravel
\$10.50 per ton \$27.50/ton delivered
\$15.50 per 100-pound bag

Sealing material at water level

Bentonite Bentonite pellets

\$16.00 per 50-pound bag
\$50.00 per 50-pound pail

Sealing material at 3-8 feet level Sealing material at water level

Bentonite Bentonite pellets

\$16.00 per 50-pound bag
\$43.25 per 50-pound pail

\$ 7.70 per 50-pound bag
\$ 75.25 per yard

Material to cap top of casing

Redi-mix concrete

\$ 7.70 per 50-pound bag
\$ 75.25 per yard

Pre-fab cap

Backhoe labor

\$ 45.00

General labor

\$110.00 per hour

Mileage

\$75.00 per hour

Taxes

\$2.45 per mile

Misc.

Expenses:

Mobilization

etc.

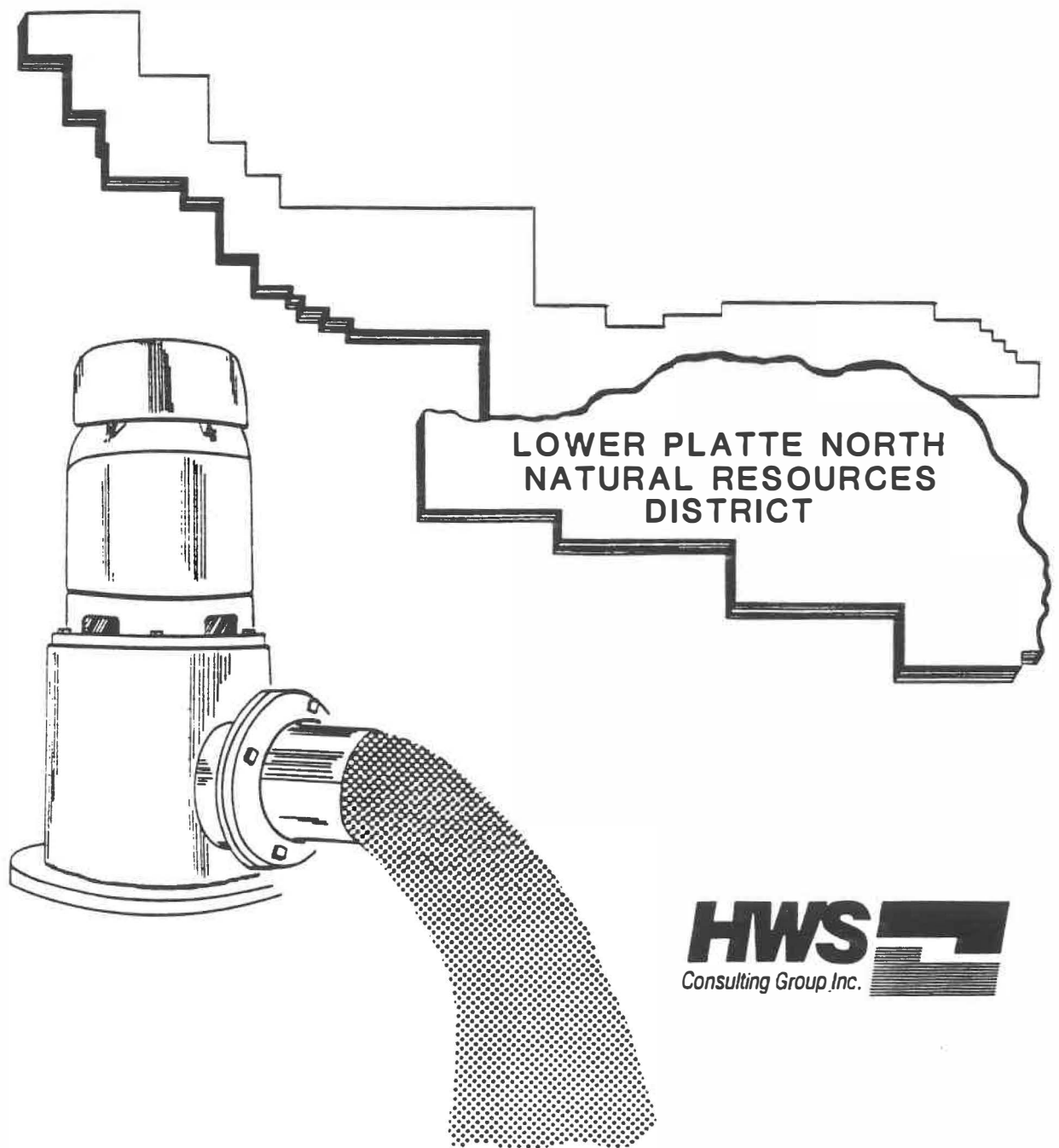
Local sales tax up to 7.5%

75% of the cost with a cap of \$250.00

*Sum of
total approved
cost X .75
= total cost
share*

GROUNDWATER MANAGEMENT PLAN

REVISED 1995



HWS 
Consulting Group Inc.



LOWER PLATTE NORTH

NATURAL RESOURCES DISTRICT

P.O. BOX 126, COMMERCIAL PARK ROAD, WAHOO, NEBRASKA 68066
PHONE (402) 443-4675 • FAX (402) 443-5339

Lower Platte North NRD Board of Directors

<i>SUBDISTRICT</i>	<i>NAME</i>
1	Dean Johnson
1	Frank G. Williams
2	David A. Shelso
2	Mary Sendgraff
3	Steven E. Grueber
3	Michael Eason
4	Dave Saalfeld
4	Melvin Sahs
5	Greg Wilke
5	Clinton Johannes
6	Steve Schmit
6	Joe Matulka
7	Jane Daufeldt
7	Ronald Sabatka
8	Donald Kavan
8	Jim McDermott
9	LeRoy Nelson
9	Ervin Bull
AT LARGE	Donald Gaeth

Lower Platte North NRD Staff

Larry Angle	Water Resources Manager
Frank Albrecht	Water Resources Specialist
Sam Barlean	Field Technician
Jill Breunig	Administrative Assistant
Ann Brodd	Secretary/Bookkeeper
Bob Heimann	O & M Manager
Dan Ludwig	Water Resources Specialist
John Miyoshi	General Manager
Tom Mountford	Assistant Manager
Shaula Ross	Water Resources Specialist
Joe Sabata	Field Technician
Kathy Vasa	Technician
Ann Youngberg	Information Specialist

Dedicated to the Conservation, Development and Preservation of your Natural Resources

Printed on Recycled Paper and is Recyclable



Table of Contents

1	Introduction
2	Geology
3	Description of the Groundwater Reservoir
4	Groundwater Flow System
5	Availability of Other Water for Artificial Recharge & Integrated Management
6	Groundwater Quality
7	Vulnerability to Pollution
8	Non-Point and Point Source Pollution
9	Identification of Present Known Problem Areas with Consideration of Potential Problem Areas
10	References
11	The Plan for Groundwater Management in the Lower Platte North NRD
12	Appendix A - Exhibits
13	Appendix B - Agency Review Letters, 1985 Plan
14	Appendix C - Glossary of Terms
15	Appendix D - Hydrographs of NRD Monitor Wells

TABLE OF CONTENTS

	<u>Page</u>
1) Introduction	1
Summary of Groundwater-Related Activities 1985-1993	2
Description of the LPN NRD.....	5
Size, Population, and Industry	5
Drainage Systems.....	7
Topography	8
Soils	10
Groundwater	11
Land Use	12
Environmentally Sensitive Resources.....	12
2) Geology	15
Geologic Sequence.....	15
Geologic Sections	16
3) Description of the Groundwater Reservoir.....	17
Definition of Terms.....	17
Description of Principal Aquifer Systems	18
Quaternary System.....	18
Ogallala Aquifer.....	18
Dakota Aquifer.....	19
Geographic Distribution of Groundwater Reservoir.....	19
Stratigraphic Definition	21
Groundwater Availability	22
Groundwater Reservoir Yield	24
Water Level Changes Predevelopment to 1991	25
Water Level Changes - Base Year	25
Groundwater Level Monitoring Network	28
4) Groundwater Flow System	30
Recharge	30
Precipitation	30
Seepage	31
Land Slope	32
Soils Data	32
Storage	33
Discharge	34
Stream Discharge	34
Groundwater Use	34
Historical Rate of Use	34
Present Use Estimates	35
Sub-irrigation and Other Uses	36
Summary	36
5) Availability of Other Water for Artificial Recharge & Integrated Management.....	38
Surface Water	38
Availability - Flowing Water	38
Availability - Water Uses.....	41
Supplemental Sources	41

TABLE OF CONTENTS - CONTINUED

	<u>Page</u>
6) Groundwater Quality	43
General Conditions	43
Quality Indicators.....	44
Total Dissolved Solids	44
Iron	45
7) Vulnerability to Pollution	47
Topography	47
Recharge	48
Soils	49
Vadose Zone	49
Depth to Groundwater.....	50
DRASTIC	51
Land Use	52
Well-Head Protection.....	53
8) Non-Point and Point Source Pollution	55
Non-Point Source Pollution.....	55
Nitrate-Nitrogen.....	55
Herbicides	56
Pesticides.....	57
Groundwater Quality Monitoring Network	57
Point-Source Pollution.....	59
Underground Storage Tank Releases.....	59
Hazardous Waste Releases.....	60
Public Water Supply Systems With Reported VOC Contamination	60
Other Potential Sources of Pollution.....	61
Feedlots.....	61
Landfills	61
Private Septic Systems.....	62
Improperly Abandoned Wells.....	63
9) Identification of Present Known Problem Areas With Consideration of	
Potential Problem Areas	64
Recharge Extremes	64
Groundwater Quantity	64
Groundwater Quality	66
10) References	69
11) The Plan for Groundwater Management in the Lower Platte North NRD	
Section A - Framework for Groundwater Management	74
Section B - Goals, Objectives, and Policies.....	77
Section C - Action Plan.....	83
Section D - Public Participation.....	91

LIST OF TABLES

<u>Table Number</u>	<u>Title</u>	<u>Following Page</u>
1	LPN NRD Summary of Groundwater-Related Activities 1985-1993	2
2	Total Acres Harvested 1960-1990	6
3	Summary Table - Land Use Data	13
4	Geologic Units and Their Water-Bearing Properties	15
5	Net Water Level Change of Greater than 5 Feet as a Percentage of Saturated Thickness; Lower Platte North NRD Groundwater Level Data; 1987-1992	27
6	Estimated Recharge Data	31
7	Estimated Groundwater in Storage	32
8	Summary of EPA Health Advisories for Chemicals	43
9	Recommended Concentration Limits for Water used for Livestock and Irrigation Crop Production	43
10	Water Analysis for Inorganic Chemicals Public Supply Wells	43
11	Locations of Permitted & Non-Permitted Waste Disposal Sites in the LPN NRD	62
12	1983 Profile of Estimated Groundwater Use	35

APPENDICES

- 12) APPENDIX A - Exhibits
- 13) APPENDIX B - Agency Review Letters, 1985 Plan
- 14) APPENDIX C - Glossary of Terms
- 15) APPENDIX D - Hydrographs of NRD Monitor Wells

APPENDIX A

List of Exhibits

<u>Exhibit Number</u>	<u>Title</u>
1	Location - Lower Platte North Natural Resources District
2	Types of Topography
3	Parent Materials of Soils
4	Soils Map Units
5	Groundwater Storage in the Principal Aquifer
6	Generalized Depth to Water
7	Cumulative Number of Registered Irrigation Wells 1940-1992
8A	Registered Wells by Decade of Development - Pre-1940
8B	Registered Wells by Decade of Development - 1940-1949
8C	Registered Wells by Decade of Development - 1950-1959
8D	Registered Wells by Decade of Development - 1960-1969
8E	Registered Wells by Decade of Development - 1970-1979
8F	Registered Wells by Decade of Development - 1980-1989
8G	Registered Wells by Decade of Development - 1990-1992
9	Registered Wells Map
10	Land Use Map
11	Geologic Bedrock Map
12	Geologic Profiles
13	Underground Water Areas of Nebraska
14	Map Showing Approximate Areal Distribution of Mesozoic Rocks and Those Areas Currently Used for Water Supplies
15	Map Showing Approximate Areal Distribution of Aquifers in Tertiary Deposits
16	Map Showing Areal Distribution of Holocene and Pleistocene Deposits
17	Groundwater Reservoir Areas
18	Configuration of the Base of the Principal Aquifer
19	Elevations of Water Levels in Wells
20	Thickness of Saturated Coarse - Grained Sediments Comprising the Principal Aquifer
21	Transmissivity of the Principal Aquifer

Exhibit Number**Title**

22	Estimated Well Yield
23	Net Water Level Change from Predevelopment Levels to Fall 1991
24	Groundwater Level Monitoring Wells
25	Net Water Level Changes 1987-1992 Lower Platte North Monitoring Network
26	Selected Hydrographs of Representative Wells
27	Mean Annual Precipitation
28	Distribution of Average Annual Precipitation
29	Precipitation Station Map
30	Losing Streams
31	Soil Associations in the Lower Platte North NRD
32	Summary of Registered Wells by Year Drilled
33	Principal Areas of Subirrigated Vegetation
34	The Platte River Since the Early 1940's
35	Distribution of Holocene and Pleistocene Deposits
36	Dissolved Solids Concentrations in Water from Holocene and Pleistocene Aquifers
37	Calcium Concentrations in Water from Holocene and Pleistocene Aquifers
38	Alkalinity of Water from Holocene and Pleistocene Aquifers
39	Sulfate Concentrations in Water from Holocene and Pleistocene Aquifers
40	Distribution of Total Dissolved Solids
41	Distribution of Iron
42	Topography Rating Map
43	Net Recharge Rating Map
43A	Soils Rating Map
44	Intermediate Unsaturated Soils (Vadose Zone) Rating Map
45	Depth to Water Rating Map
46	Groundwater Pollution Potential
47	Nitrate-Nitrogen - Irrigation and Municipal Wells

Exhibit Number**Title**

48	Nitrate-Nitrogen - Domestic and Stock Wells
49	Reported Pollution Point Sources as of February 1993
49A	Distribution of Livestock Operations with State Operating Permits
49B	Distribution of Waste Disposal Sites
50	Reported Pollution Sources - Fremont, Nebraska

INTRODUCTION

In 1985 the Board of Directors of the Lower Platte North Natural Resources District (hereinafter referred to as the LPN NRD) adopted a Groundwater Management Plan as a first step in formalizing their intent to manage the resource. The plan was developed to fulfill requirements set forth in Section 46-673.01 through .04 of the Nebraska Groundwater Management and Protection Act. The NRD's plan was approved by the Department of Water Resources in February 1986 (approval and agency review letters are included as Appendix B).

Prior to 1985, the LPN NRD's groundwater management initiatives were limited to a brief period of water level monitoring in the late 1970's, cost sharing on irrigation re-use pits, and cost sharing on water conservation practices. With the adoption of the 1985 plan, the LPN NRD embarked upon a new era of groundwater resource management marked by an intensive program of data collection designed to characterize the resource and establish the relationship with other water resource related aspects. In addition, the NRD developed education and demonstration programs designed to increase awareness of groundwater supplies, use, and protection. The LPN NRD staff and board embraced the responsibility for management of the District's water supply, and from 1985-1993 invested over \$288,000 in programs specified in the Plan, which includes staff, analysis, and equipment.

In 1991, the Nebraska Legislature enacted Legislative Bill 51 (Section 46-673.14 of the Nebraska Groundwater Management and Protection Act)) which required the following actions by the NRD:

"prior to July 1, 1993, each district shall amend its groundwater management plan to identify to the extent possible the levels and sources of groundwater contamination within the area, groundwater quality goals, long-term solutions necessary to prevent the levels of groundwater contaminants from becoming too high and to reduce high levels sufficiently to eliminate health hazards, and practices recommended to stabilize, reduce, and prevent the occurrence, increase, or spread of groundwater contamination."

This document is presented as an amendment to the 1985 LPN NRD's Groundwater Management Plan. The amendment meets the intent of LB51 and fulfills the District's need for continued understanding of the supply and quality of its groundwater resource, and sets forth a plan of protection for the future. The Board of Directors recognizes, along with the Nebraska legislature, that groundwater is a valuable resource and planned management is essential and in the public interest.

This update to the LPN NRD's Groundwater Management Plan has been developed as a progressive program management tool for present and future board members serving as a guide for the proposed direction of groundwater resource protection. Use of NRD funds to provide proper water management will be programmed through this document as an extension of the annual budgetary process. The plan provides and defines goals, objectives, policy statements, and program commitments and provides time schedules for implementation.

For reference, a glossary of groundwater related terms is included as Appendix C. A summary of the LPN NRD's groundwater related activities since 1985 is included as Table 1. In addition to the activities listed, the NRD has increased their water management staff by three staff members since 1985 as part of their commitment to support the policies outlined in the 1985 plan.

This update has been prepared by the board and staff of the Lower Platte North Natural Resources District with the assistance of The Water Policy Advisory Committees. Technical and planning assistance as well as document development was provided by HWS Consulting Group Inc.

TABLE 1

LPN NRD Summary of Groundwater-Related Activities 1985-1994

I. Regulatory

1. **Chemigation** - A program administered in response to the Chemigation Act (RRS-46-612) empowering NRD's to issue permits for application of fertilizers and pesticides through irrigation systems. The LPN NRD program started in 1987. From 1987 through 1992 a total of 309 permits were issued. A computer database was designed to assist in permit and compliance tracking.
2. **Irrigation Run-off Complaints** - NRD investigation, findings, and response actions are documented in NRD files. A total of 4 complaints were handled by the NRD during the 1985-1993 time period.

TABLE 1 - Continued

3. **Well Abandonment Program** - A program administered in response to Department of Water Resources and Department of Health regulations and Nebraska Statutes (RRS-46-602). NRD provides cost-share assistance to plug abandoned wells. An inventory of abandoned wells within the District has been completed for all counties.
4. **Special Protection Area** - In 1988 the NRD applied for and received a Special Protection Area investigation from the Department of Environmental Quality. A total of 49 irrigation wells and 60 domestic wells were sampled in the Platte Valley in Dodge County, near Fremont. Based upon sampling results, the DEQ denied the LPN NRD's request for designation of a Special Protection Area, but suggested continued monitoring of the area to ascertain quality changes.

II. Groundwater Quantity

1. **Water Level Monitoring** - A network of 68 monitor wells was established to measure water levels in the spring and fall, and has been completed each year since 1985. Eleven wells were added in 1991 in the David City area, bringing the total network to 79 wells. Starting in 1993, additional wells, district wide, are being added to the network. When completed, the network will contain approximately 120 monitoring sites.
2. **Computer Database** - The NRD developed a database to store monitor well descriptive data and water level measurements.
3. **Groundwater Model** - The NRD is developing a groundwater model for use in evaluating water level trends and forecasting future activities.

III. Groundwater Quality

1. **Sample Collection** - 1,389 groundwater samples were collected and analyzed in an analytical laboratory for selected water quality constituents from the following areas:

Date	No. of Wells Sampled	Area of Coverage
1986	155	District wide (irrigation wells)
1987	306	District wide (irrigation wells)
1988	146	District wide (irrigation wells)
1988	194	District wide resample of 1979 NURE sampling (104 domestic, 83 irrigation, and 7 stock wells)
1988	109	(Proposed) Special Protection Area - Fremont (60 domestic, 49 irrigation)
1989/ 1990	132	Platte Valley of Butler, Colfax, Saunders Counties (irrigation)

TABLE 1 - Continued

Date	No. of Wells Sampled	Area of Coverage
1990	93	Todd Valley, Saunders County (irrigation)
1990	155	Saunders County Home Well Testing (domestic)
1991	99	Shell Creek Watershed of Colfax and Platte Counties

2. **Computer Database** - Developed a computer database for storage and retrieval of collected water quality data.

III. Other

1. **Surface Water-Groundwater Interrelationships** - A program designed to investigate and map groundwater inputs to streams during the winter months was initiated in 1988. Mapping is completed for streams in Saunders, Dodge, Colfax, Butler, and Platte counties and partially completed for Boone and Madison Counties.
2. **Precipitation Monitoring** - Established a precipitation gauging network. Sites include 11 stations within or bordering the district monitored by the UNL Department of Agricultural Meteorology and Climatology and an additional 8 stations monitored by the LPN NRD. A computer database has been established to store the data.
3. **Czechland Lake** - LPN NRD has monitored two domestic wells downstream of Czechland Lake since 1990 for NO₃-N and bacteria. The NRD has sampled and analyzed drinking water wells of landowners in the Czechland Lake watershed and provided technical suggestions. In 1993 commenced monitoring activities of two watersheds involving Czechland Lake and Lake 6B addressing water quality in the feeder streams and the two lakes.
4. **Rural Domestic Wells** - Cooperated with Saunders County Extension Service in providing collection and analysis of water from rural domestic wells
5. **U.S.G.S. National Water Quality Study** - Participating with the study of the Lower Platte River by serving on the advisory Board and assisting with sample collection.
6. **Nebraska Ordinance Plant** - Assisted the U.S. Army Corps of Engineers and E.P.A. personnel on this study since 1987 in sample collection on and around the project site.

DESCRIPTION OF THE LOWER PLATTE NORTH NRD

Size, Population, and Industry

The Lower Platte North NRD is a composite of portions of seven counties in east central Nebraska. A distribution of associated county statistics demonstrates that the primary land mass, by County, is in Saunders County while the most financial support is generated from Dodge County. The City of Fremont is the single largest contributor of local general support resulting from the population of that city. The District comprises about 1,587 square miles and 1.03 million acres. It ranges about 110 miles from northwest to southeast and is roughly 65 miles wide north to south. The configuration resembles that of a coon skin cap with the tail lifted to the breeze (see Exhibit 1).

Estimated Population by County

County	% of County In the District	Acres In LPN NRD	Population		Total	Percentage of Fiscal Input
			Rural	Urban		
Boone	12.9	56,473	362	--	362	2.3
Butler	44.3	165,476	2,022	3,387	5,409	11.0
Colfax	41.9	111,528	1,414	4,237	5,651	10.0
Dodge	30.2	104,245	3,100	25,215	28,315	35.7
Madison	6.3	23,086	194	770	964	1.5
Platte	38.5	169,432	2,848	723	3,571	10.5
Saunders	81.5	401,234	6,698	6,949	13,647	29.0

Twenty-eight cities, towns and villages are located in the confines of the District. Those twenty-eight communities are listed below with present estimated populations:

Fremont	23,680	Mead	513	Bruno	141
Wahoo	3,681	Platte Center	341	Colon	128
Schuyler	4,052	Lindsay	321	Leshara	118
David City	2,522	Bellwood	395	Richland	96
North Bend	1,249	Inglewood	286	Linwood	91
Ashland (Part)	219	Prague	282	Octavia	132
Newman Grove	770	Weston	299	Rogers	89
Cedar Bluffs	591	Morse Bluff	128	Memphis	117
Yutan	626	Malmo	114	Abie	106
Ithaca	133	Tarnov	61		

Information on industrial activity demonstrates a variety of industrial types present in the District.

The various types are listed below:

Alfalfa Products	Cheese Manufacturing
Concrete Products	Dehydrated Hay
Dried Whey	Egg Products Manufacturing
Equipment Manufacturing	Feed Manufacturing
Fiberglass Manufacturing	Packing Plants
Irrigation Equipment Manufacturing	Pasta Products
Sand & Gravel Products	Soybean Manufacturing
Steel Fabrication	Trailer Manufacturing

This industrial array also yields a diversity of water needs and waste treatment problems. These needs and problems may have a degrading effect on both ground and surface water quality and quantity if not properly addressed.

As would be expected in a rural agronomic society, the main industry is agriculture. The District is thus highly oriented toward agricultural activities and those events triggering changes in that industry. A review of the cropping history of the six major counties within the District demonstrates some fundamental practice changes which may result in far reaching effects on water use and water quality. Studying the acres harvested (Nebraska Agricultural Statistics Service, 1991/92) for corn, sorghum, wheat, soybeans, hay and oats during the years 1960 through 1991, it is evident there is a substantial move toward corn and soybean production. This change in crop production practices results in a decrease in the number of acres of crops providing better soil cover, such as is provided by wheat, oats, and hay. Table 2 illustrates the fluctuation in percentage of acres harvested of a composite of the six individual crops for the six counties. Madison County information was not used. As the total number of acres harvested increases, the following occurs:

1. Number of acres of permanent cover decrease.
2. The number of acres more susceptible to erosion and runoff increases.
3. The usage of fertilizer, herbicides, pesticides, etc. increases.
4. The potential for ground and surface water degradation increases.

Total Acres
Harvested
1960-1990

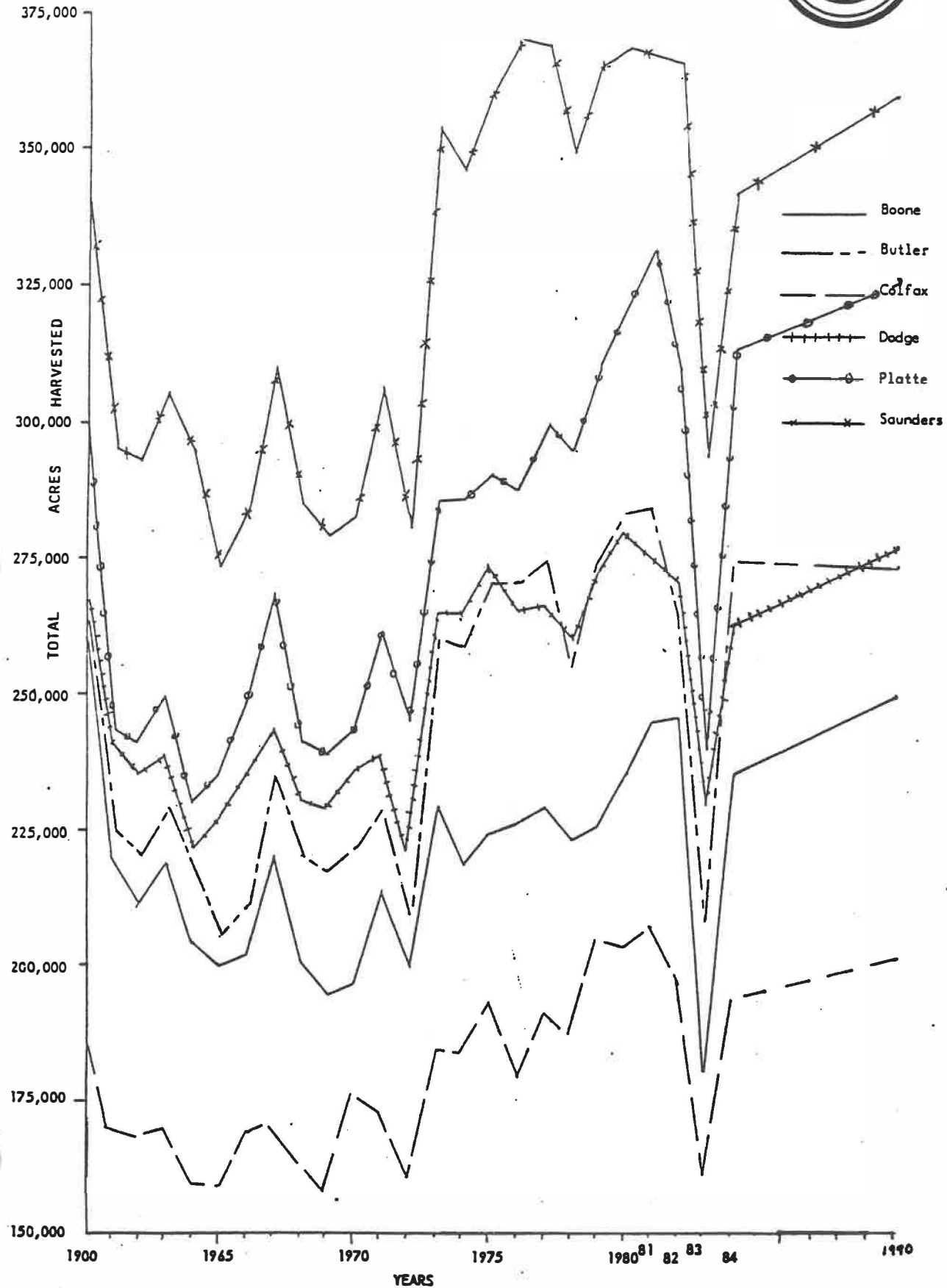


TABLE 2

According to the 1991 Nebraska agricultural statistics, the number of farms in the District have decreased significantly, resulting in an increase in the size of farming units. As the number of on-farm rural residents decrease in number, the methods of farming become more technologically oriented. Farming more ground in a shorter period of time with larger equipment leads to practice changes in the care of crops. For example, use of chemicals increases the potential for water quality degradation, if not properly applied. However, the 1991 Agricultural Statistics show a net decrease in fertilizer and pesticide usage from 1981 to 1991. For example, in 1981 fertilizer application rates for corn averaged 157 lbs/acre, in 1991 the average rate was 135 lbs/acre.

Livestock numbers tend to fluctuate with the markets and data indicates the general trend is toward a decrease in total numbers of cattle held on farms in unconfined areas. Small herds on pasture are not as prevalent as in the past and more concentrated feeding facilities may have caused or may be potential sources of future area groundwater quality problems.

The use of irrigation systems has increased dramatically. In the years leading up to 1970, the District records showed about 1,500 registered irrigation wells, but from 1970 to 1993, that number has more than doubled to 3,517. Of the total number of acres irrigated in the District, all but about five percent are irrigated with groundwater.

Drainage Systems

The Lower Platte North NRD is situated in the lower end of the Platte River basin, thus, the Platte River composes the primary flow system of the District. At a point just west of the District boundary, the Loup River and the Loup River power canal significantly augment the flow of the Platte and the effects can be seen throughout the remainder of the District. A few miles upstream from the southeast boundary of the District, the Elkhorn River joins the Platte River. These two tributaries form the major tributaries to the Platte River within the District and are also the major tributaries of the entire Platte system.

Shell Creek, along with its principal tributary Loseke-Taylor Creek, provides drainage for the northwest portion of the District and drains approximately 460 square miles. The Shell Creek system flows in a southeasterly direction joining the Platte between Schuyler and Rogers on the north bank of the river. The remainder of the north bank drainage pattern is provided by Lost Creek and Rawhide Creek. Lost Creek parallels the Platte for approximately 15 miles then joins the Platte just east of Schuyler. Rawhide Creek and its man-made drainage systems provide flow east from Schuyler to areas northeast and southeast of Fremont where it flows into the Elkhorn River.

The Lower Platte North NRD area south of the Platte River exhibits three types of drainage patterns. First, from the Polk-Butler County line east to essentially the Butler-Saunders County line, the flow systems of the small watersheds of Bellwood, Bone, and Skull Creek carry water in a northerly direction to their confluence with the Platte. Secondly, the Clear Creek Watershed drains the eastern quadrant of Saunders County in a south southeasterly direction where it joins Wahoo Creek just above that creek's confluence with Salt Creek. Thirdly, Wahoo Creek's dendritic pattern provides drainage for about 480 square miles of Saunders County and is the single largest watershed in the District. It is composed of Cottonwood, Sand, Duck, Silver, and Wahoo Creeks. The general flow pattern is to the southeast joining Salt Creek just prior to Salt Creek's confluence with the Platte River below Ashland. With the combined flow of Clear Creek at this point, runoff can cause extremely high flows and often results in large areas of lowland flooding.

Topography

Exhibit 2 demonstrates the variability of topographic features in the District. The northwest arm of the District comprising portions of Boone, Madison, and about two-thirds of Platte County is composed of a dissected plains topography. The area is mostly hilly land with moderate to steep slopes, sharp ridge crests and some old, nearly level plains. This general pattern is a result of the force of wind and water erosion on the old, fairly level plain areas.

Some flat valley areas exist in north central Platte County typified by the topography in and around Platte Center and Tarnov. East central Platte County and western Colfax County are made up of hilly land containing moderate to steep slopes and more or less rounded ridge tops. Creek beds are incised into the landscape as a result of erosive forces, causing some rough terrain.

The Platte River Valley extends through the length of the District from Columbus to Ashland, a distance of about 125 miles. Throughout the western half of this stretch the valley width is about 5 to 7 miles wide but tapers from near Fremont to about two miles wide at Ashland. The valley side walls are composed of unconsolidated sediments and vary in topographic features from gently sloping smoothly rounded hills to steep walled somewhat narrow canyons. The valley portion is nearly flat and demonstrates a slope of about 4-6 feet per mile declining to the southeast.

Through the east central portion of Saunders County, from approximately North Bend to Ashland, is a broad fertile area, 5-8 miles wide, referred to as the Todd Valley. This area is made up of nearly level lands and includes some slight south-southeasterly stream drainage. It is situated at an elevation about 80 feet above the Platte River valley.

West and southwest Saunders County and eastern Butler County are what is known as the "hill area". It is composed of bluffs along the north edge (adjacent to the Platte River valley) and rolling hills, ridges, and steep valley slopes further south of the Platte. Maximum elevation changes in the area are up to 350 feet and slopes between drainages range 100 to 200 feet per mile.

As is evident from the foregoing information and a casual drive through the District, most of the District has undergone significant erosion. Some Dakota bedrock, particularly in western and eastern Saunders County, is located near the surface. However, most of the area is overlain by Quaternary sediment deposits that completely cover the bedrock in varying depths. The slope and near-surface material strongly influence the local topography and are a major influence upon soil type, land capability and utilization of the groundwater resource.

Soils

The types of soils overlying any particular area play key roles in the relationships of precipitation or applied surface flows to surface water runoff, groundwater recharge, and consumptive water requirements. Relationships are dependent upon the permeability of the soil, ability of the soil to hold water, and slope of the surface. All of these variables influence soil infiltration rates and result in the total amount of water contained in the soil profile. As stated, these soil aspects are very important to both the surface and groundwater hydrologic characteristics. Exhibit 3 illustrates the parent materials of the soils of the state, and Exhibit 4 illustrates soil types which formed from these parent materials.

Soils in the uplands of Butler and Saunders Counties consist primarily of clays and silty clays to silty clay loams somewhat similar to the Sharpsburg and Sharpsburg-Pawnee association. However, the recent Saunders County Soil Survey update will reclassify the soils. Primary soils in the upland areas are eroded to a point where they no longer exist, and landowners are now farming in the "B" horizon. This has tremendous implications for surface and groundwater quality. Permeability of these soils is less than 1.0 inch per hour on slopes that range from gentle to 20 percent. Recharge rates are quite low and recharge is principally limited to perched aquifers. These soils are loess type soils with some intermixed glacial till areas. The drainage pattern and flood plain configuration of Wahoo Creek is primarily composed of Kennebec soils of silty clay loam ranging from moderately to poorly drained.

The western portion of the Platte River corridor is comprised of Acadia-Platte alluvial fine sands underlain by sands and gravels. The eastern portion of the corridor is practically the same, however, depth to water in the eastern area is greater. This primary water line is bounded on the north by poorly drained Gibbon-Luton silty and clayey soils. Areas to the south and a few areas along the western end of the Platte River corridor contain silty soils that are well drained and of loess origin.

The northwest corner of the District is composed of moderately to well drained silty type soils with permeabilities ranging from 1 to 2 inches per hour above the areas adjacent to Shell Creek. Areas in northeast Platte County have permeability ranges of 1.5 to 5 inches per hour.

The general pattern of soil distribution shows that soils of loess origin are found on the uplands with alluvial soils predominant on the bottom lands. Permeabilities range from practically zero to greater than 10 inches per hour (near Columbus and southeast of Bellwood). The pattern shows that, generally, soils south of the Platte River are less permeable than those of the north side. Soil textures range from fine sands to silty clays. Soil surveys have been completed for all counties and the Saunders County Soil Survey (1959) is presently nearing completion of a substantial update.

Groundwater

The generalized map of the state depicting groundwater storage (Exhibit 5) in the principal aquifer, demonstrates the District has some areas with up to 100 feet of water in storage. However, these areas are located in the extreme northwest corner where the District overlies a portion of the southeast reaches of the Ogallala formation. The remainder of the District does not fare as well. In many areas water is stored in layered formations where stored quantities range from less than 20 feet to about 100 feet. Deeper aquifers are present in some areas.

A generalized depth to groundwater map (Exhibit 6) shows the Platte River and Todd Valley corridors with depth to water averaging around 50 feet or less. The map depicts generalized depth to water over the remainder of the District to be in excess of 50 feet.

The availability of groundwater used for competing purposes has been a contributing factor in the development of the District. The level of groundwater use and irrigation development has steadily increased over the years and somewhat parallels the state trend. Two periods of more rapid irrigation well development are evident, during the 1950's and the 1970's, presented in graphic form in Exhibit 7 and mapped on Exhibits 8A through 8G. Exhibits 8F and 8G also demonstrate that the 1980's and early 1990's also have been a period of intense well development.

The center pivot has provided the opportunity for tremendous growth in irrigation, particularly during the 1970's. Areas not previously irrigable due to topographic variations are now accessible. From 1965 to March 1993, the number of registered irrigation wells has almost tripled, to a total of 3,517 wells. This development becomes more significant when viewed in light of the pattern and intensity of well development (Exhibit 9).

The greatest concentration of wells are located adjacent to the Platte River in Butler, Colfax, and Dodge counties, and within the Todd Valley in eastern Saunders County. Both of these areas are characterized by soils and terrain suitable for irrigation, but may also be highly susceptible to water quality problems. In areas of low groundwater quantity, competition between users may become acute and is anticipated to be more so in the future.

Land Use

In 1986 the USDA Soil Conservation Service field offices conducted a Land Use Survey in an attempt to gain an accurate evaluation of current land use in Nebraska. Results of the survey in the LPN NRD are shown on Exhibit 10 and are summarized on Table 3. Land use in the LPN NRD is primarily cropland (75% of the total). Of the total land in the district, 51% is non-irrigated and 24% is irrigated, but water is primarily supplied from groundwater. Approximately 10% of the NRD is pasture or rangeland, with the remainder (15%) of the NRD split between various uses.

Environmentally Sensitive Resources

Wildlife in the LPN NRD has been influenced by the increasing urbanization of the region and changes in land use. As agriculture and other human activities disperse into areas that once were woodlands, grasslands, and marshes, the wildlife has either adapted, relocated, or has been negatively affected.

Some animals, fish, and birds that previously existed in large numbers in the District are now infrequently present or completely gone. The use of pesticides and loss of habitat has had an extremely negative impact for a variety of species. Some of the endangered or threatened species known to be or may have been in the District include: bald eagle, least tern, piping plover, peregrine falcon, swift fox, black footed ferret, river otter, pallid sturgeon, and blacknose shiner (Nebraska Game and Parks Commission). Much of this wildlife depends heavily upon habitat, food, and water supported by groundwater supplies in the District.

The grasslands, woodlands, and waters of the District support many animals, birds, insects, and aquatic life that are too extensive to mention in this short section. One endangered plant species which has been identified as possibly inhabiting the NRD is the Western Prairie fringed orchid. While this plant species has been observed to be present in Southern Dodge County, it may also be present in other areas of the NRD. The southern Dodge County site is located on an upland in a perched water table setting, which would not be considered part of the manageable groundwater reservoir (Personal Communication - Mike Fritz- Nebraska Game and Parks Commission, April 1994). The orchid could be affected by changes in groundwater levels and from groundwater activities in the plan. In this area, land use changes would be more of a threat to the orchid than changes in water quantity in the principal aquifer. As development encroaches upon remaining natural grasslands, the potential for extinction of this species increases greatly. The NRD has embarked upon a program to protect and preserve some of the valuable wetland and grassland resources within its boundaries, because it is aware of the need for such preservation for future generations. The general protection of groundwater quality and quantity is important to preservation of habitats of indigenous and threatened and endangered plant and animal species. Any NRD actions to manage the groundwater resources within District boundaries will be evaluated as it may impact these valuable resources. If adverse effects on sensitive resources are identified from changing groundwater quantity or quality, the NRD will evaluate the need for modification of its Groundwater

TABLE 3

NEBRASKA NATURAL RESOURCES COMMISSION
NATURAL RESOURCES DATA BANK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SUMMARY TABLE
LAND USE DATA

LOW PLATTE NORTH NRD

PROCESSED: April 21, 1993

CATEGORY	LAND USE	ACRES	PERCENT
0	NO DATA	91765	8.20
1	NONIRRIGATED CROPLAND	576171	51.47
2	SPRINKLER IRRIGATED CROPLAND	151135	13.50
3	SURFACE IRRIGATED CROPLAND	107205	9.58
4	TAILWATER IRRIGATED CROPLAND	1920	0.17
5	FIELD BENCH IRRIGATED CROPLAND	488	0.04
6	CONTOUR BENCH IRRIGATED CROPLAND	0	0.00
7	PASTURE LAND	95775	8.56
8	SPRINKLER IRRIGATED PASTURE LAND	312	0.03
9	TAILWATER IRRIGATED PASTURE LAND	0	0.00
10	SURFACE IRRIGATED PASTURE LAND	0	0.00
11	FIELD BENCH IRRIGATED PASTURE LAND	0	0.00
12	CONTOUR BENCH IRRIGATED PASTURE LAND	0	0.00
13	RANGELAND	18334	1.64
14	FOREST LAND	15207	1.36
15	OTHER FARMLAND	23281	2.08
16	PITS AND QUARRIES	0	0.00
17	BARREN LAND	1819	0.16
18	BUILT UP LAND	18305	1.64
19	RURAL TRANSPORTATION	1311	0.12
20	WATER	16388	1.46
TOTAL		1119416	100.00

Management plan as allowed under the Nebraska Groundwater Management and Protection Act. Modifications will include actions that they could take to reduce adverse affects. The NRD will continue to support hydrologic and hydrogeologic studies which will contribute to the foundation of knowledge needed to locate and identify orchid habitat and other water related sensitive habitats.

GEOLOGY

Geologic Sequence

The geologic bedrock maps (Exhibit 11) indicate Pennsylvanian deposits underlie the Cretaceous deposits in the extreme southeast corner of the District. Table 4 presents the geologic units in profile and lists their water bearing properties.

The oldest bedrock unit of known hydrologic importance, underlying most of Saunders, Dodge, eastern Butler, and Colfax counties, is the Dakota Sandstone. According to Ginsberg (1980), the Dakota underlying Butler County ranges in thickness from 500 to 600 feet and increases somewhat in thickness into Saunders County. Water quality is highly variable within this formation and is generally considered quite poor for domestic and agricultural use.

Bordering and overlying the Dakota on the west is a ribbon of Late Cretaceous age deposits called the Graneros Shale. Overlying the Graneros Shale is a thin layer of limestone named the Greenhorn Limestone. Neither of these layers are known to supply water to wells. These two formations have undergone significant erosion and vary in thickness throughout the area.

The youngest bedrock formation in western Butler, western Colfax, and eastern Platte counties is the Carlile Shale of Late Cretaceous age. This formation overlies the previously mentioned formation and like the Graneros Shale and Greenhorn Limestone, is not known to yield water to wells.

The Niobrara formation of Cretaceous Age forms the bedrock base under most of the portion of Platte County in the Lower Platte North NRD. Although not of significant regional hydrologic importance, water may be yielded locally to wells from fractures in the rock which have become filled with water. However, water in the Niobrara formation is generally high in total dissolved solids and may be rather poor quality.

TABLE 4

Geologic Units and Their Water-Bearing Properties
Lower Platte North Natural Resources District

System	Series	Major Stratigraphic Units	Physical Character	Water Supply
Quaternary	Holocene	Modern Soils	Locally silty, clayey, or sandy.	Transmits locally variable amounts of recharge to the groundwater reservoir.
		Recent valley-fill deposits	Stream-lain deposits of gravel, sand, silt, and clay associated with the most recent cycle of erosion and deposition along present streams.	May contribute significant amounts of water to wells.
	Pleistocene	Loess	Silt with lesser amounts of very fine sand and clay deposited as wind-blown dust.	Transmits recharge to the groundwater reservoir. May provide small quantities of water to a few shallow stock or domestic wells.
		Till	Ice-deposited silty, sandy clay with gravel and larger pebbles and boulders.	Relatively impermeable. Transmits water slowly to the groundwater reservoir. Groundwater may be perched above the till. Sand deposits within the till provide water to small-capacity wells.
		Glacial outwash and other ancient valley fill deposits.	Stream-lain deposits of gravel, sand, silt, and clay associated with ancient erosional and depositional cycles.	Contributes water to wells in generally large amounts. Stream-deposited sand and gravel constitute the major reservoir in the NRD and yield water to large-capacity wells.
Tertiary	Pliocene(?)	Ancient valley-fill	Mostly unconsolidated silt. May blanket Cretaceous bedrock at base and on side slopes of paleo-valleys.	Generally too fine textured to yield water to wells.
	Miocene	Ogallala	Poorly sorted clay, silt, sand, and gravel generally un-cemented to slightly cemented.	The Ogallala constitutes a major reservoir in the western part of the NRD. Ogallal sand and gravel yield water to large-capacity wells.
Cretaceous	Upper Cretaceous	Niobrara	Chalk	May supply water to wells where fractures in the rock exist and are saturated.
		Carlile	Shale	Not known to supply water to wells.
		Greenhorn	Limestone	
		Graneros	Shale	
	Lower Cretaceous	Dakota	Sandstone and shale.	The Dakota constitutes a significant reservoir in the eastern part of the NRD. Potential yields and water quality are locally variable.

The four townships in the extreme northwest portion of the District are underlain by the Ogallala formation. The Ogallala ranges in thickness from about 10 feet in the eastern portion, to slightly more than 200 feet in thickness in the northwest tip of the District. The Ogallala does not occur in the central and eastern portions of the District.

Geologic Sections

Exhibit 12 (in pocket) demonstrates the distribution of the bedrock units across the District and illustrates the variability in the amount of overlying material. These ten cross sections demonstrate the confining layers in place and the vertical distribution of aquifer units. These will be discussed further as they pertain to the water bearing properties of the groundwater reservoir.

DESCRIPTION OF THE GROUNDWATER RESERVOIR

Definition of Terms

The following terms are defined to aid the reader in the following discussions. A larger glossary of water related terms is included in Appendix B.

Aquifer - a water bearing structure of rock or sediment capable of yielding supplies of water to wells.

Aquifer, Unconfined (Water Table) - the level below which the subsurface is saturated with water and at which the pressure head equals atmospheric pressure. A parameter associated with unconfined aquifers.

Aquifer, confined (artesian) - an aquifer in which the groundwater is isolated from the atmosphere by impermeable geologic formations and the resulting hydraulic pressure is generally greater than atmospheric pressure.

Aquifer, perched - a water bearing unit capable of yielding supplies of water to a well and containing unconfined groundwater. This unit is separated from an underlying aquifer by a less permeable unsaturated zone.

Potentiometric - Aquifer Thickness (PAT) - the distance from the potentiometric surface to the base of the principal aquifer.

Groundwater Reservoir - for any given area, the subsurface storage space between the water table and the base of the principal aquifer, includes one or more aquifers and any associated fine-grained material (usually excludes perched aquifers).

Potentiometric Surface - an "imaginary" surface representing the total head pressure in a confined aquifer that is defined by the level to which water will rise in a well.

Pressure Head - the height of a column of water which can be supported by the pressure at a given point.

Principal Aquifer - term used in describing the primary units for water supply.

Till - generally unstratified, unsorted, and unconsolidated drift consisting of intermingled clay, sand, and boulders.

Transmissivity - a rate which quantifies the ability of an aquifer to transmit water.

Unsaturated Zone - porous earth materials which contain both air and water in their pore spaces.

Description of Principal Aquifer Systems

Quaternary Aquifer System

During the Pleistocene time period, three fairly distinct types of material were deposited. The youngest, near surface deposits, are the loess soils (or wind blown dusts) composed primarily of silt containing lesser amounts of very fine sands and clay. The layer deposited just prior to the loess is composed of till dredged and placed by continental glaciers. Till is normally composed of ice-deposited silty, sandy clay containing some gravel, large pebbles, and boulders. Because the till is clayey and poorly sorted, it is not generally considered an aquifer, and often serves as a confining layer.

Glacial outwashes are composed primarily of glacial stream deposits of gravel, sand, silt, and clay associated with the water melt from the ice sheets. These channels occur on top of the till, may cut into the till, or may lie under the till. Their primarily coarse-grained deposits are the principal water bearing material for much of the District. Because of the varying erosion/deposition cycles of the Quaternary, the groundwater reservoir is a complex multilayered system of aquifers separated by fine-grained silt, clay, or till layers.

Ogallala Aquifer

The Ogallala formation is made up principally of calcareous fine to medium grained sandstone, clayey or sandy silt, and lenses of coarse-grained sands and gravels. These materials are normally uncemented. However, some areas may have become slightly cemented due to calcium carbonate complexes. Silt is the predominant material throughout the formation but significant amounts of sand and gravel and sandstone allow some highly productive wells to be developed in this formation. The portion of the Ogallala in the Lower Platte North NRD is merely the eastern tip of this aquifer where most of the state's water is in storage.

Dakota Aquifer

The Dakota formation is often not classified as a principal aquifer due to the fact its geology within the NRD is not well defined and the chemical characteristics are generally undesirable. However, since it is used for a source of water where shallower aquifers do not provide an adequate water supply, it is appropriate to recognize its significance. The Dakota is composed of a thick series of interbedded sandstones and shales. The sandstone varies from very fine grained to quite coarse and may contain gravel deposits near the base. The shale is of a sandy, carbonaceous clayey material. Normally, in this area, the Dakota sandstones are penetrated and screened in combination with overlying aquifer material in order to gain sufficient saturated thickness for an irrigation well.

Due to the normal consideration of the Dakota as a secondary supply of water, it has not been included in the descriptive maps of the principal aquifer (i.e., saturated thickness and the base of the aquifer).

Geographic Distribution of Groundwater Reservoir

Exhibit 13 illustrates the underground water areas of Nebraska. From this map, it is evident that the Lower Platte North NRD is situated over four of these groundwater regions. The Platte River Valley coincides with the Platte River as it is contained within the District. The northwest portion of the District (half of Platte, Boone, and Madison counties) is located in the east central Dissected Plains. Portions of Platte, Colfax, and Dodge counties are integrated into the northeast Nebraska Glacial Drift, and Saunders and Butler counties are in the southeast Nebraska Glacial Drift region.

Exhibit 11 depicted the locations of the Dakota and Ogallala formations. Of the bedrock formations these two are the principal bedrock water bearing units in the District, with the Ogallala utilized as a principal aquifer. These two formations are located in the east-southeast and northwest parts of the District, respectively. Exhibit 14 (Dakota) and Exhibit 15 (Ogallala) show their spatial

distribution and Exhibit 16 illustrates the distribution of potential water bearing Holocene and Pleistocene (Quaternary) deposits of the District, which contain the majority of the aquifer units composing the groundwater reservoir.

The geologic profiles (Exhibit 12) demonstrate the extreme variability in the areal distribution of Holocene and Pleistocene aquifers. The generalized map of the state (Exhibit 16) demonstrates that the Platte Valley, Wahoo Creek, and Shell Creek are areas of bottom land configuration containing a thin alluvial layer. Adjacent to the Shell Creek area, in western Platte County and in Boone County, are mixed dune sands and sandy table lands that provide water for irrigation and public use. The areas of western Saunders and most of Butler County are primarily composed of loess deposited on glacial drift and contain water bearing layers of varying depths.

The Todd Valley in eastern Saunders County is an area of Quaternary deposits of sands and gravels constituting a very important regional groundwater reservoir. These deposits, in combination with the Dakota, are the source of supply to nearly all of the wells in that area.

Irrigation development throughout the District provides some indication of the geographic distribution of the groundwater reservoirs. Exhibit 9 (registered wells through March 1993) clearly demonstrates irrigation has developed somewhat extensively along the Platte River corridor, from the west end of the District to the Fremont area. Development in Colfax, Platte, and Boone counties closely follows the groundwater availability patterns. Irrigation well development in Saunders County is almost exclusively limited to the Todd Valley and the Sand/Duck Creek areas adjacent to the Todd Valley.

The LPN NRD has subdivided the District into four groundwater reservoir areas based upon aquifer types, areal distribution and development. These areas are referred to as Shell Creek, Platte Valley, Uplands, and Todd Valley (Exhibit 17).

Stratigraphic Definition

The generalized geologic profiles (Exhibit 12) were developed by combining published geologic profiles and UNL Conservation and Survey Division in-house reports. These profiles have become a valuable tool in educating the staff, directors, and public about the complex, multi-layered system of groundwater settings within the District. The ten profiles yield an excellent underground look at the layered configuration of the District.

Table 4 is developed as a stratigraphic column showing depositional sequence, age, and characteristics of the various units. The table shows Holocene deposits, or recent valley fills, may contribute significant amounts of water to wells in some areas. Pleistocene loess deposits provide small quantities of water to a few shallow stock and domestic wells, while the till areas include intermingled sand deposits that may provide water for small capacity wells. The glacial outwashes and other ancient valley deposits contribute water to wells in fairly large amounts. Stream deposited sand and gravels of the Quaternary age constitute the major regional aquifers in the NRD, in terms of yielding water to large capacity wells.

The Ogallala and the overlying Quaternary in the western portion of the NRD is a major aquifer in that area. These units, although variable in depth and thickness, yield water to large capacity wells. The Niobrara formation through Platte County may supply water to wells if they are located in fractured rock. Few wells have been developed in the Niobrara because of sufficient quantities of overlying Quaternary material in most areas.

The Dakota constitutes a significant secondary aquifer in the eastern part of the NRD. The Dakota is penetrated and tapped by wells over a significantly large area in combination with overlying Quaternary deposits. Well yields and water quality from the Dakota are locally quite variable.

Groundwater Availability

The configuration of the base of principal aquifer map (Exhibit 18) does not include the highly variable Dakota formation as part of the principal aquifer, which has been excluded due to the lack of substantive information identifying its use and depth. Exhibit 18 is a modification of the Department of Environmental Quality and Conservation and Survey Division, UNL 1980 base configuration map. The update was accomplished by plotting additional data points from the drillers logs of irrigation, municipal, and monitoring wells. The contours were adjusted accordingly and represent a map of the base of the aquifer according to data available as of August 1985. This map by itself does not tell much about the groundwater reservoir, but coupled with the water table map, it helps in defining aquifer thickness.

Key variations from the 1980 Conservation and Survey Division map are in the areas from the Butler/Saunders County line west through Butler County, around the Platte Center area, and the Newman Grove and Lindsay regions. The new lines of the bedrock map indicate locations of possible bedrock valley forms in the older formations. Sands, gravels, and pebbles have filled these areas and thereby provided sufficient area for water storage.

Exhibit 19 represents the average water level surface in the principal aquifers in 1985. While the water table surface changes with time, the 1985 map is used here to generally represent regional direction of groundwater flow and elevation of the water table. The lines of equal water elevation may not constitute a continuous water level surface. Variability in mapped water levels may be explained as a result of data being obtained from wells of various depths and screened at different depth intervals, penetrating both confined and unconfined aquifers. In some areas of Butler, Dodge, and Saunders counties, water level contours may not represent actual elevations because of insufficient monitoring information and the complexity of the geology.

The water level elevation map represents the water level that will rise in a well and not necessarily the "water table". Some of the regional aquifers are "confined" (or more commonly known as "artesian") so the water levels in these wells will represent different conditions than those measured in an unconfined (water table) aquifer. The LPN NRD will periodically update this Exhibit in order to monitor changes in groundwater flow at various times of the year or over the long term.

A thickness map of saturated coarse-grained sediments of the principal aquifer (less the Dakota), noted as Exhibit 20, was developed for the plan in 1985, to more accurately define the areal distribution and thickness of saturated sand and gravel deposits. The map was constructed using data from registered irrigation well logs of sufficient detail, as well as those logs of the Conservation and Survey Division test holes. This map will be updated with new information from well logs as they become available.

A large portion of the subsurface of the District is composed of glacial till and other silts and clays not readily providing water to wells and may act as confining beds contributing to artesian head in the underlying sands. Exhibit 20 provides definition of the thickness of saturated coarse-grained material without considering the effects of artesian head or perched water levels. This map provides a basis for making conservative estimates of water in storage and well yield.

The saturated thickness map demonstrates that a sizeable portion of Saunders, Dodge, and Butler Counties are underlain by aquifers less than 50 feet thick. A large part of the remainder of the District is underlain by less than 100 feet of saturated sand. Generally, the Todd Valley area, the paleovalley just north and east of David City, areas adjacent to Tarnov, and a portion of the northwest corner of the District appear to have a significant saturated thickness and sizeable quantity of water in storage for present uses at current rates.

Water level rises and declines can be directly related to changes in saturated thickness only in an unconfined aquifer. In a confined aquifer, water level declines do not represent a reduction in saturated thickness, but rather a reduction of artesian head. Water level fluctuations cannot be directly related to percent of saturated thickness unless the hydraulic relationship has been accurately defined.

Groundwater Reservoir Yield

Transmissivity values are used to quantify the ability of an aquifer to transmit water and assist in explaining present development and future development potential of the principal aquifers. Values of transmissivity are normally expressed in terms of thousands of gallons/day/square foot. To visualize this (transmissivity) value, imagine a one square foot window in the side of an aquifer for one day with a hydraulic gradient of one. If the window were lengthened to stretch from the top of the aquifer to the bottom, and still be one foot wide, the amount of water that would flow out of this window in one day would be called the transmissivity (gallons of water yielded per square foot of formation per day). Transmissivity relates indirectly to well yield. Well yield, usually expressed in gallons per minute, is the ultimate measure of the volume of water which can be extracted from a well in an aquifer. (Design efficiency and purpose of the well often mark the ability of an aquifer to produce water). As a function of aquifer thickness and permeability, transmissivity estimates provides an indication of the productivity of an aquifer. Exhibit 21 illustrates areas adjacent to the Platte River, the Todd Valley, Central Platte County, and the upper Ogallala area of Boone County (in the District) possessing transmissivity values of more than 100,000 gallons per day, per foot of formation. The area of west central Saunders County and east central Butler County exhibit transmissivity values ranging from 1-20,000 gallons per day, per foot.

Calculation of transmissivity values requires fairly site-specific data analysis. Parameters used in transmissivity calculations are the saturated thickness and the permeability of the formation with respect to water. Detailed large scale calculations of transmissivity values have not been made for the Lower Platte North NRD. The state map, as discussed above, is sufficient to provide a general idea of transmissivity values over the District.

A more meaningful map, at least from the District's standpoint, is a map evaluating the ability to provide water to a well. Exhibit 22 depicts a general estimated well yield for the District aquifer areas, minus the Dakota. This map agrees in context with the generalized state map of transmissivity. It relates the saturated thickness and transmissivity data while providing an overview of estimated area yields assisting in developing area specific management decisions.

Water Level Changes - Predevelopment to 1991

A critical element in managing groundwater is the determination of what happens to the water levels in the groundwater reservoirs over time. In 1985, when the first LPN NRD groundwater management plan was developed, little data existed for use in analysis of water level trends. Ideally, a long period of record is desired to evaluate water level changes from predevelopment to the present which would provide long-term trends with averaging for seasonal and climatic variations. The U.S.G.S. and the Conservation and Survey Division long ago recognized this need and began a cooperative water level measurement program, in 1930, designed to observe and document water level changes throughout Nebraska. Unfortunately, the period of record in the LPN NRD does not date from 1930 and is too short to adequately determine long-term trends in water levels. However, where possible, individual comparisons have been made between 1991 water levels and estimated predevelopment water levels in the U.S.G.S. "1991 Water Level Changes report" and estimated predevelopment water levels were determined for a large portion of the NRD. Predevelopment water levels are defined as the approximate average water level at a well site, prior to human development. All available water-level data collected prior to or during the early stages of development were used to estimate predevelopment water levels.

Exhibit 23 sets forth the U.S.G.S. and Conservation and Survey Divisions approximation of net water level change from estimated predevelopment to fall, 1991. The lower Shell Creek Reservoir and the Uplands Reservoir contain large areas where data was insufficient to determine predevelopment water levels. Monitoring wells outside the LPN NRD boundary were included on this Exhibit to provide a broader view of possible border concerns. Generally, from the few points for which predevelopment water levels are estimated within the NRD, it appears water levels have changed less than 5 feet. The only two exceptions of note are the area between Ithaca and Memphis and the one N.E. of North Bend which show declines slightly greater than five feet. The water level in a monitor well located south of David City, in the Lower Platte South NRD, is estimated to have dropped more than 40 feet since predevelopment. This well is located in an intensively developed, confined aquifer, where water level drop may reflect a drop in artesian pressure rather than dewatering of the saturated thickness. The LPN NRD's monitoring program also indicates the area near David City (north of this well) to be in an area of decline in the past.

Water Level Changes - Base Year

In the 1985 Plan, one area of primary concern was the lack of a sufficient water level monitoring network to detect changes. In 1986, the LPN NRD began a program to fill this gap, utilizing 68 actively monitored wells for spring and fall measurement (pre and post-irrigation season). Monitor well locations are shown on Exhibit 24. Results of monitoring from the spring of 1987 through spring of 1993 are mapped on Exhibit 25, while selected hydrographs of key representative wells are presented on Exhibit 26.

As with any graph or map of data, the numbers presented must be placed in the proper perspective to be meaningful for management. The data gathered by the LPN NRD indicate a tendency toward decreasing water levels when tested against 1987 as the base year. 1987 was a relatively wet year and hydrograph data showed an elevated water table. However, 1987 is an excellent year to use as an "index" year because of the accuracy of the water level measurements from that time on. As additional water level data from the monitoring network is

collected, a better picture of the long-term trend in water levels in the District aquifers will develop. The "index" year can be adjusted over time to more closely approximate a "normal" year.

The levels shown in Exhibit 25 can be placed into perspective by consideration of their relationship to the saturated thickness of the aquifer. Exhibit 20 is a map of saturated thickness of the various coarse grained aquifers of the District from the 1985 Plan and Table 5 summarizes the net water level changes as a percentage of saturated thickness.

Table 5
Net Water Level Change as a Percentage of
Saturated Thickness, Selected Wells: Lower Platte North NRD
Groundwater Level Data; Spring 1987 - Spring 1993

Well #	County	Aquifer	Long-Term Net Change (feet)	Estimated Saturated Thickness (ft)	Approximate % of Saturated Thickness
6	Platte	Shell Creek	-5.0	50 - 100	5 - 10
8	Platte	Shell Creek	-5.2	75 - 100	5 - 7
12	Platte	Shell Creek	-4.4	100 - 150	3 - 4
17	Platte	Shell Creek	+2.2	75 - 100	2 - 3
21	Colfax	Shell Creek	-2.5	75 - 100	2 - 3
24	Butler	Platte Valley	-6.1	75 - 100	6 - 8
25	Butler	Platte Valley	-6.7	75 - 100	6 - 9
66	Dodge	Platte Valley	-6.5	25 - 50	13 - 26
27	Butler	Uplands	-3.3	150	2
30	Butler	Uplands	-10.9	100 - 150	7 - 11
31	Butler	Uplands	-7.2	150 - 200	3 - 5
34	Saunders	Uplands	-0.4	100 - 150	<1
43	Saunders	Uplands	-2.4	75 - 100	2 - 3
48	Saunders	Uplands	-7.3	75 - 100	7 - 10
49	Butler	Uplands	-4.0	150 - 200	2 - 3
53	Butler	Uplands	-9.4	0 - 25	>38
57	Saunders	Todd Valley	-6.3	100 - 150	4 - 6

As shown in Table 5, a water level decrease in Well No. 31 (saturated aquifer thickness of 150 to 200 feet) does not carry the same implications as a 10 feet decrease in Well No. 53 (saturated aquifer thickness of 0 to 25 feet). The water level decline in the former well is less than 5 percent of aquifer saturated thickness, while in the latter just 6 miles to the north, it is over 35 percent.

Generally, District-wide water levels have declined slightly from 1987 through 1993, (less than five feet). The most significant area of decline has occurred in the David City area where water levels have declined more than 10 feet from the spring of 1987 to spring 1992. These declines are likely to be pressure head changes since this aquifer is considered to be a confined or semi-confined aquifer. Further monitoring and investigation is needed to define the relationship between the declines in water levels, changes in pressure head, and saturated thickness so as to place the declines in perspective. The LPN NRD added 11 monitoring wells in this area in 1991 to assist in gaining more pertinent information. The Shell Creek groundwater reservoir also shows some small areas of decline (<5 feet), but is difficult to characterize due to insufficient data. The LPN NRD plans to increase the number of wells monitored in this reservoir. The Platte River and Todd Valley reservoirs show only slight declines (<5 feet) from both estimated predevelopment and the 1987 "index" year. Both of these reservoirs are intensively developed and appear to be supporting this development without large-scale mining of groundwater occurring. Hydrographs of NRD monitor wells are included as Appendix C for further reference.

Groundwater Level Monitoring Network

As of June 1994 a total of 116 wells are being monitored district-wide for groundwater level changes. The Lower Platte North NRD plans to add more wells to the network in the next few years to a goal of 120 wells. Expansion into the Shell Creek Reservoir is the first priority, where multiple aquifers are known to exist. This reservoir is of concern because water levels have been declining to near the 10% level of saturated thickness.

A secondary network of 11 wells was added in the David City area in 1991. Most of these wells will be added to the primary trend monitoring network with the remainder monitored only in the spring. The aquifers in this area are semi-confined and show great fluctuation from spring to fall every year. In several areas the saturated thickness had declined close to 7% by the spring readings of 1992, which is the first trigger level for groundwater management of a confined aquifer.

The NRD's water level monitoring program is still being formulated. The first wells in the network were initiated in 1985. The NRD intends to have a trend network established for the entire district, with secondary networks established for more intensive monitoring in problem areas.

GROUNDWATER FLOW SYSTEM

Recharge

Groundwater recharge is dependant upon a variety of important parameters which include: water availability; the amount, frequency, and timing of precipitation; land slope and land use; soil infiltration rates; vertical permeability, and soil conditions.

Precipitation

Precipitation in the Lower Platte North NRD serves as the principal source of water for recharge in all but the Platte River Valley adjacent to the River. Exhibit 27 demonstrates the mean annual precipitation for the state and the Lower Platte North NRD. The average annual water requirement for maximum yield by crops varies from 25 inches for corn to 22 inches for grain sorghum and soybeans. It, therefore, appears that an abundance of moisture exists over the District, however, the timing and amount of precipitation determines crop water availability. (Exhibit 28 illustrates the timing and distribution of precipitation). Moisture needs are more critical at certain times in the crop growing cycle and if moisture is not available, crop production can and does suffer. Detailed evaluations of precipitation versus soil moisture and crop water needs are necessary components in providing a comprehensive management system.

This area of the state receives maximum precipitation in April, May, and June. The maximum water use period by crops stretches from April through September (crop dependant), with July, August, and September water requirements exceeding available average precipitation. It is apparent that at certain times there is a need for irrigation water in order to produce higher yields.

Temperature fluctuations and wind patterns are two other variables combining with precipitation to influence the amount of water moving down to the water table for recharge.

The LPN NRD recognized the need for good records of precipitation in anticipation of developing a District groundwater model. Since 1985, the NRD has supported expansion of the precipitation data collection network, and now has a network that covers the NRD and is considering adding a few new stations. The present distribution of the NRD precipitation network is mapped on Exhibit 29.

Seepage

Exhibit 30 indicates the Platte River is a losing stream from Columbus to the Salt Creek confluence. Field work by NRD staff has also indicated that the Platte River loses water to the east and north but gains from the south and west, as it flows to its confluence with the Elkhorn. From the Elkhorn River to Salt Creek, water moves underground to the west into the Lincoln municipal well fields. The slope of the water table between the Platte and Elkhorn rivers also indicates a potential loss of water by eastward seepage into the Elkhorn River aquifer. If the Elkhorn River is a gaining river in this stretch, it probably returns such gains to the Platte River at the confluence of the two rivers.

Some seepage from Lake Babcock has contributed a small amount of recharge in the area of the District adjacent to that structure. Some water logging on adjacent lands has occurred and is possibly due to an elevated water table caused by this seepage.

The LPN NRD has instituted a program of mapping seeps along streams in the NRD. These maps will be useful for water budget calculations, modeling, groundwater contamination, and identification of discharge/recharge acres. The LPN NRD has almost completed this type of mapping within the NRD.

Estimated Recharge Data
Lower Platte North Natural Resources District

	<u>Soil/Topographical Region</u>	<u>Area Mi²</u>	<u>Average Precipitation in. (ft)</u>	<u>Estimated Average Percent Recharged</u>	<u>Total Recharge</u>	
					<u>AF</u>	<u>MG</u>
1.	Silty soils in valleys, developed on alluvium.	339	28 (2.33)	15	7.6×10^4	2.5×10^4
2.	Silty soils on uplands, terraces or plains, developed on loess.	945	28 (2.33)	5	7.2×10^4	2.4×10^4
3.	Loamy or sandy soils in valleys, terraces, or plains, developed on alluvial sands.	162	28 (2.33)	20	4.9×10^4	1.6×10^4
4.	Silty, clayey, or loamy soils in uplands, developed on glacial till and loess.	35	28 (2.33)	1	4.5×10^2	1.5×10^2
5.	Other	62	---	---	---	---

TABLE 6

Land Slope

Land slope is an important recharge component as the slope determines how rapidly rainfall will run off an area or will be retained for infiltration into the groundwater reservoir. The variability of topography in the District is significant. The District encompasses six of the seven types of topography as defined by the UNL Conservation and Survey Division (Exhibit 2). In general terms, one would expect less runoff and more water available for recharge in the valleys or flat-lying areas than in areas of rolling hills. This higher recharge rate associated with sandy type soil valley areas makes them more susceptible to groundwater contamination through percolation. Reference to area and site specific slope information can be obtained from county soil surveys and topographic maps.

Soils Data

Site specific information related to particular soils and their hydrologic properties may be obtained from the soil surveys of Boone, Butler, Colfax, Dodge, Madison, Platte, and Saunders counties. Later soil surveys include tables classifying soils into four hydrologic units and illustrates runoff estimates and infiltration rates.

General soil association areas in the Lower Platte North NRD are found on Exhibit 31. A comparison of this Exhibit and Exhibit 2 provides a general overview of soils overlaying particular topographic regions. The following graphic provides an estimated percentage of average annual groundwater recharge from precipitation within topographic regions.

Topographic Region	Natural Recharge (%)
Valleys	20-30
Plains	3-5
Dissected Plains	10-15
Sandhills	25-30
Rolling Hills	1-5*
Bluffs and Escarpments	1-2

*Recharge is usually to perched aquifers.

LOWER PLATTE NORTH NRD
ESTIMATED GROUNDWATER IN STORAGE
(Does Not Contain Dakota Water - only saturated coarse sediments -
no clay/silt water)

Township	Feet Average Sat. Thickness X 0.2 X	Area Mile 2	mi2 x 640 Acres =	(acre feet) Water Volume
22-6W	100	16	10,240	204,800
22-5W	125	36	23,040	576,000
21-5	75	27	17,280	259,200
21-4	50	36	23,040	230,400
20-5	75	9	5,760	86,400
20-4	50	22	14,080	140,800
20-3	50	26	16,640	166,400
19-3	100	24	15,360	307,200
19-2	125	36	23,040	576,000
19-1W	125	36	23,040	576,000
19-1E	75	36	23,040	345,600
19-2E	75	24	15,360	230,400
18-2W	75	17	10,880	163,200
18-1W	75	30	19,200	288,000
18-1E	100	30	19,200	384,000
18-2E	75	30	19,200	288,000
18-3E	75	14	8,960	134,400
17-2E	75	36	23,040	345,600
17-3E	50	36	23,040	230,400
16-1E	75	30	19,200	288,000
15-1E	100	18	11,520	230,400
15-2E	100	18	11,520	230,400
15-3E	100	36	23,040	460,800
16-2E	75	36	23,040	345,600
16-3E	25	36	23,040	115,200
17-4E	75	36	23,040	345,600
17-5E	75	36	23,040	345,600
17-6E	50	36	23,040	230,400
17-7E	50	36	23,040	230,400
17-8E	75	30	19,200	288,000
17-9E	25	13	8,320	41,600
16-4E	0	36	23,040	-
16-5E	0	36	23,040	-
16-6E	50	36	23,040	230,400
16-7E	100	36	23,040	460,800
16-8E	30	30	19,200	192,000
15-4E	100	36	23,040	460,800
15-5E	0	36	23,040	-
15-6E	0	36	23,040	-
15-7E	75	36	23,040	345,600
15-8E	100	30	19,200	384,000
15-9E	25	25	16,000	80,000
14-5E	75	18	11,520	172,800
14-6E	75	36	23,040	345,600
14-7E	50	36	23,040	230,400
14-8E	75	30	19,200	288,000
14-9E	50	36	23,040	230,400
13-8	25	30	19,200	96,000
13-9	50	35	22,400	224,000
				12,425,600 AF

Plus an estimated 530,200 for townships uncalculated 12,955,800 AF
It is estimated that the range is about 10-20 million acre feet which
is approximately 1% of the state total. The above figures represent
about 0.6% of the state total in storage.

TABLE 7

Table 6 provides a generalized estimate of recharge by soil types for the entire NRD. Estimates were based on measurements of acres in each soil type, multiplied by the estimated recharge times precipitation, to obtain an estimated recharge in acre-foot.

Storage

Exhibit 5 demonstrates the generalized map of groundwater in storage in the principal aquifers (does not include the Dakota aquifer) of the state. Table 7 provides an estimate of groundwater in storage by township in the Lower Platte North NRD and indicates approximately 13,000,000 acre feet of water in storage in the District. This storage figure is estimated to be low as it includes only the saturated coarse sediments and does not include the Dakota, the Quaternary fine-grained deposits, or differences in storage resulting from artesian conditions.

In developing the 1985 Groundwater Management Plan, the LPN NRD divided the District into three generalized groundwater planning and potential management areas. In attempting to determine the volume of stored water within the three areas, some estimates of portions of townships in the respective areas had to be made. (This determination is on file at the Lower Platte North NRD office.) The calculations produced the following estimated volumes in storage by area, and is estimated to be about 1% of the states total storage.

Saunders/Butler County Uplands	4,132,240 AF
Platte River Corridor	4,039,560 AF
Northwest Uplands	4,784,000 AF

The high numbers in the Saunders/Butler County area may be misleading as the preponderance of that amount is located in the Todd Valley region of Eastern Saunders County.

Exhibit 20 shows the saturated thickness of water bearing areas of the Quaternary sands and gravels and Ogallala sandstones. Unsaturated areas of the District allowing storage of significant quantity are limited. One area in northwest Saunders County, (communication with Vince Dreeszen 1985) may have slight storage potential but is assumed to be uneconomical to develop as a groundwater storage area. More detailed studies would have to be made to determine the type of storage facilities versus economic compatibility of systems and system use.

Discharge

Stream Discharge

Quantifying stream discharge will take time to develop as the present stream flow data is not of sufficient quantity or quality to make such determinations. Several streams flow year round and many more exhibit intermittent flows, however, repetitive flow records that could provide District evaluations of flow fluctuations do not presently exist. Currently (1993) the NRD measures streamflow for baseflow conditions at fourteen sites in late August and early September.

Groundwater Use

Historical Rate of Use

The primary volumetric uses of groundwater in the District has been to support irrigation, and municipal water needs. Since actual historical water use values or estimates are not available, the development of irrigation wells serves as an indicator of aquifer use. Exhibit 32 provides a look at the development through cumulative totals and annual totals of irrigation well development by county. Exhibits 7 and 8A through 8G graphically illustrates the 1950's and 1970's have been periods of rapid well installation. It also appears that the late 1980's and early 1990's may be considered a period of intense well development. Exhibit 9 depicts the distribution of irrigation wells as of 1993 and demonstrates areas of most intense irrigation.

Groundwater is the principal source of supply for public drinking water systems. All cities, towns, and villages in the District derive their supply from the groundwater reservoirs. Lincoln (located out of the District) and Fremont have extensive well fields along and adjacent to the Platte River in Saunders and Dodge Counties, respectively and Exhibit 8 shows the location of the present municipal well fields in the NRD.

Industry, rural domestic and livestock needs make up the other uses of historical significance, as well as present and projected future groundwater usage.

Present Use Estimates

Table 12 provides a profile of estimated groundwater usage 1983. This table was generated to demonstrate the magnitude and importance of the groundwater reservoir to the various present users. These figures vary with needs for water in any given year and are dependant on temperature and moisture conditions within the District. Irrigation, domestic and livestock uses were estimated using 1983 registered well data and USGS data. Public supply and self-supplied industrial water use values were obtained from the Nebraska Water Use Data Program Data Bank.

Even though the City of Lincoln is not located in the Lower Platte North NRD, a significant portion of the well field for Lincoln's public water supply is situated along the Platte River north of Ashland. It is reported that the present use rate for the city of Lincoln, out of the well field, averages 31 mgd (million gallons per day), but can be as high as 95 mgd in the summer months. This volume, added to that required by irrigation and other public and private users within the District, indicates that the quantity, as well as the quality of the groundwater of the District is extremely important for continued and or sustained development.

TABLE 12

**1983 Profile of Estimated Groundwater Use
Lower Platte North NRD
(By Counties or Portions of Counties within the District)
(Values in Acre-Feet)**

	Boone	Butler	Colfax	Dodge	Madison	Platte	Saunders
Irrigation							
Pivots	8,831	7,948	6,513	4,747	1,766	12,916	17,662
Gravity	2,261	49,403	57,316	58,733	1,357	27,451	35,830
Total	11,092	57,351	63,829	63,480	3,123	40,367	53,492
Public Supply	----	614	721	4,541	219	348	35,949
Self-Supplied Industry	----	----	38	2,062	----	----	106
Rural Domestic	40	230	150	150	40	280	690
Total	11,132	58,195	64,738	70,233	3,382	40,995	90,237

Dodge County - Municipal and Industry use a greater % of total use than other areas - of concern because use is from rather shallow aquifers.

Future Use Estimates

The City of Lincoln is presently developing a new well field on a Platte River Island just downstream from the southeast corner of the District. This well field is anticipated to about double the possible volume of water per day taken from the aquifer.

The Metropolitan Utilities District has purchased land along the Platte River in Saunders County across the River from the Douglas/Sarpy County line. This area is to be developed into a municipal well field, providing water to the City of Omaha and surrounding areas. Monitoring of these activities will be incorporated into the LPN NRD groundwater program.

With increases in nitrates and potential increases in chemical constituents in rural drinking water supplies, the potential for regional drinking water supplies must be explored by the District.

Other Uses

Exhibit 33 presents generalized subirrigation areas of the District. To date, the demand upon the aquifer resulting from subirrigation, evapotranspiration, sand pit development, and phreatophytic growth is not quantified. Those needs and volumes are to be computed if a complete management scheme is to be realized that provides optimal use of the resource.

Summary

Based on available data, the groundwater flow system appears to be somewhat in equilibrium with inflow approximately matching discharge. Some decline of water level has occurred district-wide since 1987. The area of most significant decline is located near David City. The period of record for water level monitoring, however, is extensive enough to determine that a portion of the decline is a result of normal climatic variation and a portion is a result of groundwater mining.

The need for groundwater in the District is destined to increase. Lincoln estimates that by the year 2005, its daily use may average 48 million gallons per day with one day peak use estimates to exceed 100 million gallons per day. Municipal uses place a relatively high economic value on the water for domestic usage. Total population served with groundwater from the District presently approaches 250,000, and with addition of a new well field near Yutan by MUD in Saunders county, that population figure will more than double and possibly triple within a decade.

Economic values associated with crop production in the District will be calculated as the base data is accumulated and distribution and cropping practices are analyzed. The three major crops grown in the district demonstrates the need of a water use range of 21 to 26 inches to provide a finished product. A gross water budget will be developed in accordance with the Lower Platte North NRD ground and surface water management strategy when water quantities and needs are better known.

AVAILABILITY OF OTHER WATER FOR ARTIFICIAL RECHARGE AND INTEGRATED MANAGEMENT

Surface Water

Flowing Water

It is inevitable that as the value of water increases and the demand for somewhat limited supplies of water increases, the greater the attention focused on the streams and rivers of the state and the NRD. Bentall, 1982, states "within the last few years, several projects entailing additional storage features and greater use of water from the river (Platte) have been proposed. These have become controversial and other new proposals are likely to become equally so, largely because their effect on the river's flow is feared by many to be detrimental to the large flocks of migrating waterfowl that stop over in the (central) valley and to the several well fields designed to induce recharge from the river. Another fear is that groundwater withdrawals, principally for irrigation, already have had a marked depletion effect on river flow and that in the future they will continue to do so in a progressively increasing rate." Those fears associated with potential loss of water are present and are often the forces that guide management decision making processes. As a result, ineffectual methods of management are often employed in an attempt to circumvent or prevent the taking of the resource.

It has been noted that the flow of this region of the Platte River is a combination of the Upper Platte, the Loup and the Elkhorn Rivers. Shell Creek and Wahoo Creek Watersheds also provide small but at times significant flows to the Platte in this reach. Several heretofore ungauged minor tributaries and groundwater inflow areas provide the remainder of the flowing water supply.

The flow entering the NRD from the upper Platte system has fluctuated from overbank flows to periods of no flow. DWR data indicates that during a 30-year record analysis, about 36 percent of the flow in the Lower Platte River has originated above the North Loup (North Bend station). At that same point, 60 percent of the flow originated in the Loup River system. DWR data indicate the remainder of the flow is from Shell Creek, unmeasured tributaries and river gains from valley groundwater contribution.

The data, for 51 years, at Ashland shows the contributions of flow are: Elkhorn River - 22 percent, Loup River - 48 percent, upper Platte River - 28 percent; tributaries and valley groundwater inflow - the remaining 2 percent. The annual and seasonal percentages of contribution vary extensively and are dependant upon the type of water year within the areas of influence. As the precipitation influences flow, the dry periods likewise influence flow and the manner of loss and gain to groundwater areas is often linked with flow volume.

Exhibit 34 (Bentall 1983), provides a graphic representation of proportional flow and instream use of the system. He further stated that the average annual depletion rate within the river is about 1,380 cubic feet per second (CFS) or about 1,000,000 acre feet per year. Bentall also points out that, if sufficient storage can be found, consumptive use totaling about 300,000 acre-feet per year could be feasible on the Platte River upstream from the Loup's mouth, if an occasional year of almost no flow at Duncan could be tolerated. He further states that the Platte River, downstream from the Loup River, could be a supply source for as much as 1,500,000 acre feet of additional development without resulting in rare no-flow years. The no flow years would be reduced if development was associated with instream flow activities. Bentalls work shows that there is a supply of water in the Platte (with the Loup) that may be used for conjunctive use schemes, artificial recharge (if feasible), irrigation development, industrial development, municipal well fields, and recreation and fish and wildlife enhancement.

DWR also concludes that, for a 50-year monitoring period, the mainstream flows have remained relatively constant. Flow changes must be assessed relative to the continual development of irrigation systems with Platte River corridor. Minor flow fluctuations are presently seen as reflecting short-term climatic changes between wet and dry conditions. It is apparent that further use of stream and river flows will need to be monitored to detect flow trend changes, no matter how subtle. It is interesting to note that work done by groups opposed to the Landmark irrigation project demonstrated a reduction in Platte River flow above Columbus due to development of center pivot irrigation along the Platte River corridor.

Flow patterns of the Platte River are very important to the municipal well field recharge. Lincoln well field personnel report that fluctuating flows are necessary to cleanse the river bed. This cleaning allows for better percolation of the river flow into the groundwater aquifer for municipal well capture and usage. Low flows also contribute to a change in the municipal drinking water quality. It is becoming extremely important to fully investigate and monitor the potential quality changes that accompany flow fluctuations.

The importance of the Loup River system to the Lower Platte area cannot be overstressed as the high quality water is and can continue to be a valuable asset. Greater concern must be addressed to the management of the system, not only by those in the Loup basin, but by those who are dependant on the quality and quantity thereof.

Contained Water

A review of the DWR dam inventory printout indicates that the amount of water stored behind dams in the Lower Platte North NRD is relatively insignificant. Storage capability at maximum acre feet of storage amounts to about 24,300 acre feet with normal storage about 4,100 acre feet. Of the maximum storage capability, two structures account for one-third of the capacity (Clear Creek 22-A and Trouble Creek). These two also account for one-fourth of the normal storage.

The potential for storing surface water in the District is excellent due to the topography in the District. The needs for stored surface water includes water quality improvement, flood control, industrial use, irrigation, recreation, and wildlife enhancement.

Water Uses

Surface water uses for irrigation have been documented by USGS and the DWR. The following information shows the surface water use by County, in the District.

County	Diversion Permits	C.F.S. Granted
Boone	1	0.94
Butler	20	33.70
Colfax	35	30.18
Dodge	7	8.32
Madison	0	0
Platte	27	19.77
Saunders	<u>89</u>	<u>97.15</u>
TOTAL	179	191.07

Those permits are granted for a total of 17,836 acres of land.

Supplemental Sources

The NRC, Supplemental Water Supplies Policy Issue Study, 1984, defines supplemental water as additional water provided to supply that which is lacking, needed, or desired. The study further reports that, "because water is unevenly distributed in time and space, storage and transportation are the key elements in any strategy to provide supplemental water...supplemental water is considered to be water which is made available for use within a specific area by moving it from one area to another and/or storing it for use at a later time."

Supplemental sources of water are normally few in number and first supply needs are aimed at acquiring unappropriated stream flow of the Loup and Elkhorn River systems. These sources along with Platte River flow could be moved and placed in storage reservoirs for surface distribution. Economics plays an important part of any decision attempting to develop this method

of supplemental supply augmentation. This method is not completely dismissed as a possibility in the Lower Platte North NRD, but its application at the present time or near future is not on the immediate planning horizon.

Some viable sources that must be determined and substantiated are: more extensive use of the Dakota Aquifer (dependent on quality and quantity monitoring), development of larger flood control structures with irrigation potential, management of moisture in the soil profile, and reduction of evapotranspiration (crop changes, irrigation scheduling, lowering water table to protect from loss by evapotranspiration). These latter methods of supplemental supplies appear most feasible in providing more usable water and saving normal supplies. More in-depth analysis must be included in developing management decisions and future supplemental supply augmentation.

GROUNDWATER QUALITY

General Conditions

The characterization of groundwater quality in the Lower Platte North NRD has become increasingly easier with the wealth of water quality samples collected during the past seven years. More than 1,300 wells have been sampled for various constituents ranging from general inorganic chemicals to radioactive isotopes, nitrates, and pesticides. Most inorganic chemicals are considered to be indicative of the natural quality of the water. As water is a solvent for many salts and some types of organic matter, it reflects the chemical constituents of the aquifer and aquifer material in the time frame it is sampled.

The background conditions of groundwater in the principal aquifer types in the Lower Platte North NRD are discussed below, in part from Engberg (1984).

The quality of water from the Quaternary deposits is generally quite variable. (Exhibit 35 shows distribution of Holocene & Pleistocene deposits). The quality is affected by recharge from precipitation, man induced changes, and from stream flow. In areas of shallow depth to water, the quality can be and frequently is strongly affected by local point source contamination (discussed in a subsequent section). The importance of maintaining good quality water in this aquifer is pointed out by Engberg, as he states over one-half of the groundwater used in Nebraska is from this system. He points out that the state mean for total dissolved solids (T.D.S.) is about 437 mg/L. Total dissolved solids is a good general indicator of water quality, reflecting in part the sodium content and degree of mineralization of the water. His information also shows that the state mean for nitrate in this system is 5.3 mg/L, which is just over half the drinking water limit of 10 mg/L. Exhibit 36 shows that the generalized T.D.S. in the Lower Platte North NRD ranges between 251-750 mg/L. Exhibit 37 demonstrates that calcium concentrations in most of Platte, Colfax, and half of Butler Counties are higher than 75 mg/L. Most of Saunders, Dodge, and the eastern half of Butler are not plotted due to the lack of sufficient data. Alkalinity, Exhibit 38, normally ranges between 101-300 mg/L except in

TABLE 8
Summary of EPA Health Advisories
for Chemicals

This pesticide summary is offered as a quick reference to compare chemicals for which the Environmental Protection Agency has prepared Lifetime Health Advisory Levels.

Note: When details are needed, the EPA Health Advisory summary for the chemical in question should be consulted. The pen and ink changes have been made on the summaries to correct them as of November 14, 1989. The risk levels change occasionally as the EPA receives additional data about the chemical. Changes are printed in the Congressional Record or inquiries on risk level can be made to the EPA regional office in Kansas City.

LHAL - Lifetime Health Advisory Level - The level at or below which EPA data indicates the chemical presence in water can be consumed for a lifetime with no more than a one in one million chance of causing cancer and no chance of other non cancer health problems. These levels are subject to change as more data becomes available. When chemicals are considered carcinogenic an additional margin of safety is added to the LHAL.

LHAL Units - Are in either Micrograms per liter (parts per billion) or milligrams per liter (parts per million).

MCL - Maximum Contaminant Level - The maximum level of contamination in drinking water allowed by federal law when being provided for public use. Water at or below this level has not shown to produce long-term adverse health effects.

Abbreviations for Water Treatment

ACA - Activated Carbon Adsorption (Includes both granular & powdered)
(GACA) - Granular Activated Carbon Adsorption
(PACA) - Powdered Activated Carbon Adsorption

IE - Ion Exchange

OO - Ozone Oxidation

RA - Resin Adsorption

RO - Reverse Osmosis

UI - Ultra-violet Irradiation

11/14/89

Name	Common Names	Use	Lifetime Health Advisory Level (LHAL and MCL Guidelines	Hypothetical Cancer Risk When Consumed in Water at or Below Listed Level for a Lifetime ¹	Risk When Ingested Above LHAL Based on Human Data and and Animal Studies	Most Promising Way to Remove from Water
Acifluorfen	Blazer, Carbofluorfen Tackle, RH-6201	Herbicide	No designated LHAL	1 Microgram per liter One chance in one million of cancer	Damage to heart, liver, kidneys, blood, fetal development	ACA & RO
Alachlor	Lasso	Herbicide	No designated LHAL MCL = 2 Micrograms per liter	0.4 Micrograms per liter. Once chance in one million of cancer	Damage to liver, kidney, spleen and eyes	No Information available
Aldicarb & Aldicarb Sulfoxide	Temik	Pesticide	10 Micrograms per liter	Data inadequate	Inhibition of enzyme cholinesterase	ACA
Aldicarb Sulfone	Temik	Pesticide	40 Micrograms per liter	Data inadequate	Inhibition of enzyme cholinesterase	ACA
Ametryn	Ametrex, Gesapax	Herbicide	60 Micrograms per liter	Data inadequate	Damage to liver	GACA
Atrazine	Atranex Crlsazine	Herbicide	3 Micrograms per liter	Possible carcinogen	Tremors & damage to liver and heart	ACA
Baygon	Propoxur, Unden Blattanex	Insecticide	3 Micrograms per liter	Possible carcinogen	Damage to various organs and nervous system and inhibits production of enzyme, cholinesterase	GACA
Bentazon	Basagram	Herbicide	20 Micrograms per liter	Data inadequate	Weight loss and inflammation of prostate glands	No information available
Bromacil	Borea, Hyvar, Uragan	Herbicide	90 Micrograms per liter	Possible carcinogen	Damage to testes, liver and thyroid gland	
Butylate	Sutan, R-1910	Herbicide	350 Micrograms per liter	Data inadequate	Damage to testes, liver, kidney & fetal devel- opment	No information available
Carbaryl	Sevin	Insecticide	700 Micrograms per liter	Data inadequate	Damage to liver and kidneys, reduced fertility, inhibition of cholinesterase	ACA, OO
Carbofuran	Furadan, Curaterr	Pesticide	40 Micrograms per liter	None	Damage to testes and uterus plus inhibited of cholinesterase.	GACA, PACA

Name	Common Names	Use	Lifetime Health Advisory Level (LHAL and MCL) Guidelines	Hypothetical Cancer Risk When Consumed in Water at or Below Listed Level for a Lifetime ¹	Risk When Ingested Above LHAL Based on Human Data and and Animal Studies	Most Promising Way to Remove from Water
Carboxin	D-735, DCMO, Vitavax	Fungicide, seed protectant and wood preservative	700 Micrograms per liter	Data inadequate	Damage to kidneys and liver	ACA and RO
Chloramben	Amiben, Vegiben	Herbicide	100 Micrograms per liter	Data inadequate	Damage to liver and fetal development	ACA, IE
Chlordane (All uses canceled in April, 1988)	Dichlorodene, Octachlor, Velsicol-1068	Insecticide	No designated LHAL. MCL = 2 Micrograms per liter	0.03 Micrograms per liter. One chance in one million.	Damage to liver and central nervous system and cancer	GACA, PACA
Chlorothalonil	Bravo, Daconil	Fungicide	1.5 Micrograms per liter	2 Micrograms per liter. One chance in one million	Kidney damage and excessive weight loss	ACA, RO
Cyanazine	Bladex	Herbicide	10 Micrograms per liter	Data inadequate	Damage to liver, blood, birth defects	ACA
Dalapon	Dowpon, Ded-weed	Herbicide	200 Micrograms per liter	Data inadequate	Changes in kidney and liver weights	ACA, IE
2,4-Dichloro- phenoxyacetic Acid	24D, Oqua-Kleen	Herbicide	70 Micrograms per liter	Data inadequate	Damage to liver and kidneys, changes in blood	ACA, RO
DBCP	Nemafunc	Pesticide (for nematodes)	No designated LHAL. MCL = 0.2 Micrograms per liter	0.03 Micrograms per liter. One chance in one million	Damage to kidneys, liver and testes	Aeration, ACA
Diazinon	Spectracide, Basudin, AG-500	Insecticide	0.6 Micrograms per liter	None	Inhibition of cholinesterase	RO, GACA, OO
Dicamba	Banvel	Herbicide	200 Micrograms per liter	Data inadequate	Changes in liver and weight loss	ACA
1,2- Dichloropropane	Propylene dichloride or 1,2 DCP	Solvent	No designated LHAL. MCL = 5 Micrograms per liter	0.6 Micrograms per liter. One chance in one million	Damage to liver	GACA, Tower Aeration
1,3- Dichloropropene	DCP, Telone	Soil fumigant	No designated LHAL	0.2 Micrograms per liter. One chance in	Damage to bladder and kidneys	GACA

Name	Common Names	Use	Lifetime Health Advisory Level (LHAL and MCL) Guidelines	Hypothetical Cancer Risk When Consumed in Water at or Below Listed Level for a Lifetime ¹	Risk When Ingested Above LHAL Based on Human Data and and Animal Studies	Most Promising Way to Remove from Water
Dieldrin (Uses have been cancelled)	HEOD, Dieldrex	Pesticide for soil insects	No designated LHAL	0.002 Micrograms per liter. One chance in one million	Damage to bladder, liver and birth defects	RO, GACA, OO
Dinoseb	DNBP, Dinitro	Herbicide, dessicant, dormant fruit spray	7 Micrograms per liter	Data inadequate	Damage to liver and thyroid, reduced fertility-birth defects	ACA, IE
Diphenamid	Dymld, Enide	Herbicide	200 Micrograms per liter	Data inadequate	Damage to liver and thyroid	GACA
Disulfoton	Disyston Dithiodemeton	Insecticides	0.3 Micrograms per liter	None	Reduced organ weights, damage to eyes, genetic mut., decreased chol'ase	None known
Diuron	DCMU, Karmex	Herbicide	10 Micrograms per liter	Data inadequate	Damage to spleen, fetal development and methemoglobinemia	GACA, chlorination
Endrin (Manufacturing eliminated)	---	Insecticide	2.0 Micrograms per liter	Non carcinogenic-- (manufacturing cancelled)	Damage to liver and convulsions	ACA, RO, Coagulation filtration
Ethylene Dibromide (All pesticide uses cancelled)	EDB, Dowlume, Pestmaster	Soil fumigant	No designated LHAL MCL = 0.05 Micrograms per liter	0.0004 Micrograms per liter. One chance in one million	Damage to liver, kidneys, and testes, genetic mutations	Aeration, boiling and ACA
Ethylene Thiourea	ETU	Fungicide	No designated LHAL	0.2 Micrograms per liter. One chance in one million	Damage to thyroid, genetic mutations and birth defects	No information available
Fenamiphos	Nemacur	Nematode control	2 Micrograms per liter	Data inadequate	Chance in organ weights, reduced fetal weights, and survival, abnormal- ities in bone devel- opment, inhibition of enzyme development	No information available
Fluometuron	Cotoron, C-2059	Herbicide	90 Micrograms per liter	Data inadequate	Damage to liver, kidneys and spleen	GACA

Name	Common Names	Use	Lifetime Health Advisory Level (LHAL and MCL) Guidelines	Hypothetical Cancer Risk When Consumed in Water at or Below Listed Level for a Lifetime ¹	Risk When Ingested Above LHAL Based on Human Data and and Animal Studies	Most Promising Way to Remove from Water
Heptachlor (All uses cancelled)	3-Chlorochlordene	Insecticide	No designated LHAL. MCL = 0.4 Micrograms per liter	0.008 Micrograms per liter. One chance in one million	Damage to liver and chromosomes	GACA and aeration
Hexachloro- benzene	HCB-Perchlorobenzene	Fungicide-Insecticide	No designated LHAL. MCL = 1 Microgram per liter	0.02 Micrograms per liter. One chance in one million	Damage to liver, kidneys, ovaries, skin and nervous system. Decreased fetal weight.	ACA
Hexazinone	Velpar	Herbicide	200 Micrograms per liter	Data inadequate	Damage to liver, blood and chromo- somes and reduced body weight of offspring	No information available
Methomyl	Dupont 1179, Lannate or Nudrin	Insecticide	200 Micrograms per liter	Data inadequate	Damage to kidney, spleen, liver, and bone marrow	GACA
Methoxychlor	Malate	Insecticide	400 Micrograms per liter	Data inadequate	Inhibition of growth	GACA, RO
Metolachlor	Dual, Primextra	Herbicide	100 Micrograms per liter	Possible carcinogen	Damage to testes, Methemoglobinemia	GACA
Metribuzin	Lexone, Sencor	Herbicide	200 Micrograms per liter	Data inadequate	Damage to kidneys	GACA
Nitrate and Nitrite	---	Fertilizer, food preservative	Nitrate-10 Milligrams per liter Nitrite-1 Milligram per liter	Data inadequate	Methemoglobinemia in small children up to age 6 months	IE, Distillation, and RO
Oxamyl	Vydate, DPX-1410	Insecticide	200 Micrograms per liter	Does not cause cancer	Decreased weight, lower fetal survival, and inhibition of enzyme cholinesterase	ACA
Pentachloro- phenol (To be removed from registered list)	PCP	Wood preservative, herbicide, disin- fectant, Mossicide, defoliant	200 Micrograms per liter	Possible carcinogen	Damage to liver and kidney, delayed fetal development	ACA

11/14/89

Name	Common Names	Use	Lifetime Health Advisory Level (LHAL and MCL) Guidelines	Hypothetical Cancer Risk When Consumed in Water at or Below Listed Level for a Lifetime ¹	Risk When Ingested Above LHAL Based on Human Data and and Animal Studies	Most Promising Way to Remove from Water
Picloram	Tordan	Herbicide	500 Micrograms per liter	Data inadequate	Damage to liver, thyroid, testes, and arteries	GACA
Prometon	Gesafam, Pramitol	Herbicide	100 Micrograms per liter	Data inadequate	Adverse effects on growth	GACA, RO, RA
Pronamide	Kerb, Propyzamide	Herbicide	50 Micrograms per liter	Possible carcinogen	Damage to liver	RO
Propachlor	Bexton, Ramrod	Herbicide	90 Micrograms per liter	Data inadequate	Damage to liver, kidney and blood	PACA, OO, RO
Propazine	Gesomil, Millogard, Primatol P	Herbicide	10 Micrograms per liter	Possible carcinogen	Decreased fetal weight and bone development.	No information available
Propham	IPC, Beet-Kleen	Herbicide	100 Micrograms per liter	Data inadequate	Delayed fetal development, inhibition of enzyme, cholinesterase	GACA
Simazine	Princep, Aquazine	Herbicide	1 Micrograms per liter	Possible carcinogen	Causes tremors, damage to testes, kidneys, liver, thyroid, sperm production, gene mutation	ACA
2,4,5-Trichloro- phenoxyacetic (All uses cancelled by EPA)	2,4,5-T, Dacamine, Fence rider	Woody plant control	70 Micrograms per liter	Data inadequate	Damage to liver, kidney, and lungs, reduced fetal weight	ACA
2,4,5-TP (All uses cancelled by EPA)	Silvex	Herbicide	50 Micrograms per liter	Data inadequate	Adverse effect on liver and kidneys	ACA
Tebuthiuron	Graslan, Spike	Herbicide	500 Micrograms per liter	Data inadequate	Damage to pancreas, excessive weight loss	No information available

Name	Common Names	Use	Lifetime Health Advisory Level (LHAL or MCL) Guidelines	Hypothetical Cancer Risk When Consumed in Water at or Below Listed Level for a Lifetime ¹	Risk When Ingested Above LHAL Based on Human Data and Animal Studies	Most Promising Way to Remove from Water
Terbacil	Sinbar	Herbicide	90 Micrograms per liter	Non-carcinogenic	Damage to liver, reduced fetal weight	No information available
Terbufos	Counter	Insecticide	0.9 Microgram per liter	Non-carcinogenic	Damage to eyes and stomach, disturbs fetal development and inhibits enzyme, cholinesterase	ACA, IE
Trifluralin	Treflan	Herbicide	5 Micrograms per liter	Possible carcinogen	Damage to liver and kidneys, decreased fetal weight and increased miscarriages	RO, GACA, and conventional coagulation, sedimentation, and filtration

¹ When chemicals are considered carcinogenic, an additional margin of safety is provided in setting the Lifetime Health Advisory level.



Health Advisory Summaries

EPA has prepared the attached Health Advisory Summaries for participants in the National Pesticide Survey and is now making them available to the general public. The Survey is testing a statistically representative sample of 1,350 wells — some in every state — in order to provide a national assessment of pesticide contamination of drinking water wells.

Health advisory information has been prepared for the substances listed below because of their potential for reaching drinking water. These pesticides are among the more than 100 pesticides and breakdown products that the Survey is testing for during its two-year study of private and community water system wells. The Health Advisory Summaries describe possible health effects of these pesticides and suggest actions that may be taken by a well owner or community system operator to ensure a safe drinking water supply.

The Summaries are based on longer, more technical scientific documents called Health Advisories, which identify, for each contaminant, the level of pesticide concentration in drinking water that would not pose a health risk. These levels, based on human data or experimental animal studies, include a "margin of safety."

Appropriate Health Advisory Summaries are sent to well owners and operators when the National Pesticide Survey finds pesticides in their drinking water wells. This information is also being made available to federal, state, and local officials and to industry, farm and environmental groups for further distribution. Health Advisory levels are offered as guidance. They are subject to change as new information becomes available. Experts can advise well owners on the appropriate actions to take if pesticides are found in drinking water.

Information on how to obtain the full Health Advisories or the Summaries can be obtained by calling the EPA's Safe Drinking Water Hotline's toll-free number, Monday to Friday, 8:30 a.m.-4:30 p.m. E.S.T. The number is 1-800-426-4791 or, in Washington, D.C., 382-5533.

For more information on the Survey, write to: Director, National Pesticide Survey, Office of Drinking Water (WH-550A), U.S. EPA, 401 M Street, S.W., Washington, D.C. 20460.

LIST OF HEALTH ADVISORY SUMMARIES

Acifluorfen	Chlordane	Endrin	Pentachlorophenol
Alachlor	Chlorothalonil	Ethylene dibromide	Picloram
Aldicarb &	Cyanazine	Ethylene thiourea	Prometon
Aldicarb sulfone &	Dalapon	Fenamiphos	Pronamide
Aldicarb sulfoxide	2,4-D	Fluometuron	Propachlor
Ametryn	DBCP	Heptachlor &	Propazine
Atrazine	Diazinon	Heptachlor epoxide	Propham
Baygon	Dicamba	Hexachlorobenzene	Simazine
Bentazon	1,2-Dichloropropane	Hexazinone	2,4,5-T
Bromacil	1,3-Dichloropropene	Methomyl	2,4,5-TP (Silvex)
Butylate	Dieldrin	Methoxychlor	Tebuthiuron
Carbaryl	Dinoseb	Metolachlor	Terbacil
Carbofuran	Diphenamid	Metribuzin	Terbufos
Carboxin	Disulfoton	Nitrate/Nitrite	Trifluralin
Chloramben	Diuron	Oxamyl	

TABLE 9**Recommended Concentration Limits
for Water Used for Livestock and
Irrigation Crop Production
(Freeze and Cherry 1979)**

Constituent	Livestock Limits (mg/L)	Crops Limits (mg/L)
Total Dissolved Solids		
Small Animals	3000.0	
Poultry	5000.0	
Other Animals	7000.0	
Nitrate-Nitrogen	45.0	
Arsenic	0.2	0.1
Boron	5.0	0.75
Cadmium	0.05	0.01
Chromium	1.0	0.1
Fluoride	2.0	1.0
Lead	0.1	5.0
Mercury	0.01	
Selenium	0.05	0.02

Water Analyses for Inorganic Chemicals
Public Supply Wells *

* From the Nebraska Health Department
publication "Drinking Water Quality
in Nebraska Communities, 1984."

Community	Well No.	Date Sampled	pH	TDS	Fe	Mn	F	Alk	Hard	Ca	NO ₃ -N	Cl	SO ₄	Na
Abie	64-1	9-74	7.6	1108	0.6	0.0	0.83	312	352	99	0.6	216	201	270
Bellwood	68-1	7-76	7.8	424	0.3	0.1	0.26	264	320	96	1.2	8	97	14
	76-1	7-76	7.9	520	0.5	0.7	0.24	292	384	122	0.0	8	128	12
Bruno	36-1	9-74	7.3	358	0.0	0.0	0.32	144	264	75	4.2	22	96	13
	65-1	9-74	7.5	298	0.0	0.0	0.37	208	236	64	4.4	4	6	14
Cedar Bluffs	57-1	6-76	7.3	330	0.0	0.0	0.22	272	276	92	0.8	8	11	8
	69-1	5-74	7.4	486	0.5	0.4	0.35	276	312	96	2.2	4	60	14
Colon	61-1	4-77	7.5	370	15.0	0.2	0.42	312	280	80	0.2	0	38	25
	68-1	4-77	7.5	400	0.0	0.2	0.46	312	284	82	0.0	0	38	24
David City	47-1	1-78	7.7	428	1.1	0.4	0.27	308	328	101	0.2	2	59	12
	52-1	1-78	6.9	448	0.6	0.4	0.27	300	328	101	0.0	2	65	11
	63-1	2-76	6.9	798	2.3	1.4	0.27	372	532	165	0.0	8	245	8
	66-1	1-78	7.4	538	0.2	0.6	0.28	368	424	115	0.0	2	92	17
	72-1	1-78	7.9	352	4.5	0.6	0.24	300	320	96	0.2	0	27	7
Fremont	34-1	6-76	7.9	406	0.0	0.0	0.52	228	280	86	0.0	12	99	14
	39-1	6-76	7.6	616	0.0	0.4	0.33	212	412	120	0.6	32	215	19
	41-1	6-76	7.7	466	0.0	0.0	0.32	184	280	40	3.2	30	131	20
	53-1	6-76	8.2	672	0.0	0.1	0.32	236	444	134	1.8	20	250	15
	54-1	6-76	7.8	596	0.0	1.0	0.38	252	380	115	0.5	16	203	24
	56-1	6-76	8.1	658	0.7	0.0	0.31	212	440	139	1.6	12	290	18
	67-1	6-76	8.3	272	0.0	0.0	0.39	180	192	62	0.0	12	52	12
	70-1	6-76	8.3	392	0.0	0.3	0.34	188	250	80	0.6	16	105	17
	77-1	7-78	7.4	392	0.0	0.2	0.36	152	220	72	6.6	10	93	22
	77-2	7-78	7.5	390	0.1	0.6	0.25	172	220	70	0.6	12	101	21
	77-3	7-78	7.5	378	0.5	0.1	0.27	172	196	67	0.4	10	86	23

TABLE 10
(Continued)

Community	Well No.	Date Sampled	pH	TDS	Fe	Mn	F	Alk	Hard	Ca	NO ₃ -N	Cl	SO ₄	Na
Lindsay	23-1	1-83	7.2	322	0.9	Nil	0.27	296	284	85	0.1	2	19	17
	75-1	1-83	7.2	384	0.1	0.1	0.25	276	316	99	3.8	22	21	16
	43-1	1-83	7.2	416	Nil	0.2	0.25	320	336	99	4.5	14	11	26
Malmo	04-1	4-76	7.3	436	0.2	0.0	0.28	256	280	80	8.2	14	40	12
Mead	58-1	5-75	7.5	428	1.0	0.5	0.52	312	296	94	0.4	2	43	16
	69-1	8-76	7.6	318	0.1	0.0	0.48	248	260	70	3.3	4	34	12
	76-1	3-78	7.8	392	1.8	0.2	0.62	276	316	88	3.0	0	59	15
Memphis	72-1	3-77	7.1	204	0.0	0.0	0.38	152	140	38	1.2	4	15	12
Morse Bluff	62-1	9-75	7.2	386	0.2	0.1	0.29	284	304	93	0.0	2	50	9
	79-1	6-79	7.3	350	0.2	0.0	0.21	288	292	93	2.1	4	51	14
Newman Grove	50-1	4-77	7.2	374	0.0	0.0	0.28	328	312	91	1.2	6	19	15
	63-1	4-77	7.2	374	0.0	0.0	0.30	300	308	94	1.4	8	23	11
North Bend	67-1	9-75	7.4	574	0.0	0.0	0.39	304	344	109	0.0	30	104	18
Platte Center	78-1	3-79	7.3	450	0.2	0.0	0.23	292	320	100	1.6	4	23	14
Prague	61-1	4-74	7.9	364	20.5	2.3	0.33	276	300	75	0.2	8	31	27
	70-1	4-74	7.4	566	10.0	4.0	0.37	344	380	106	0.0	46	57	39
Rogers	17-1	5-76	7.4	400	0.0	0.0	0.29	300	328	90	1.2	8	59	14
Schuyler	46-1	1-83	7.3	364	0.0	0.0	0.35	236	264	78	3.1	18	27	23
	60-1	1-83	7.3	390	0.0	0.0	0.37	256	288	86	5.3	12	31	22
	67-1	1-83	7.3	776	0.0	0.0	0.38	288	504	144	10.3	178	50	63
	70-1	1-83	7.3	512	0.0	0.0	0.46	304	360	99	5.3	42	41	31
	74-1	1-83	7.4	832	0.1	0.0	0.38	284	512	146	9.5	188	52	66
Wahoo	33-1	10-75	7.6	472	0.0	0.0	0.32	256	300	88	6.3	10	58	14
	38-1	6-73	8.4	408	0.0	0.0	0.30	256	260	75	9.1	8	20	32
	53-1	10-75	7.4	440	0.0	0.0	0.32	244	276	80	2.6	10	58	12
	63-1	10-75	7.5	488	0.0	0.0	0.34	272	304	88	5.4	16	62	17

TABLE 10 (Continued)

Community	Well No.	Date Sampled	pH	TDS	Fe	Mn	F	Alk	Hard	Ca	NO ₃ -N	Cl	SO ₄	Na
Weston	30-1 58-1 (Composite)	4-76	7.4	388	0.1	0.0	0.32	252	268	80	0.8	10	40	8
Yutan	08-1 48-1 69-1 (Composite)	9-74	7-4	418	0.0	0.0	0.41	300	284	86	0.0	10	46	52

ABBREVIATIONS USED IN COLUMNS:

pH - The relative acidity of the water. A pH of 7.0 is considered neutral, less than 7 is increasingly acidic, greater than 7 is basic or alkaline.

TS - Total solids, in mg/l, water with more than 1,000 mg/l will likely contain chemicals that cause taste or odor and make water corrosive.

Fe/Mn - Iron and Manganese in mg/l, in excess cause staining of plumbing fixtures and clothes; may plug screens and pipes.

F - Fluoride in mg/l, beneficial to children's teeth at about 1 mg/l.

Alk - Total alkalinity, as mg/l calcium carbonate, ability of water to neutralize acid, caused by carbonate and bicarbonate ions.

Hard - Total hardness, as mg/l calcium carbonate, "soap wasting" property of water, the "harder" the water, the more soap required - less than 50 mg/l is considered "soft", up to about 200 mg/l not objectionable.

Ca - Calcium, mg/l, a complexing mineral.

NO₃ - Nitrate, as mg/l of NO₃-N, alters blood chemistry and restricts oxygen carrying capability of blood.

Cl - Chloride, mg/l, a complexing mineral.

SO₄ - Sulfate, as mg/l, may impart a taste to water and acts as a laxative.

Na - Sodium, mg/l, sewage waters are high in Na, may be unsafe to those on sodium-restricted diets.

central Butler County where it is normally above 300 mg/L. Sulfate concentrations, Exhibit 39, are generally between 11-100 mg/L.

Water quality of the Ogallala aquifer contains the following mean concentration levels of constituents: total dissolved solids - 422 mg/L, calcium - 56 mg/L, alkalinity - 170, sulfate - 25 mg/L. The exact concentrations of these chemicals are not known as the present data are limited, but the LPN NRD's future plans are to sample the portion of Shell Creek watershed using the Ogallala aquifer.

Dakota waters have not been sampled in quantity sufficient to yield generalizations about water quality. It is known that the quality of Dakota water is extremely variable but is nevertheless the source of drinking water for Abie and the partial source of supply for Memphis and Yutan.

As may be seen from a comparison of Tables 8 and 9, Drinking Water standards are more restrictive than are water quality standards for livestock and crops. Table 10 provides a look at sample data from public water supplies within the Lower Platte North NRD, for sample periods as indicated. The data provide a general drinking water supply chemistry for the District and a background on which the LPN NRD built its quality monitoring program.

Quality Indicators

Two primary constituents were selected to illustrate the general chemical composition of groundwater found in the District and are monitored, along with other chemicals, to assess the changes of quality. These two constituents are total dissolved solids (TDS) and iron.

Total Dissolved Solids - (T.D.S.)

Total dissolved solids (T.D.S) is a general indicator of water quality for most purposes. It reflects in part the sodium content and degree of mineralization of the water. This is important to the continued use of water for irrigation, to the aesthetic quality of the drinking water supply, and to the use of water for some industrial purposes.

Total dissolved solids (TDS) values are widely used in evaluating water quality and provide a convenient means of comparing types of waters as water containing excessive TDS may not be suitable for certain uses. The Safe Drinking Water Act has set a secondary limit of 500 mg/L (parts per million) for drinking water. Water with more than 1,000 mg/L will likely contain some chemicals that impart a taste or odor, or make the water encrusting or corrosive (NDOH 1984).

The distribution of TDS within the NRD is dependent upon several factors including the source aquifer, the depth and construction of the well, and how much the well is used. In general, higher TDS values are found in wells where the source aquifer is the Dakota Sandstone.

Exhibit 40 shows the distribution of TDS from wells within the LPN NRD. With the exception of eight wells, all wells tested were below 1,000 mg/L TDS. The probability of obtaining water with TDS values above 500 mg/L generally increases south of the Platte River in Butler and Western Saunders Counties. Although TDS values above 500 mg/L can be found throughout the LPN NRD, groundwaters in the Platte Valley near Fremont, and along Shell Creek, generally have the lowest TDS values.

Iron

Although iron is the second most abundant element in the earth's outer crust, concentrations present in groundwater generally are small. Iron is an essential element for animals and plants. If present in water in excessive amounts, however, iron will cause staining of laundry and plumbing fixtures and impart a strong taste and odor to the water. Therefore, iron may be objectionable in domestic and industrial water supplies (Hem 1985). The Safe Drinking Water Act has set a secondary limit of 0.3 mg/L (parts per million) for iron. It is a useful indicator parameter for evaluating the suitability of a water supply for certain uses.

Figure 41 illustrates the distribution of iron concentrations reported within the LPN NRD. Concentrations of iron in groundwater can be affected by such factors as the composition of the formation rock, the amount of recharge available to the aquifer, chemical conditions in the aquifer, and the depth and pumping rate of the well. Corrosion of metal casing and pump parts can contribute significant iron to well water and in these cases, data are not representative of the aquifer. In general, higher iron concentrations are found in the eastern one-third of the LPN NRD, although almost all wells tested show somewhat elevated iron (above 0.2 mg/L). Groundwater from wells located in the Todd Valley and near Fremont and Wahoo appear to have a higher probability of containing elevated iron concentrations.

VULNERABILITY TO POLLUTION

The vulnerability of groundwater to spills and releases of contaminants or the application of fertilizers and pesticides is dependent upon many factors including the volume and type of the potential pollutant and the subsurface hydrogeologic features of the area. Topography, recharge, soils, the vadose zone (unsaturated soils above the water table), and depth to water are several of the physical features which will influence whether a pollutant can impact groundwater. A comparison model named DRASTIC (see Page 49) uses the parameters listed above and others to help predict the vulnerability of groundwater to surface pollution in areas larger than 100 acres. The following sections discuss in detail some of the key parameters affecting pollution potential in the NRD and concludes with results of the DRASTIC modeling done by Spalding (1990) in the Lower Platte River Basin study, the impact of land use on groundwater reservoirs, and wellhead protection.

Topography

The slope of the land determines the likelihood that a contaminant will run-off or will infiltrate to the groundwater. Level land offers the greatest potential for pollution because neither the pollutant nor precipitation run-off. Steeper slopes provide less opportunity for infiltration but more contaminants are allowed to run-off into surface water, possibly polluting groundwater from streams.

A generalized map of topography in the LPN NRD was compiled from the Spalding (1990) data files and is presented on Exhibit 42. From this exhibit it is apparent a large portion of the land mass of the NRD is flat with relatively gentle slopes, especially in the Todd Valley and Platte Valley areas. These areas would be more conducive to infiltration.

Recharge

Recharge is the principal vehicle for transporting a contaminant through the unsaturated zone to the water table. It can be of three types (1) natural recharge (which is precipitation infiltrating through the ground and percolating to the water table); (2) irrigation return flows; and (3) artificial recharge which augments precipitation. The greater the amount of recharge, the more water is available for leaching and transport of a contaminant and the greater the potential for pollution.

Recharge is one of the most difficult, if not the most difficult, hydrogeologic parameter to quantify largely due to the lack of available data describing observed recharge rates in Nebraska. Estimates are presented in various UNL theses and some limited site-specific observations have been made. In the early 1980's, CSD and other State agencies made recharge estimates for the State Water Planning Process. Spalding (1990) in the Lower Platte Valley Study incorporated some of this information and utilized other guidelines to infer this parameter for his study. Ten to fifteen percent of the mean annual precipitation was assumed to approximate recharge on flat, silty soils. Slightly higher recharge rates of 2-4 inches per year were assumed on flat loamy or sandy soils. In areas with extensive irrigation, irrigation return flows were conservatively estimated at six inches or about 30% of the irrigation water applied. Recharge was estimated at less than 2 inches in the steep glacial till uplands where the topography is more conducive to runoff than to recharge.

The lowest recharge rates occur in the silty clay loams of the uplands with slightly higher rates in the loamy and sandy Platte River Valley Plain soils. The highest recharge rates occur in areas where natural recharge on flat, silty soils is augmented by irrigation return flows. Irrigated lands where irrigation return flows may serve as potential recharge, are apparent on the land use map (Exhibit 10). A generalized map of net recharge is presented as Exhibit 43, compiled from Spalding (1990) data files. The highest recharge areas are found along the Platte River Valley, the Todd Valley, and Butler County.

Soils

Soils significantly affect the amount of recharge to an aquifer, as well as the ability of a contaminant to move vertically through the soil. Soils can serve to filter, sorb, or otherwise attenuate contaminants. "In general, the type of clay in the soil, the shrink/swell potential of the clay, and the grain size of the soil affect the soils capability to reduce the pollution potential. Generally, the less the clay shrinks and swells and the smaller the grain size, the less the pollution potential". (Spalding 1990, p. A-13). Soils are mapped and presented on Exhibit 4 and distribution of soils as they relate to pollution potential are mapped on Exhibit 43A. The soil ratings on Exhibit 43A were assigned to each soil type based on maps prepared by the Natural Resources Commission from Soil Conservation Service Maps.

Vadose Zone

The vadose zone is described as the unsaturated zone below the land surface and above the water table. The type of material in the vadose zone determines its contaminant attenuation characteristics. Biodegradation, neutralization, mechanical filtration, chemical reaction, volatilization, and dispersion are major attenuation processes occurring in the vadose zone. The vadose zone media also controls the path length and route of a contaminant and affects the time available for attenuation and the amount of material encountered. In general, the finer textured the media the lower the pollution potential.

Clay and other fine grained material in the vadose zone will significantly impede the downward migration of contaminants from the surface to the groundwater. Where the vadose zone is comprised of coarse grained sands or gravel, or where the water table is less than ten feet deep, contaminants leaching from the surface have a higher likelihood of impacting the groundwater quality.

The vadose (unsaturated) zone characteristics were compiled by Spalding (1990) and Exhibit 44 was prepared from the data files for that report. In general, shallow water tables and coarse grained vadose zone materials are more likely to occur in low lands along the Platte River and its tributaries. Thicker, fine grained vadose zone areas are more typical of upland areas throughout the NRD. Though not depicted on this Exhibit, recent soil survey activity indicates areas in the Todd Valley have sand and gravel deposits very near the surface. This can easily contribute to groundwater contamination.

Depth to Groundwater

Depth to water can be defined as the distance between the land surface and the surface of an unconfined aquifer. It determines the thickness of the geologic material through which a contaminant must move before reaching the aquifer and can affect the contact time between a contaminant and the surrounding media. As a general rule, the greater the depth to water, the longer the travel time in the unsaturated zone and the greater the opportunity for attenuation of a contaminant.

Exhibit 45 presents the relative depth to water within the NRD (compiled by Spalding 1990). Depth to water data were obtained from the U.S. Geological Survey, Conservation and Survey Division (CSD) groundwater files, test hole logs, and irrigation and municipal well registrations. In those areas where these data sources did not provide adequate information, depths to water were calculated using topographic and regional water table maps.

Depths to water range from less than 5 to greater than 100 feet in the LPN NRD. Shallow depths to water (<15 feet) occur in the Platte River Valley and its tributaries, and in the Todd Valley (<45 feet). The greater depths to water (>100 ft.) occur in the uplands of Butler and Saunders Counties.

DRASTIC

DRASTIC is a relatively new standardized methodology that predicts the pollution potential of groundwater in areas larger than 100 acres. DRASTIC is a screening tool which lends itself to mapping and facilitates comparisons of the relative potential of pollution in different areas. Because it was developed to evaluate pollution potential in relatively large areas, DRASTIC is used to provide a first approximation prior to site assessment. For example, a specific waste disposal site could not be selected with DRASTIC but areas that are hydrogeologically unsuitable could be eliminated from further consideration and more promising areas identified. Other potential uses of DRASTIC include prioritizing areas for groundwater monitoring and designating areas for groundwater protection.

DRASTIC is an acronym for the seven hydrogeologic factors evaluated to determine the potential for pollution of an aquifer. They are depth to water (D), net recharge (R), aquifer media (A), soil media (S), topography (T), impact of the vadose zone (I), and hydraulic conductivity of the aquifer (C). Each of these seven (7) factors has an associated weight factor and in calculation each data point is given a ranking. Exhibit 46 shows the DRASTIC index map generated for the NRD (from Spalding 1990). The lower the DRASTIC index number, the lower the vulnerability to pollution. The less vulnerable areas are shown in dark blue with the more vulnerable areas shown in yellow and orange. As expected, based on the DRASTIC Model, large areas of the uplands, which comprise a significant portion of the NRD, demonstrate a low pollution potential and a low vulnerability.

The Platte Valley and tributary drainage systems are clearly outlined by a higher DRASTIC index compared to the surrounding uplands. The higher potential areas are associated with low lying river valleys. The potentially higher vulnerable areas are located along the Platte River, the area of Saunders County containing the Lincoln well field, the area of Dodge County containing the Fremont Well Field, and the proposed MUD well field.

Land Use

Land use above a groundwater reservoir plays an important role in the potential for non-point source pollutants impacting the groundwater. A highly vulnerable area (such as the Platte Valley reservoir) becomes an area of concern primarily because of the intensity of irrigated cropland and associated use of agrichemicals overlying it. Many of the factors used in the DRASTIC evaluation combine to make this land most desirable for irrigated land development (e.g.; flat terrain, shallow depth to water, good aquifer recharge, well drained soils, etc.).

Comparison of Exhibits 10 (Land Use), 17 (Groundwater Reservoir areas), and 46 (Groundwater Pollution Potential), reveal that the Platte Valley groundwater Reservoir is the most vulnerable and intensively cropped reservoir, thus likely requiring the greatest level of management over the long-term. Municipal well fields which currently serve large populations such as the cities of Fremont and Lincoln are located in this sensitive reservoir, with the City of Omaha also considering expansion of their well-field into this reservoir.

The Shell Creek Reservoir contains some intensive irrigated land development, primarily in areas which are slightly more prone to pollution potential than others. These areas will require closer monitoring than the remainder of the Reservoir, which is primarily dryland cropland, pasture, and rangeland.

The Todd Valley Reservoir has experienced substantial irrigated crop development in an area with medium to low vulnerability characteristics. The remainder of the area is developed primarily as dryland cropland. This reservoir, however, will also require careful monitoring as there are areas of known contamination developing.

The Upland reservoirs are the least vulnerable in the NRD to pollution. In addition these areas are also characterized by dryland farming, pasture and rangeland. These factors combine to make this reservoir less likely to suffer man-induced water quality problems. However, this reservoir is also characterized by limited supplies of groundwater, and must be managed carefully to maintain existing supplies.

Well-Head Protection

The concept of delineating well-head protection areas (i.e., land areas that contribute recharge to a well) is a modern outgrowth of the historical public health guidelines of providing adequate spacing between wells and potential sources of contamination. Nebraska regulations promulgated under the Nebraska Safe Drinking Water Act (1976) required public water supplies to provide some control over the recharge areas of their wells. Few communities, however, exercised strict control to completely guarantee the integrity of the supply. In recent years, with increasing emphasis on pollution prevention rather than cleanup, more attention has been devoted to defining well-head protection areas for drinking water wells.

The City of Lincoln has been particularly interested in defining well-head protection areas (Ayers, 1991). Development of a new M.U.D. well field near Yutan will also likely result in study and protective measures. The LPN NRD encourages communities within the NRD to investigate and adopt well-head protection as a priority and will assist on a case by case basis with support of well-head protection area delineations.

NON-POINT SOURCE POLLUTION

Non-point source pollution is generally defined as pollution arising from diffuse sources where no single point of release can be identified. While non-point source pollution can be related to weathering of minerals or soil erosion, human activities are commonly the originator for non-point source groundwater pollution. The diffuse application of fertilizers, pesticides, and herbicides in agricultural operations as well as urban areas account for large areas of land with soils containing these additives. Heavy application of chemicals, coupled with heavy precipitation or irrigation can result in these chemicals leaching to the groundwater. Overland flow resulting from runoff can also provide a means of chemical leaching to the groundwater aquifer. In Nebraska, as well as in the LPN NRD nitrate is the most common non-point source pollutant.

Nitrate/Nitrogen

Nitrates can be found in most areas in Nebraska. Sources of nitrates include breakdown of organic material in soils, human or livestock wastes, and chemical fertilizers. When exposed to nitrate levels in excess of 10 mg/L in drinking water, infants younger than about six months of age may develop methemoglobinemia or "blue-baby" syndrome. The maximum contaminant limit for nitrate under the Safe Drinking Water Act is 10 ppm as nitrate-nitrogen ($\text{NO}_3\text{-N}$).

Non-point source nitrate pollution refers to areas demonstrating elevated nitrate levels which are generally a result of widespread agricultural fertilizer application, either commercial or organic. Non-point source nitrates may also be associated with elevated levels of other agricultural chemicals such as atrazine.

Point source nitrate contamination is more localized and is generally associated with human or livestock waste migrating into shallow groundwater. Poorly constructed or located domestic wells often have nitrate levels exceeding the drinking water standard of 10 ppm. It may be difficult to distinguish between non-point and point source nitrate pollution in these situations unless an on-site investigation is conducted.

The general distribution of nitrate-nitrogen within the NRD (irrigation and municipal wells) is mapped on Exhibit 47. A majority of the wells with elevated nitrates are domestic or stock wells which may be the result of point source contamination (Exhibit 48). Data suggest certain areas are developing non-point source problems, including the Schuyler-Richland areas, the Platte Valley of Butler County, and the Memphis-Mead Todd Valley area.

Two public water supply systems currently have reported nitrates exceeding 10 ppm (Department of Health, 1992). Other towns in the NRD which historically had elevated levels of nitrates have been able to significantly reduce or eliminate nitrates by abandoning older wells and installing new ones, these instances are not shown on this map if the problem has been corrected.

Herbicides

In 1988 and 1989, the Lower Platte North NRD cooperated with other NRD's in the Lower Platte Valley Groundwater Quality Study (Spalding, 1990) to sample selected wells for Atrazine. The study covered three Natural Resources Districts, and a total of 54 wells were sampled for Atrazine. Of these, 33 wells were sampled in the Lower Platte North NRD, primarily concentrated in the Platte and Todd Valley groundwater reservoirs, which are identified as potentially vulnerable areas. All wells sampled in the LPN NRD were below the proposed E.P.A. maximum contaminant level of 3 ppb, with the exception of two wells south of Fremont. It was determined through further study these wells were apparently contaminated from a point source. Low concentrations (0.02 - 3.0 ppb) were detected in the areas of intensive corn production where atrazine is applied annually, which suggests contamination is non-point source. Atrazine was detected in 23 of the 30 irrigation wells sampled, with detectable concentrations ranging from 0.02 to 14.8 ppb. Breakdown products of atrazine were not looked for, yet can be present in significant concentrations and go undetected with normal analytical procedures. Present on going research indicates that Atrazine breaks down to a set of products which are more harmful than the mother component. The LPN NRD continues to test for herbicides with triazine screening as was performed in the Todd Valley in 1990 and Shell Creek in 1991.

Pesticides

Studies in Nebraska and elsewhere in the Midwest have indicated significant levels of pesticides dissolved in groundwater locally and regionally (i.e., Nebraska's Central Platte Valley). Deep percolation of contaminated recharge through permeable soils has been identified as the primary path of contaminant travel which also places shallow aquifers in jeopardy. Pesticides are commonly found in surface waters, particularly during and after spring runoff events. Pesticide contamination may also occur as a point-source problem, typically associated with contaminated soils around a mixing or wash-out area. Triazine screens have been a regular part of the NRD monitoring activities since 1990. The nature and extent of significant pesticide contamination in the NRD will be better defined in the future with additional sampling and trend analysis.

Groundwater Quality Monitoring Network

The groundwater quality monitoring program was established in 1986, with the goal of sampling selected wells across the entire NRD for the purpose of establishing baseline data. The NRD is still in the process of completing the baseline sampling. The most critical reservoirs were sampled first where problems were most likely to be present. Baseline sampling has been completed in the Platte and Todd Valley reservoirs. A total of _____ wells were sampled from 1986-1993, analyzed for Nitrate, with selected wells tested with a triazine screen.

In 1991 intensive sampling (18 wells/township) was initiated in the Shell Creek reservoir. Completion of this reservoir's baseline sampling has been delayed by wet summers and decreased use of irrigation, but is intended to be completed in 1994.

Intensive sampling of Uplands in Butler and Saunders counties will be initiated in 1995. Areas irrigated for crop production will be tested for nitrate-nitrogen with a triazine screen and nitrogen isotopes used on selected wells.

After completion of baseline sampling the strategy for future data collection is as follows: approximately 3 irrigation wells/township will be selected as fixed (trend) monitoring points; an additional 3 wells/township will be selected randomly for analysis; fixed points will be sampled every 2-3 years with a new set of random wells selected for each sampling period; wells will be tested for nitrate-nitrogen, major ions, and with triazine screens and nitrogen isotopes on selected wells. All reservoirs will not be sampled the same year. The number of wells done per year will be dependent upon budget, manpower, and weather constraints. Problem areas will also be sampled more intensively as problems appear. It is intended (once the Groundwater Management Plan is adopted) that sample analysis by the landowners (required under the Plan) for nitrate-nitrogen be incorporated into the database, reducing the need for an elaborate monitoring network.

POINT SOURCE POLLUTION

Point source pollution generally impacts the quality of the groundwater in localized areas. However, when these sites are located above potential drinking water supplies or are located adjacent to domestic or municipal wells the impact of a spill or leak can affect larger land areas and populations. Even spills that are cleaned up to health-based cleanup goals of a regulatory agency can impact drinking water supplies as human taste thresholds of many chemicals are below the health-based "action" levels (e.g., toluene, xylenes).

There are numerous manufacturing facilities and petroleum handling facilities, grain bin storage sites, and fertilizer and pesticide storage facilities within the LPN NRD. Although new regulations and generally improved product and waste handling procedures have reduced the chances of a spill or release of contaminants from these type of activities, historically, numerous spills have been documented. Exhibits 49 and 50 presents the location of these reported pollution sources within the NRD, and within the City of Fremont, respectively.

Underground Storage Tank Hydrocarbon Releases

This type of release generally involves a spill or leak from buried tanks at gasoline filling stations or industrial sites. Known as Leaking Underground Storage Tanks (LUST) they are regulated by the Nebraska Department of Environmental Quality (NDEQ) according to provisions of Nebraska Title's 118 and 126. Some LUST spills have been traced to locations no longer used as gas stations and in these cases the spills are known as "orphan tanks" and are also regulated and investigated by the NDEQ. It is not uncommon to have several LUST sites located within the same block on heavily used highways and streets.

Hazardous Waste Releases

Hazardous waste releases are defined as those sites where contaminants other than petroleum have been found in the groundwater. Such sites are often associated with manufacturing facilities or petrochemical or grain storage facilities. Hazardous waste sites are regulated in Nebraska by either the Nebraska Department of Environmental Quality (NDEQ) in provisions of the Nebraska Titles 118 and 126 or by the US Environmental Protection Agency (EPA) provisions of the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly referred to as the "Superfund."

Operation of the Nebraska Ordinance Plant (NOP) south of Mead, Nebraska has resulted in intensive groundwater contamination in that area. The sites sampling results reveal groundwater contamination by degreasers, explosives, and nitrate. The site is presently listed as a federal clean-up site by the Corps of Engineers and the Environmental Protection Agency and activity is underway in that regard.

Public Water Supply Systems With Reported VOC Contamination

The Nebraska Department of Health (NDOH) regularly tests public water supplies in the State for the presence of Volatile Organic Compounds (VOC's). These compounds are generally mobile in groundwater and include many common solvents, degreasers, paint thinners, septic tank cleaners, and grain fumigants. VOC's have been increasingly found in drinking water supplies. Public water supply systems in the NRD with VOC's in their tap water are also included on Exhibit 49. Some overlap may occur on this figure due to the fact that the water supply problem may be a result of the spill which is also mapped. NDOH responds to public water supply contamination and provides oversight relative to the quality of water delivered to the consumer. The NDEQ is notified of these results and may require groundwater investigation and take protection action.

Other Potential Sources of Pollution

Identification of potential point sources of pollution is important to protection of groundwater supplies. Ideally, all potential pollution sources should be identified on maps so siting of new wells can be accomplished considering the source area. Unfortunately, the database is limited for items such as feedlots, septic systems, and abandoned wells. At present, site specific studies are needed to inventory all potential pollution sources in a well's capture zone for long-term viability of the well.

Feedlots

Presently, there are 42 feedlot operations located within the LPN NRD as identified and regulated for State Operating Permits by the NDEQ (NDEQ files). These feedlots are mapped on Exhibit 49A. The NDEQ also estimates that this is only a small percentage of the total operations, even though all such operations are encouraged to be operating with permits under the control of NDEQ. The principal pollutants associated with feedlots are nitrogen, phosphorus, chloride, oxygen-demanding materials, and microorganisms. High levels of livestock waste pollution may also cause discoloration, odor, and taste problems in drinking water supplies. Minimization of the potential for groundwater pollution will depend heavily upon proper management of the animal waste control systems as required by NDEQ.

Landfills

Through the years the population in the NRD has disposed of their garbage in a variety of ways including burning, unauthorized "dumps", properly engineered landfills, and landfills lacking in proper siting, design, and operation techniques. Vast changes in the State solid waste regulations have brought about significant change in where garbage is handled and disposed of in the NRD. In order for a landfill to operate it must be approved by the State and be issued a permit. If a permit is not obtained the landfill must be closed. Currently, the LPN NRD does not contain a permitted landfill. The closest permitted landfill is the Kobus Landfill near David

City and other larger towns outside the NRD. The closed or inactive landfills can pose a threat to groundwater supplies if they were not properly sited. The NDEQ landfill section is in the process of determining potential problem sites.

Based on NDEQ file data, there are 13 non-permitted (closed or inactive) landfill sites in the NRD (Table 11, Exhibit 49B). While none of these sites are known contributors to groundwater pollution, the potential exists by virtue of their previous use, and should be considered when evaluating and/or investigating groundwater contamination problems.

Private Septic Systems

A conventional private septic system consists of a septic tank and laterals which serve as an absorption field. Improperly sited or constructed systems, inappropriate soils, or a high density of systems can and often does cause groundwater contamination. Liquid waste flows from household tanks to the absorption field where it is partially treated as it filters through the soil. Soil type is crucial to this process since only certain types of soils can adequately treat the effluent. A soil with large pores allows the effluent to move quickly and does not hold it long enough for sufficient treatment before it reaches the groundwater. For example, increased installation of septic systems for recreational households along the Platte River, where the water table is shallow and soils are coarse, may pose a potential pollution problem to municipal and individual water supplies. Where soils are too tight, septic systems will not drain adequately and may break down or cause nuisance conditions. Pollutants of concern from septic systems are nitrate, bacteria, viruses, and hazardous chemicals.

The location of septic systems with respect to drinking water supply wells is crucial to whether they may cause contamination problems. Many domestic wells are located in close proximity to septic systems can and do intercept contaminants. If the well is improperly constructed, the well may even serve as a conduit for pollution.

TABLE 11

**Locations of Permitted and Non-permitted
Waste Disposal Sites in the Lower Platte North NRD
June, 1994**

(Source: NDEQ unpublished file data)

County	Town	Legal Location
Butler	Abie	Sec. NW1/4, NE1/4, S-17, T-16N, R4E
Butler	Bellwood/Rising City	Sec. NW1/4, NW1/4, S-3, T15N, R1E
Butler	Bruno	Sec. SE1/4, NE1/4, S10, T15N, R4E
Butler	David City	Sec. NW1/4, NW1/4, S-24, T15N, R3E
Colfax	Schuyler	Sec. NE1/4, SE1/4, S14, T17N, R3E
Dodge	North Bend	Sec. SW1/4, SE1/4, S7, T17N, R6E
Dodge	Fremont	Sec. E1/2, SW1/4, NE1/4, S4, T17N, R9E, Sec. E1/2, NW1/4, SE1/4, S4, 17N, R9E, Sec. NE1/4, SE1/4, S4, 17N, R9E, Sec. SE1/4, SE1/4, S4, 17N, R9E, Sec. NE1/4, NE1/4, S9, T17N, R9E
Madison	Newman Grove	Sec. NE1/4, NE1/4, S34, T22N, R4W
Platte	Lindsay	Sec. SW1/4, SE1/4, S34, T20N, R3W
Saunders	Ashland	Sec. NE1/4, NE1/4, S11, T12N, R9E
Saunders	Malmö	S21, 15N, R6E
Saunders	Mead	Sec. NW1/4, NW1/4, S36, T15N, R8E
Saunders	Prague	Sec. NW1/4, NW1/4, S1, T15N, R5E
Saunders	Weston	Sec. SE1/4, SW1/4, S9, T14N, R6E
Saunders	Wahoo	Sec. W1/2, SW1/4 of S2, T14N, R7E

There are presently no available statistics summarizing the number of septic systems in the LPN NRD. Towns with wastewater collection and treatment plants are less likely to have septic pollution, although municipal wastewater pipe systems may leak and contaminate groundwater.

Improperly Abandoned Wells

Abandoned water wells can serve as a conduit for groundwater pollution if they are inadequately sealed to prevent surface drainage of pollutants. The Nebraska Statutes, R.R.S. 46-602 requires proper decommissioning of groundwater wells by all landowners who have abandoned wells. The LPN NRD currently offers a cost-share program for proper well decommissioning, to assist in assuring it is properly done.

IDENTIFICATION OF PRESENT KNOWN PROBLEM AREAS WITH CONSIDERATION OF POTENTIAL PROBLEM AREAS AND INFORMATION DEFICIENCIES

Recharge Extremes

The only area of identified recharge extremes is located adjacent to the storage facility of Lake Babcock and is very limited in scope.

Some areas along and adjacent to the Platte River demonstrate high water table levels and further investigation is needed to determine natural versus man induced recharge of these areas.

Areas of localized rising water levels have been pointed out by members of the Public Advisory Committees. At present, these appear to be the result of cropland irrigation over shallow confining beds and need to be analyzed and proper management methods developed.

Groundwater Quantity

Uplands

The David City Area in the Butler County uplands, has shown a marked decline in water levels in the past. It is difficult to relate this decline to saturated thickness because there is not a 1:1 comparison, due to pressure head (potentiometric pressure) consideration. The relationship between water level changes, pressure head, and saturated thickness must be determined to understand the significance of changes and what can be done to identify and alleviate problems.

Shell Creek

This reservoir is difficult to characterize due to the lack of data. The monitoring network needs expansion in the northern portion of the Shell Creek groundwater reservoir. The current monitoring network indicated a declining trend in water levels in this reservoir which approximates 10% of saturated thickness in some areas. Relationship of water levels to saturated thickness must be determined for this aquifer.

Platte River

Results of monitoring in this reservoir show slight declines (<5 feet) from predevelopment (U.S.G.S. data) and slightly greater declines (still less than 5 feet on average) against the index year.

Todd Valley

Results of monitoring in the Todd Valley show slight declines (<5 feet) from both predevelopment and the index year. One well in upper Clear Creek shows a water level decline approaching 10% of saturated thickness.

General

- 1) The current monitoring network includes 116 wells. Expansion of the network in areas where few wells are presently monitored (e.g., Shell Creek) and in areas where problems may be present or will be in the near future is planned. In 1993, the NRD plans to expand the network to include 120 wells.
- 2) Determination of well elevations are necessary for all wells so that water table elevation maps can be constructed and regional and local changes in groundwater flow direction can be assessed.
- 3) Refinement of the LPN NRD groundwater computer model is needed to predict vulnerable areas to groundwater decline.
- 4) More information is needed on aquifer recharge rates and discharge (including water use).
- 5) A consistent scheme for evaluation of water level changes is needed to quantify their significance. The NRD has established an "Index" year of 1987 to reference changes. As time progresses and more data is acquired, appropriate "index" levels may be adjusted to more closely approximate "predevelopment" water levels.

- 6) Further coordination with other local, State, and Federal agencies collecting groundwater level data is needed. The NRD database should be a central repository for this data since the NRD is responsible for groundwater management.

Groundwater Quality

Uplands

There is a general lack of irrigation well sample data in the Butler County Uplands and that is due to fewer wells being developed in this reservoir. Stock and irrigation well samples reveal some contamination is present in the township southwest of Bellwood and south of Octavia. The lack of sample analyses for this area does not allow for broad interpretation of these results. Areas where irrigation development is present are to be more intensively sampled to allow for baseline establishment in the next few years.

Shell Creek

Upper: The upper Shell Creek groundwater reservoir (in Platte, Madison, and Boone Counties) is also presently characterized by limited sample analyses. A few domestic/stock wells and the Lindsay water supply well contain elevated nitrate levels. Groundwater sampling to establish baseline data is scheduled for the summer of 1994.

Lower: Generally water quality in the eastern end of the Shell Creek Reservoir appears to be quite good. Some wells appear to be approaching 8 ppm, however, no pattern is present to indicate an area-wide problem. Trend monitoring will be important in this area and is planned.

Platte River

North of the Platte River, an area beginning just west of Richland to east of Schuyler contains a number of wells which are approaching or exceeding 10 ppm (MCL). The township west of Bellwood and south of the river contains numerous wells approaching or exceeding the MCL. The Rawhide Creek drainage area north and west of Fremont contains a number of wells approaching or exceeding 10 ppm.

An area east of Linwood and west and north of Octavia also contain wells which exceed 10 ppm. These areas are all located in the Platte Valley alluvium, the NRD's aquifer most vulnerable to pollution. Trend monitoring will be important in this aquifer to identify other areas which may be degrading and to monitor effects of management strategies. Trend monitoring of the aquifer system is scheduled to begin in 1994.

Todd Valley

The most significant area of nitrate contamination in the Todd Valley is present in a triangular area encompassed by the area around and adjacent to Wahoo, Mead, and stretching south to Memphis. This area contains numerous wells approaching or exceeding the MCL for nitrate contamination.

Test results of shallow domestic/stock wells in the Todd Valley reveal that this aquifer contains numerous wells approaching or exceeding the MCL for nitrate. The widespread pattern, when compared to the irrigation/municipal results, supports the conclusion that the shallow portion of the Todd Valley alluvium is generally contaminated with nitrates. The results of irrigation and municipal well sampling, generally developed deeper into the aquifer, reveal that generally north and west of Mead, groundwater nitrate pollution is not apparent. Some wells along Sand Creek and near Silver Creek seem to be developing as problem areas.

General

- 1) Point source pollution from volatile organic compounds (VOC's) and other hazardous wastes within the NRD is present in or near several towns and cities and these pollution sources are (or may be) threatening drinking water supplies. The NDEQ is responsible for oversight of clean up activities which can be costly and very time consuming. Substantial clean up operations are underway at numerous sites in Fremont, Wahoo, and near Mead. Other areas are also in the process of clean up. The impact of such point sources on drinking water supplies is generally unknown until it occurs and impacts a water supply well.

- 2) More information is needed regarding the size of public water supply well-head protection areas in the NRD, along with a detailed inventory of possible point sources within those areas.
- 3) Non-point source pollution of streams from agricultural runoff may be impacting groundwater supplies. Further identification of the surface water and groundwater relationships will be needed to determine the connection between the two and allow for appropriate response.
- 4) Expansion of the NRD's water quality monitoring network will be needed to adequately cover the NRD and to monitor changes. Sampling networks should especially be intensified in problem areas identified above as is currently being done in the Richland-Schuyler areas. Trend and random monitoring will be conducted every 2-3 years in the most vulnerable aquifers (Platte and Todd Valley) and at least 3-5 years in others (Shell Creek and the Uplands).
- 5) Stronger coordination and data sharing with local, State, and Federal agencies is needed to develop a comprehensive picture of water quality concerns in the NRD. The NRD should obtain at a minimum the following data as they are collected by the agency:

Pollution Spills - NDEQ

Public Water Supply Sample Results - NDOH
and Regulatory Notices

Results of Special Investigations - USGS, C&SD

REFERENCES

- Bentall, Ray, July 1982. Nebraska's Platte River, A Graphic Analysis of Flows. Conservation and Survey Division UNL.
- Bentall, Ray and Schaffer, F. Butler, 1975. Availability and Use of water in Nebraska 1975. Conservation and Survey Division UNL and U.S. Geological Survey.
- Burchett, R.R., Ruel, E.C., Dreezen, V.H., and Prichard, G.E., 1975. Bedrock Geologic Map Showing Thickness of Overlying Quaternary Deposits. Fremont Quadrangle and Part of Omaha Quadrangle, Nebraska. Conservation and Survey Division UNL and U.S. Geological Survey.
- Chu, Tyan-Ming, 1988. Investigation of the Thermal Regime in a River Aquifer System Near Ashland, Nebraska.
- Conservation and Survey Division UNL, 1959. Boone County Preliminary Groundwater Study.
- Conservation and Survey Division UNL, 1983. Center Pivot Irrigation System in Nebraska 1983.
- Conservation and Survey Division UNL, 1984. Correlation Between Topographic Regions and Nebraska Soil Association Areas. Table
- Conservation and Survey Division UNL, 1984. Estimated Percentage of Average Annual Groundwater Recharge from Precipitation Within Topographic Regions. Table
- Conservation and Survey Division UNL, 1980. General Soil Map of Fremont Area - Nebraska.
- Conservation and Survey Division UNL, November 1984. Handbook on the Preparation of Groundwater Management Plans.
- Conservation and Survey Division UNL, 1957. Madison County Preliminary Groundwater Study.
- Conservation and Survey Division UNL, 1981. Nebraska's Platte River, A Graphic Analysis of Flow.
- Conservation and Survey Division UNL. Nebraska Soil Associations.
- Conservation and Survey Division UNL, 1958. Platte County Preliminary Groundwater Study.
- Conservation and Survey Division UNL. Thickness of Unstratified Material.
- Conservation and Survey Division, 1969. Underground Water Areas: Topographic Regions Map.
- Conservation and Survey Division UNL, 1993. Unpublished Cross-Sections.
- Conservation and Survey Division UNL and Department of Environmental Control, 1979 Maps. Configuration of Base of Principal Aquifer, 1979. Configuration of the Watertable Spring 1979. Thickness of the Principal Aquifer 1979.
- Conservation and Survey Division UNL and U.S. Geological Survey, 1984. Groundwater Levels in Nebraska.

REFERENCES - Continued

- Currier, P., Linngle, G., VanDerwalker, J., 1985. Migrating Bird Habitat on the Platte and North Platte Rivers in Nebraska.
- Department of Environmental Control, 1985. Nebraska Groundwater Quality Protection Strategy - Final Report.
- Department of Environmental Control, 1984. 1984 Nebraska Water Quality Report.
- Department of Environmental Control, 1985. STORET, Water Quality Printout. U.S. Geological Survey.
- Department of Environmental Quality, 1992. "LUST (Leaking Underground Storage Tanks) List."
- Department of Environmental Quality, February 1988. Assessment and Classification of Community Solid Waste Disposal Sites in Nebraska.
- Department of Environmental Quality, December 1992. Chemical Storage Facilities.
- Department of Environmental Quality Permit, Permit Database, Feeding Operations, November 1992. All Agricultural Facilities.
- Department of Water Resources, 1982. Forty-Fourth Biennial Report.
- Department of Water Resources, 1983. Platte River Supply Downstream from Columbus.
- Department of Water Resources (DWR), 1992. Registered Wells Database.
- Ellis, Michael J. and Pederson, Darryll T., June 1984. Groundwater Levels in Nebraska 1984. Conservation and Survey Division Water Survey Paper Number 59, prepared in cooperation with U.S. Geological Survey.
- Engberg, Richard A., 1984. Appraisal of Data for Groundwater Quality in Nebraska. U.S. Geological Survey Water-Supply Paper 2245.
- Environmental Protection Agency, December 1992. "CERCLIS (Comprehensive Environmental Response, Compensation and Liability Information System.)"
- Environmental Protection Agency, December 1992. PCB Database.
- Environmental Protection Agency, December 1992. RCRIS (Resource Conservation and Recovery Information System) and RCRA (Resource Conservation and Recovery Act) Notifier List.
- Environmental Protection Agency (accessed through Natural Resource Commission), All Data to December 1992. STORET (EPA Water Quality Database).
- Ginsberg, Marilyn H., 1983. Hydrogeology of Butler County, Nebraska. Nebraska Water Survey Paper 55. University of Nebraska-Lincoln.

REFERENCES - Continued

- Krueger, Jim, 1983. Groundwater Pollution Potential in Nebraska. Department of Environmental Control.
- Krueger, Jim, 1984. Nebraska Groundwater Quality Protection Strategy: Problem Assessment. Department of Environmental Control.
- Lawton, D., Veys, C., and Goodenkauf, O., 1980. An Inventory of Public Industrial and Power Generating Water Use in Nebraska, 1979-1980. Conservation and Survey Division UNL and U.S. Geologic Survey.
- Nebraska Cooperative Extension Service, 1985. Estimated Crop and Livestock Production Costs. Extension Service 85-972.
- Nebraska Department of Health, 1992. "Analytical Results for Inorganic Chemicals from Public Water Systems."
- Nebraska Department of Health, 1984. Drinking Water Quality in Nebraska Communities.
- Nebraska Department of Health, 1983-1992. Public Water Supply Wells.
- Nebraska Department of Health, 1993. VOC Analysis for Public Water Systems, (Database).
- Nebraska Natural Resource Commission, Data Bank Printouts, 1983-1985. Registered Irrigation Wells, 1985; Groundwater Level Summary, 1984; Dam Inventory, 1985; Gauging Status, 1985; Center Pivot Inventory, 1983; Crop Harvest by Acres, 1984.
- Nebraska Natural Resource Commission, 1982. Policy Issue Study on Groundwater Reservoir Management.
- Nebraska Natural Resource Commission, 1982. Policy Issue Study on Instream Flow.
- Nebraska Natural Resource Commission, 1985. Policy Issue Study on Integrated Management of Surface Water and Groundwater.
- Nebraska Natural Resource Commission, 1984. Policy Issue Study of Supplemental Water Supplies.
- Nebraska Natural Resource Commission and U.S. Geological Survey, January 21, 1992. File Report on 1990 Water Use Data Collection and Processing.
- Nebraska Natural Resource Commission, 1974. Lower Platte River Basin Water Quality Management Plan. For Department of Environmental Control.
- Nebraska Natural Resource Commission, 1990. Water Use Data System.
- Nebraska State Fire Marshalls Office, 1993. Registered Underground Storage Tanks.
- Nebraska Statutes Relating to Groundwater Management Protection Act, November 1983.
- SEC DONOHUE, 1992. Supplemental RI/FS Former Mead, Nebraska Ordinance Plant.

REFERENCES - Continued

- Souders, V.L., 1967. Availability of Water in Eastern Saunders County, Nebraska. U.S. Geological Survey.
- Spalding, Roy, 1985-1989. Assessments of Statewide Groundwater Quality Data from Domestic Wells in Rural Nebraska.
- Spalding, Roy, Exner, Mary, 1980. Groundwater Nitrate-Nitrogen Concentrations. Map
- Spalding Roy, Exner, Mary, 1990. Occurrence of Pesticides and Nitrate in Nebraska.
- Spalding Roy, Exner, Mary, 1990. Occurrence of Pesticides and Nitrate in Nebraska Groundwater.
- Spalding, Roy, Exner, Mary, et.al., 1990. Water Quality in Lower Platte River Basin with Emphasis on Agrichemicals.
- State of Nebraska; Soil Conservation Service Engineers; Holm, Baird, 1991. Nebraska Solid Waste Management Plan.
- USDA Soil Conservation Service 1972. Boone County Soil Survey.
- USDA Soil Conservation Service 1982. Butler County Soil Survey.
- USDA Soil Conservation Service 1982. Colfax County Soil Survey.
- USDA Soil Conservation Service 1979. Dodge County Soil Survey.
- USDA Soil Conservation Service 1984. Madison County Soil Survey.
- USDA Soil Conservation Service 1985. Platte County Soil Survey Draft.
- USDA Soil Conservation Service 1965. Saunders County Soil Survey.
- U.S. Geological Survey and Conservation and Survey Division UNL, 1991. Groundwater Levels in Nebraska.
- U.S. Geological Survey and Conservation and Survey Division UNL, 1984. Groundwater Maps.
- U.S. Geological Survey, 1985. Hydraulic Characteristics of Nebraska Soil. Water Supply Paper 2222.
- U.S. Geological Survey, 1985. Printout - WATSTORE (Groundwater Quality).
- U.S. Geological Survey, 1993. Depth to Water.
- U.S. Geological Survey, all dates to 1992. U.S. Geological Survey Water Quality Database (WATSTORE).

REFERENCES - Continued

- U.S. Geological Survey, 1968. Water-Mineral Relations of Quaternary Deposits in the Lower Platte River Drainage Area in Eastern Nebraska.
- UNL Department of Agriculture Meteorology, 1990. "Climatic Data Summary for NE 1990."
- Veys, C.L., November 1985. Personal Communication.
- Veys, C.L., and Goodenkauf, O., 1985. Draft Groundwater Quality Management Plan Exhibits and Tables. Hoskins-Western-Sonderegger.
- Wilhite, Don, 1981. An Analysis of Nebraska Precipitation Climatology with Emphasis on Occurrence of Day Conditions. UNL Agricultural Meteorology and Climatology Center.

THE PLAN FOR GROUNDWATER MANAGEMENT IN THE LOWER PLATTE NORTH NATURAL RESOURCES DISTRICT

Section A Framework for Groundwater Management

The Lower Platte North NRD prepared a Master Plan for resources management in the late 1980's, which serves as a parent document to the 1994 updated Groundwater Management Plan. The Master Plan is the foundation from which individual resource planning occurs, and guides the allocation of financial and manpower resources. The Water Quality, Supply, and Pollution Abatement goal and subsequent objectives to support the goal which are present in the Master Plan follows:

GOAL

ASSURE ADEQUATE QUANTITY AND QUALITY OF STREAM FLOW, GROUNDWATER, AND SURFACE RESERVOIRS WITHIN THE DISTRICT FOR BENEFICIAL USES AS PRESCRIBED BY LAW.

OBJECTIVE 1

Insure that all chemigation users are properly trained and comply with state rules and regulations so as to reduce the occurrence of groundwater contamination through the application of pesticides and fertilizers.

OBJECTIVE 2

Actively pursue the proper use of chemigation criteria and assure that all who chemigate have permits to do so.

OBJECTIVE 3

Develop and maintain rural landowner and community reporting stations for well monitoring, water usage, and rainfall statistics.

OBJECTIVE 4

Insure proper local management of ground and surface water resources through cooperation with local community governments, agencies and private firms, which may involve development of Special Protection Areas and groundwater management and control areas.

OBJECTIVE 5

Comply with the District's Groundwater Management Plan as well as state standards and regulations in order to meet proper conservation requirements.

OBJECTIVE 6

Assist federal and state agencies in the protection of ground and surface waters from non-point and point sources of pollutants.

OBJECTIVE 7

Maintain groundwater quality and quantity monitoring programs.

OBJECTIVE 8

Encourage and develop programs to assist users in reducing irrigation water needs through best management practices.

OBJECTIVE 9

Develop instream flow requirements that will assist in providing a stable development climate within the District.

OBJECTIVE 10

Develop best management alternatives for chemical use in areas where susceptibility to groundwater pollution is high.

OBJECTIVE 11

Cooperate with state and federal agencies to provide adequate methods of testing groundwater for pollutants.

OBJECTIVE 12

Assist in the development of rural water districts with other applicable entities as required.

OBJECTIVE 13

Develop criteria and data for wellhead protection standards to allow District urban areas to participate in this program.

The goals, objectives, policies, and programs set forth in this Groundwater Management Plan Update were developed in support of the LPN NRD Master Plan, and provide further detail regarding ways to accomplish the intent of the Master Plan. It is the intent of the Lower Platte North NRD to wisely and proactively manage the groundwater resources within the District, while maintaining local control over management and use.

Since the NRD's first Groundwater Management Plan was adopted in 1985, many significant changes have occurred regarding regulatory requirements, responsibilities, and options for groundwater management. The Nebraska Legislature, through the Nebraska Groundwater Management Act and its amendments has offered NRDs the opportunity to manage groundwater at the local level if they choose to accept such responsibility. The Act however, also provides options for intervention at the State level should the NRDs require assistance. To recognize a problem or potential problem and do nothing to prevent or alleviate it is no longer a viable option. An NRD must have a plan of action ready to retain total local control and resource protection.

A summary of "Identified Present Known Problem Areas With Consideration of Potential Problem Areas and Information Deficiencies" has been presented in this plan. It is evident from information presented in the plan that there are several areas of concern which warrant extensive action to meet the goals of both the Master Plan and the Groundwater Management Plan's adopted goals and objectives for resource management.

In the area of groundwater quality, the most significant area of concern is the increase of nitrate concentrations. In the uplands of Saunders and Butler Counties, the data base may not allow for a broad interpretation of the areal distribution. In the Shell Creek reservoir, elevated nitrate levels may not be present but a more comprehensive and definitive monitoring network is

needed. Areas along the Platte River do exhibit elevated levels of nitrate contamination. This finding is consistent with the DRASTIC vulnerability index, which suggests this reservoir is highly vulnerable to pollution. The Todd Valley reservoir is also showing areas where nitrates are becoming higher. A report by Roy Spalding and Mary Exner indicated areas along the Platte River in Butler, Platte, Colfax, and Dodge Counties, the Todd Valley and Shell Creek exhibit an overall nitrate increase about 1 part per million per year from 1978/79 to 1988/89. Along with the higher nitrate concentrations is the potential problem of pesticide contamination. Surface runoff from the agricultural areas in the District are known to carry extremely high levels of pesticides, particularly during spring rainfall events.

As the State moves to recognize the interrelationship of surface and groundwater laws, an area needing extensive analysis is that of the physical surface/groundwater relationship. Some areas of the District demonstrate a potential for significant deterioration of a groundwater aquifer caused by surface water problems. Deep soil samples in the District also point out very high levels of nitrates in the soil profile just below the root zone moving into the groundwater aquifer.

The rate of development of irrigation wells in the District illustrates densely developed aquifers in many areas, which could result in overdraft. This trend is evident in a report from the Nebraska Department of Water Resources showing a steady increase in the number of new well registrations per year. Recharge rates and abilities to recover from overdraft of the aquifer and declines due to climatic changes must be understood for the entire District. Management of the physical system must reflect the ability of the system to respond to natural changes. Water level monitoring must be increased to provide a more comprehensive assessment of the systems responses to stress situations.

The Lower Platte North NRD recognizes the need for comprehensive, practical, and effective systems of groundwater management, combining both non-regulatory and regulatory approaches. Non-regulatory options such as data collection, public education, encouragement of voluntary use of best management practices, demonstration programs, and others have been used by the NRD as primary management tools prior to development of this plan. The District intends to expand its management scheme to include regulatory options available to the NRD under the Nebraska Groundwater Management Act. Regulatory tools authorized under this Act include:

- 1) Allocating the total permissible withdrawal of groundwater;
- 2) Rotation of use of groundwater;
- 3) Well-spacing requirements pursuant to Section 46-673.12;
- 4) Requiring the use of flow meters on wells;
- 5) Best management practices;
- 6) Requiring the analysis of water or deep soils for fertilizer and chemical content;
- 7) Educational programs designed to protect water quality; or
- 8) Moratorium on new well drilling (Control Area only).

(Source: Laws 1982, LB375, 11; Laws 1986, LB894, 30; Laws 1991, LB 51,4.)

In order for the NRD to legally utilize the tools outlined above, a Groundwater Management Area must be established with definable boundaries. The LPN NRD intends to establish the entire NRD as a Groundwater Management Area, allowing for utilization of the regulatory tools (listed above) as appropriate for overall management and for problem (subarea) management. Details are provided in Sections B and C of this Plan.

PLAN FOR GROUNDWATER MANAGEMENT IN THE LOWER PLATTE NORTH NATURAL RESOURCES DISTRICT

Section B Goals, Objectives, and Policies

In 1985, the Lower Platte North Natural Resources District developed, in accordance with the Groundwater Management and Protection Act of 1975, a Groundwater Management Plan. At that writing, little water quality or water quantity data existed in the NRD. The Plan, as a result of the lack of information, set forth a vigorous course of action which included sixty-four (64) actions designed to provide the District a dataset upon which proper management decisions could be based. Since 1985, the District has placed into action or has completed, 85% of those action items. The remaining 12 are actions which relied upon the database in order to be implemented, and are incorporated into this Groundwater Management Plan.

Goals established in 1985 also reflected the lack of a sufficient database and were adopted in order to assist in the building of such a dataset. With passage of LB 51, the District was in a position to analyze the considerable water information gathered since 1985. The analysis revealed a distinct set of needs for program realignment. The following goals, objectives, and policies or program components will serve to guide the District over the next several years.

GOAL #1 : Groundwater Reservoir Life

**TO PROVIDE A SUSTAINED GROUNDWATER SUPPLY OF QUALITY WATER
ADEQUATE TO SUPPORT REASONABLE AND BENEFICIAL USES, AND
MAINTAIN LONG-TERM QUALITY YIELDS.**

OBJECTIVE

Designate the entire Lower Platte North Natural Resources District as a Groundwater Management Area, consistent with Nebraska State Statutes 46-673.01 - 46-673.06.

Policy - Within two years of the date of approval of the Groundwater Management Plan by the Director of Water Resources, the Lower Platte North Natural Resources District shall establish a District-wide Groundwater Management Area.

Policy - A phased approach to water quality management based upon a Maximum Contaminant Levels (MCL) and Lifetime Health Advisory Levels (LHAL) trigger scheme, and water-level management with triggers based on water level declines with appropriate management actions, will be implemented (triggers and controls are set forth in Section C of this Plan).

Policy - Prior to establishing the Groundwater Management Area, the NRD will perform the necessary analysis to delineate subarea management boundaries for specific problem area management.

Policy - Establish and implement a Groundwater Management Area education program, to include proper fertilizer and pesticide application, irrigation scheduling and water use efficiency, urban fertilizer and pesticide use, water quality and chemical health risks, agricultural reporting needs, crop water efficiency, pump plant efficiency, adopted groundwater management triggers, and other groundwater issues as applicable.

Policy - Implement an education program to inform the public regarding the need for developing the LPN NRD as a Groundwater Management Area, with special emphasis on the adopted Management Schemes (outlined in Section C of this document).

Policy - Expand the NRD newsletter to include more information on groundwater activities.

Policy - Develop a network of demonstration farms, by aquifer, to exhibit water use efficiency benefits and solicit cooperation for voluntary metering and reporting to the NRD.

Policy - Increase the awareness of effective long-term conservation and utilization of the groundwater aquifer.

Policy - Coordinate education and information program with NDEQ, NNRC, NDOH, NDWR, and applicable local and federal agencies, to include the above items and other items such as proper well locations, number of wells per area, and new well construction.

GOAL #2: Management Systems Development

PROVIDE A SYSTEM OF GROUNDWATER MANAGEMENT TO SUPPORT THE GROUNDWATER RESERVOIR LIFE GOAL, BASED UPON AN ADEQUATE TECHNICAL FOUNDATION AND PUBLIC AWARENESS OF GROUNDWATER ISSUES.

OBJECTIVE

Provide technically accurate and updated water quantity data upon which to base management decisions.

Policy - Update the saturated thickness map by recording and mapping thickness from all new registered well logs and other new sources of information, to assist in further delineation of groundwater aquifers.

Policy - Update water level contour maps that coincide with groundwater data received from monitoring. Contour maps will be used to monitor changes in direction of groundwater flow and saturated thickness.

Policy - Enhance data collection in confined aquifers by monitoring at least 5% of the total registered wells in each confined aquifer. Use the data to evaluate predevelopment pressure head levels and changes from predevelopment to the present.

Policy - Develop a methodology to statistically analyze water level fluctuations, evaluate the significance of the changes, and relate to the management scheme developed for the GMA.

Policy - Increase the number of observation/monitoring wells in District groundwater reservoirs to provide greater coverage for early problem area detection. The actual number of wells and locations will be based upon the intensity of development of the aquifer and the dependence on the aquifer water supply for various uses. Ultimately the NRD's system will include at least 120 wells.

Policy - Support and perform studies to aid in groundwater model development to predict the amount of water which may be withdrawn from each groundwater aquifer to support the Groundwater Reservoir Life Goal.

Policy - Continue coordination of data collection, storage and analysis with other local, state and federal agencies and groups.

OBJECTIVE

Provide the most technically accurate and updated water quality data upon which to base management decisions.

Policy - Adjust the density of the groundwater quality monitoring network for each aquifer, providing data adequate to evaluate long-term trends and identify present and potential problem areas. The number of wells to be monitored is dependent on the percent of irrigated acres and the number of wells needed to irrigate those acres in each groundwater reservoir to establish and reaffirm baseline conditions.

Policy - Perform trend and random monitoring every 2 years in the most vulnerable areas and problem areas, and every 4 years in less vulnerable areas and areas not presently exhibiting water quality problems.

Policy - Continue coordination of data collection, storage and analysis with other local, state and federal agencies and groups relating to pollution spills (Nebraska Department of Environmental Quality - NDEQ), public water supplies and regulatory notices (NDOH), and results of special investigations (Conservation and Survey Division - C&SD, Department of Water Resources - DWR, NDEQ, Nebraska Department of Health - NDOH, U.S. Geological Survey - USGS, Environmental Protection Agency - EPA, Corps of Engineers - COE, etc.).

Policy - Continue to perform and/or support isolated water quality investigations in NRD aquifers as conditions dictate and the need arises.

Policy - Support nitrogen isotope studies where necessary to determine the source of a nitrate problem and its areal extent for problem boundary definition.

Policy - Support deep soil sampling in areas where suspected over-application of commercial fertilizer and/or animal manure has occurred.

Policy - Perform triazine screen testing of selected wells within the most vulnerable areas of each groundwater reservoir.

Policy - Perform studies to assess needs, benefits, costs, etc. when requested, for possible development of regional or rural drinking water supply systems.

Policy - Develop a program to assist in monitoring rural drinking water wells in cooperation with other agencies.

Policy - Coordinate the NRD's groundwater programs with the Nebraska Department of Agriculture in support of the State of Nebraska's Federal Insecticide, Fungicide, Rodenticide Act and farm management plans.

OBJECTIVE

Further develop and enhance the NRD's computer database management system to provide continual support for program advancements.

Policy - Increase the hardware capabilities of the NRD for data storage, retrieval and analysis, and interfacing with other program needs. Adapt the systems components to be compatible with local, state and federal systems.

Policy - Identify software needs to support: trend analysis; predict impacts of management decisions; and provide mapping capabilities. Acquire software to complement the NRD's hardware.

Policy - Refine the LPN NRD groundwater computer model to provide adequate prediction of vulnerable areas of decline.

Policy - Establish a QA/QC program for data entry to eliminate database errors.

Policy - Utilize the hardware and software capabilities to produce required periodic reports in a standard and meaningful format.

OBJECTIVE

To develop a coordinated NRD program to assist in implementation of the State of Nebraska's wellhead protection program. The NRD program will be targeted toward assisting the District's communities and supportive of the District's efforts in managing ground and surface water.

Policy - Further develop the information needs and assist in the continuance and upgrading of the present LPN NRD well decommissioning program.

Policy - The District will assist any community in the NRD with proper development of a Wellhead Protection Program.

Policy - The District will be the central repository for District water supply contamination information as received from the NDOH and NDEQ.

Policy - Make NRD database information on pollution and water quality readily available to all District communities for use in planning for Wellhead Protection.

Policy - If a Wellhead Protection Area is established due to non-point source pollution, the District may set boundary areas that are less than 9 square miles in size.

Policy - The District will develop a process to locate, identify, and catalogue past, present, and potential point and non-point sources of contamination (to include present and abandoned feedlots, landfills, dumps, industrial sources, etc.), which will be utilized in all ground and surface water program analysis and management.

OBJECTIVE

To support and conduct special studies, research, and data gathering activities that will assist the District in its understanding and management of groundwater.

Policy - Perform sandpit studies when appropriate, to address the locations of such pits, their fluctuations, evaporation/transpiration, and estimated effect on the groundwater table.

Policy - Continue to evaluate the adequacy of the Districts precipitation network and expand where appropriate.

Policy - Support studies/research and refinement of the DRASTIC program to further identify and understand recharge characteristics and areas vulnerable to pollution in the District.

Policy - Support and perform percolation studies to understand the recharge potential of groundwater reservoirs, particularly those areas where known or suspected contamination occurs.

Policy - Develop a water balance model for the NRD considering the effect of phreatophytic growth on the groundwater table and wetlands.

Policy - Participate in and perform instream flow studies which identify the streams dependence upon groundwater for base flow.

Policy - Participate in studies and research to quantify and qualify the interconnection between ground and surface water.

Policy - Support geologic and hydrogeologic studies which will contribute to the foundation of knowledge needed to locate and identify areas where changes in groundwater quality/quantity may impact environmentally sensitive resources.

OBJECTIVE

To adequately support the Groundwater Management Plan through proper application of District resources.

Policy - Provide sufficient qualified personnel, funding, and equipment to fully support the groundwater management system and the needs of the program.

Policy - Annually re-evaluate and upgrade the Districts Groundwater Management Plan and the resulting Groundwater Management Area designations.

Policy - Develop background information and a methodology to address potential NRD cost share programs for meter application, assistance with collection of irrigation and drinking water samples for analysis and deep soil sampling. The NRD will only cost-share with landowners that have registered wells with the Department of Water Resources. If wells are unregistered, proper registration forms will be provided by the NRD and a 6-month period will be allowed for registration before the illegal well will be reported to the Department of Water Resources. Chemigation permits will only be issued on registered wells.

PLAN FOR GROUNDWATER MANAGEMENT IN THE LOWER PLATTE NORTH NATURAL RESOURCES DISTRICT

Section C Action Plan

The Lower Platte North NRD is strongly aware prevention is extremely less costly than correction of a groundwater problem after it has developed. Knowledge of this principle has required the District to develop a groundwater program emphasizing protection based on a proactive approach rather than on a reactive, corrective approach. Data gathered by the District, the USGS, NDEQ and the University of Nebraska since 1985 has indicated areas where groundwater quality nitrate conditions have deteriorated beyond those established as health standards. Other data also indicate problem areas are presently developing which need to be intercepted in order to bring about a clean up of the reservoir and to halt a continuing trend of increased pollution.

The District did not enter into this activity without developing a method to arrive at what is felt to be a consistent planning and implementation strategy aimed at protection of the resource. Within two years of the date of approval of the Groundwater Management Plan by the Director of Water Resources, the District will establish a District-wide Groundwater Management Area. The quality component of the plan is a phased approach based on a Maximum Contaminant Levels (MCL) and health-based standards trigger scheme, addressing Nitrate, pesticides, and other human non-point source contaminant levels in the system. The quantity component of the plan is developed around triggers based on water level declines with appropriate management actions for confined and unconfined aquifers.

A major component of the plan is the implementation of an education program which includes, but is not limited to: proper fertilizer application (both commercial and private), irrigation scheduling and water use efficiency, water quality and chemical health risks, agricultural reporting needs, adopted groundwater management triggers, social/economic aspects, and other issues as applicable. An essential item of the education program is the development of demonstration farms, by aquifer, exhibiting water use efficiency benefits, irrigation scheduling, crop water efficiency, and fertilizer and pesticide application. Another essential item of the education program will be development of educational materials to address proper application of fertilizers, pesticides, and other chemicals on lawns and other non-commercial applications in urban areas. Prior to establishing Phase II and III Level Groundwater Management Areas, the NRD will perform necessary analysis sufficient to delineate subarea management boundaries for specific problem areas associated with levels of concern.

Groundwater Quality Management Program

The Groundwater Quality Management Program is based on a set of contaminant level triggers designating the Phase of the program in which a particular area must be placed. Phase I nitrate triggers are set at 0 to 8 parts per million in the Groundwater reservoir and includes the entire District. Phase II triggers are from 8.01 to 10 parts per million nitrate concentration in the groundwater while Phase III trigger levels range from 10.01 parts per million or greater. "Other" human-induced non-point source contaminants, such as pesticides have phased trigger levels based upon Maximum Contaminant Levels (MCL) or Lifetime Health Advisory Levels (LHAL). Phase I triggers are set at 0 to 80% of the contaminants MCL/LHAL and includes the entire NRD. Phase II areas will be established when contaminants are present at 80-100% of the

MCL/LHAL. Phase III areas will be established when the MCL/LHAL is exceeded (>100%). Currently, no "other" contaminated areas have been identified that are approaching the upper limit of a Phase I area. As "other" contaminants approach the Phase I area limit, contaminant-specific programs and regulations will be adopted, similar to the nitrate regulations which are based upon increasing levels of management and actions.

For the purpose of implementing Phases II and III of groundwater management, the LPN NRD has established some guidelines by which a problem area is identified, and Phase II and III area boundary setting studies will be initiated. Groundwater management units will be reservoir specific. Within the same reservoir, boundary setting studies will be initiated when: water quality analytical results, within a minimum 9 square mile area are at identified trigger levels, over a minimum of 2 sampling events. The area must contain a minimum of 10 registered wells and contaminant trigger levels must be exceeded in over 50% of the wells. When registered wells are not available, other wells may be used. Initial investigation by the NRD will be to determine if the contamination is a result of point-source or non-point source pollution. If non-point source is concluded more intensive investigation for boundary setting will ensue.

If a Wellhead Protection Area should be established due to non-point source pollution, the District may set boundaries that are less than 9 square miles.

Data derived from the monitoring network established by the District, combined with special studies, monitoring studies performed by the USGS, University of Nebraska, NDEQ, County Extension programs, and others as applicable, will be used as the database on which to formulate Phase II and Phase III area boundaries.

Upon confirmation of the GWMP by the Department of Water Resources, the District will move immediately into the process of evaluating Phase boundaries by performing a series of confirmation studies aimed at boundary setting. The District will also begin the development and implementation of the education program. This program will become progressively more intense as an area shifts from one Phase to another higher Phase.

Within two-years of the acceptance of the GWMP, the District will designate the entire NRD in Phase I of the program. The reasoning for this action is in keeping with the Districts goal "to provide a sustained Groundwater supply of quality water adequate to support reasonable and beneficial uses, and maintain long-term quality yields."

PHASE I CONTROLS:

- ◆ All operators in Phase I areas within the District, who use any type of fertilizer, either commercial or organic, are required to be certified by the District every four (4) years. Certification will be consistent with the Districts chemigation program and applicable to the State FIFRA program. The education/certification program will be developed with the assistance of the Cooperative Extension personnel and others, as applicable.

- ◆ A groundwater analysis for nitrogen (nitrate nitrogen) content for irrigation, municipal, and industrial wells must be made every four years using NRD approved analysis methods, and results submitted to the NRD by December 31 of the fourth year. This analysis is deemed necessary to both assist the NRD in their monitoring program and to aid the operator in developing a knowledge of their particular groundwater nitrate level. This knowledge can readily be translated into a decrease of nitrogen usage by an operator and thus a financial incentive to properly use that nitrate in the system. A methodology for sample collection and proper analysis procedures will be a part of the education program.
- ◆ A soil analysis (3-4 feet in depth) for nitrogen (nitrate nitrogen) content for each field under control of the operator used for commercial crop production are encouraged every four years. NRD approved analysis methods should be used, and results submitted to the NRD by December 31 of the fourth year. This analysis is likewise considered necessary to aid the operator in developing a knowledge of their pending useable soil profile nitrogen and of that amount already inaccessible to the crops. A methodology for sample collection and proper analysis procedures will be a portion of the education program.
- ◆ All operators are encouraged to submit a Fertilizer Application Report to the NRD once every four years on a form provided by the District, which indicates the pounds per acre of nitrogen (commercial and organic) applied to each field under their control for the past four years. The quantity in pounds per acre of pesticides applied for each field where applied, will also be encouraged. Such reports will incorporate, if applicable, those reports required under the NRD chemigation program and such reporting requirements resulting from the implementation of the State assumption of the Federal Insecticide, Fungicide, Rodenticide Act (FIFRA). These reports will also remain consistent with changes resulting from reauthorization of the Clean Water Act which affects such reports.
- ◆ Passage of LB-981 by the Nebraska Legislature in 1994, requires all new wells to be drilled in any management area which will pump greater than 50 gpm to have a permit prior to construction. The cost of the permit will be consistent with conditions of the law. Penalties applied under this Law will be in accordance with the law.
- ◆ Application of organic fertilizer (liquid manure, dried manure, sludge or composted organic waste) is very diversified and poses management problems relative to the size of the operation. The desire of the District is to allow farming operations to continue, yet not allow the N concentration in the groundwater to increase. Not all organic waste contains the same amount of N per unit of measurement, as such the amount/acre/year allowed to be applied in Phase I areas will be based on method of collection and storage, land application method, types of crops or cover crop, soil types, landscape features, source of manure, and previous manure application rates. Amount/acre/year of manure applied on each field is encouraged to be reported on the Fertilizer Application Report and submitted to the NRD once every four years.
- ◆ No fall applications of N fertilizer (commercial) will be allowed on non-sandy or fine textured soils until after November 1. Such determination of non-sandy soils or fine textured soils will also be determined and identified in the same manner as sandy soils.

- ◆ Fall and winter applications of N fertilizer (commercial) will be prohibited on sandy soils. Sandy soils will be designated utilizing the USDA Soil Conservation Service Soil Surveys for the counties in the District. Such determination will be set forth prior to designation and identified prior to confirming the GWMA Phase I program. Commercial fertilizer can be applied on sandy soils after March 1 of the crop year.

Present data indicates that some of the areas in the District may be placed in the Phase II category upon designation of the GWMA in the District. Phase II areas will be delineated via the above noted procedure of delineating boundaries. Such delineation will cause extended activities to be brought into play. Those additional requirements are:

PHASE II CONTROLS:

- ◆ A continuation of Phase I activities as they apply.
- ◆ A Groundwater analysis for nitrogen (nitrate) content for all irrigation, municipal, and industrial wells must be made annually and reported to the NRD by December 31.
- ◆ Annual soil samples in the root zone (3' to 4' in depth) on each field used for commercial crop production are required for Phase II and Phase III areas. This information will be used in conjunction with use of proper best management practices. The results of the soil samples will accompany the annual report made to the NRD by December 31.
- ◆ All operators will submit a Fertilizer Application Report to the NRD at the end of each crop year or prior to December 31 of each year. Submittal will be on a form(s) developed by the NRD. Reporting of Application of Pesticides will be encouraged on this form.
- ◆ Commercial nitrogen-fertilizer as anhydrous ammonia will be permitted on non-sandy or fine textured soils from November 1 to March 1, provided that an approved inhibitor is used and applied as recommended. After March 1 an inhibitor is not needed.
- ◆ In order to assure use of an approved inhibitor, the operator will be required to furnish certification from a dealer that an approved inhibitor was used and applied as recommended. Methodology for this activity will be developed as part of the education program.
- ◆ The District will begin a voluntary fertilizer calibration program addressing all applications and will strongly encourage operators to participate in the process. The District may, as conditions warrant, choose to develop a cost share program with operators.
- ◆ Monitoring (meters or time totalizers) of water applications will be required to allow operators to better manage fertilizer applications and control excessive nitrate leaching into the aquifer. If time totalizers are used then well output must be certified by the NRD. This activity will be phased in over a period of six (6) years.

- ◆ In Phase II and Phase III areas, amount per acre per year of organic fertilizer allowed to be applied (liquid manure, dried manure, sludge, or composted organic waste) will be based on method of collection and storage, land application method, types of crops or cover crop, soil types, landscape features, source of manure, and previous manure application rates. The Nebraska Cooperative Extension Service Bulletin EC 89-117 "Fertilizing Crops with Animal Manure" shall be used as guidance unless more current guidelines are available. Amount/acre/year of manure applied on each field is to be reported on the Fertilizer Application Report and submitted to the NRD by December 31 of each year. The amount and timing of application must be adjusted to the N concentration in the soil profile and groundwater content. Application is allowed to frozen soils and is to be determined on a site-by-site basis as this is a prime cause of both groundwater and surface water degradation.
- ◆ The education program will be expanded to assist the Phase II operators and other personnel in the area to realize that continued increases of nitrate and/or other non-point source contamination could cause the area to be elevated to a Phase III area.

Phase III areas are characterized by contaminant levels exceeding the MCL or LHAL in the groundwater. Present data indicates the potential to delineate areas in the District where nitrate levels are consistently in this range. Areas designated as Phase III areas are further constrained in order to more fully protect the citizens of the area and to remediate the aquifer.

PHASE III CONTROLS:

- ◆ Phase I and Phase II controls remain in effect.
- ◆ Monitoring (meters or time totalizers) of water applications to allow operators to better manage fertilizer applications and control leaching of nitrates is to be phased in over 4 years. If time totalizers are used then well output is to be certified by the NRD.
- ◆ The application of commercial nitrogen fertilizer is prohibited in the fall and winter on all soils until after March 1. Spring applications of commercial nitrogen fertilizer will require split applications (pre-plant and sidedress) or the use of an approved inhibitor applied as recommended. If a split application is used and 50 percent or more is applied as a pre-plant, the use of an approved inhibitor applied as recommended is still required.
- ◆ If 50% or more of commercial nitrogen fertilizer is applied to pre-plant then operators are required to furnish certification from the dealer that an inhibitor was used at recommended rates. Methodology for this process will be developed as part of the education program.
- ◆ Require fertilizer calibration monitors on applications >50 lbs./acre. The application of fertilizer (>50 lbs/acre) would be required to be calibrated to the results of soil and water tests and monitored for compliance. The District may choose to develop or increase a cost share program.

Groundwater Quantity Management Programs

The District is composed of both confined and unconfined aquifers. Confined aquifers being generally defined as those aquifer areas where there is a pressure such that the water tends to rise in the well casing. This rise is termed the potentiometric head. Unconfined aquifers are those which do not exhibit this characteristic. The two differing types, due to their varying characteristics, are treated differently in the designation of Levels in the management of the system.

The LPN NRD has defined subareas within the District that have similar aquifer conditions. When greater than 50% of the LPN NRD monitoring wells in a subarea has reached or exceeded the trigger level, then a control area can be established. As more information becomes available in the future, these subareas can be further defined.

LPN NRD monitoring wells are established by a cooperative agreement with the current landowners on a voluntary basis. Due to hydrologic considerations LPN NRD monitoring wells are not to be located on municipal well field property.

Unconfined Aquifers

Unconfined aquifer management subareas are to be designated within the District when conditions, indicate a 10% drop in the saturated thickness of the aquifer. Assessment of percentage drop will be calculated utilizing the spring readings of the wells over a three (3) year period assessed against the baseline 1987 well levels or a more recent index year water level adopted by the Board of Directors and revised in the Ground Water Management Plan to establish the new baseline. When this condition is noted to be developing, the District will enhance the education program which may assist in correcting the situation. If this type of action does not provide the needed results the following will occur.

LEVEL 1 CONTROLS:

- ◆ The area will be designated a Level 1 Quantity Area and operators of irrigation, municipal, and industrial well systems must attend education classes designed by the District and in agreement with applicable other agency input. Certification of all operators is required every four years.
- ◆ A permit will be required for all new wells to be drilled in the area which will pump greater than 50 gpm.
- ◆ The District will encourage well metering on irrigation, municipal, and industrial wells (meters or time totalizers). This voluntary well metering program will be established with possible incentives available to operators. Incentives may include a variety of options and will be developed prior to designation of a Level 1 area.
- ◆ Encourage an acre-inch allocation system that will be developed per commercial crops planted that are dependent on that particular aquifer.
- ◆ The District will encourage submission of the Water Use Report to the NRD prior to December 31 of the fourth year.

As conditions become more severe the District will utilize a 15 percent drop in the saturated thickness as the trigger to move into Level 2 quantity programs.

LEVEL 2 CONTROLS:

- ◆ The same requirements as in Level 1 but enhanced.
- ◆ Well meters or time totalizers will be a requirement on all irrigation, municipal, and industrial wells. If time totalizers are used then well output must be certified by the NRD.
- ◆ An acre-inch allocation per crop planted will be put into place and will be based on the aquifer and the use of the aquifer.
- ◆ The District will require annual submission of the Water Use Report to the NRD by December 31.
- ◆ Well spacing requirements will be applied in the Level 2 area pursuant to Section 46-673.12 of the State Statutes. (Well spacing will vary with % of decline in the aquifer.)
- ◆ Best management practices will be required to conserve water and will be developed prior to designation of the area as a Level 2 Area.

Confined Aquifers

The sensitivity of the confined aquifers has led the District to the decision to manage them in a different manner than the unconfined aquifers. The triggers are based on a reduction in the potentiometric-aquifer thickness. The potentiometric surface is defined as an "imaginary" surface representing the total head of groundwater in a confined aquifer that is defined by the level to which water will rise in a well. The potentiometric-aquifer thickness (PAT) is defined as the distance from the potentiometric surface to the base of the principal aquifer. The use of this procedure requires the data derived from the well drilling operation as the total aquifer thickness will need to be determined.

Three Levels have been assigned to the confined aquifer designations. Level 1A is triggered by a 7 percent drop in potentiometric-aquifer thickness. Assessment of percentage drop will be calculated utilizing the spring readings of the wells over a three (3) year period assessed against the 1987 baseline well levels or a more recent index year water level adopted by the Board of Directors and revised in the Ground Water Management Plan to establish the new baseline. This program is one of primarily education and the controls applied are:

LEVEL 1A CONTROLS:

- ◆ Operators of irrigation, municipal, and industrial well systems are required to attend education classes as designed by the District. These classes will be developed prior to any area being designated. All operators are to be certified every four years.
- ◆ Permits are required for all new wells to be drilled in the area which will pump greater than 50 gpm.

- ◆ The District will encourage well metering (meters or time totalizers) on all irrigation, municipal, and industrial wells.
- ◆ Encourage adoption of acre-inch allocations on crops planted that are dependent on the aquifer.
- ◆ The District will encourage submission of the Water Use Report to the NRD prior to December 31 of the fourth year.

Level 2A is triggered by a 10 percent drop in the potentiometric-aquifer thickness of the aquifer and the following controls are applied.

LEVEL 2A CONTROLS:

- ◆ The same controls as set forth in Level 1A apply.
- ◆ Well meters or time totalizers are required to be installed and used on all irrigation, municipal, and industrial wells. If time totalizers are used then well output must be certified by the NRD.
- ◆ The District will develop and assess acre-inch allocations per crops planted. These allocations will be developed according to data assessments, wells in the area, use of the wells, and other pertinent factors leading to the proper assessment of the available resource.
- ◆ The District will require an annual submission of the Water Use Report to the NRD prior to December 31.

The trigger for the Level 3A Area is a 15 percent drop in the potentiometric-aquifer thickness. This level signals the need for extreme measures as the aquifer is under considerable stress.

LEVEL 3A CONTROLS:

- ◆ Same conditions as applied in Level 1A and Level 2A as applicable.
- ◆ As required, the District will further adjust the acre-inch allocations. Such adjustment will be commensurate with the data developed from implementation of Level 2A area designation.
- ◆ The District will adopt a well spacing requirement pursuant to Section 46-673.12 Nebraska statutes and implement such a system. Well spacing will vary with % decline in the aquifer.

AGRICULTURAL RESEARCH FACILITIES

Agricultural Research Facilities within the LPN NRD may apply to the Board of Directors for a modification of the individual requirements within the groundwater management areas, that specifically affects the land they own or operate. Such requests will be reviewed on a case-by-case basis.

APPEAL PROCESS

In implementing the LPN NRD Groundwater Management Plan, all those affected are provided with an administrative appeal process whereby they may address the Board of Directors to present their case. The incorporation and functioning of the appeals process is carried out with the same manner as other administrative appeals processes utilized by the District (i.e., sediment and erosion control program appeal process).

SUMMARY

In pursuing the goals of this Groundwater Management Plan, the District will orient its programs in support of accomplishing the goals, objectives and policies of the plan. Provisions will be incorporated in the process to allow for Areas and Levels to change over time in response to changes in either nitrate levels, chemical constituent levels, or water levels.

TABLE 1
QUALITY

AREA	DATE TO BEGIN	PHASE	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Phase I Area	0-8 ppm NO ₃ -N in groundwater, or <80% of MCL/LHAL of "other" man-induced, non-point source contaminants.	a) All operators using any type of fertilizer must attend the education/certification classes established by the District to become certified, every 4 years. b) A groundwater analysis for nitrogen (NO₃-N) content for all wells pumping greater than 100 gpm and irrigating commercial crops must be made every 4 years and reported to the NRD by December 31 of the fourth year. c) A soil (3-4 ft. depth) analysis for nitrogen (NO₃-N) content on each field growing commercial crops are encouraged every 4 years and results reported to the NRD by December 31 of the fourth year. d) All operators are encouraged to submit a Fertilizer Application Report to the NRD prior to December 31 once every 4 years which indicates the pound per acre of nitrogen (commercial and organic) and quantity per acre of pesticides applied to each field on crop lands under their use for the reporting period. Such reports will incorporate, if applicable, those reports required under the NRD chemigation program and such reports resulting from implementation of the State assumption of the Federal Insecticide Fungicide, Rodenticide Act (FIFRA). e) Require permits for all new wells to be drilled which will pump greater than 50 gpm. f) Amount/acre/year of organic manure allowed (liquid manure, dried manure, sludge or composted organic waste) will be based on method of collection and storage, land application method, types of crops or cover crop, soil types, landscape features, source of manure, and previous manure application rates. g) No Fall application of N fertilizer (commercial) on non-sandy or fine textured soils until after November 1. h) Fall and Winter applications of N fertilizer (commercial) is prohibited on sandy soils. Commercial fertilizer can be applied on sandy soils after March 1.

TABLE 2
QUALITY

AREA	DATE TO BEGIN	PHASE	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Phase II Area	8.01-10 ppm NO ₃ -N in groundwater, or >80% but <100% of MCL/LHAL of "other" man-induced, non-point source contaminants.	a) Same as Phase I b) A groundwater analysis for Nitrogen (NO₃-N) content for all wells pumping greater than 100 gpm and irrigating commercial crops must be made annually, and reported to the NRD by December 31. c) A soil (3-4 ft. depth) analysis for nitrogen (NO₃-N) content on each field growing commercial crops are required annually and results reported to the NRD by December 31. d) The Fertilizer Application Report must be submitted to the Lower Platte North NRD each crop year prior to December 31. e) Commercial Nitrogen Fertilizer will be permitted on non-sandy or fine textured soils from November 1 to March 1 provided that an approved inhibitor is used at recommended rates. After March 1 inhibitor is not needed. f) Require operators applying commercial fertilizer from November 1 to March 1 to furnish certification from dealer that an approved inhibitor was used as recommended. g) Encourage fertilizer calibration monitors on all applications and develop cost-share programs. h) Monitor (meters or time totalizers) water applications to allow operators to better manage fertilizer applications and control leaching of Nitrates. (Phase in over 6 years) i) Amount/acre/year of organic manure allowed (liquid manure, dried manure, sludge or composted organic waste) will be based on method of collection and storage, land application method, types of crops or cover crop, soil types, landscape features, source of manure, and previous manure application rates. (Use of Nebraska Cooperative Extension Service Bulletin EC-89117 is recommended.) Amount and timing of application must be adjusted to the N concentration in the soil profile and groundwater content. Application to frozen soils on a site-by-site basis. j) Expand education programs.

TABLE 3
QUALITY

AREA	DATE TO BEGIN	PHASE	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Phase III Area	greater than 10.01 ppm NO ₃ -N in groundwater, or >100% of MCL/LHAL of "other" man-induced, non-point source contaminants.	a) Same as Phase I and Phase II b) Monitor (meters or time totalizers) water applications to allow operators to better manage fertilizer applications and control leaching of Nitrates (Phase in over 4 years). c) Application of commercial nitrogen fertilizer is prohibited in the fall and winter on all soils until after March 1. Spring applications of commercial nitrogen fertilizer will require split applications (pre-plant and sidedress) or the use of an approved inhibitor applied as recommended. (On split application, if 50% or more is applied as a pre-plant the use of an approved inhibitor applied as recommended is still required). d) If 50% or more of commercial nitrogen fertilizer is applied at pre-plant then operators are required to furnish certification from the dealer that an inhibitor was used at recommended rates. e) Require fertilizer calibration monitors on applications of > 50 lbs. per acre.

TABLE 4
UNCONFINED AQUIFERS
QUANTITY

AREA	DATE TO BEGIN	LEVEL	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Level I	10% drop in the saturated thickness.	a) All operators of well systems that pump greater than 100 gpm must attend education classes designed by the District. All operators to be certified every 4 years. b) Permits required for all new wells to be drilled which will pump greater than 50 gpm. c) Encourage well metering program (meters or time totalizers) to be established on all wells pumping greater than 100 gpm. d) Encourage adoption of acre-inch allocations per crops planted that are dependant on the aquifer. e) Encourage submission of the Water Use Report to NRD prior to December 31 of the fourth year.

TABLE 5
UNCONFINED AQUIFERS
QUANTITY

AREA	DATE TO BEGIN	LEVEL	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Level II	15% drop in the saturated thickness.	a) Same as Level I. b) Require well meters or time totalizers to be installed on all wells pumping greater than 100 gpm. c) Require adoption of acre-inch allocations per crops planted that are dependent on the aquifer. d) Require annual submission of the Water Use Report to the NRD prior to December 31. e) Requirement of well-spacing pursuant to Section 46-673.12 - Nebraska Statutes. (Will vary with % of aquifer decline.) f) Require use of best management practices to conserve water.

TABLE 6
CONFINED AQUIFERS
QUANTITY

AREA	DATE TO BEGIN	LEVEL	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Level 1A	7% drop in potentiometric-aquifer thickness.	a) All operators of well systems that pump greater than 100 gpm must attend education classes designed by the District. All operators to be certified every 4 years. b) Permits required for all new wells to be drilled which will pump greater than 50 gpm. c) Encourage well metering program (meters or time totalizers) to be established on all wells pumping greater than 100 gpm. d) Encourage adoption of acre-inch allocations per crops planted that are dependent on the aquifer. e) Encourage submission of the Water Use Report to NRD prior to December 31 of the fourth year.

1) The potentiometric surface is defined as an "imaginary" surface representing the total head of groundwater in a confined aquifer that is defined by the level to which water will rise in a well.

2) The potentiometric-aquifer thickness (PAT) is defined as the distance from the potentiometric surface to the base of the principal aquifer.

TABLE 7
CONFINED AQUIFERS
QUANTITY

AREA	DATE TO BEGIN	LEVEL	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Level IIA	10% drop in potentiometric-aquifer thickness.	a) Same as level IA. b) Require well meters or time totalizers to be installed on all wells pumping greater than 100 gpm. c) Require adoption of acre-inch allocations per crops planted that are dependant on the aquifer. d) Require annual submission of the Water Use Report to the NRD prior to December 31.

TABLE 8
CONFINED AQUIFERS
QUANTITY

AREA	DATE TO BEGIN	LEVEL	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Level IIIA	15% drop in potentiometric-aquifer thickness.	a) Same as level IA and IIA. b) Further adjust acre-inch allocations. c) Require well-spacing pursuant to section 46-673.12 Nebraska Statutes. (Will vary with % of aquifer decline) d) Require use of best management practices to conserve water.

TABLE 9
LPNNRD's - GROUNDWATER QUALITY MANAGEMENT PROGRAM

RULES AND REGULATIONS	Phase I	Phase II	Phase III
1. Phase areas will be established on Nitrate-Nitrogen (NO ₃ -N) concentration found in the groundwater.	0-8 ppm	8.01-10 ppm	10.01 ppm or >
2. Phase areas can be established on other non-point source contaminants found in the groundwater or soil.	0-80% MCL/LHAL	80-100% MCL/LHAL	>100% MCL/LHAL
3. Operators using any type of fertilizer are required to become certified every 4 years.	X	X	X
4. A groundwater analysis for Nitrogen (NO ₃ -N) content for all wells pumping greater than 100 gpm irrigating commercial crop production must be made and reported to the NRD by December 31.	Once every 4 yrs.	Annually	Annually
5. Soil samples in the root zone (3 to 4 ft. deep) are to be taken and reported to the NRD by December 31.	Encouraged	Annually	Annually
6. Fertilizer Application Report (both commercial and organic fertilizers) to NRD prior to December 31.	Encouraged	Annually	Annually
7. Permit for all new wells to be drilled which will pump greater than 50 gpm.	X	X	X
8. Amount/acre/year of organic fertilizer allowed (liquid manure, dried manure, sludge or composted organic waste) will be based on method of collection and storage, land application method, types of crops or cover crop, soil types, landscape features, source of manure, and previous manure application rates.	X		
9. No fall application of N fertilizer (commercial) on non-sandy soils until after November 1.	X		
10. Fall and winter applications of commercial nitrogen fertilizer is prohibited on sandy soils. Commercial fertilizer can be applied on sandy soils after March 1.	X	X	
11. Commercial nitrogen fertilizer permitted on non-sandy soils from November 1 to March 1 provided an approved inhibitor is used at recommended rates.		X	
12. Require operators applying commercial fertilizer from November 1 to March 1 to furnish certification from dealer that an approved inhibitor was used as recommended.		X	
13. Encourage fertilizer calibration monitors on all applications and develop cost-share programs.		X	
14. Monitor water applications to allow operators to better manage fertilizer application and control leaching of Nitrogen.		phase in over 6 yr.	phase in over 4 yr.
15. Amount/acre/year of organic fertilizer allowed (liquid manure, dried manure, sludge or composted organic waste) will be based on method of collection and storage, land application method, types of crops or cover crop, soil types, landscape features, source of manure, and previous manure application rates. Amount and timing of application must be adjusted to the N concentration in the soil profile and groundwater content. Application to frozen soils on a site-by-site basis.		X	X
16. Expand Education program.		X	X
17. Application of commercial nitrogen fertilizer is prohibited in the fall and winter on all soils until after March 1. Spring applications of commercial nitrogen fertilizer will require split application (pre-plant and sidedress) or the use of an approved inhibitor applied as recommended. (On split applications, if 50% or more is applied as a pre-plant, the use of an approved inhibitor applied as recommended is still required.)			X
18. If 50% or more of commercial nitrogen fertilizer is applied at pre-plant then operators are required to furnish certification from dealer that an inhibitor was used at recommended rates.			X
19. Require fertilizer monitors on all applications greater than 50 lbs/acre.			X

TABLE 10
LOWER PLATTE NORTH NRD
GROUNDWATER QUANTITY MANAGEMENT PROGRAM

UNCONFINED AQUIFER		
Rules and Regulations	Level I 10% drop in saturated thickness	Level II 15% drop in saturated thickness
1. All operators of well systems that pump greater than 100 gpm must attend education classes and be certified every 4 years.	X	X
2. Permit required for all new wells to be drilled which will pump greater than 50 gpm.	X	X
3. Well metering program established on all wells pumping greater than 100 gpm.	Encouraged	Required
4. Adopt acre-inch allocations per crops planted dependent on aquifer.	Encouraged	Required
5. Water Use Report to NRD prior to December 31.	Encouraged	Annually
6. Require well-spacing pursuant to section 46-673.12 (will vary with % decline)		X
7. Require use of best management practices.		X

CONFINED AQUIFERS			
Rules and Regulations	Level IA 7% drop in potentiometric-aquifer thickness	Level IIA 10% drop in potentiometric-aquifer thickness	Level IIIA 15% drop in potentiometric-aquifer thickness
1. All operators of well systems that pump greater than 100 gpm must attend education classes and be certified every 4 years.	X	X	X
2. Permits required on all new wells to be drilled which will pump greater than 50 gpm.	X	X	X
3. Well metering program established on all wells pumping greater than 100 gpm.	Encouraged	Required	Required
4. Adopt acre-inch allocations per crops planted dependant on aquifer.	Encouraged	Required	Required
5. Water Use Report to NRD prior to December 31.	Encouraged	Annually	Annually
6. Require well spacing pursuant to Section 46-673.12. (Will vary with % decline)			X
7. Require use of best management practices.			X

PLAN FOR GROUNDWATER MANAGEMENT IN THE LOWER PLATTE NORTH NATURAL RESOURCES DISTRICT

Section D Public Participation

Public knowledge of the ideas and designs included in the Groundwater Management Plan is crucial to the successful implementation of the plan. Therefore, the Board of Directors felt that a series of public hearings and meetings to present and discuss the changes to the adopted Groundwater Management Plan would be beneficial. Public hearings and meetings were held at the following locations:

<i>July 26, 1993</i>	Public Hearing - Fremont Public Hearing - Schuyler Public Hearing - Wahoo
<i>July 28, 1993</i>	Public Hearing - Platte Center Public Hearing - David City
<i>August 25, 1993</i>	Press Conference - Wahoo
<i>September 8, 1993</i>	Public Meeting - Wahoo
<i>August 29, 1994</i>	Public Hearing - Wahoo
<i>August 31, 1994</i>	Public Hearing - Platte Center

During each public meeting the plan was presented by NRD staff. Public comments, questions, and concerns were recorded for consideration by the Board and possible incorporation into the Plan. Overall the meetings were very beneficial, and provided guidance to the Board of Directors and NRD staff. Appropriate comments were incorporated into the Plan.

In addition to the public meeting process, public awareness was fostered through a series of 17 news articles in local papers, 5 radio spots, and presentations at 7 area meetings during 1993 and 1994. The LPN NRD board and staff is grateful to those who took the time to participate in this process.

TABLE 1
QUALITY

AREA	DATE TO BEGIN	PHASE	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Phase I Area	0-8 ppm NO ₃ -N in groundwater, or <80% of MCL/LHAL of "other" man-induced, non-point source contaminants.	a) All operators using any type of fertilizer must attend the education/certification classes established by the District to become certified, every 4 years. b) A groundwater analysis for nitrogen (NO₃-N) content for irrigation, municipal, and industrial wells must be made every 4 years and reported to the NRD by December 31 of the fourth year. c) A soil (3-4 ft. depth) analysis for nitrogen (NO₃-N) content on each field growing commercial crops are encouraged every 4 years and results reported to the NRD by December 31 of the fourth year. d) All operators are encouraged to submit a Fertilizer Application Report to the NRD prior to December 31 once every 4 years which indicates the pound per acre of nitrogen (commercial and organic) and quantity per acre of pesticides applied to each field on crop lands under their use for the reporting period. Such reports will incorporate, if applicable, those reports required under the NRD chemigation program and such reports resulting from implementation of the State assumption of the Federal Insecticide Fungicide, Rodenticide Act (FIFRA). e) Require permits for all new wells to be drilled which will pump greater than 50 gpm. f) Amount/acre/year of organic manure allowed (liquid manure, dried manure, sludge or composted organic waste) will be based on method of collection and storage, land application method, types of crops or cover crop, soil types, landscape features, source of manure, and previous manure application rates. g) No Fall application of N fertilizer (commercial) on non-sandy or fine textured soils until after November 1. h) Fall and Winter applications of N fertilizer (commercial) is prohibited on sandy soils. Commercial fertilizer can be applied on sandy soils after March 1.

TABLE 2
QUALITY

AREA	DATE TO BEGIN	PHASE	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Phase II Area	8.01-10 ppm NO ₃ -N in groundwater, or >80% but <100% of MCL/LHAL of "other" man-induced, non-point source contaminants.	a) Same as Phase I b) A groundwater analysis for Nitrogen (NO₃-N) content for all irrigation, municipal, and industrial wells must be made annually, and reported to the NRD by December 31. c) A soil (3-4 ft. depth) analysis for nitrogen (NO₃-N) content on each field growing commercial crops are required annually and results reported to the NRD by December 31. d) The Fertilizer Application Report must be submitted to the Lower Platte North NRD each crop year prior to December 31. e) Commercial Nitrogen Fertilizer will be permitted on non-sandy or fine textured soils from November 1 to March 1 provided that an approved inhibitor is used at recommended rates. After March 1 inhibitor is not needed. f) Require operators applying commercial fertilizer from November 1 to March 1 to furnish certification from dealer that an approved inhibitor was used as recommended. g) Encourage fertilizer calibration monitors on all applications and develop cost-share programs. h) Monitor (meters or time totalizers) water applications to allow operators to better manage fertilizer applications and control leaching of Nitrates. (Phase in over 6 years) i) Amount/acre/year of organic manure allowed (liquid manure, dried manure, sludge or composted organic waste) will be based on method of collection and storage, land application method, types of crops or cover crop, soil types, landscape features, source of manure, and previous manure application rates. (Use of Nebraska Cooperative Extension Service Bulletin EC-89117 is recommended.) Amount and timing of application must be adjusted to the N concentration in the soil profile and groundwater content. Application to frozen soils on a site-by-site basis. j) Expand education programs.

TABLE 3
QUALITY

AREA	DATE TO BEGIN	PHASE	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Phase III Area	greater than 10.01 ppm NO ₃ -N in groundwater, or >100% of MCL/LHAL of "other" man-induced, non-point source contaminants.	a) Same as Phase I and Phase II b) Monitor (meters or time totalizers) water applications to allow operators to better manage fertilizer applications and control leaching of Nitrates (Phase in over 4 years). c) Application of commercial nitrogen fertilizer is prohibited in the fall and winter on all soils until after March 1. Spring applications of commercial nitrogen fertilizer will require split applications (pre-plant and sidedress) or the use of an approved inhibitor applied as recommended. (On split application, if 50% or more is applied as a pre-plant the use of an approved inhibitor applied as recommended is still required). d) If 50% or more of commercial nitrogen fertilizer is applied at pre-plant then operators are required to furnish certification from the dealer that an inhibitor was used at recommended rates. e) Require fertilizer calibration monitors on applications of > 50 lbs. per acre.

TABLE 4
UNCONFINED AQUIFERS
QUANTITY

AREA	DATE TO BEGIN	LEVEL	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Level I	10% drop in the saturated thickness.	a) Operators of irrigation, municipal, and industrial well systems must attend education classes designed by the District. All operators to be certified every 4 years. b) Permits required for all new wells to be drilled which will pump greater than 50 gpm. c) Encourage well metering (meters or time totalizers) to be established on all irrigation, municipal, and industrial wells. d) Encourage adoption of acre-inch allocations per crops planted that are dependant on the aquifer. e) Encourage submission of the Water Use Report to NRD prior to December 31 of the fourth year.

TABLE 5
UNCONFINED AQUIFERS
QUANTITY

AREA	DATE TO BEGIN	LEVEL	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Level II	15% drop in the saturated thickness.	a) Same as Level I. b) Require well meters or time totalizers to be installed on all irrigation, municipal, and industrial wells. c) Require adoption of acre-inch allocations per crops planted that are dependent on the aquifer. d) Require annual submission of the Water Use Report to the NRD prior to December 31. e) Requirement of well-spacing pursuant to Section 46-673.12 - Nebraska Statutes. (Will vary with % of aquifer decline.) f) Require use of best management practices to conserve water.

TABLE 6
CONFINED AQUIFERS
QUANTITY

AREA	DATE TO BEGIN	LEVEL	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Level 1A	7% drop in potentiometric-aquifer thickness.	a) Operators of irrigation, municipal, and industrial well systems must attend education classes designed by the District. All operators to be certified every 4 years. b) Permits required for all new wells to be drilled which will pump greater than 50 gpm. c) Encourage well metering (meters or time totalizers) on all irrigation, municipal, and industrial wells. d) Encourage adoption of acre-inch allocations per crops planted that are dependent on the aquifer. e) Encourage submission of the Water Use Report to NRD prior to December 31 of the fourth year.

1) The potentiometric surface is defined as an "imaginary" surface representing the total head of groundwater in a confined aquifer that is defined by the level to which water will rise in a well.

2) The potentiometric-aquifer thickness (PAT) is defined as the distance from the potentiometric surface to the base of the principal aquifer.

TABLE 7
CONFINED AQUIFERS
QUANTITY

AREA	DATE TO BEGIN	LEVEL	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Level IIA	10% drop in potentiometric-aquifer thickness.	a) Same as level IA. b) Require well meters or time totalizers to be installed on all irrigation, municipal, and industrial wells. c) Require adoption of acre-inch allocations per crops planted that are dependant on the aquifer. d) Require annual submission of the Water Use Report to the NRD prior to December 31.

TABLE 8
CONFINED AQUIFERS
QUANTITY

AREA	DATE TO BEGIN	LEVEL	TRIGGERS	CONTROLS
Lower Platte North Natural Resources District		Level IIIA	15% drop in potentiometric-aquifer thickness.	a) Same as level IA and IIA. b) Further adjust acre-inch allocations. c) Require well-spacing pursuant to section 46-673.12 Nebraska Statutes. (Will vary with % of aquifer decline) d) Require use of best management practices to conserve water.

TABLE 9
LPNNRD's - GROUNDWATER QUALITY MANAGEMENT PROGRAM

RULES AND REGULATIONS	Phase I	Phase II	Phase III
1. Phase areas will be established on Nitrate-Nitrogen (NO ₃ -N) concentration found in the groundwater.	0-8 ppm	8.01-10 ppm	10.01 ppm or >
2. Phase areas can be established on other non-point source contaminants found in the groundwater or soil.	0-80% MCL/LHAL	80-100% MCL/LHAL	>100% MCL/LHAL
3. Operators using any type of fertilizer are required to become certified every 4 years.	X	X	X
4. A groundwater analysis for Nitrogen (NO ₃ -N) content for all irrigation, municipal, and industrial wells must be made and reported to the NRD by December 31.	Once every 4 yrs.	Annually	Annually
5. Soil samples in the root zone (3 to 4 ft. deep) are to be taken and reported to the NRD by December 31.	Encouraged	Annually	Annually
6. Fertilizer Application Report (both commercial and organic fertilizers) to NRD prior to December 31.	Encouraged	Annually	Annually
7. Permit for all new wells to be drilled which will pump greater than 50 gpm.	X	X	X
8. Amount/acre/year of organic fertilizer allowed (liquid manure, dried manure, sludge or composted organic waste) will be based on method of collection and storage, land application method, types of crops or cover crop, soil types, landscape features, source of manure, and previous manure application rates.	X		
9. No fall application of N fertilizer (commercial) on non-sandy soils until after November 1 .	X		
10. Fall and winter applications of commercial nitrogen fertilizer is prohibited on sandy soils. Commercial fertilizer can be applied on sandy soils after March 1 .	X	X	
11. Commercial nitrogen fertilizer permitted on non-sandy soils from November 1 to March 1 provided an approved inhibitor is used at recommended rates.		X	
12. Require operators applying commercial fertilizer from November 1 to March 1 to furnish certification from dealer that an approved inhibitor was used as recommended.		X	
13. Encourage fertilizer calibration monitors on all applications and develop cost-share programs.		X	
14. Monitor water applications to allow operators to better manage fertilizer application and control leaching of Nitrogen.		phase in over 6 yr.	phase in over 4 yr.
15. Amount/acre/year of organic fertilizer allowed (liquid manure, dried manure, sludge or composted organic waste) will be based on method of collection and storage, land application method, types of crops or cover crop, soil types, landscape features, source of manure, and previous manure application rates. Amount and timing of application must be adjusted to the N concentration in the soil profile and groundwater content. Application to frozen soils on a site-by-site basis.		X	X
16. Expand Education program.		X	X
17. Application of commercial nitrogen fertilizer is prohibited in the fall and winter on all soils until after March 1. Spring applications of commercial nitrogen fertilizer will require split application (pre-plant and sidedress) or the use of an approved inhibitor applied as recommended. (On split applications, if 50% or more is applied as a pre-plant, the use of an approved inhibitor applied as recommended is still required.)			X
18. If 50% or more of commercial nitrogen fertilizer is applied at pre-plant then operators are required to furnish certification from dealer that an inhibitor was used at recommended rates.			X
19. Require fertilizer monitors on all applications greater than 50 lbs/acre.			X

TABLE 10
LOWER PLATTE NORTH NRD
GROUNDWATER QUANTITY MANAGEMENT PROGRAM

UNCONFINED AQUIFER		
Rules and Regulations	Level I 10% drop in saturated thickness	Level II 15% drop in saturated thickness
1. Operators of irrigation, municipal, and industrial well systems must attend education classes and be certified every 4 years.	X	X
2. Permit required for all new wells to be drilled which will pump greater than 50 gpm.	X	X
3. Well metering established on irrigation, municipal, and industrial wells.	Encouraged	Required
4. Adopt acre-inch allocations per crops planted dependent on aquifer.	Encouraged	Required
5. Water Use Report to NRD prior to December 31.	Encouraged	Annually
6. Require well-spacing pursuant to section 46-673.12 (will vary with % decline)		X
7. Require use of best management practices.		X

CONFINED AQUIFERS			
Rules and Regulations	Level IA 7% drop in potentiometric-aquifer thickness	Level IIA 10% drop in potentiometric-aquifer thickness	Level IIIA 15% drop in potentiometric-aquifer thickness
1. Operators of irrigation, municipal, and industrial well systems must attend education classes and be certified every 4 years.	X	X	X
2. Permits required on all new wells to be drilled which will pump greater than 50 gpm.	X	X	X
3. Well metering program established on all irrigation, municipal, and industrial wells.	Encouraged	Required	Required
4. Adopt acre-inch allocations per crops planted dependant on aquifer.	Encouraged	Required	Required
5. Water Use Report to NRD prior to December 31.	Encouraged	Annually	Annually
6. Require well spacing pursuant to Section 46-673.12. (Will vary with % decline)			X
7. Require use of best management practices.			X

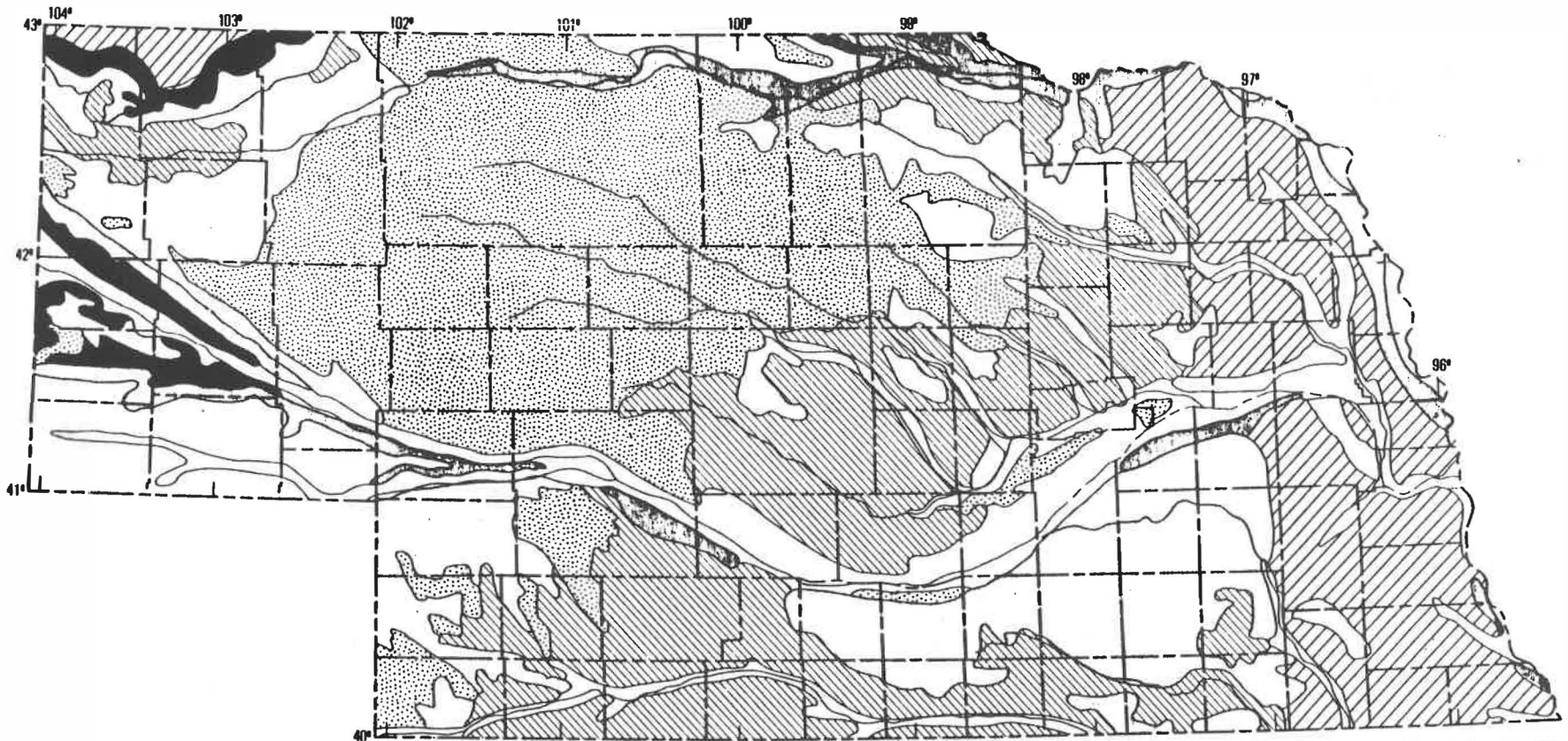
APPENDIX A

A map of Nebraska showing its county boundaries and names. The map is oriented with North at the top. A scale bar in the upper right corner indicates distances in miles (0, 20, 40) and kilometers (0, 20, 40). The text "LPN NR" is visible on the right side of the map. The counties shown are: Sioux, James, Sheridan, Cherry, Keya Paha, Boyd, Brown, Rock, Holt, Knox, Cedar, Dixon, Dakota, Scotts Bluff, Morrill, Garden, Grant, Hooker, Thomas, Blaine, Loup, Garfield, Wheeler, Antelope, Pierce, Wayne, Thurston, Banner, Cheyenne, Lincoln, Arthur, McPherson, Logan, Custer, Valley, Greeley, Boone, Madison, Stanton, Cuming, Burdette, Washburn, Colfax, Dodge, Douglas, Sarpy, Cass, Hamilton, York, Seward, Lancaster, Omaha, DeWitt, Clay, Fillmore, Saunders, Caddo, Johnson, Nemaha, Pawnee, Richardson, and Franklin. The map also shows the Missouri River to the west and the Kansas border to the south.

LOCATION

Types of topography.

EXHIBIT 2



Topography from Elder, 1969

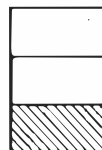


EXPLANATION

Valleys—flat-lying land along the major streams. The materials of the valleys are stream-deposited silt, clay, sand, and gravel.

Plains—flat-lying land which lies above the valley. The materials of the plains are sandstone or stream-deposited silt, clay, sand, and gravel overlain by wind-deposited silt (loess).

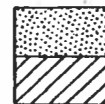
Dissected Plains—hilly land with moderate to steep slopes, sharp ridge crests, and remnants of the old, nearly level plain. The Dissected Plains are old plains eroded by water and wind.



Valleys

Plains

Dissected plains



Sand Hills

Rolling hills



Bluffs and escarpments

Valley-side slopes

Bluffs and Escarpments—rugged land with very steep and irregular slopes. Bedrock materials, such as sandstone, shale, and limestone, are often exposed in these areas.

Valley-Side Slopes—moderately sloping land which occurs between the escarpments and the major stream valleys in western Nebraska. These areas are mostly siltstone bedrock covered by a few feet to a few tens of feet of sand, gravel, or silt.

Sand Hills—hilly land composed of low to high dunes of sand stabilized by a grass cover. The sand dunes mantle stream-deposited silt, sand and gravel, and sandstone.

Rolling Hills—hilly land with moderate to steep slopes and rounded ridge crests. In eastern Nebraska, the Rolling Hills are mostly glacial till that has been eroded and mantled by loess, while in northwestern Nebraska the hills were produced by the erosion of clay and clay-shale beds.

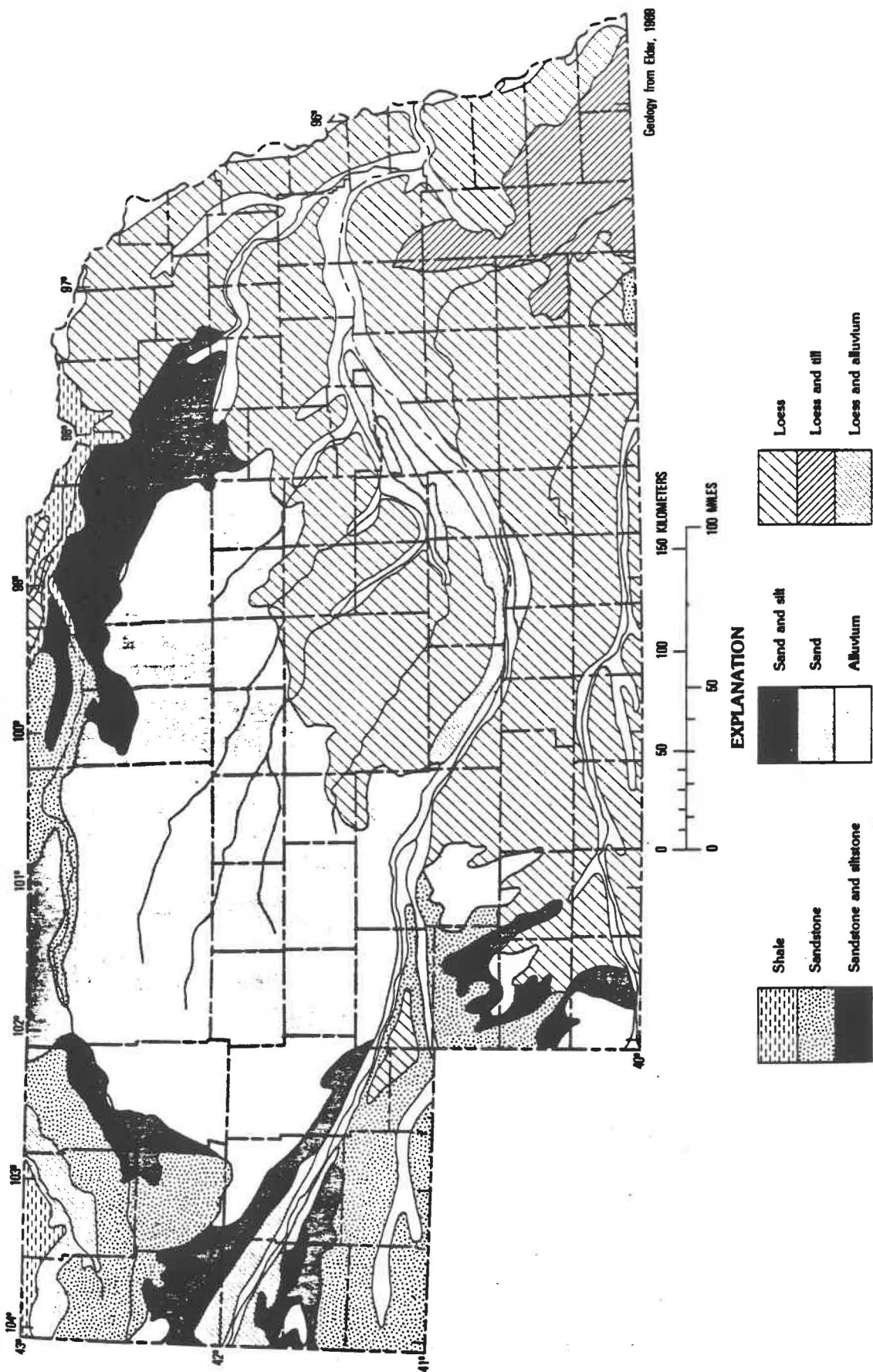


EXHIBIT 3

NEBRASKA NATURAL RESOURCES COMMISSION
DATA BANK

Legend

- Interstate and Primary Highways
- U.S. and State Highways
- County Boundary
- Lower Platte North Boundary



Lower Platte North NRD

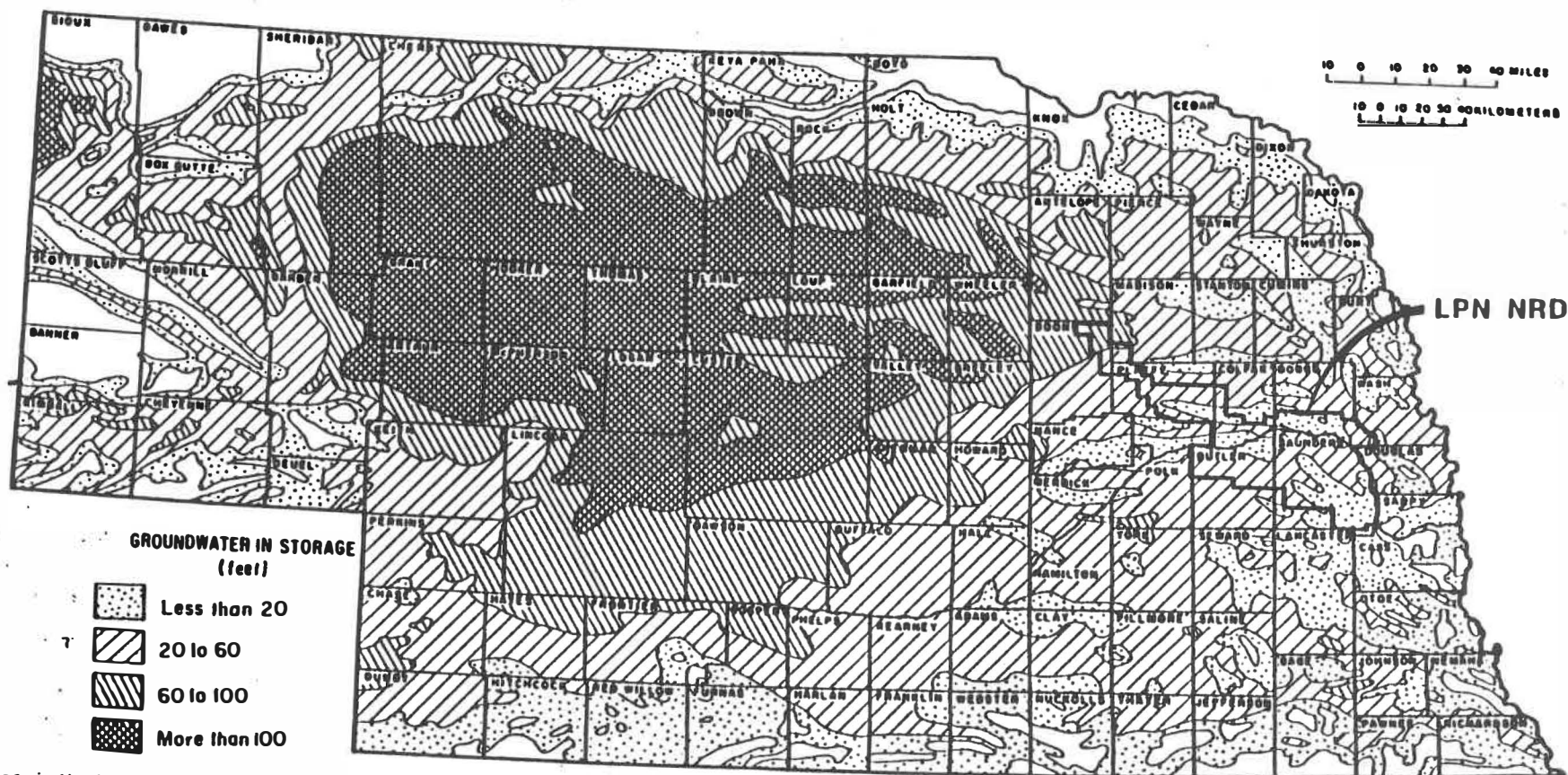


Information Sources

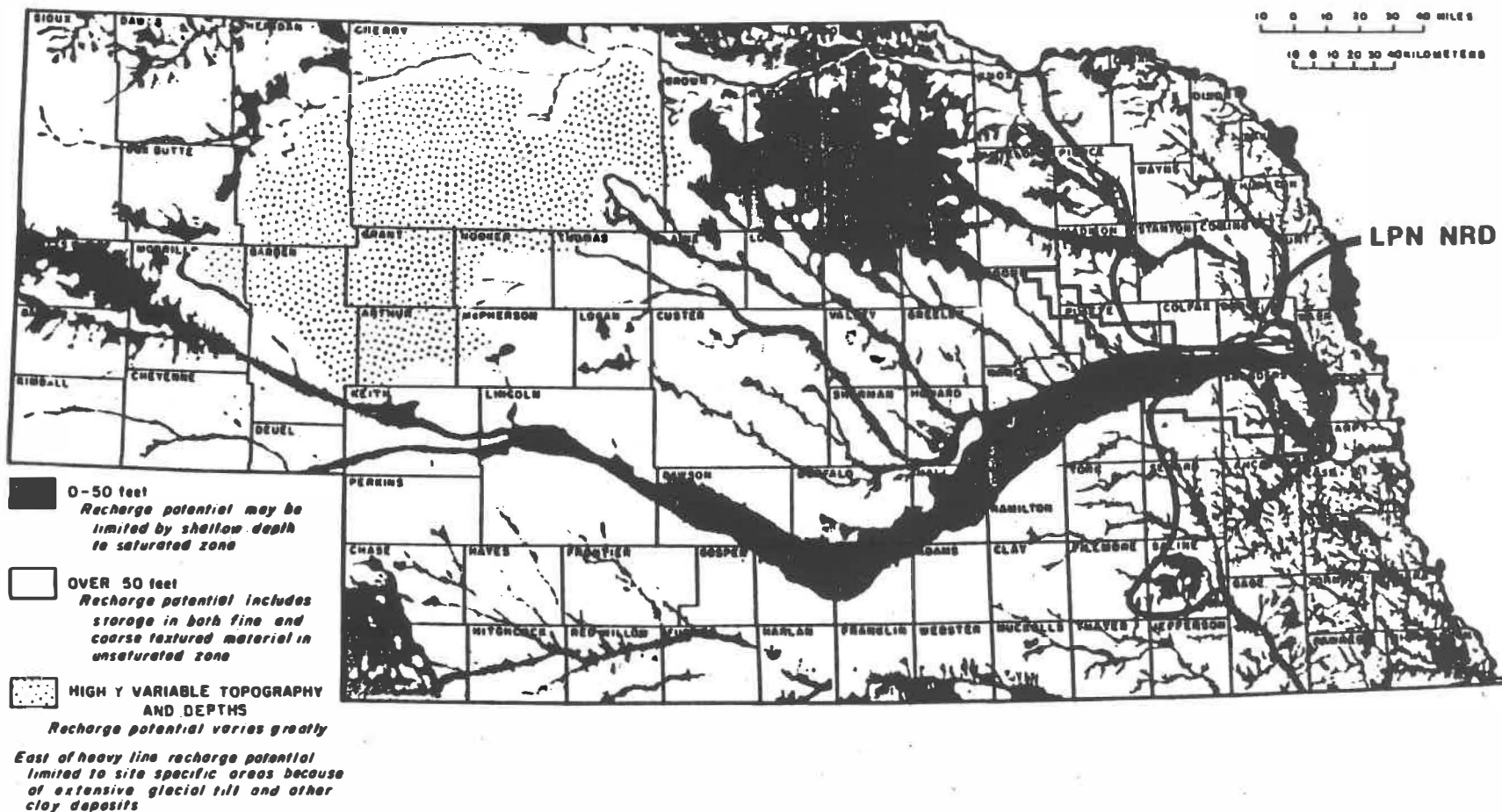
Produced by - Nebraska Natural Resources Commission
Data Date - USDA Soil Conservation Service, NR1000 Data Base
NRB Process - NRCS/USFS
Processed - April 1985

Soils Map Units

	BELFORE-WOODY-FILLMORE		HORD-HALL-WOOD RIVER-HOBBS
	INAVALE-CASS-BARNET-PLATTE-BOEL		IDA-WONORA-NAPIER-HOBBS
	COLY-ULY-HOBBS-HOLDREGE-HORD		KENNEBEC-WABASH-ZOOK-NODAW
	GIBBON-LUTON-SALTINE-WAHH-ZOOK		MARSHALL-PONCA-JOHNSON-KEN
	GOETHENBURG-PLATTE-LEX-ALDA		WONORA-IDA-JUDSON-KENNEBEC
	HASTINGS-FILLMORE-CRETE-BUTLER-HOBBS		WOODY-NORA-JUDSON-BELFORE-
	HOBBS-HORD-HALL-CASS		HORD-HALL-HOBBS-KENNESAW-FILLMORE
	HOLDER-FILLMORE-BUTLER-HOBBS		O'NEILL-BROCKSBURG-HORD-BL
	HORD-HALL-HOBBS-KENNESAW-FILLMORE		NORA-CROFTON-WOODY-ALCESTE



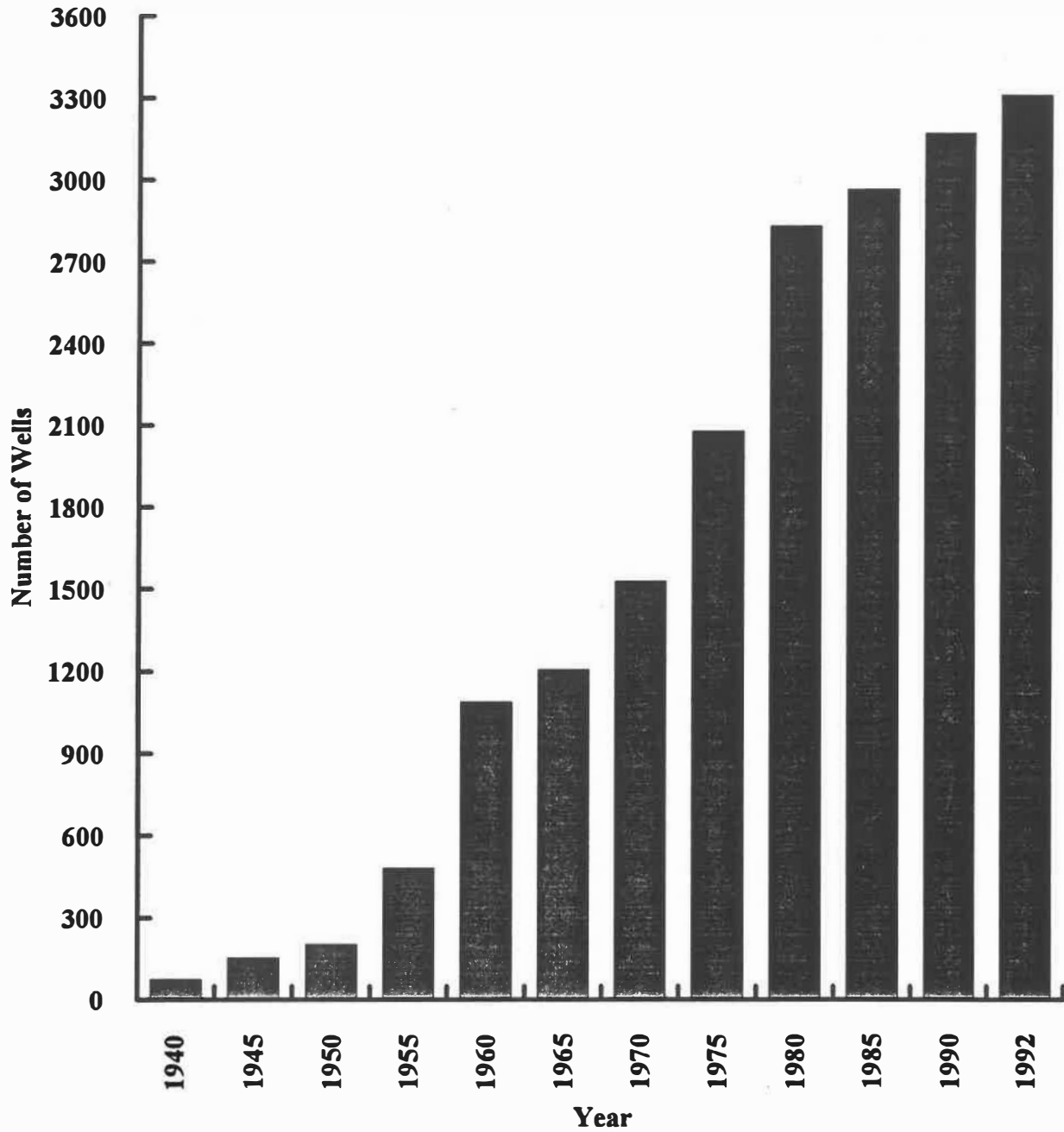
Groundwater Storage in the Principal Aquifer. The amount of water, in feet, estimated to be contained within the principal aquifers of the state.



Generalized Depth to Water - This map was developed from a depth to water map which was produced by CSD for the NRC policy issue study on groundwater reservoir management (1982).

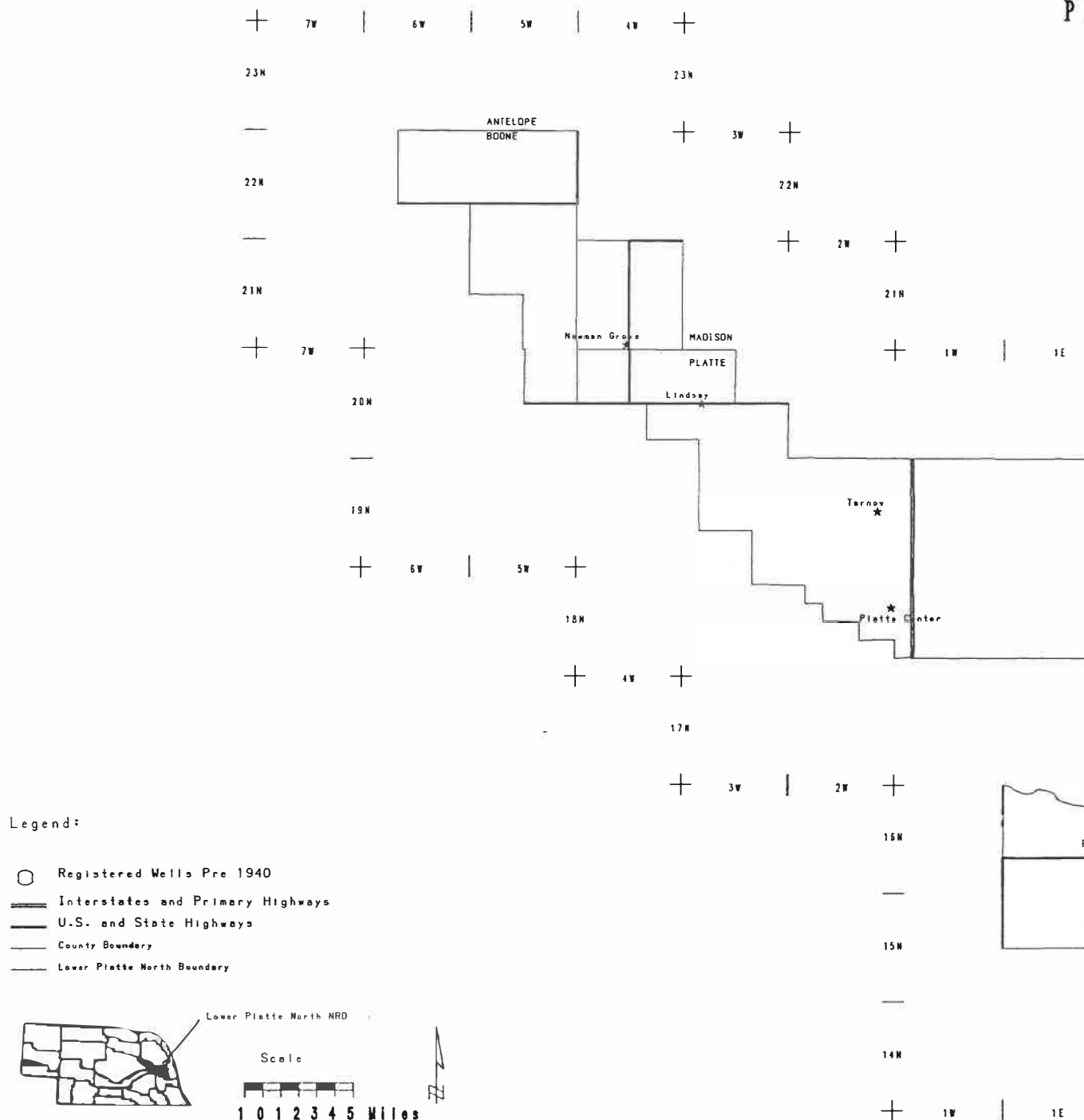
EXHIBIT 7

Cumulative Number of Registered Irrigation Wells 1940 - 1992 Lower Platte North NRD



NEBRASKA NATURAL RESOURCES COMMISSION DATA BANK

REGISTERED WELLS
P



Information Sources:

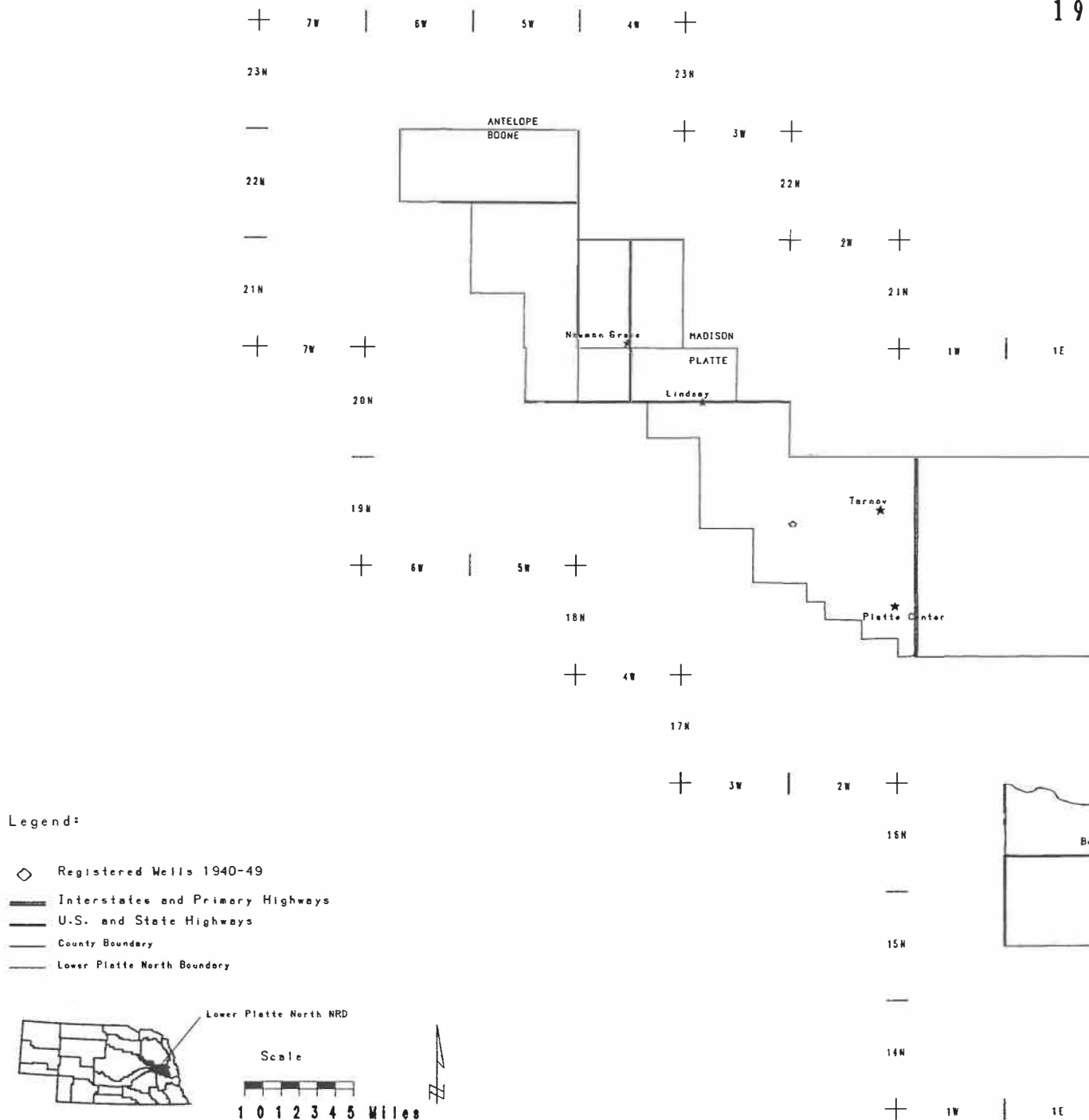
Produced By - Nebraska Natural Resources Commission
Topographic Data - TIGER Files, U.S. Bureau of the Census, 1990
Registered Wells Data - Nebraska Department of Water Resources
Updated through February 1993

GIS Process - ARC/INFO
Processed - June, 1993

NEBRASKA NATURAL RESOURCES COMMISSION DATA BANK

REGISTERED WELL

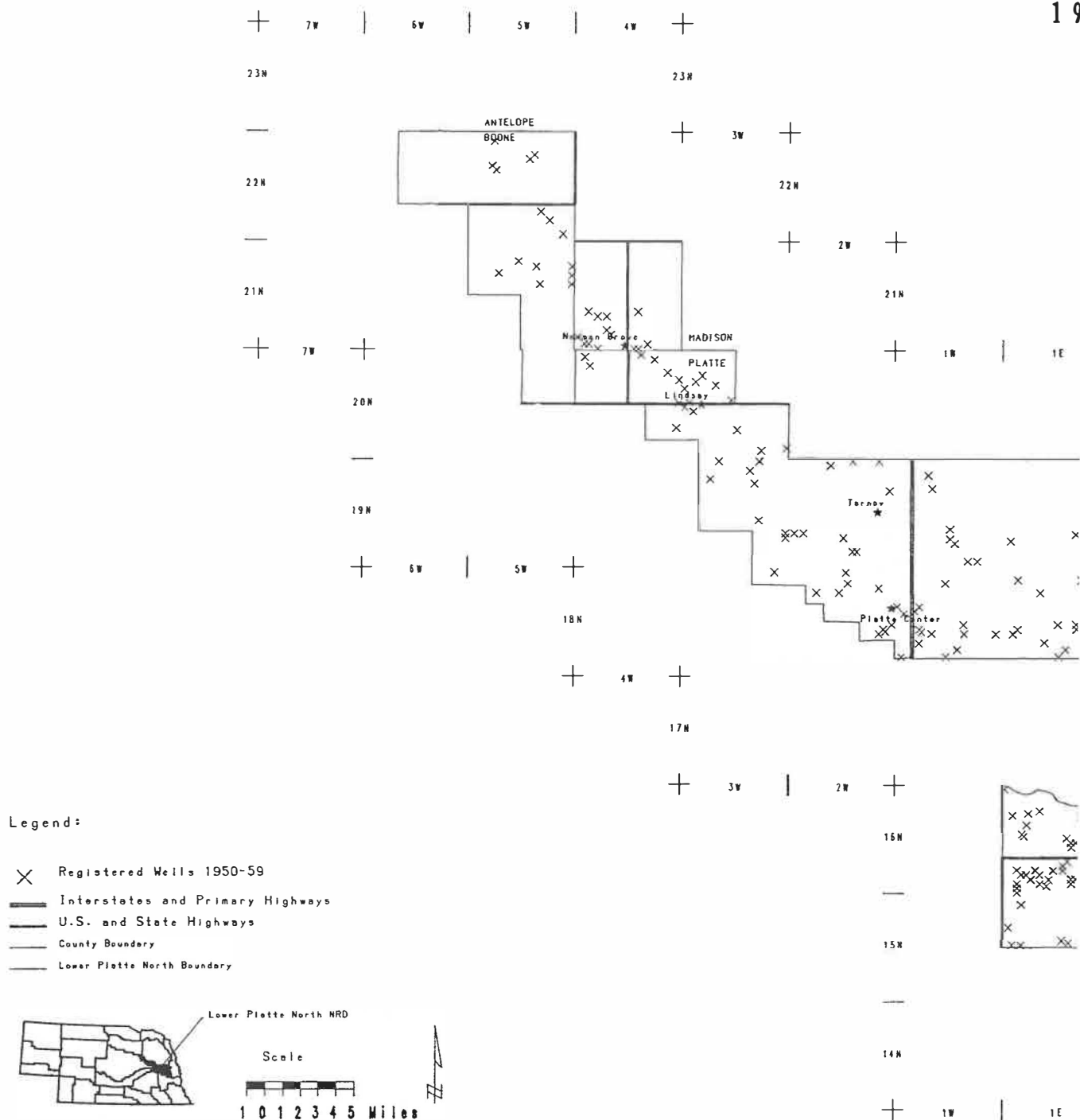
19



NEBRASKA NATURAL RESOURCES COMMISSION DATA BANK

REGISTERED WELLS

19



Information Source:

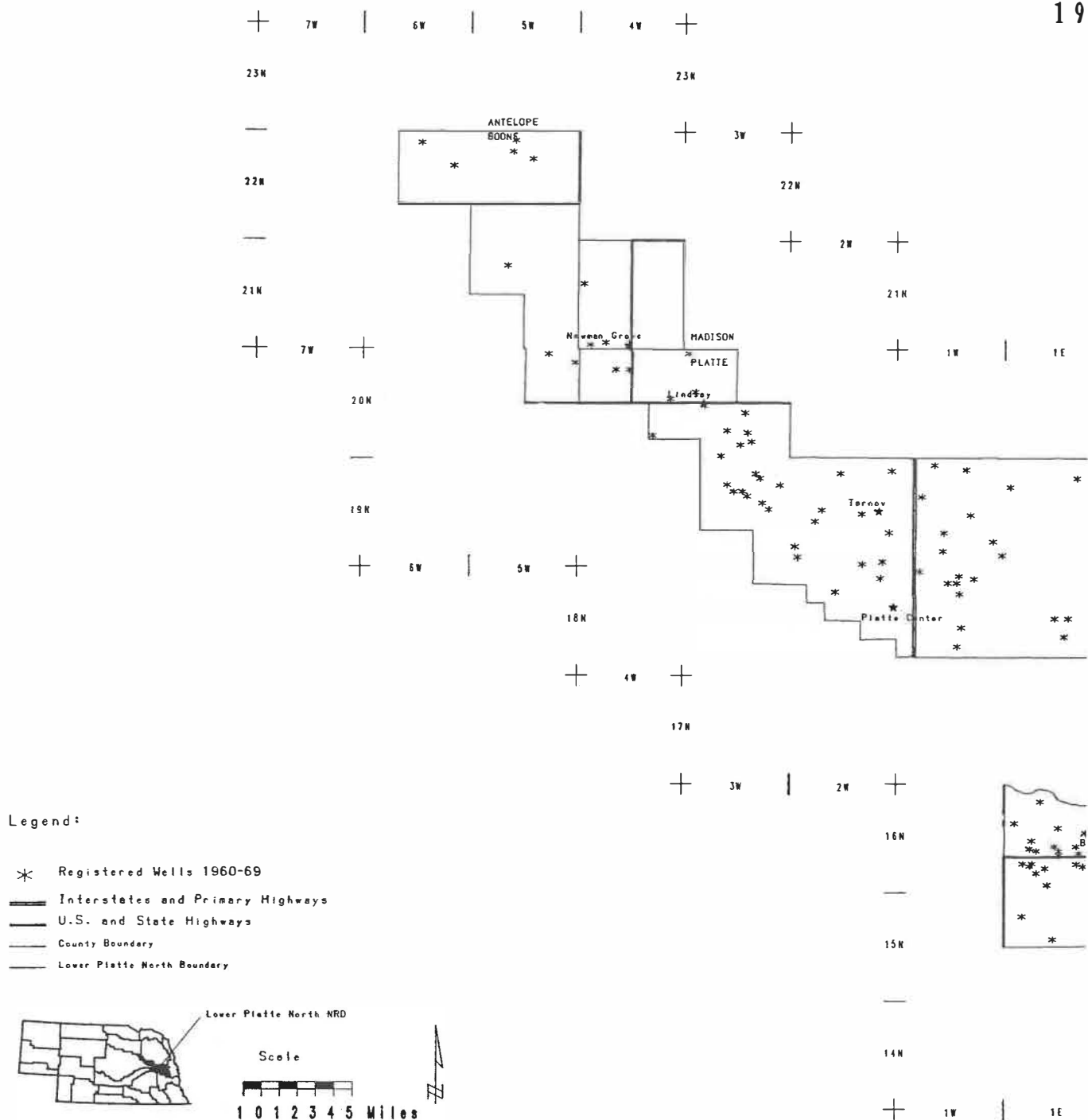
Produced By - Nebraska Natural Resources Commission
Topographic Data - TIGER Files, U.S. Bureau of the Census, 1990
Registered Wells Data - Nebraska Department of Water Resources
Updated through February 1993

GIS Process - ARC/INFO
Processed - June, 1993

NEBRASKA NATURAL RESOURCES COMMISSION DATA BANK

REGISTERED WELLS

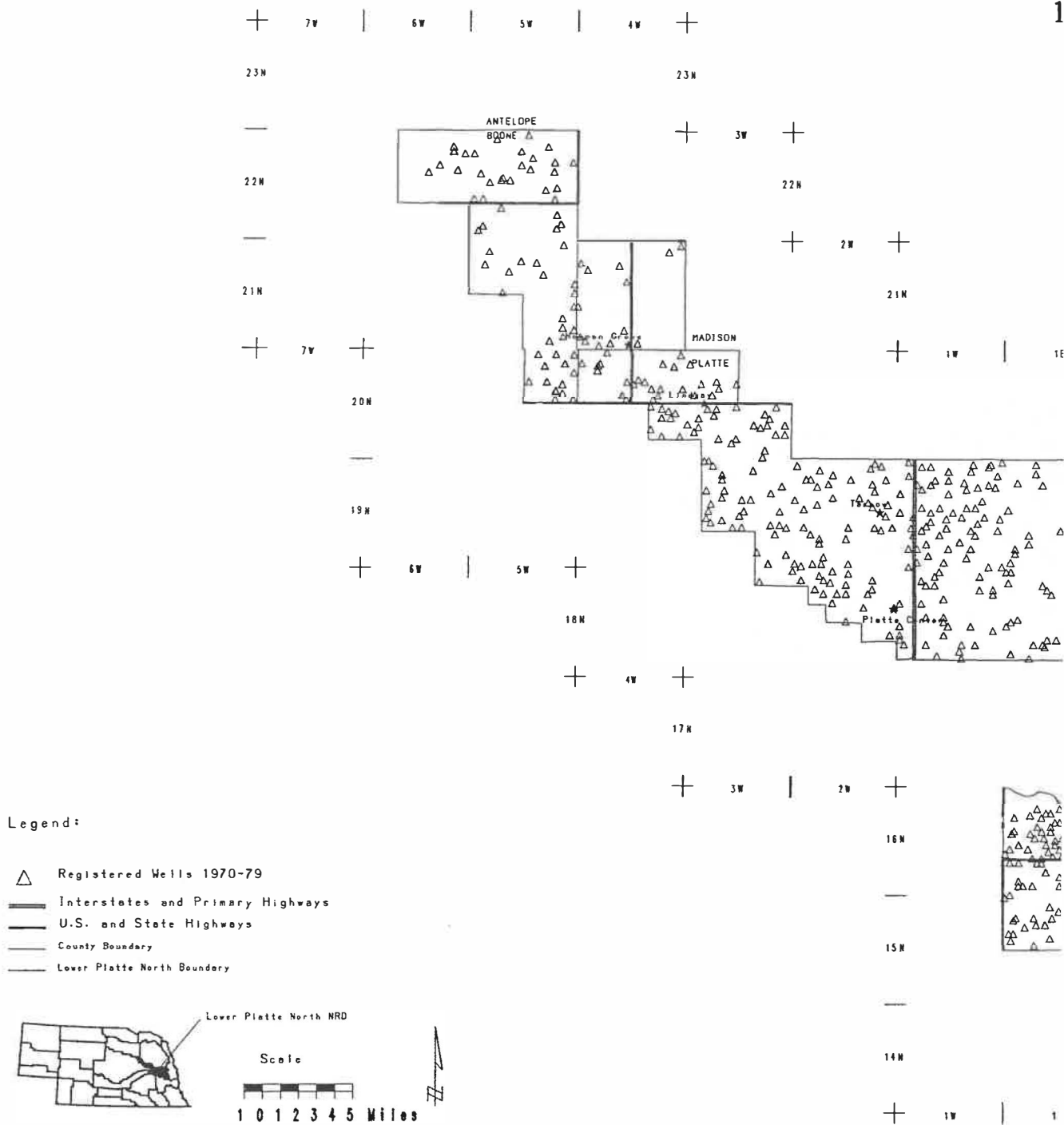
19



NEBRASKA NATURAL RESOURCES COMMISSION DATA BANK

REGISTERED WEI

1



Information Source:

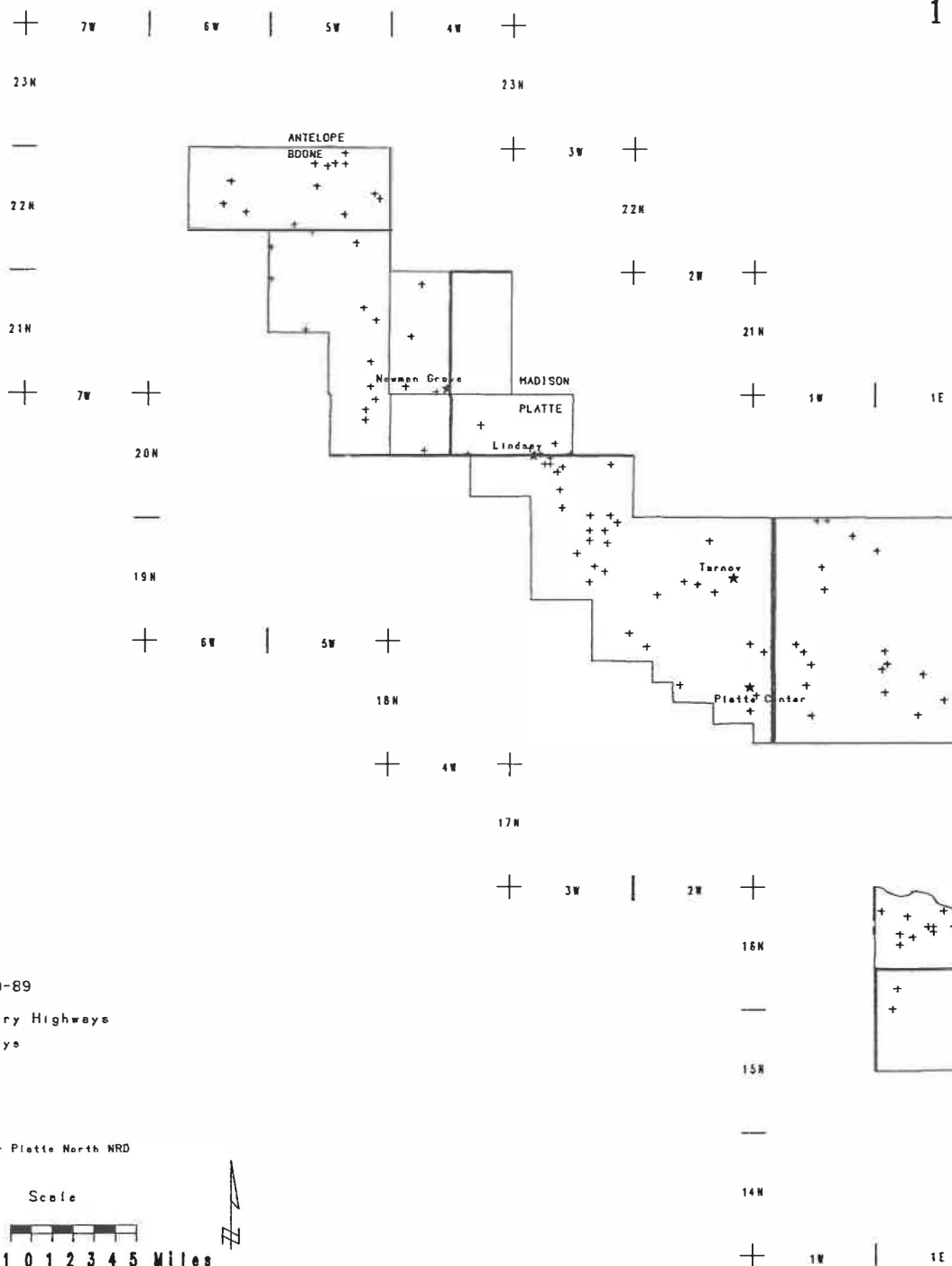
Produced By - Nebraska Natural Resources Commission
Topographic Data - TIGER Files, U.S. Bureau of the Census, 1990
Registered Wells Data - Nebraska Department of Water Resources
Updated through February 1993

GIS Process - ARC/INFO
Processed - June, 1993

NEBRASKA NATURAL RESOURCES COMMISSION DATA BANK

REGISTERED WELLS

1



Information Sources:

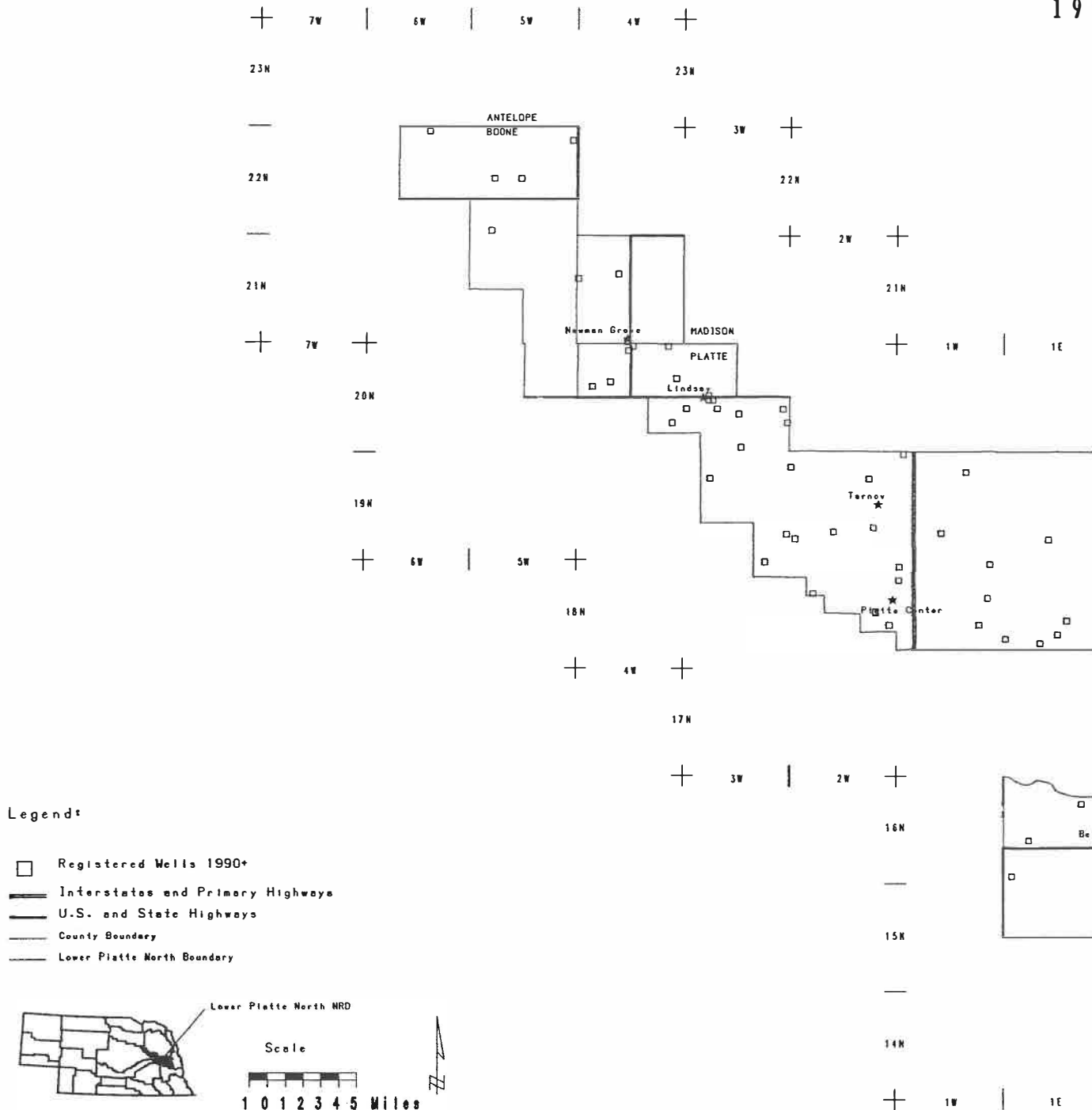
Produced By - Nebraska Natural Resources Commission
Topographic Data - TIGER Files, U.S. Bureau of the Census, 1990
Registered Wells Data - Nebraska Department of Water Resources
Updated through February 1993

GIS Process - ARC/INFO
Processed - June, 1993

NEBRASKA NATURAL RESOURCES COMMISSION DATA BANK

REGISTERED WELL

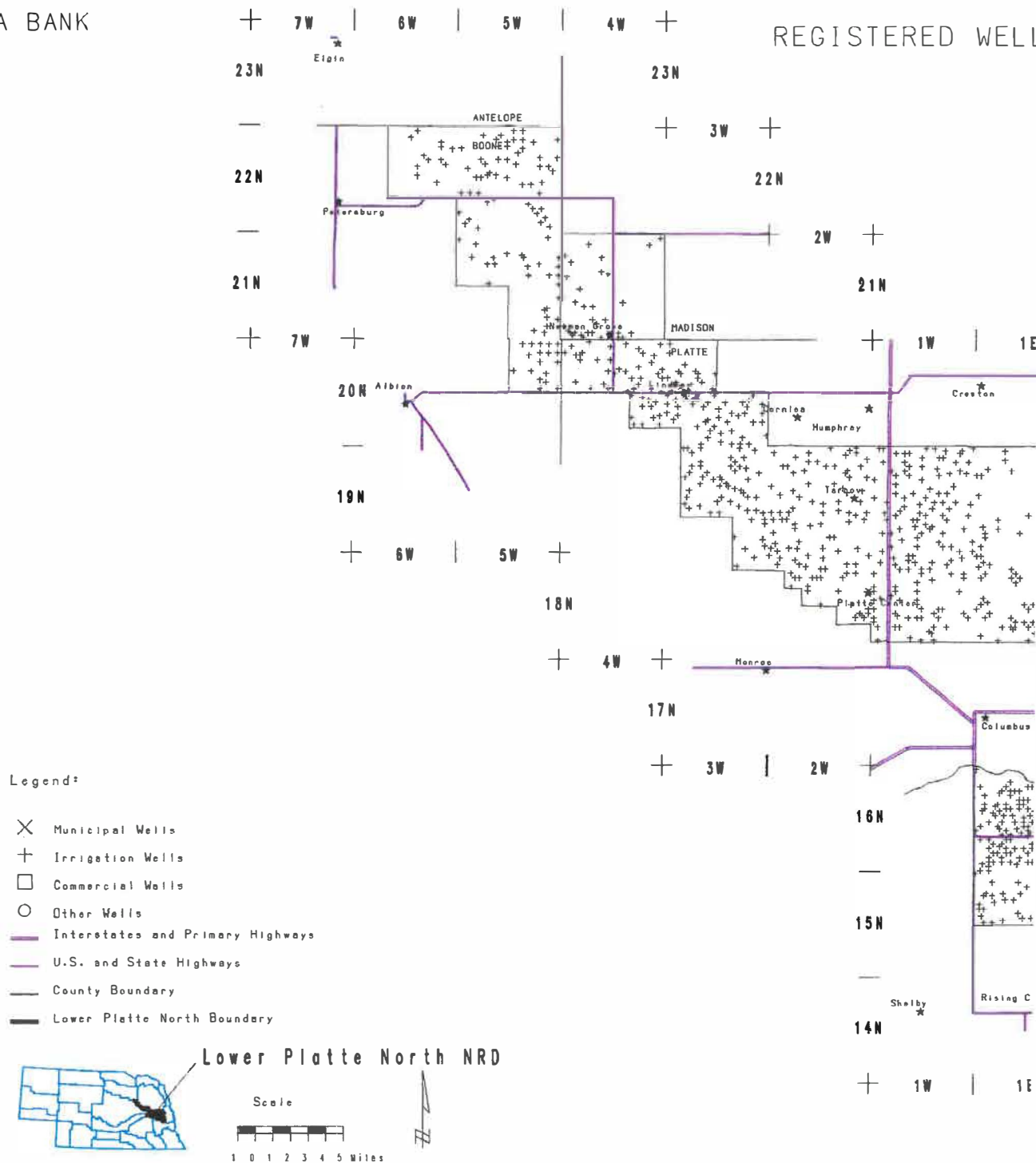
19



NEBRASKA NATURAL RESOURCES COMMISSION

DATA BANK

REGISTERED WELL



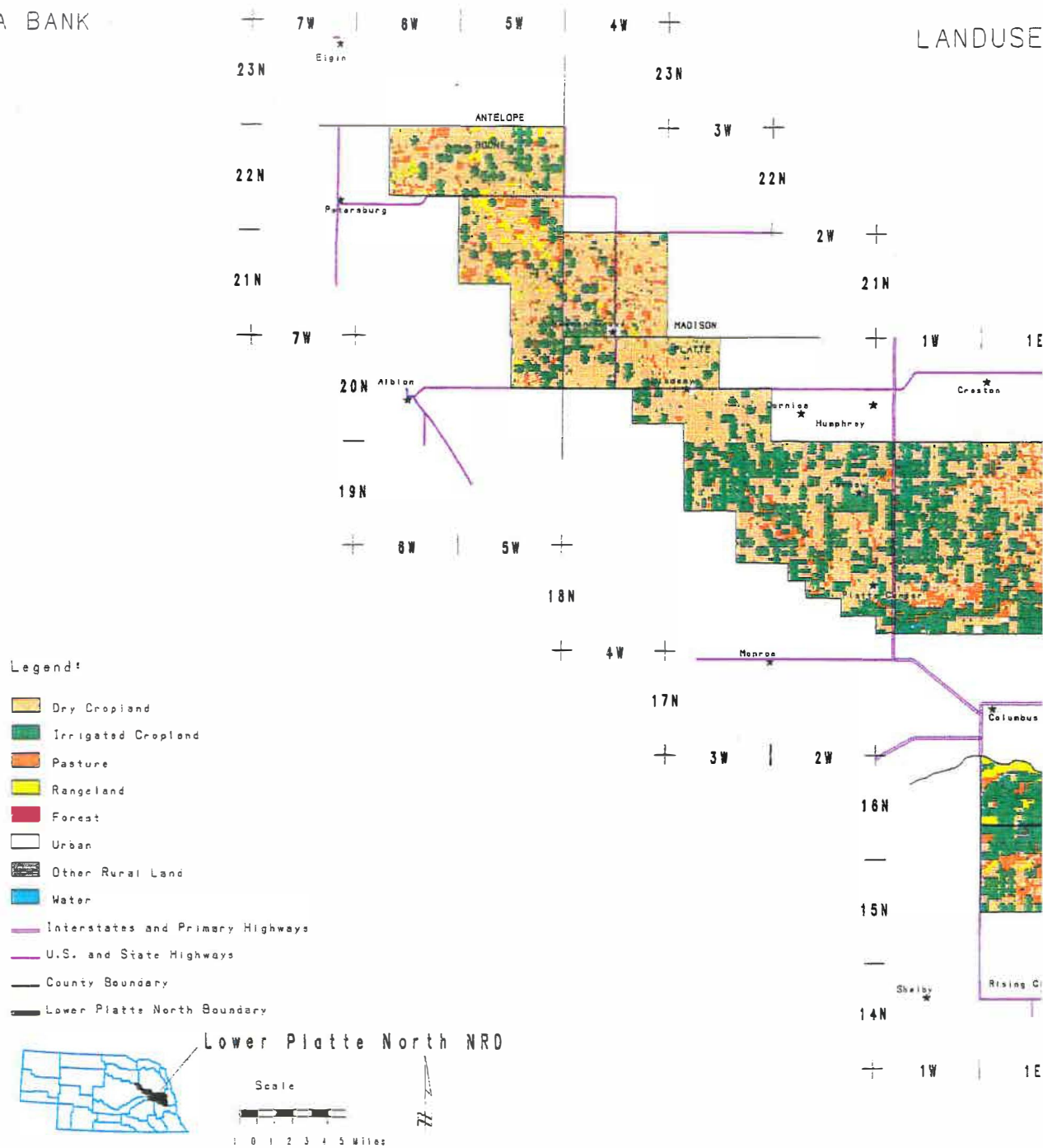
Information Source:

Produced By - Nebraska Natural Resources Commission
 Topographic Data - TIGER Files, U.S. Bureau of the Census, 1990
 Registered Wells Data - Nebraska Department of Water Resources
 Updated through December 1991

GIS Process - ARC/INFO
 Processed - April, 1993

NEBRASKA NATURAL RESOURCES COMMISSION
DATA BANK

LANDUSE



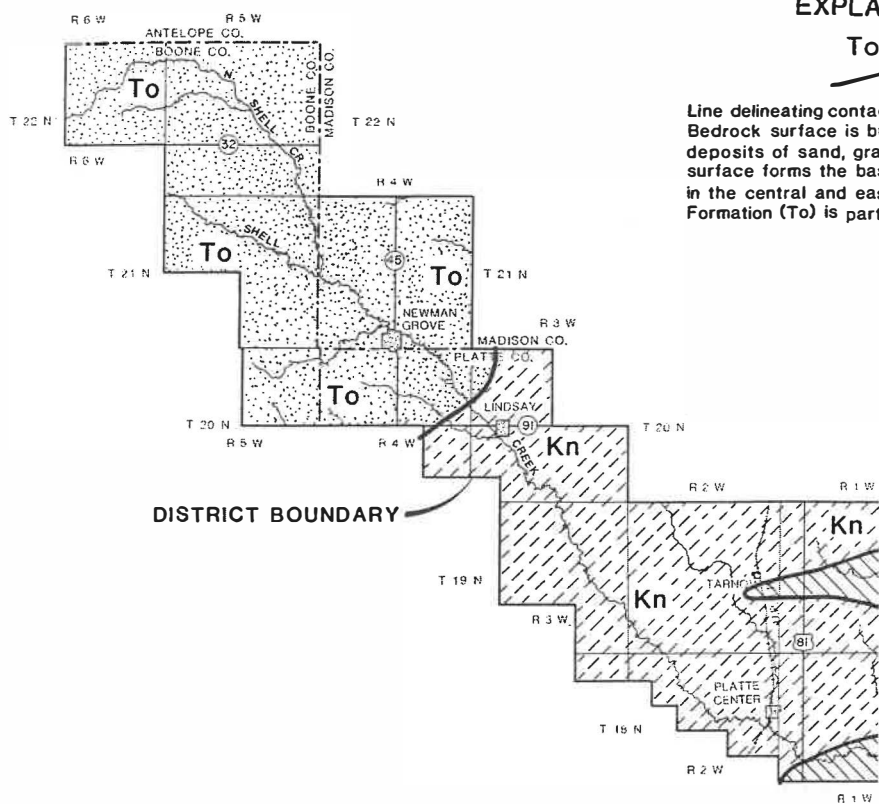
Information Source:

Produced By - Nebraska Natural Resources Commission
Topographic Data - TIGER Files, U.S. Bureau of the Census, 1990
Landuse Data - SCS, Nebraska Resources Census, 1983-84
GIS Process - ARC/INFO
Processed - April, 1993

EXPLA

To

Line delineating contact
Bedrock surface is bi
deposits of sand, gra
surface forms the ba
in the central and ea
Formation (To) is part



LOCATION



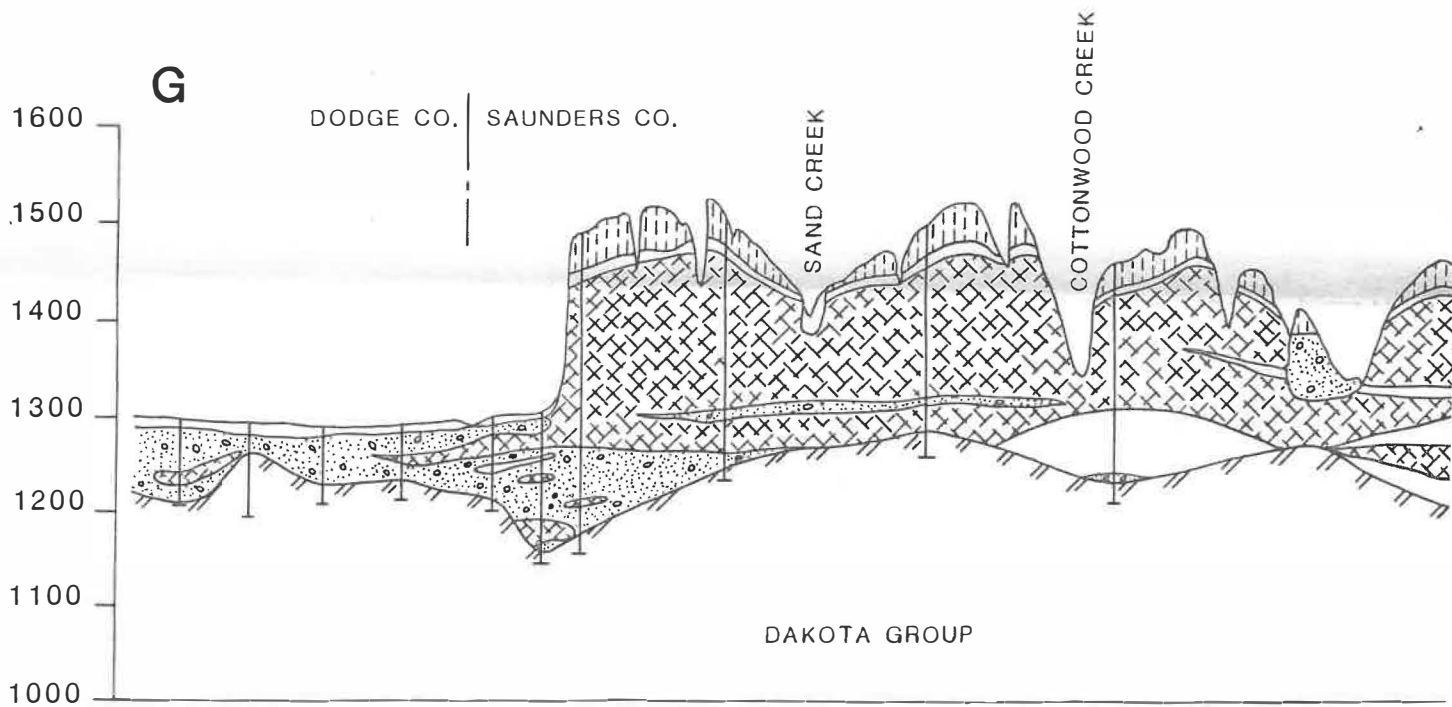
GENERALIZED GEOLOGIC PROFILE

Lower Platte North Natural Resources Dist

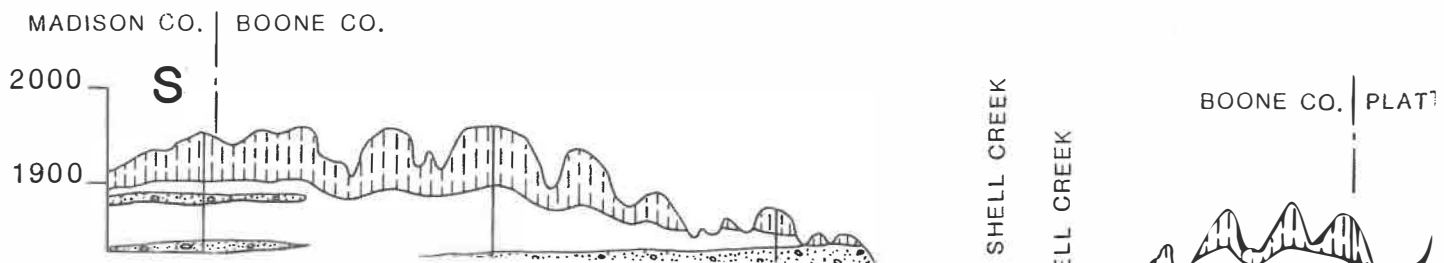
KEY

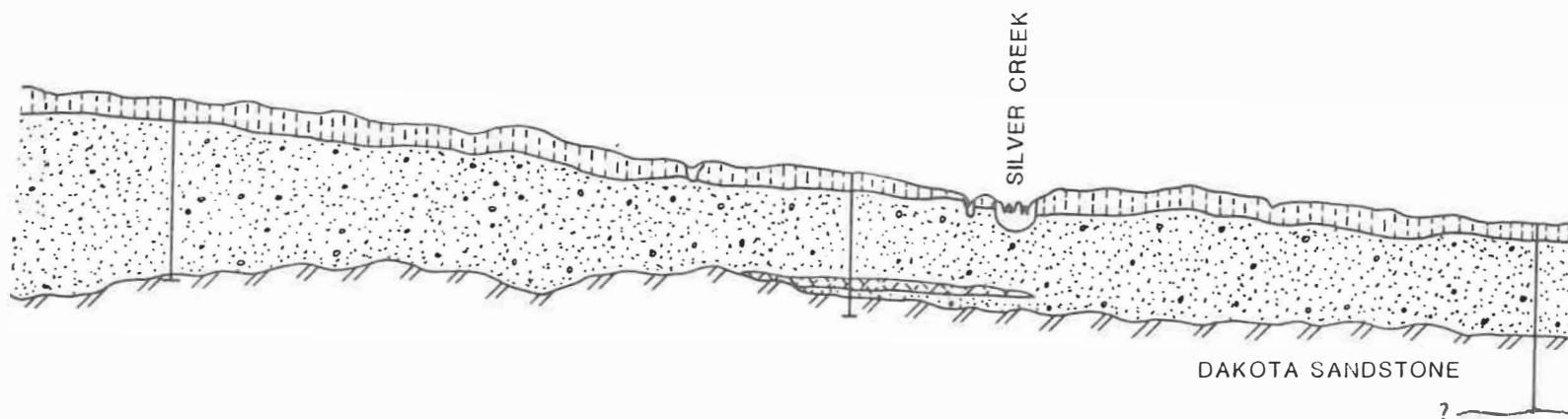


—●— Profile Line. Dot represents location of Conservation test holes, and corresponds to the

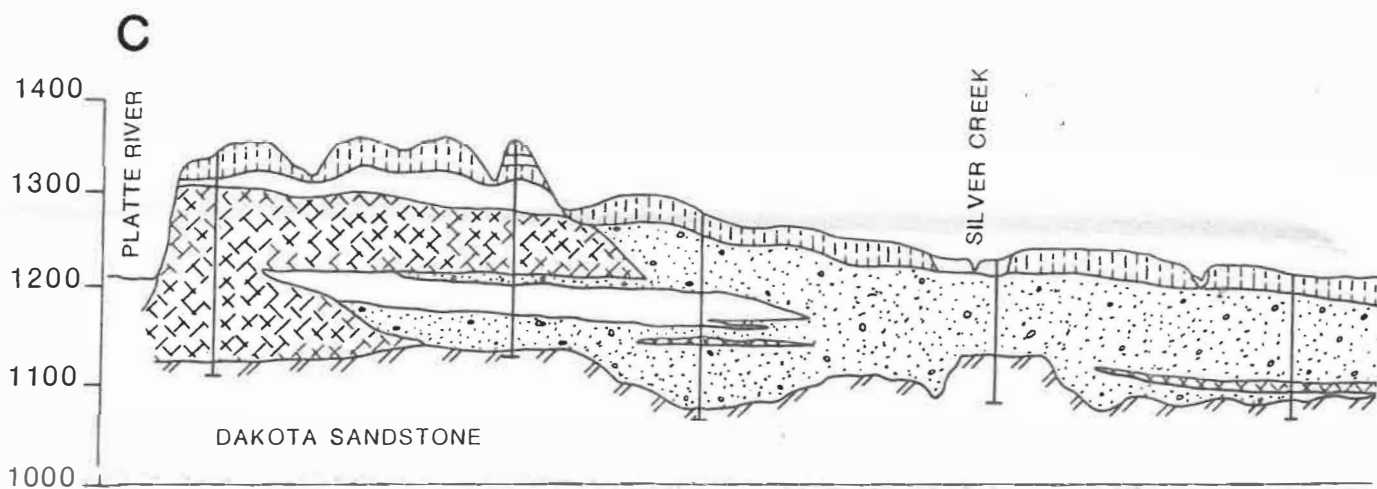


Source: Unpublished Section, Conservation and Survey Division

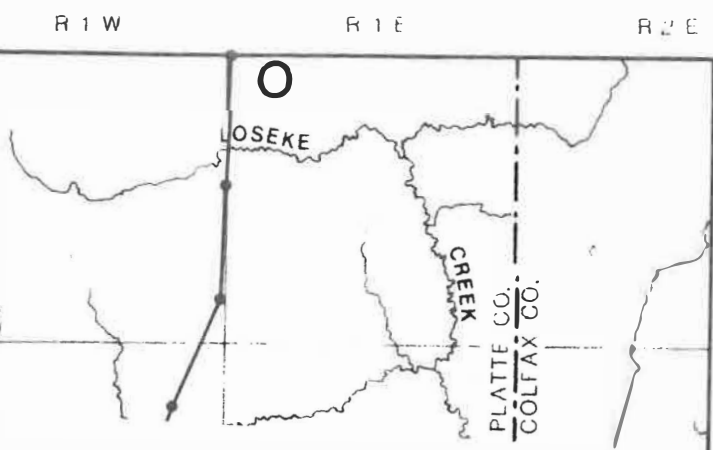


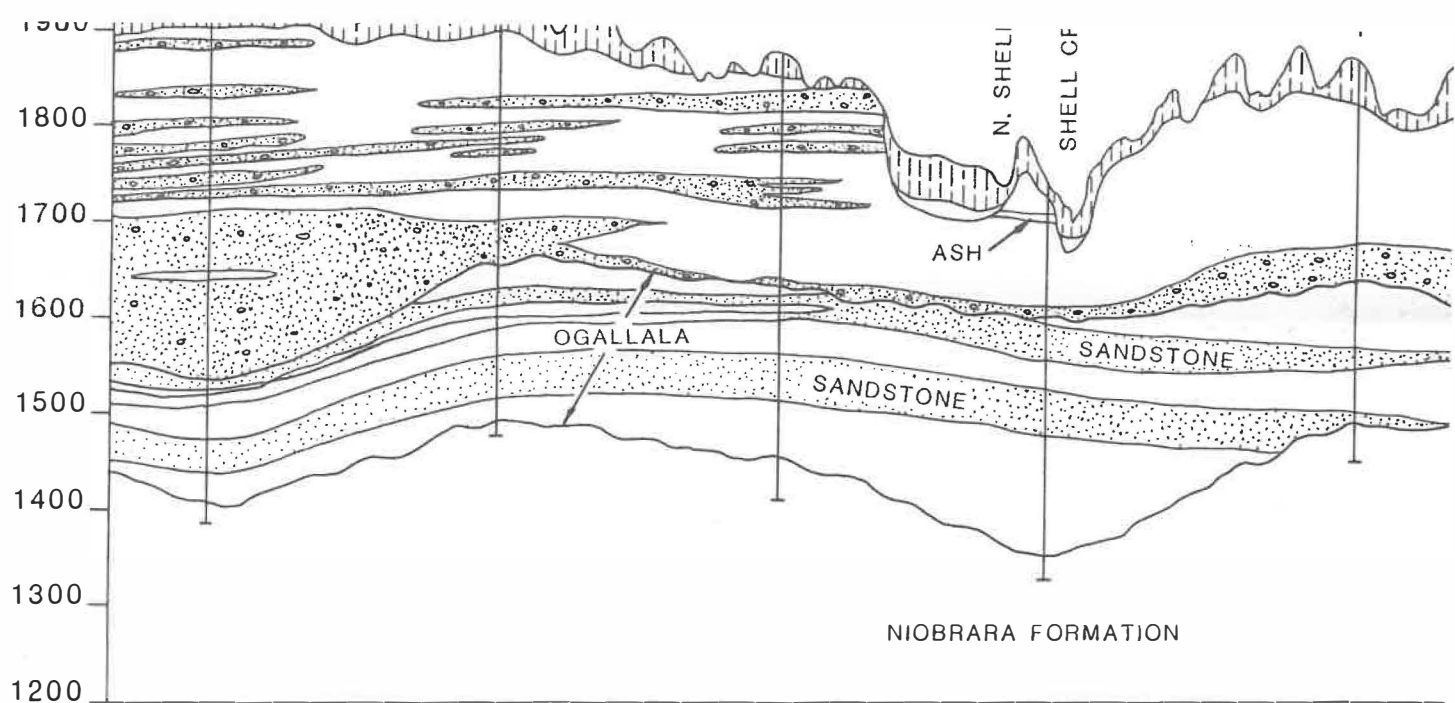


Eastern Saunders County, Nebraska,"
1967.

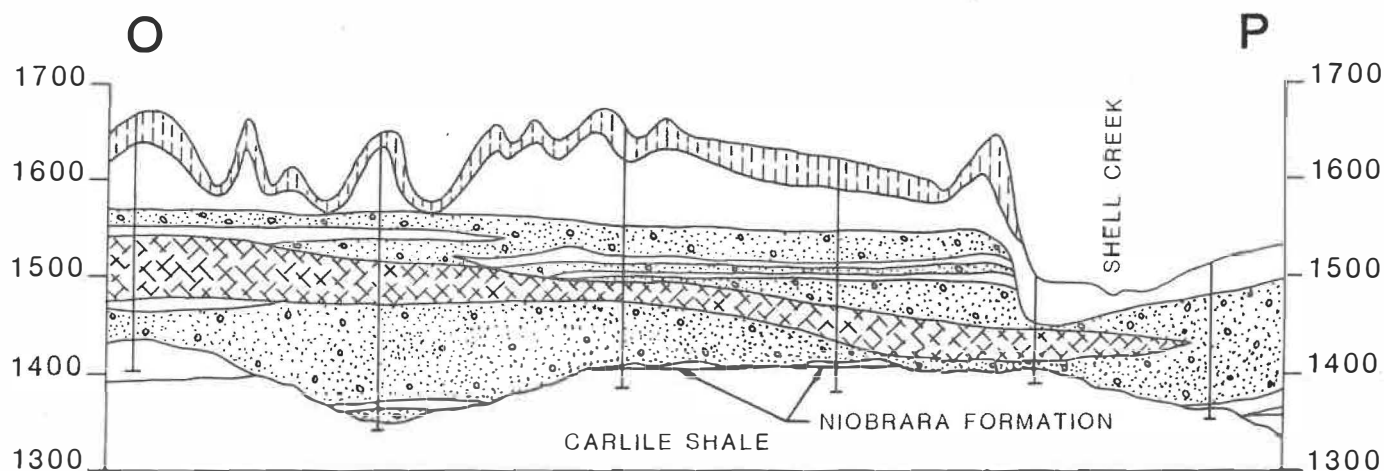


Source: "Availability of Water in Eastern Saunders County, Nebraska,"
V.L. Souders, U.S.G.S., 1967.

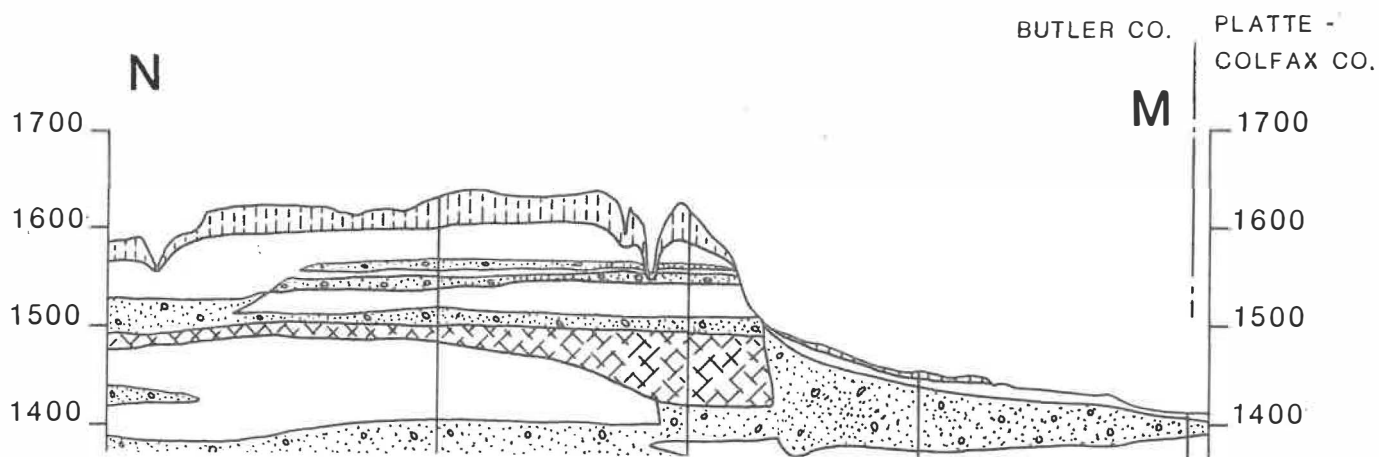


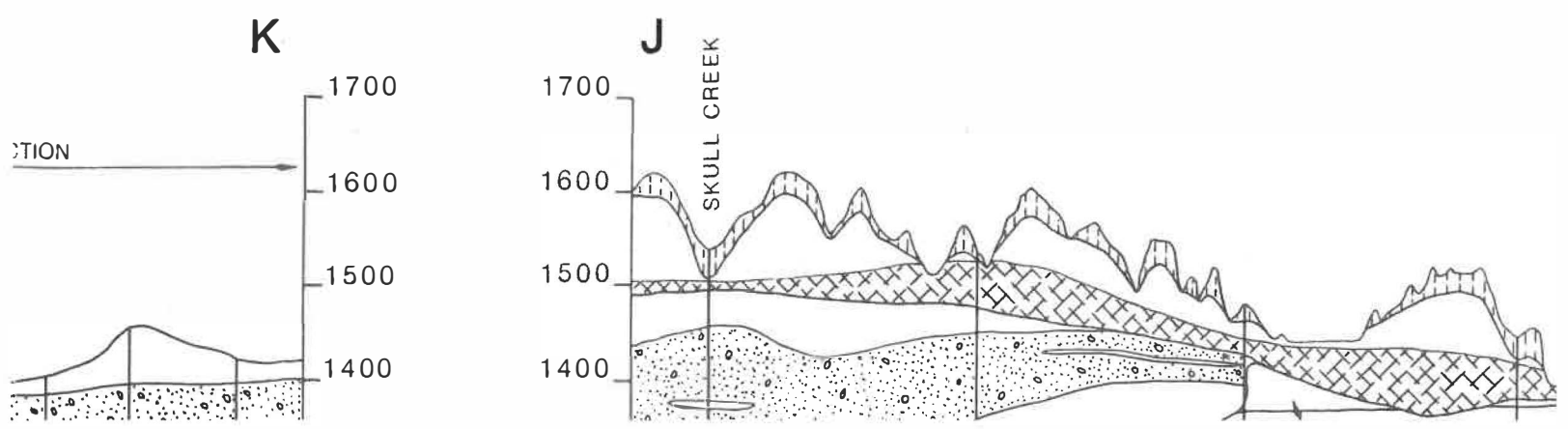
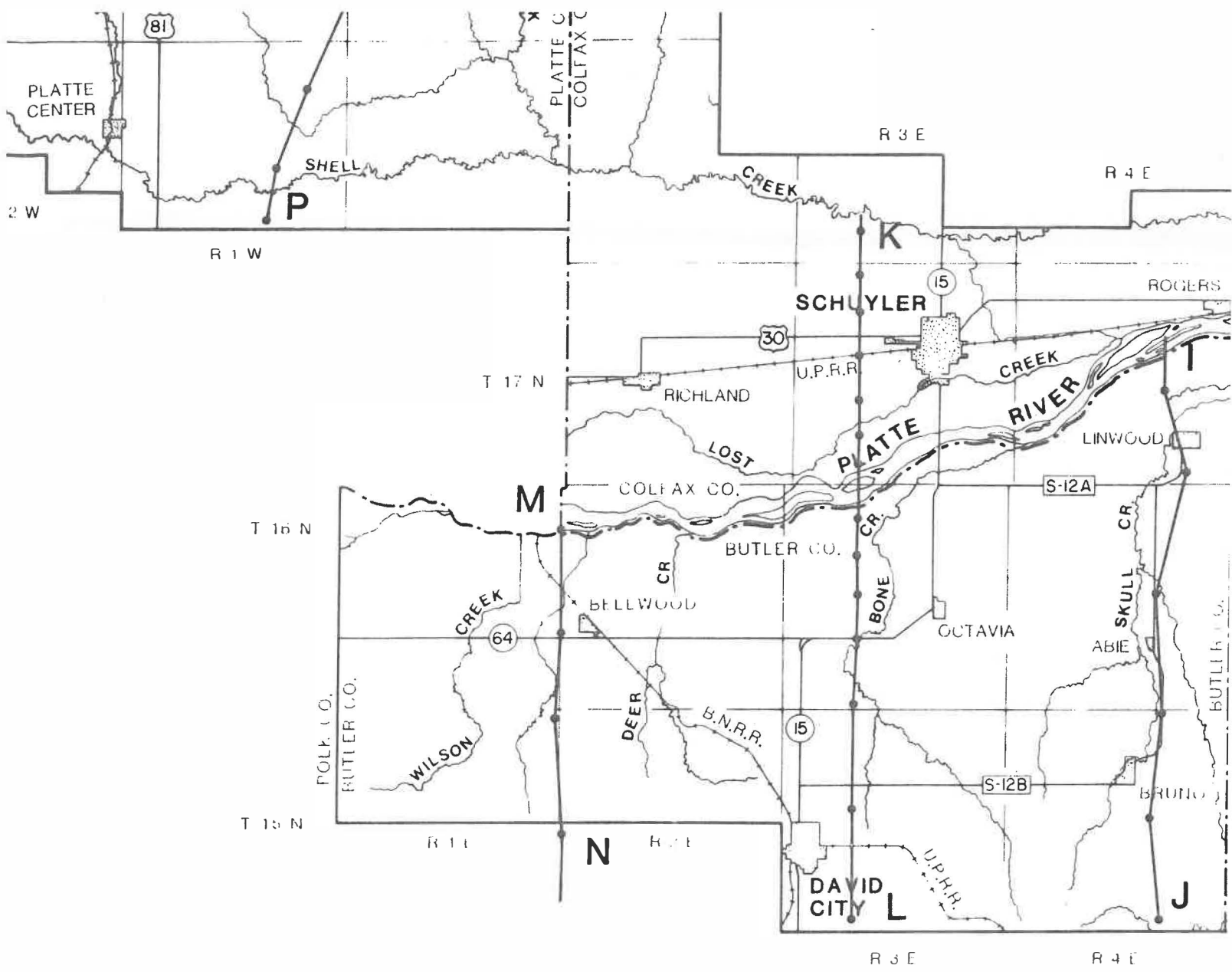


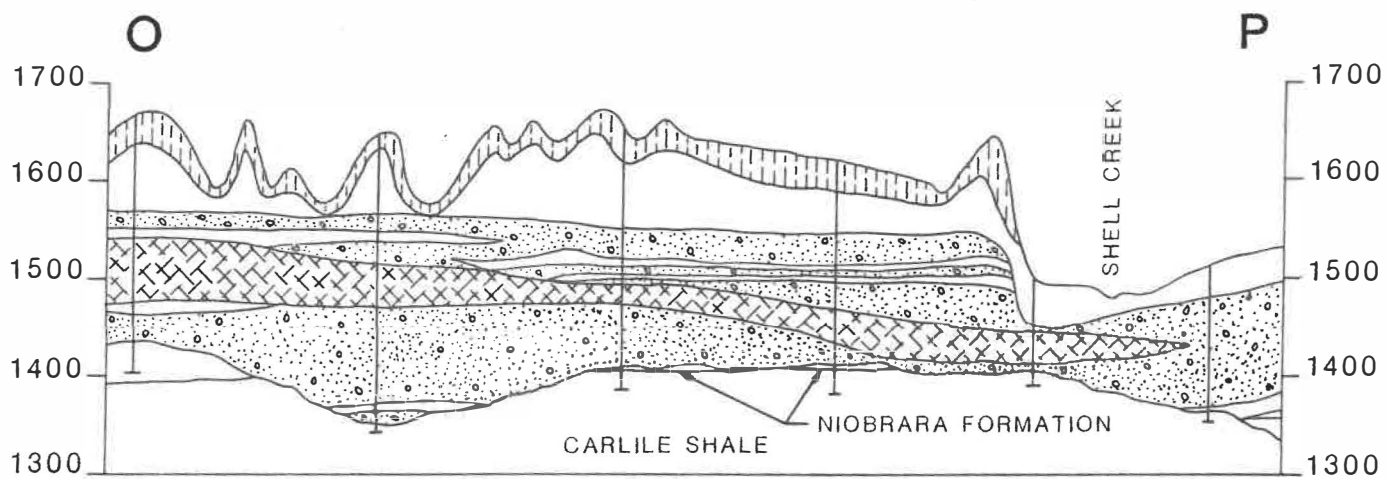
Source: "Boone County Preliminary Groundwater Study;" Conservation and Survey Division, 1959.



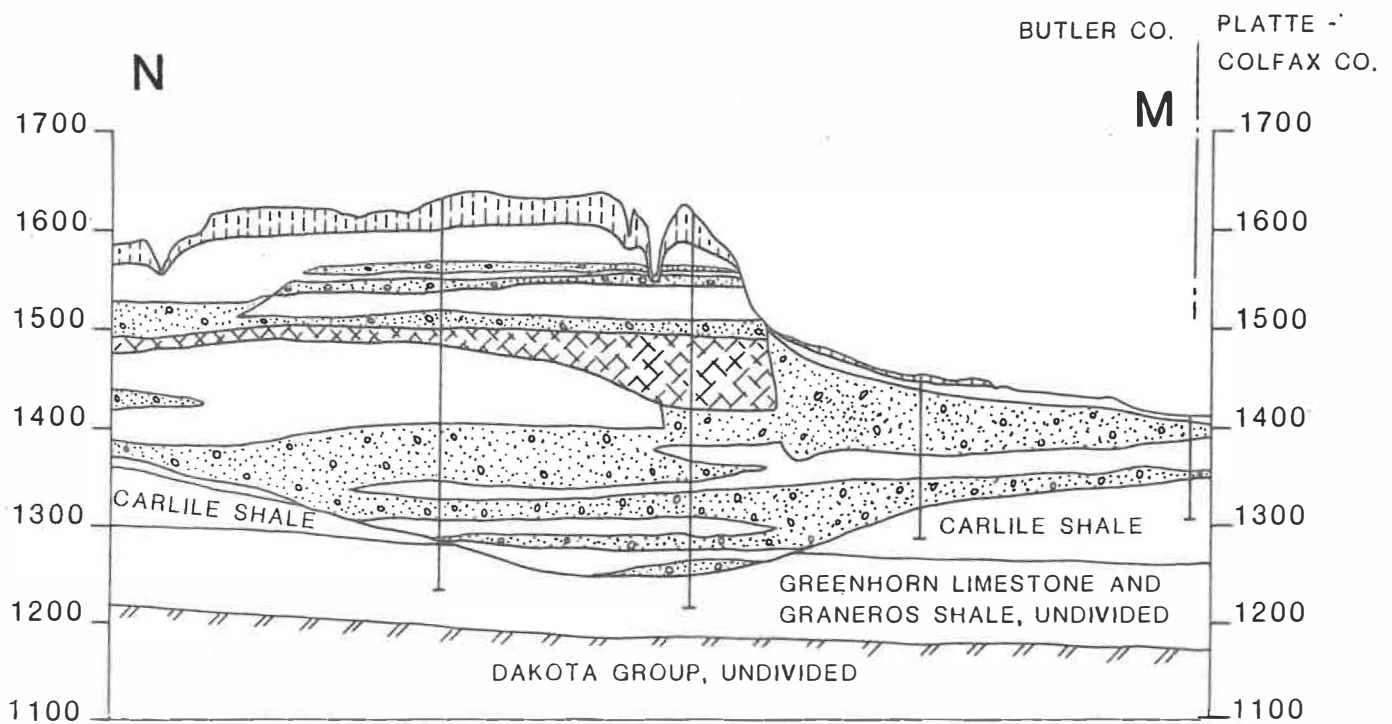
Source: "Platte County Preliminary Groundwater Study," Conservation and Survey Division, 1958.



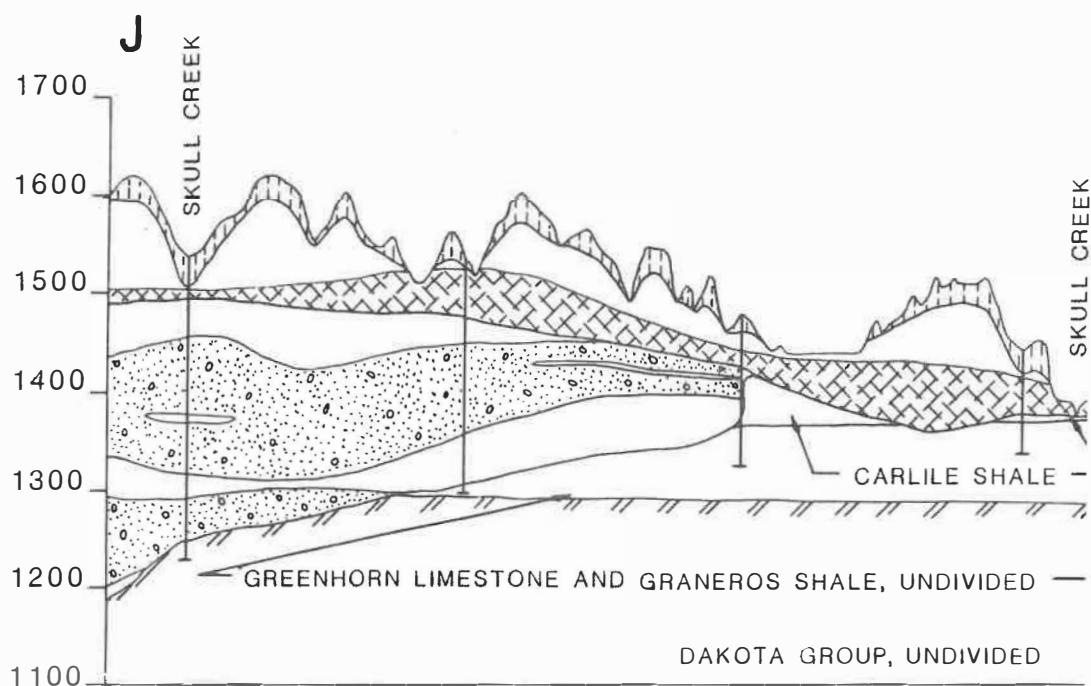
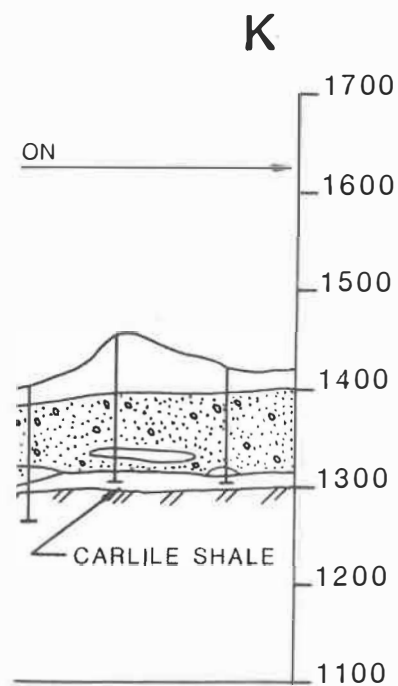
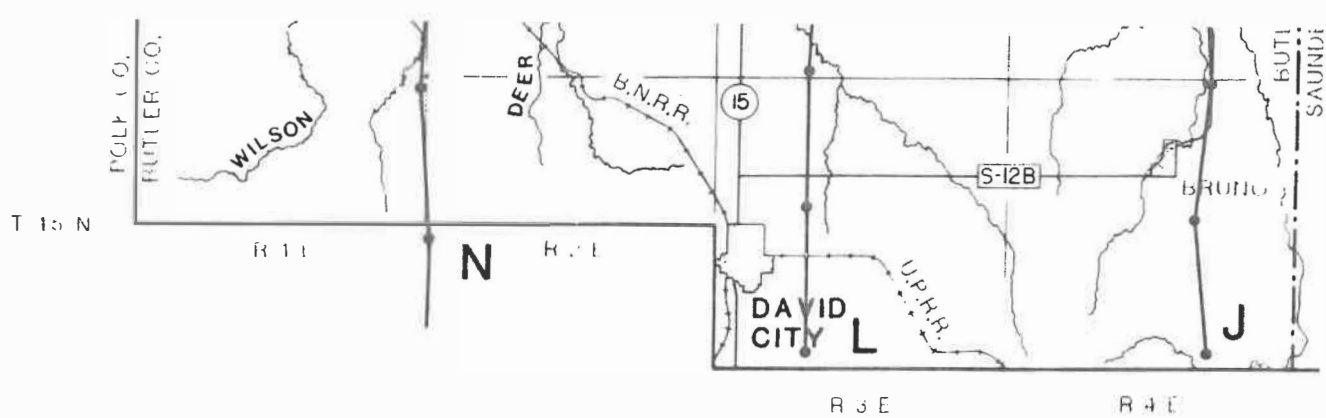




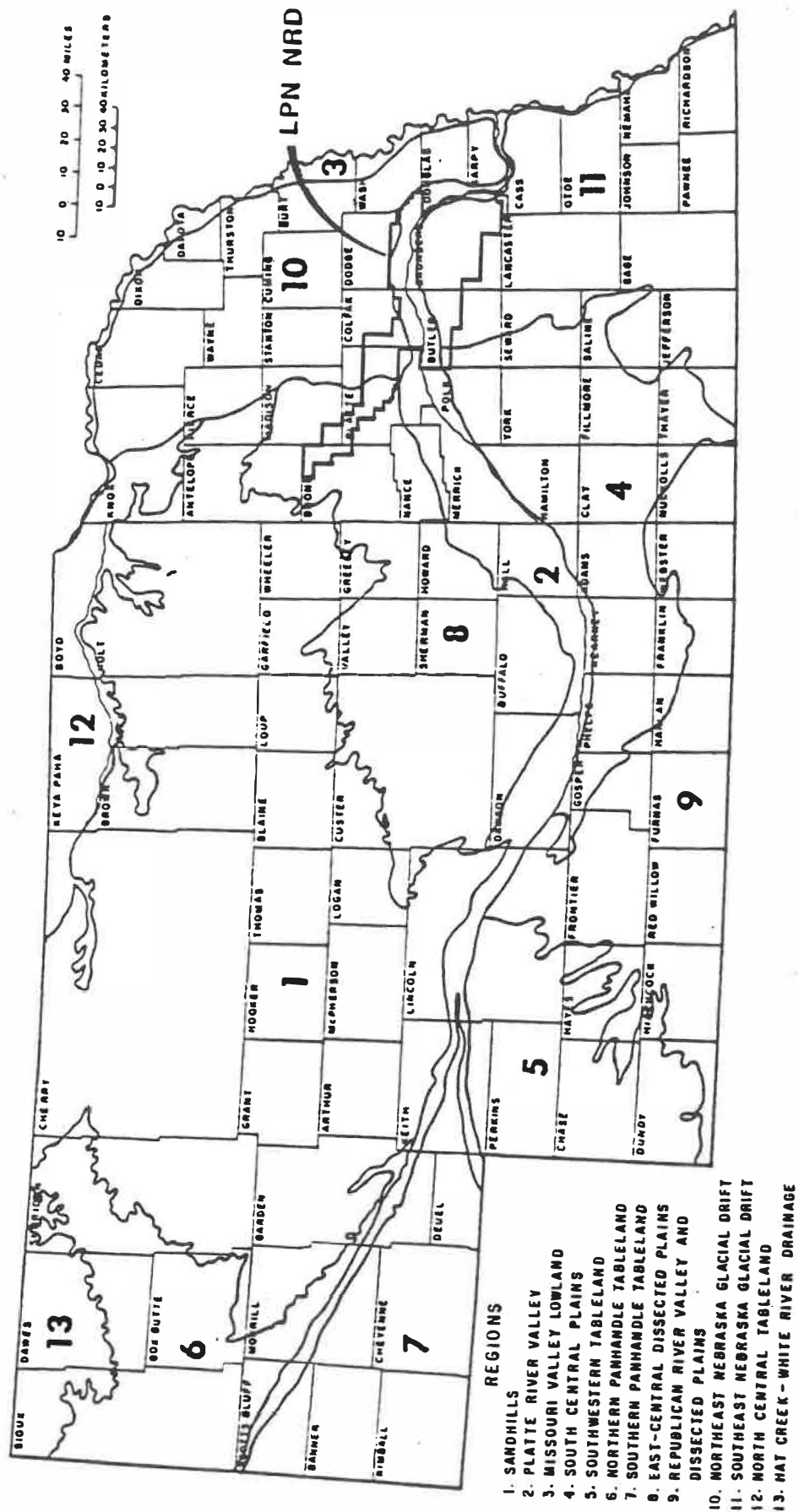
Source: "Platte County Preliminary Groundwater Study," Conservation and Survey Division, 1958.



Source: "Hydrogeology of Butler County," M. Ginsberg, Conservation and Survey Division, 1983.

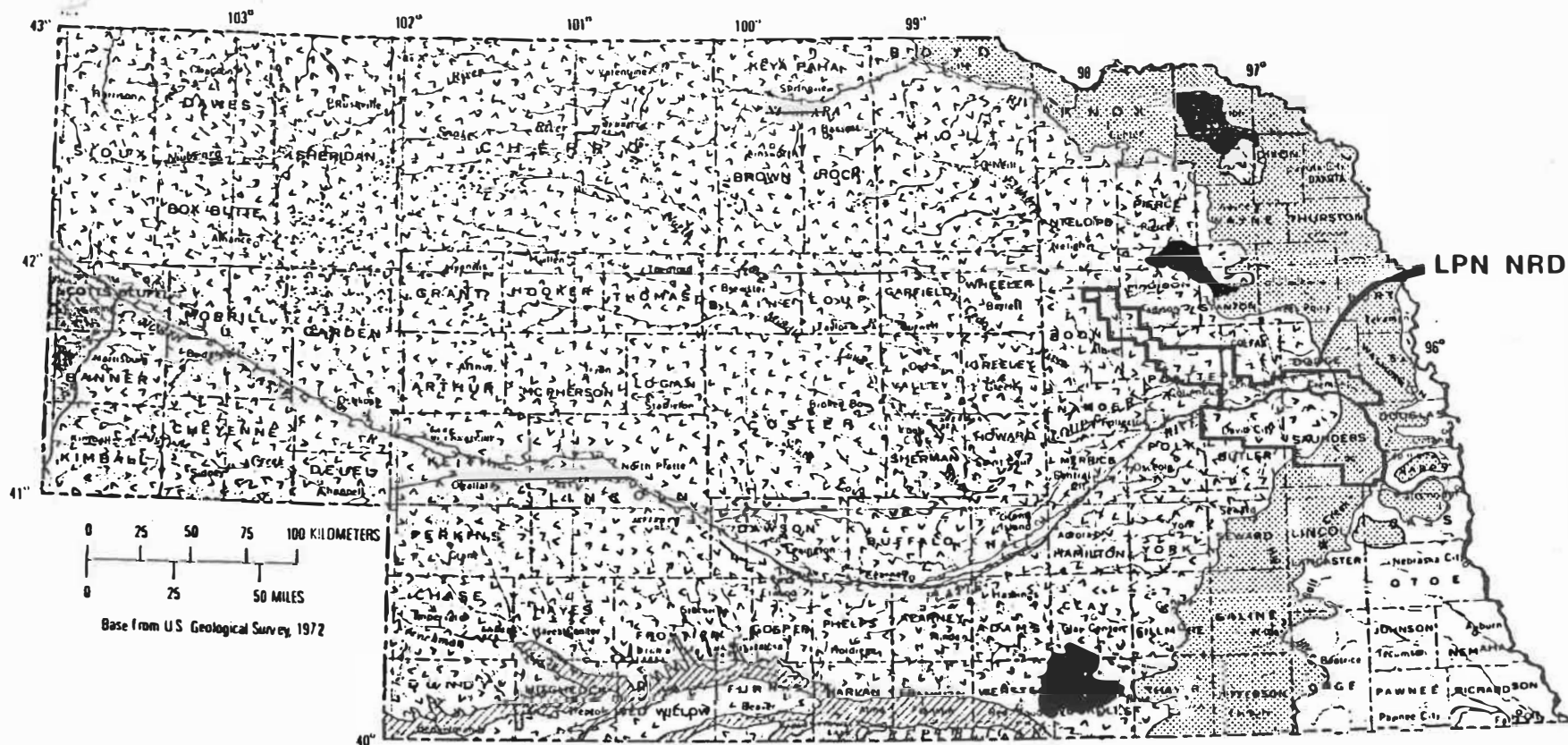


Source: "Hydrogeology of Butler County," M. Ginsberg, Conservation and Survey Division, 1983.



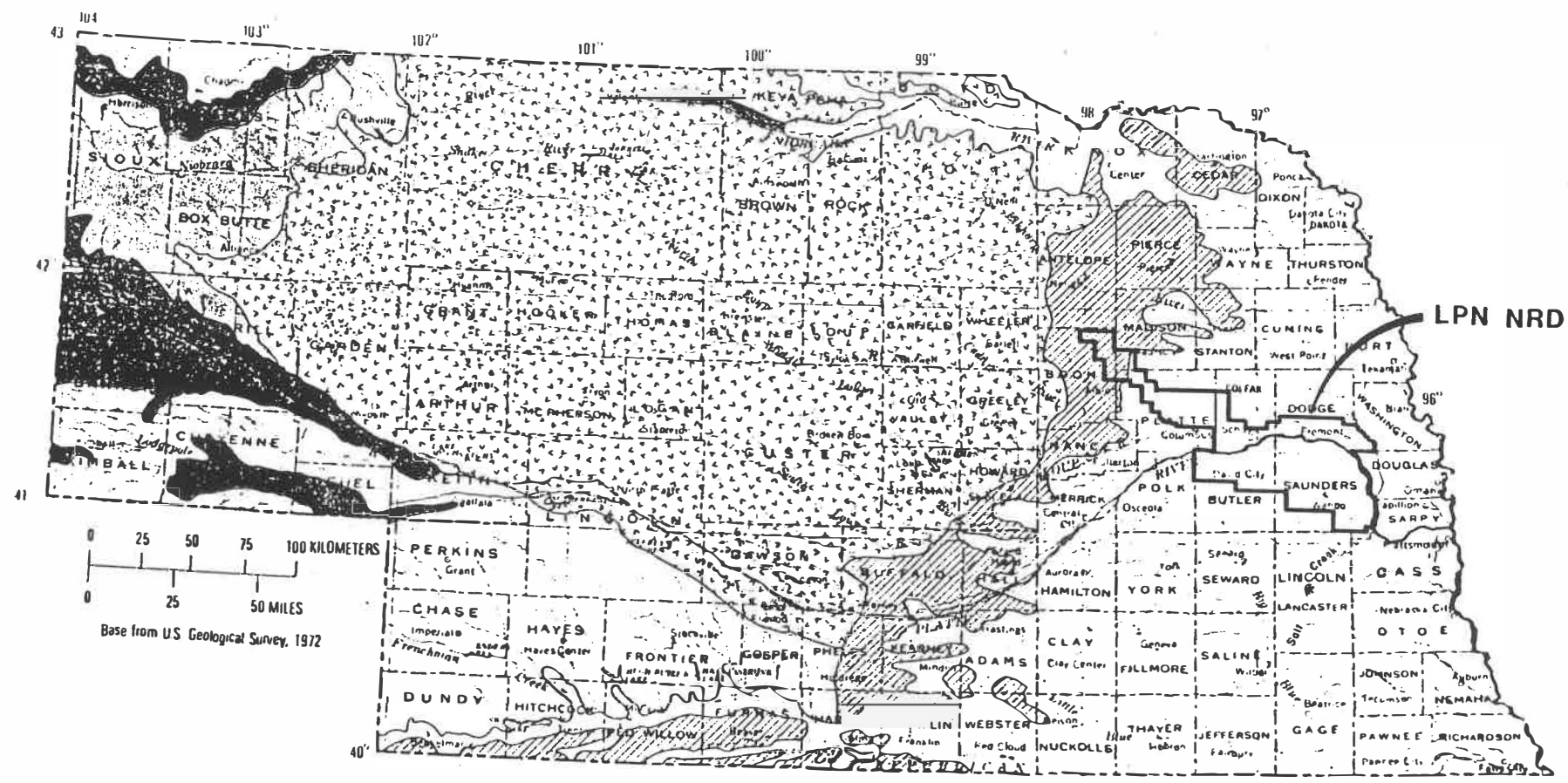
Underground Water Areas of Nebraska

From: Reed, 1969, "Underground Water Areas"



Map showing approximate areal distribution of Mesozoic rocks and those areas currently (1982) used for water supplies.

From: Engberg, "Appraisal of Data for Groundwater Quality in Nebraska", USGS, 1984

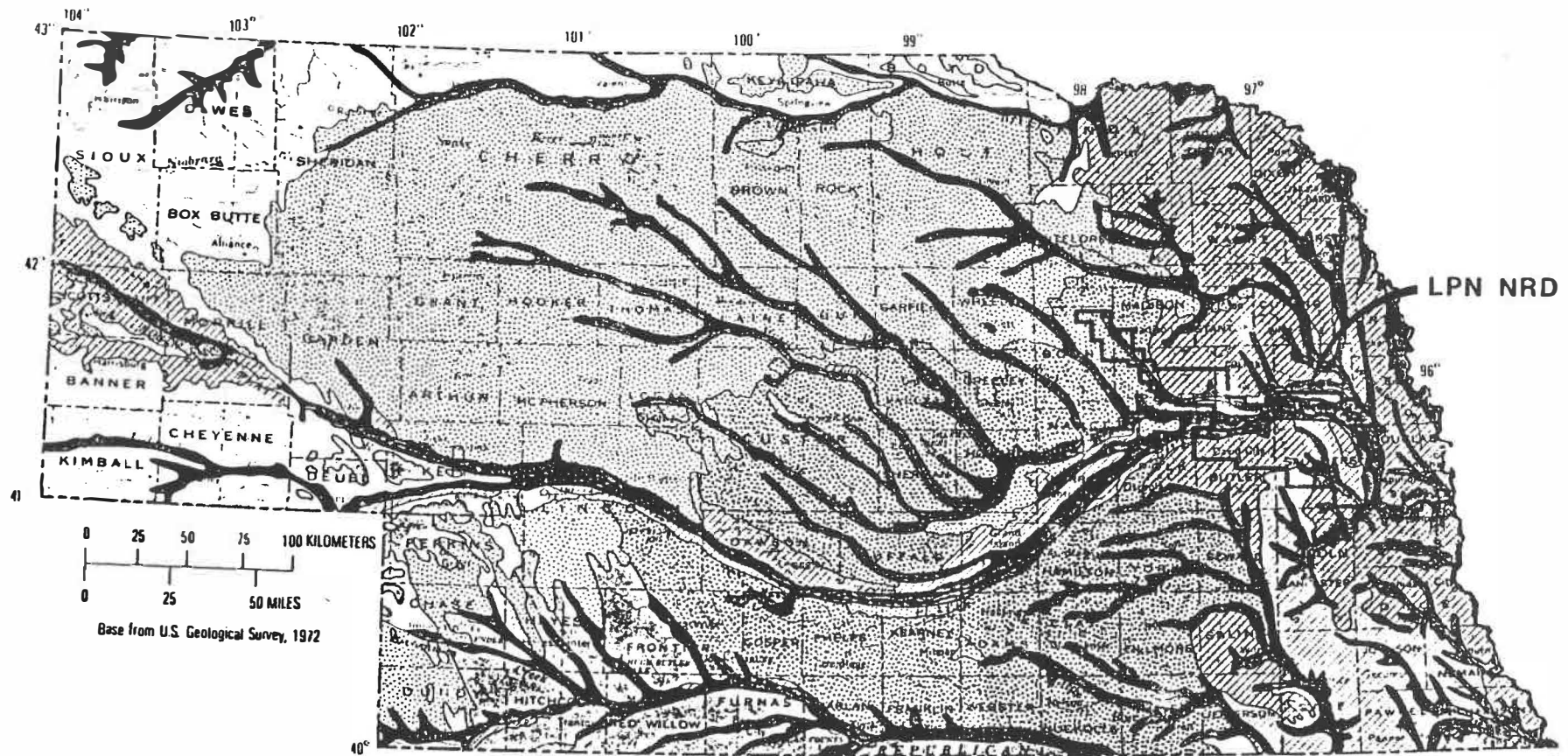


Base from U.S. Geological Survey, 1972

EXPLANATION

- | | | | |
|---|--|---|--|
|  | OGALLALA FORMATION |  | ARIKAREE GROUP |
|  | OGALLALA FORMATION—Wells may be finished in both the Ogallala and overlying Pleistocene deposits |  | BRULE AND CHADRON FORMATIONS OF WHITE RIVER GROUP, UNDIVIDED |
|  | OGALLALA FORMATION—Deposits are thin and are a source of water only occasionally |  | TERTIARY DEPOSITS ABSENT |

Map showing approximate areal distribution of aquifers in Tertiary deposits.

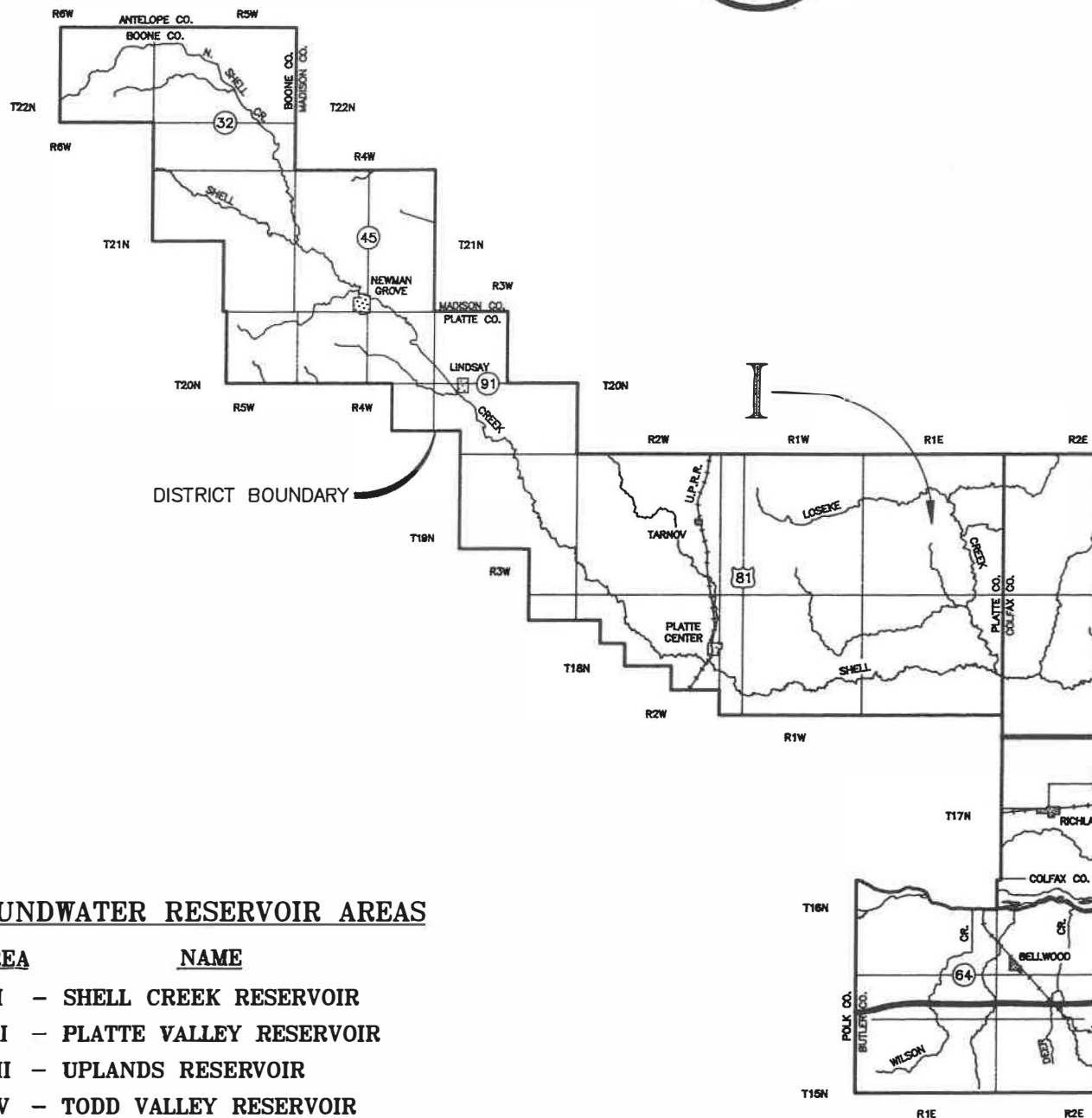


From Candra, Reed, and Gordon, 1950

Map showing areal distribution of Holocene and Pleistocene deposits.

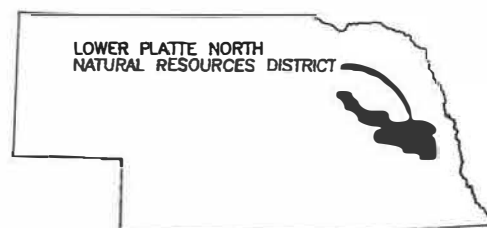


LOWER PL NATURAL DIS'

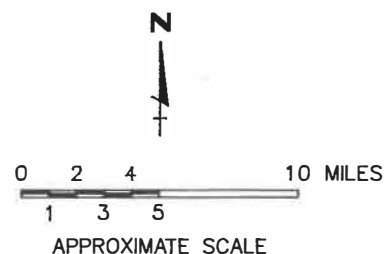


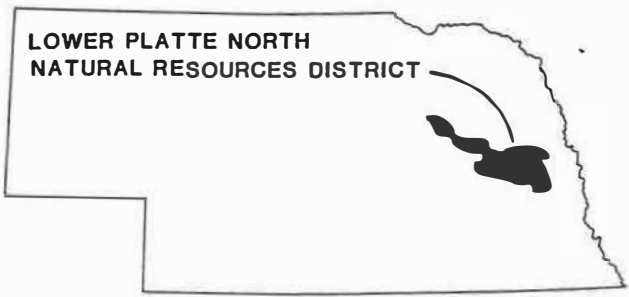
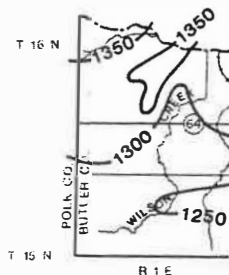
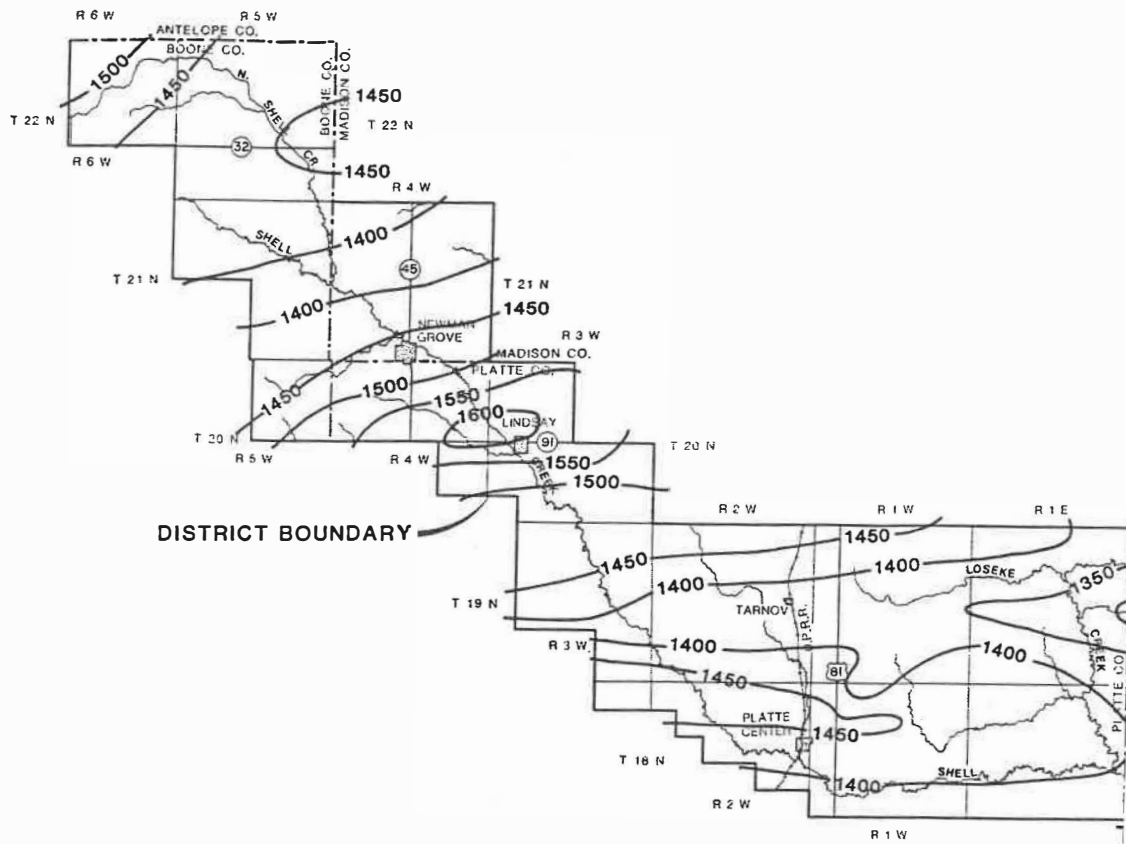
GROUNDWATER RESERVOIR AREAS

AREA	NAME
I	SHELL CREEK RESERVOIR
II	PLATTE VALLEY RESERVOIR
III	UPLANDS RESERVOIR
IV	TODD VALLEY RESERVOIR



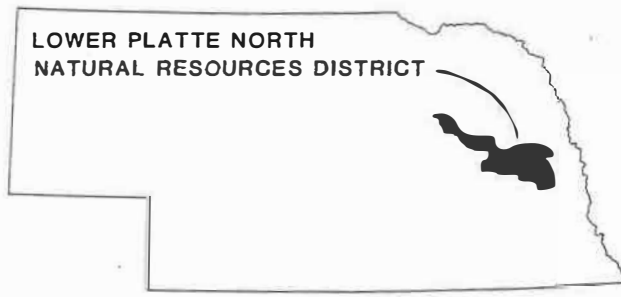
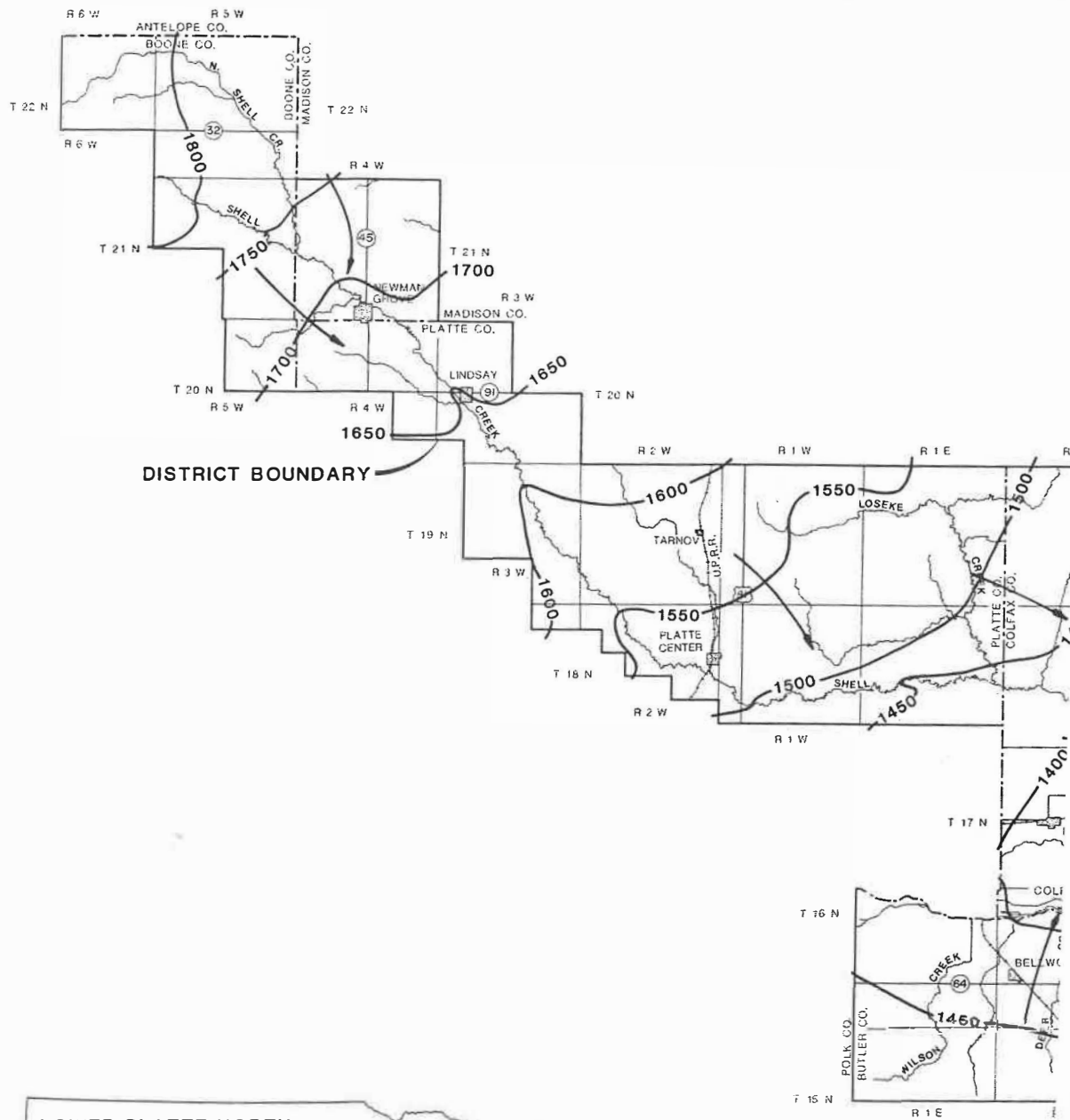
LOCATION





LOCATION

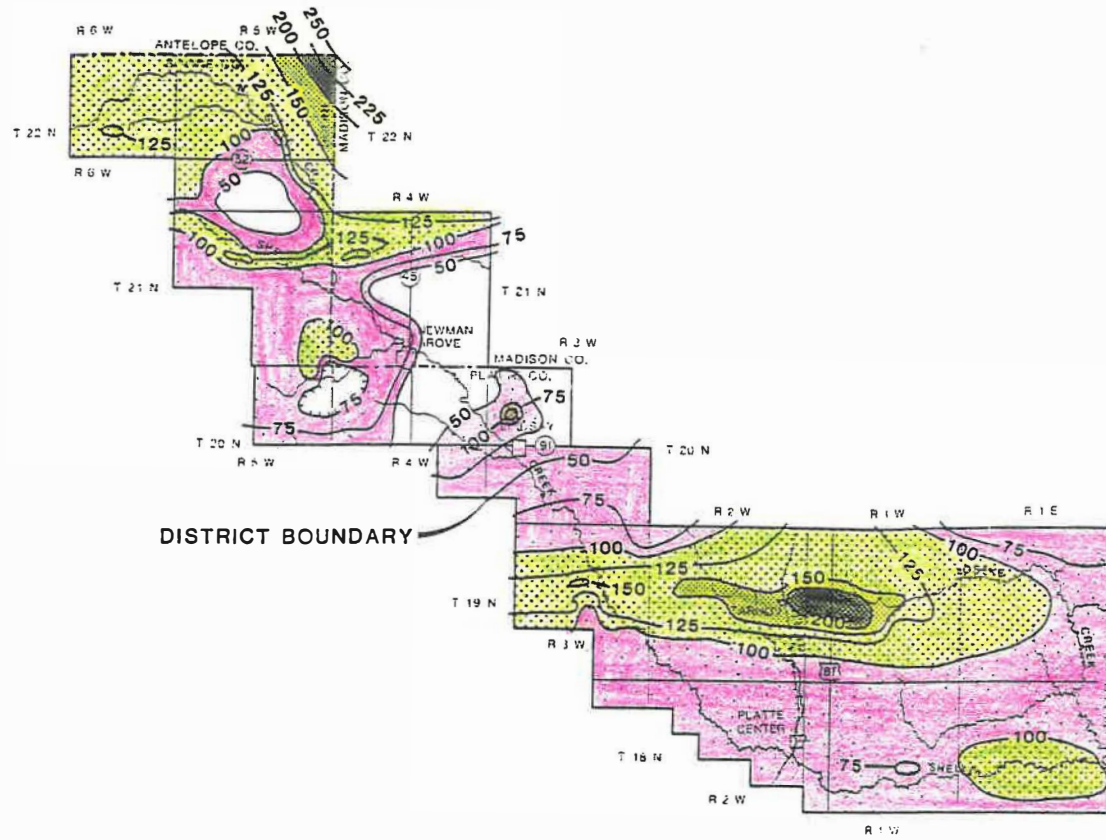




LOWER PLATTE NORTH
NATURAL RESOURCES DISTRICT

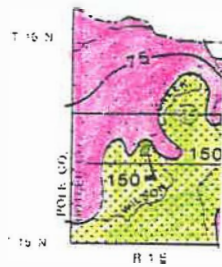
LOCATION

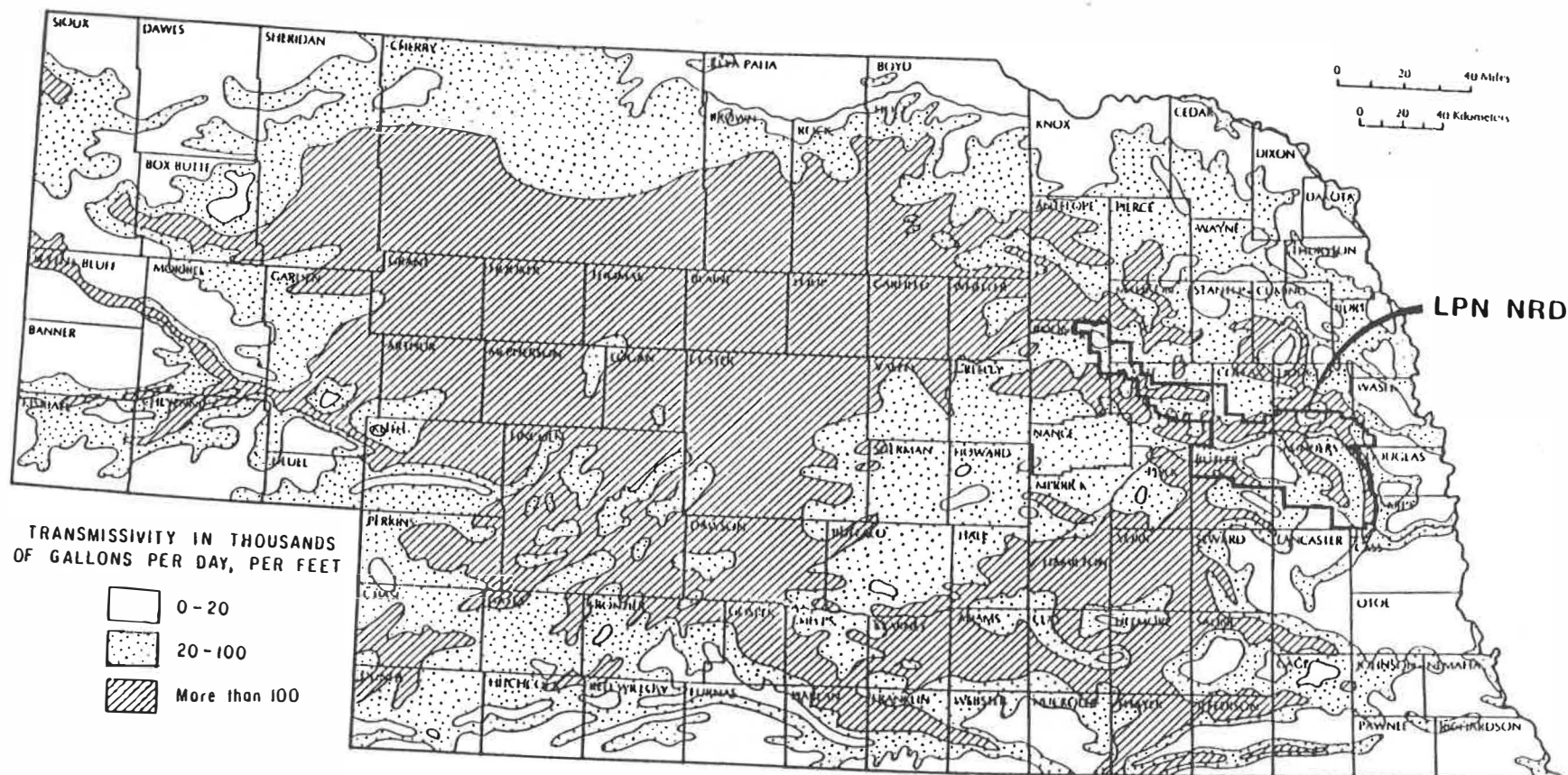




LOWER PLATTE NORTH
NATURAL RESOURCES DISTRICT

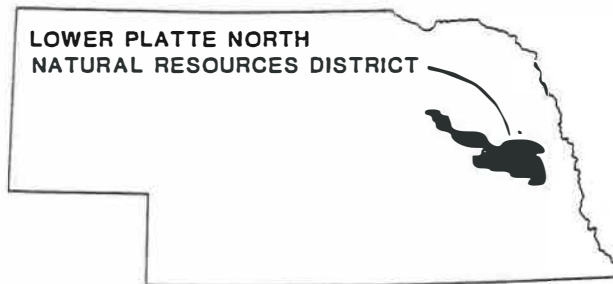
LOCATION





Transmissivity of the Principal Aquifer - A function of aquifer thickness and permeability, transmissivity estimates provide an indication of the productivity of an aquifer. Also available from CSD are transmissivity maps at a scale of 1:500,000.

From: "Policy Issue Study on Groundwater Reservoir Management",
Nebraska Natural Resources Commission, 1982



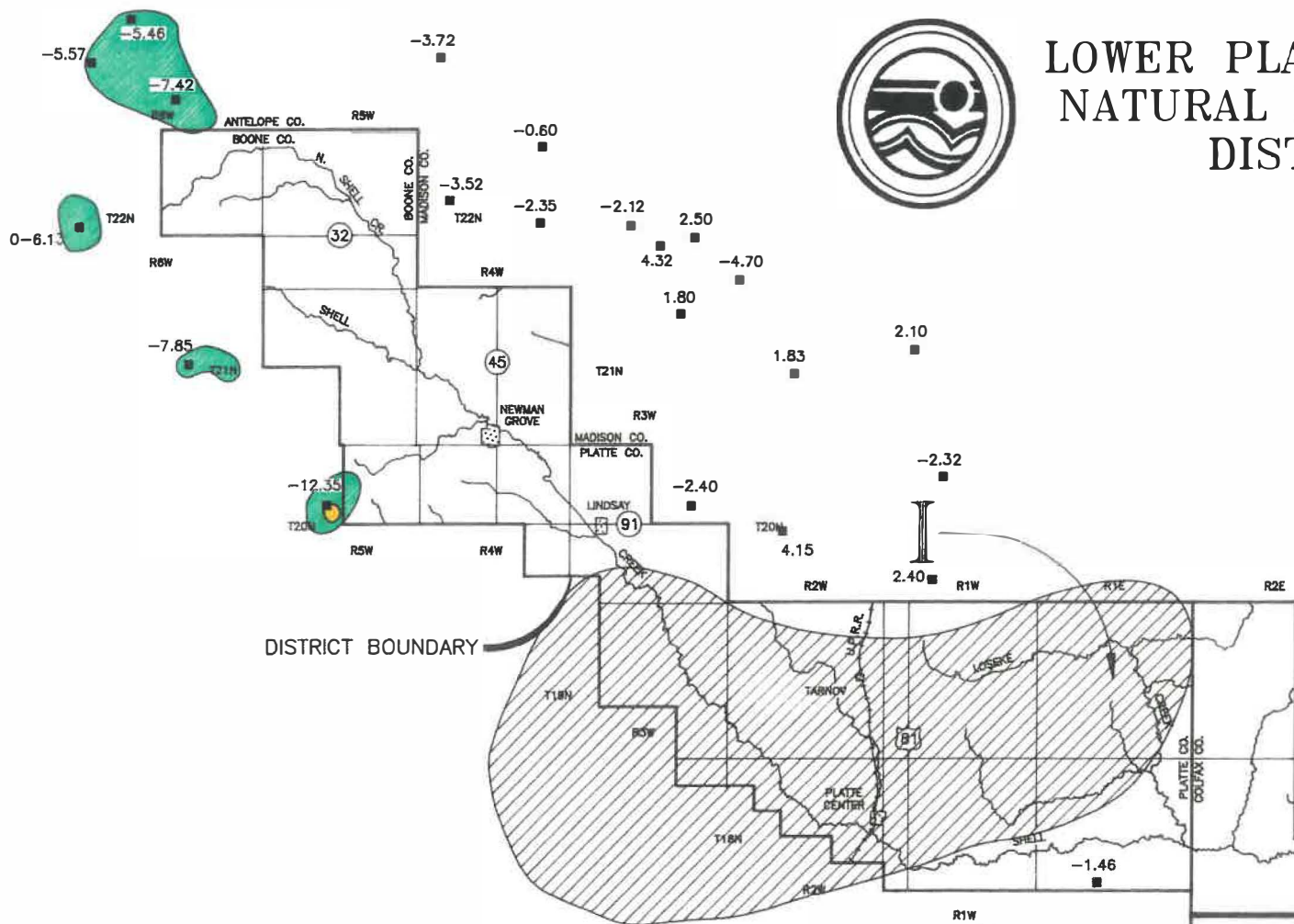
LOCATION

5



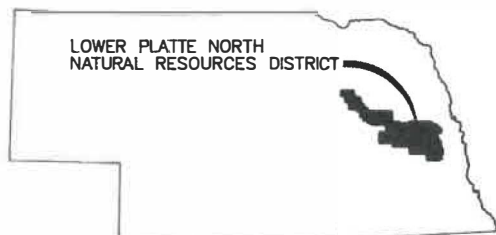


LOWER PLATE NATURAL DIST

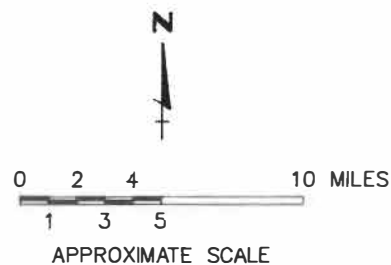


GROUNDWATER RESERVOIR AREAS

AREA	NAME
I	SHELL CREEK RESERVOIR
II	PLATTE VALLEY RESERVOIR
III	UPLANDS RESERVOIR
IV	TODD VALLEY RESERVOIR



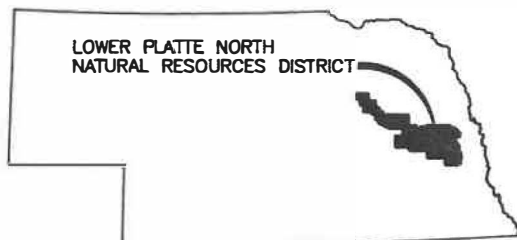
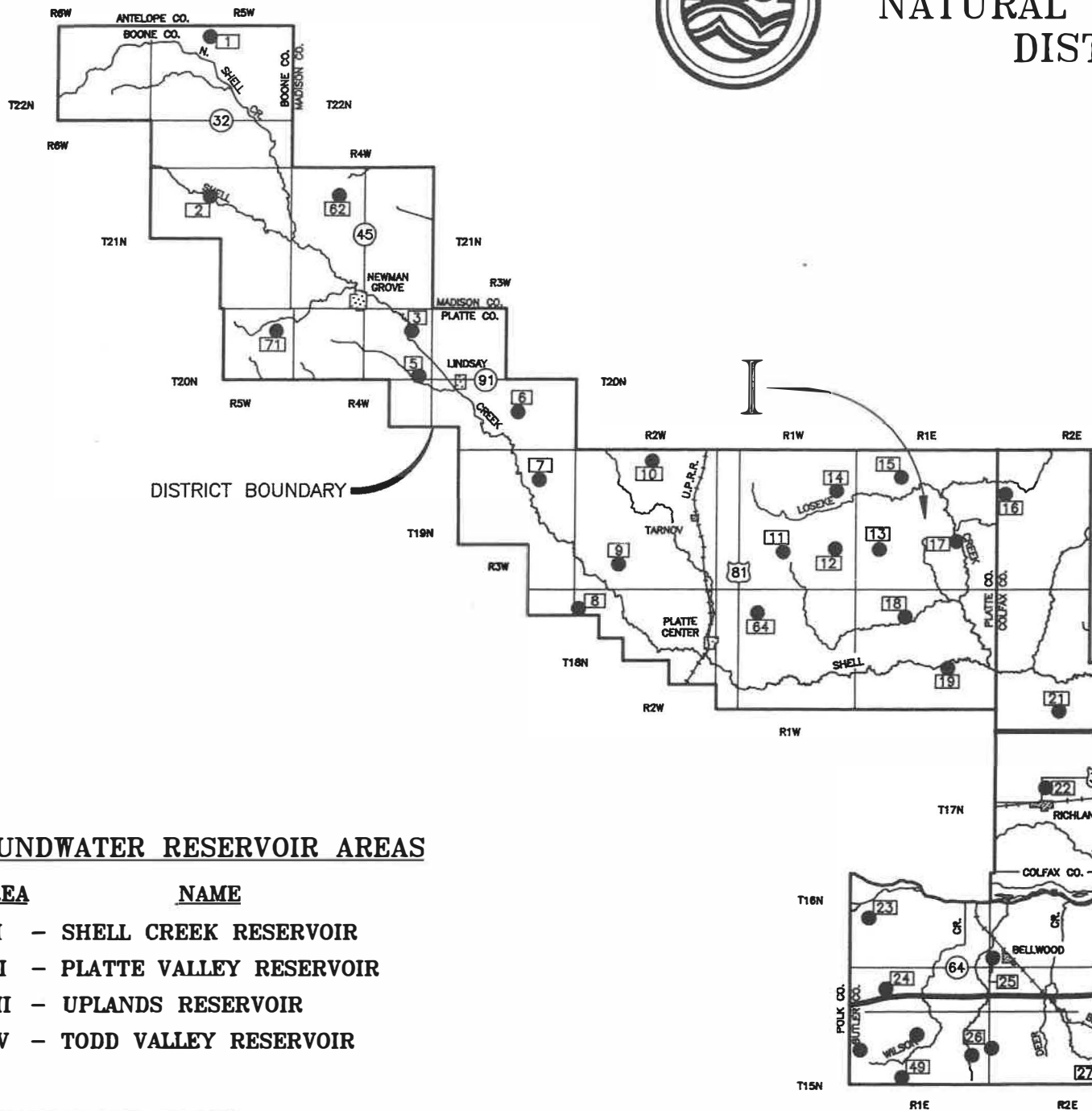
LOCATION



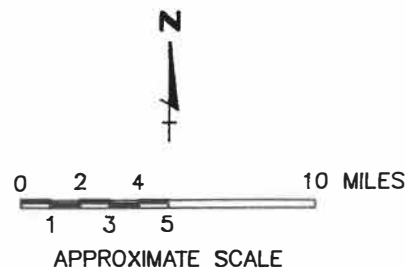
Source: U.S. Ge



LOWER PLATE NATURAL RESOURCES DISTRICT

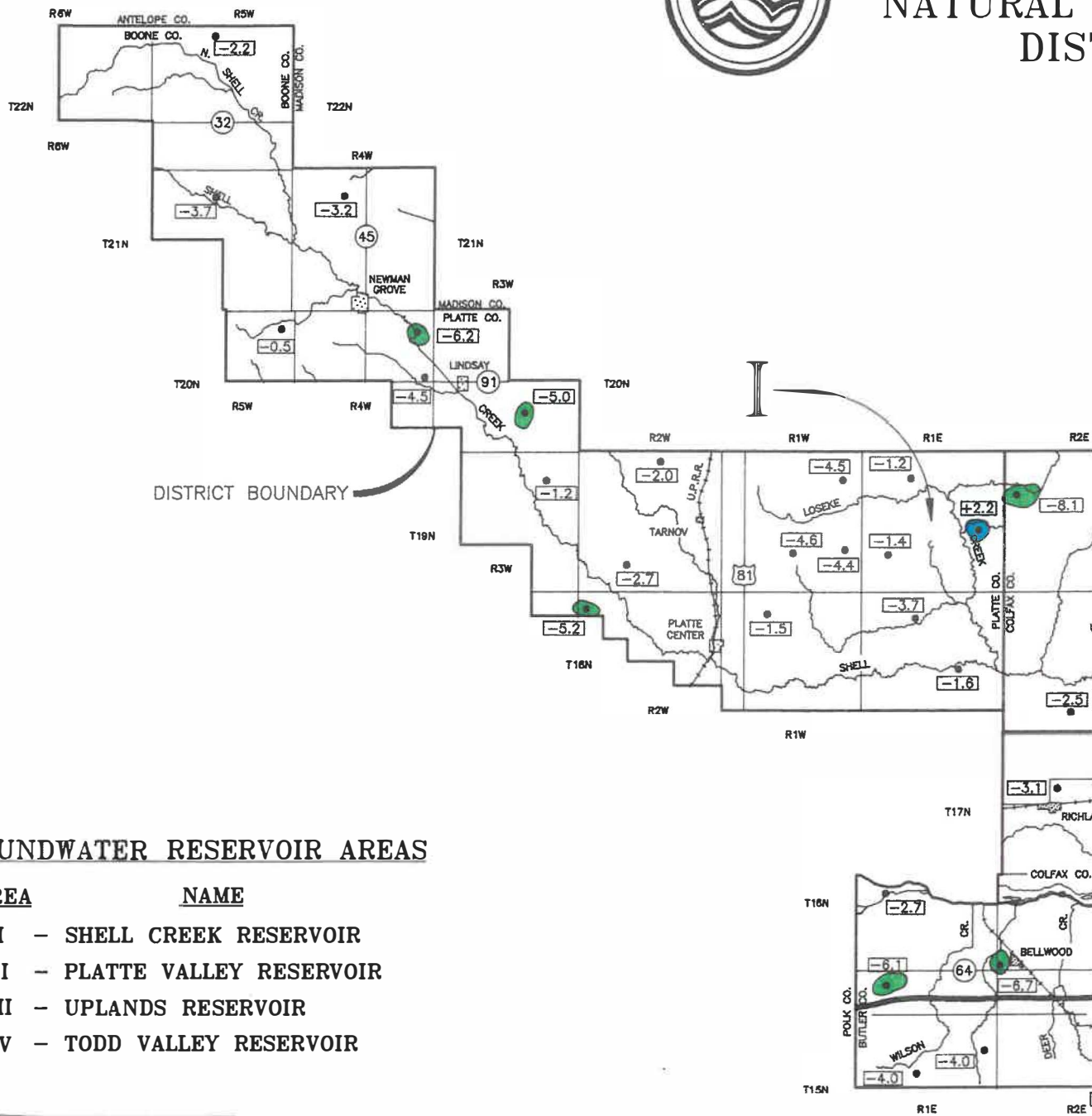


LOCATION



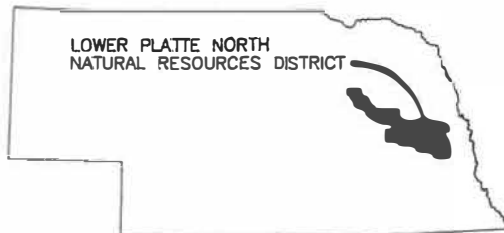


LOWER PLATTE NATURAL DISTRICT

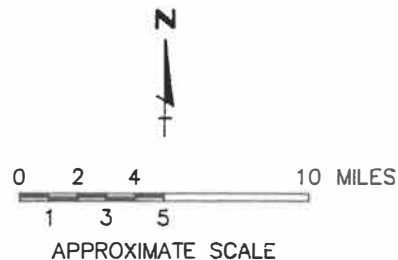


GROUNDWATER RESERVOIR AREAS

AREA	NAME
I	SHELL CREEK RESERVOIR
II	PLATTE VALLEY RESERVOIR
III	UPLANDS RESERVOIR
IV	TODD VALLEY RESERVOIR

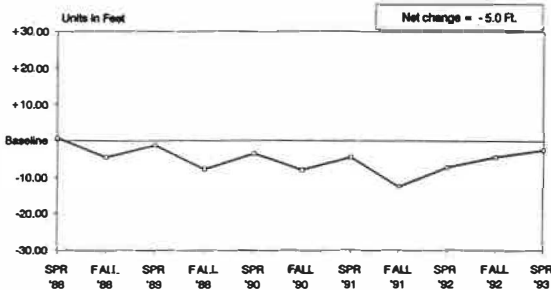


LOCATION

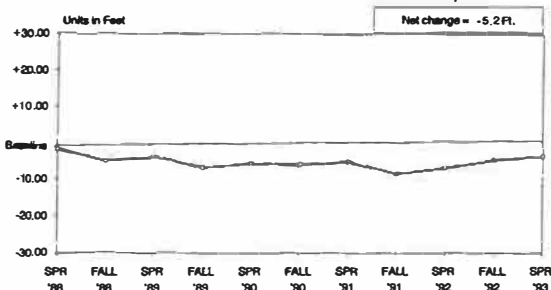


SHELL CREEK

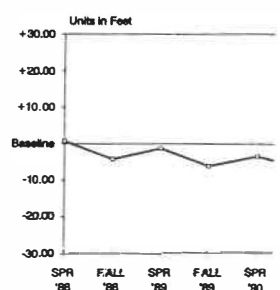
Changes in Water Levels Since 1987 (Baseline)
Well: 6 20N-3W-22DDCC Platte Co. Shell Cr. Aquifer



Changes in Water Levels Since 1987 (Baseline)
Well: 8 18N-2W-6CBAA Platte Co. Shell Cr. Aquifer

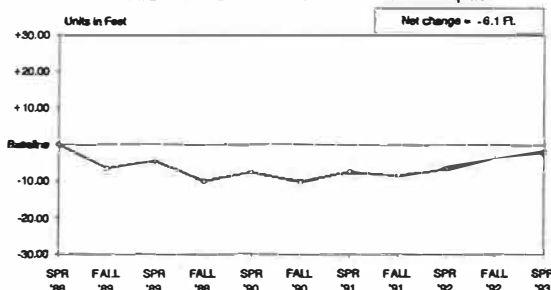


Changes in Water Levels Since 1987 (Baseline)
Well: 12 19N-1W-25CA Platte Co. Shell Cr. Aquifer

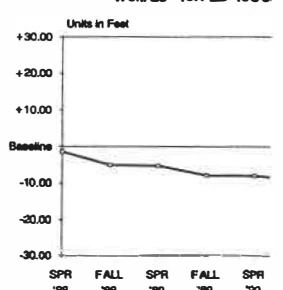


PLATTE VALLEY

Changes in Water Levels Since 1987 (Baseline)
Well: 24 16N-1E-32AAAD Butler Co. Platte V. Aquifer

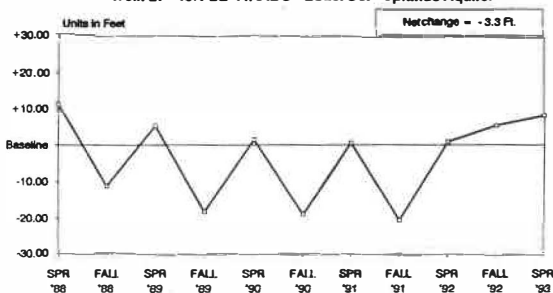


Changes in Water Levels Since 1987 (Baseline)
Well: 25 16N-2E-19CC Butler Co. Platte V. Aquifer

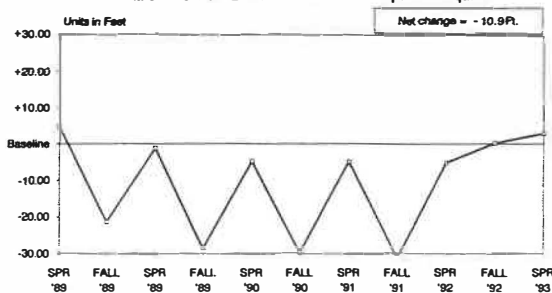


UPLANDS RESERVOIR

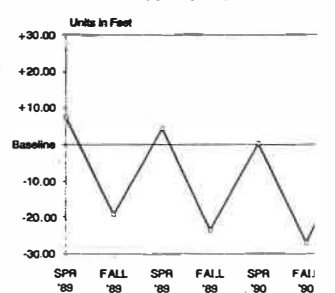
Changes in Water Levels Since 1987 (Baseline)
Well: 27 15N-2E-14AABC Butler Co. Uplands Aquifer



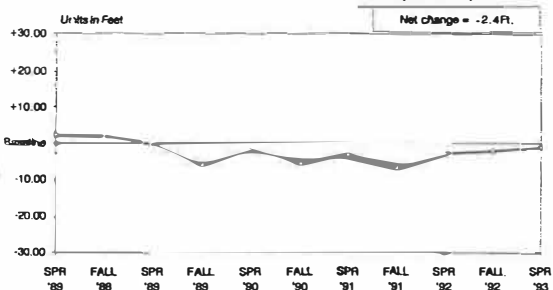
Changes in Water Levels Since 1987 (Baseline)
Well: 30 15N-3E-21ACBB Butler Co. Uplands Aquifer



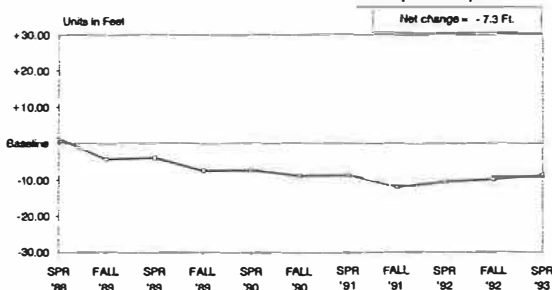
Changes in Water Levels Since 1987 (Baseline)
Well: 31 15N-4E-33CBDA Butler Co. Uplands Aquifer



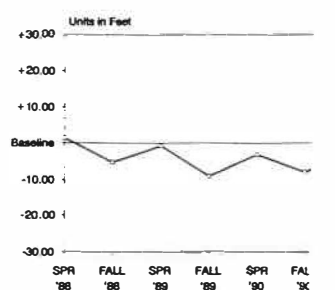
Changes in Water Levels Since 1987 (Baseline)
Well: 43 17N-7E-38AACC Saunders Co. Uplands Aquifer

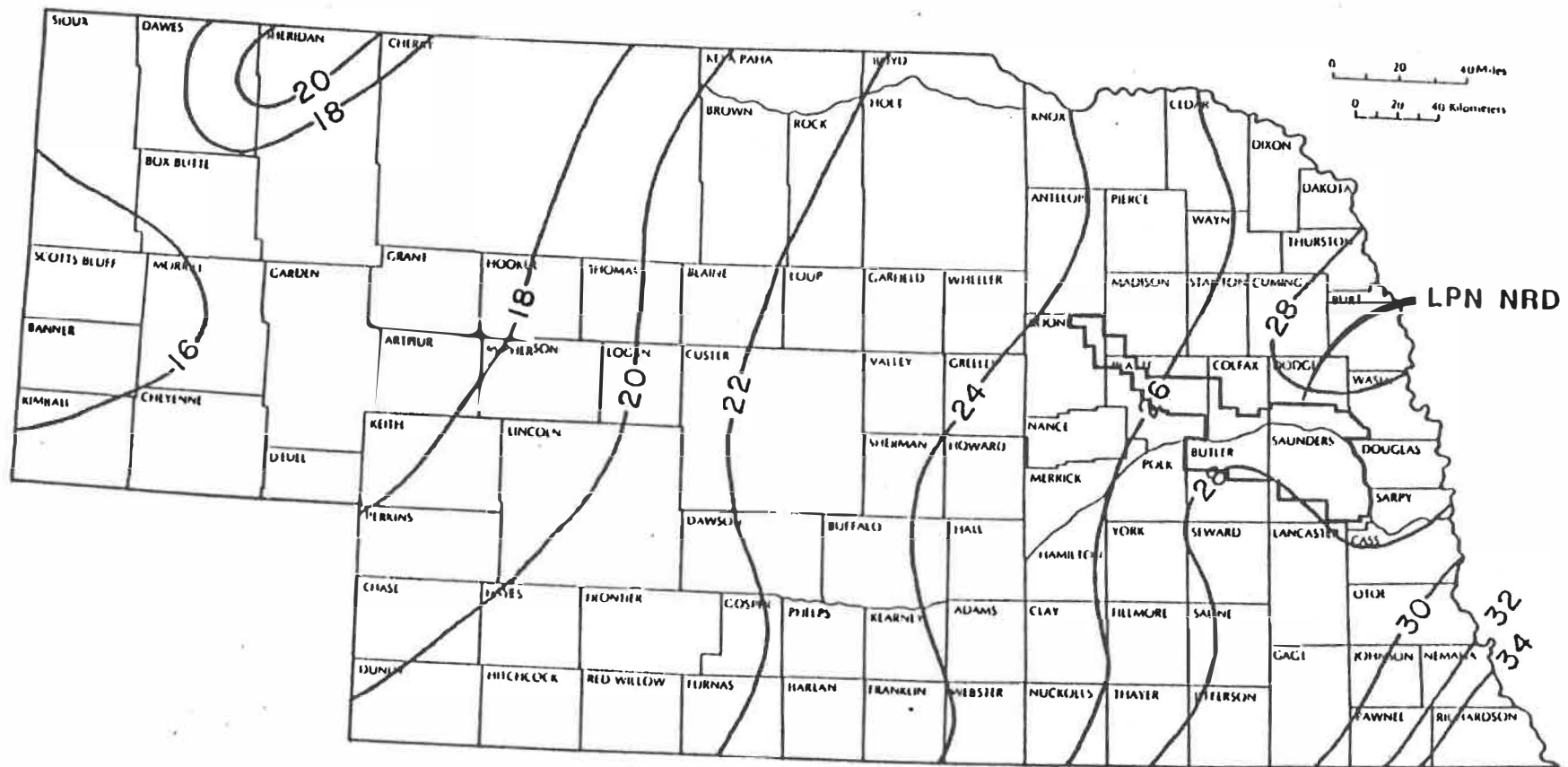


Changes in Water Levels Since 1987 (Baseline)
Well: 48 15N-8E-13DAAB Saunders Co. Uplands Aquifer

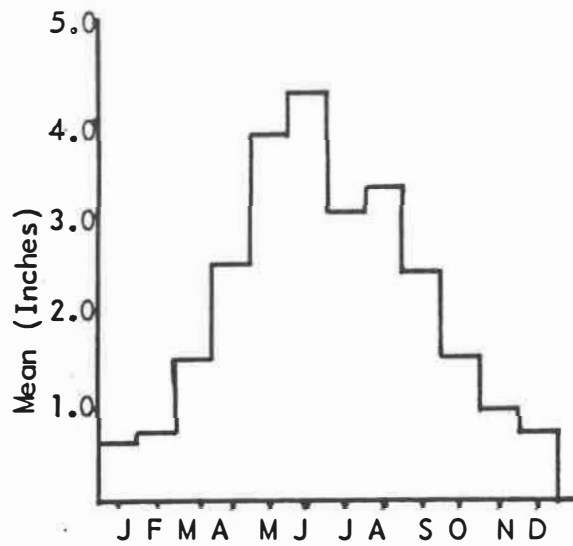


Changes in Water Levels Since 1987 (Baseline)
Well: 49 15N-1E-16DACC Butler Co. Uplands Aquifer

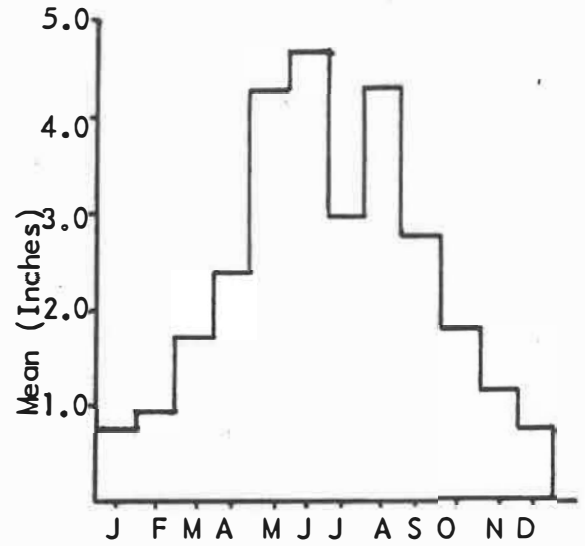




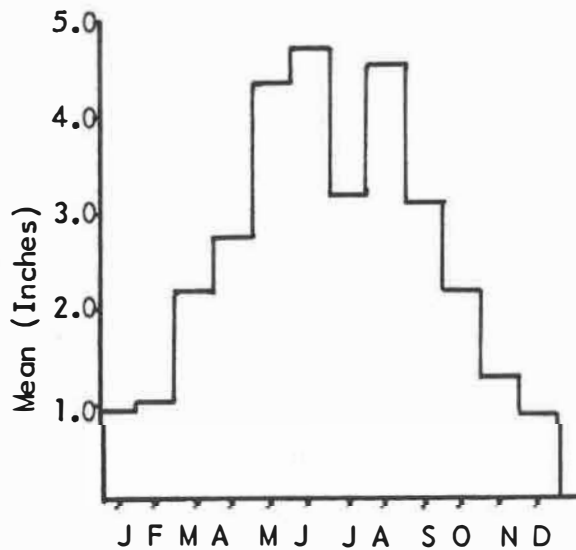
Mean Annual Precipitation (in inches) from 1900 to 1979 - This map is reproduced from "An Analysis of Nebraska's Precipitation Climatology with Emphasis on Occurrence of Dry Conditions", Agricultural Experiment Station, UN-L, Wilhite, D., 1981.



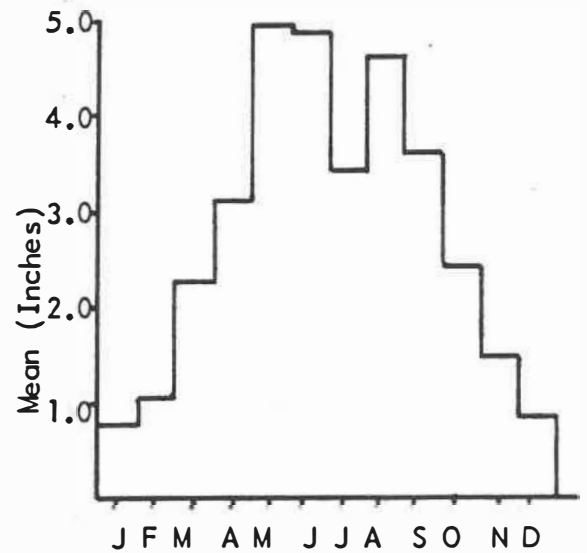
Months
Mean Annual = 25.38"
Albion
Boone County



Months
Mean Annual = 28.43"
Schuyler
Colfax County



Months
Mean Annual = 30.66"
Fremont
Dodge County

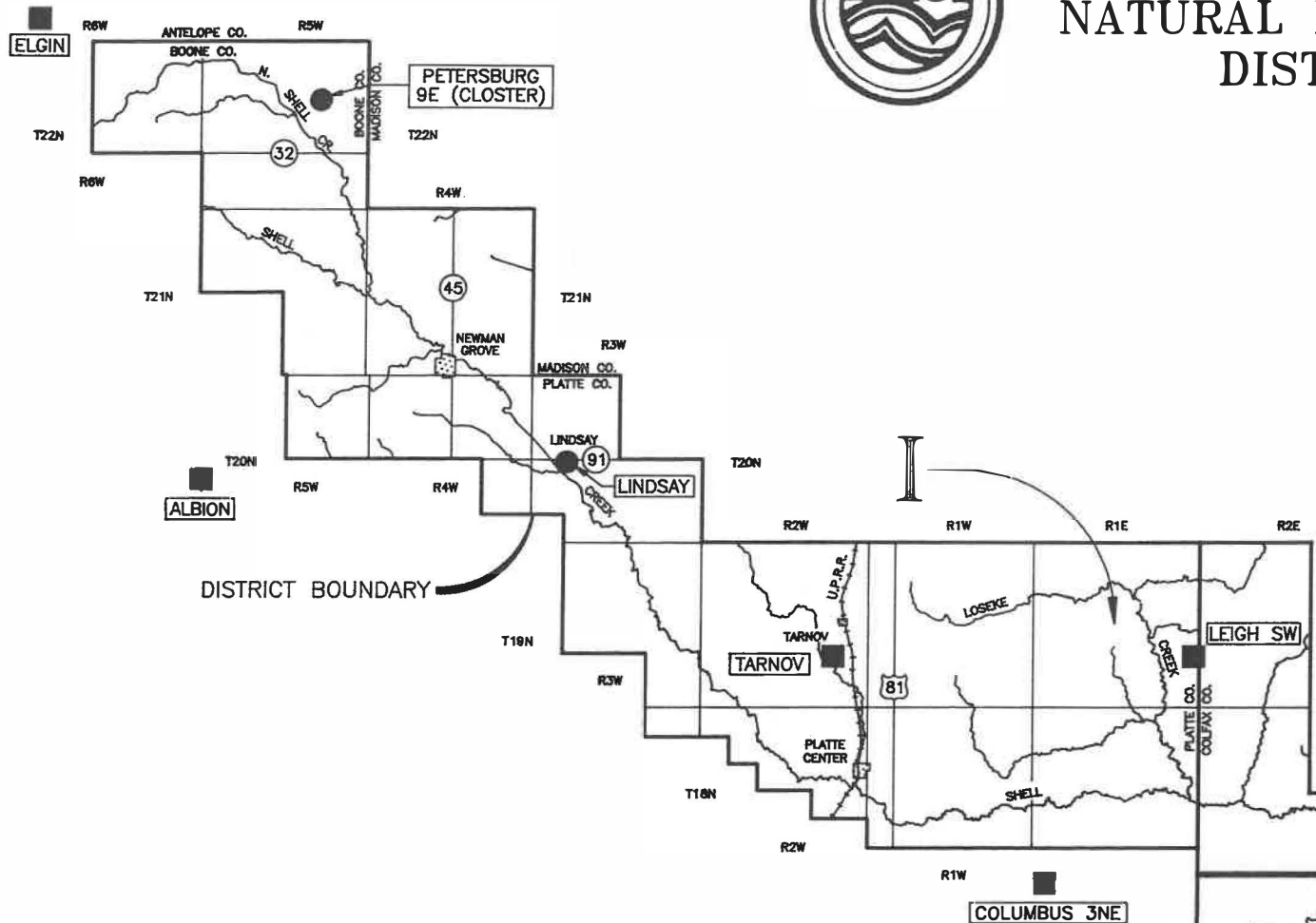


Months
Mean Annual = 33.96"
Wahoo
Saunders County

DISTRIBUTION OF AVERAGE
ANNUAL PRECIPITATION

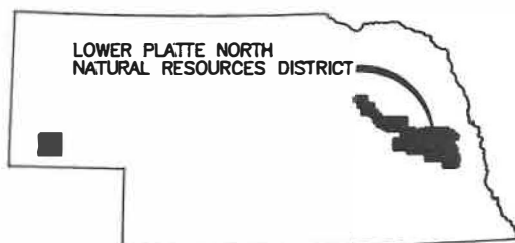


LOWER PLATE NATURAL RESOURCES DISTRICT

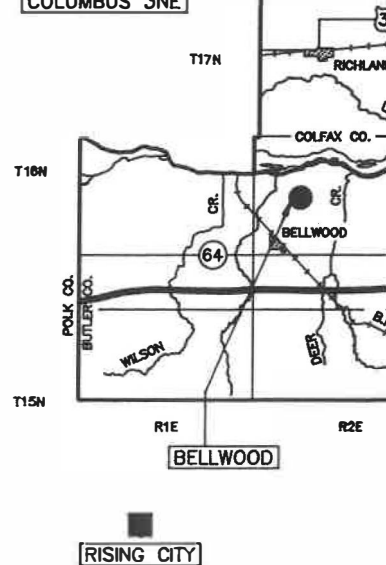
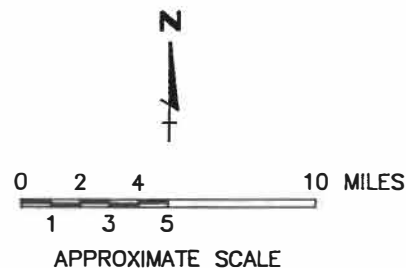


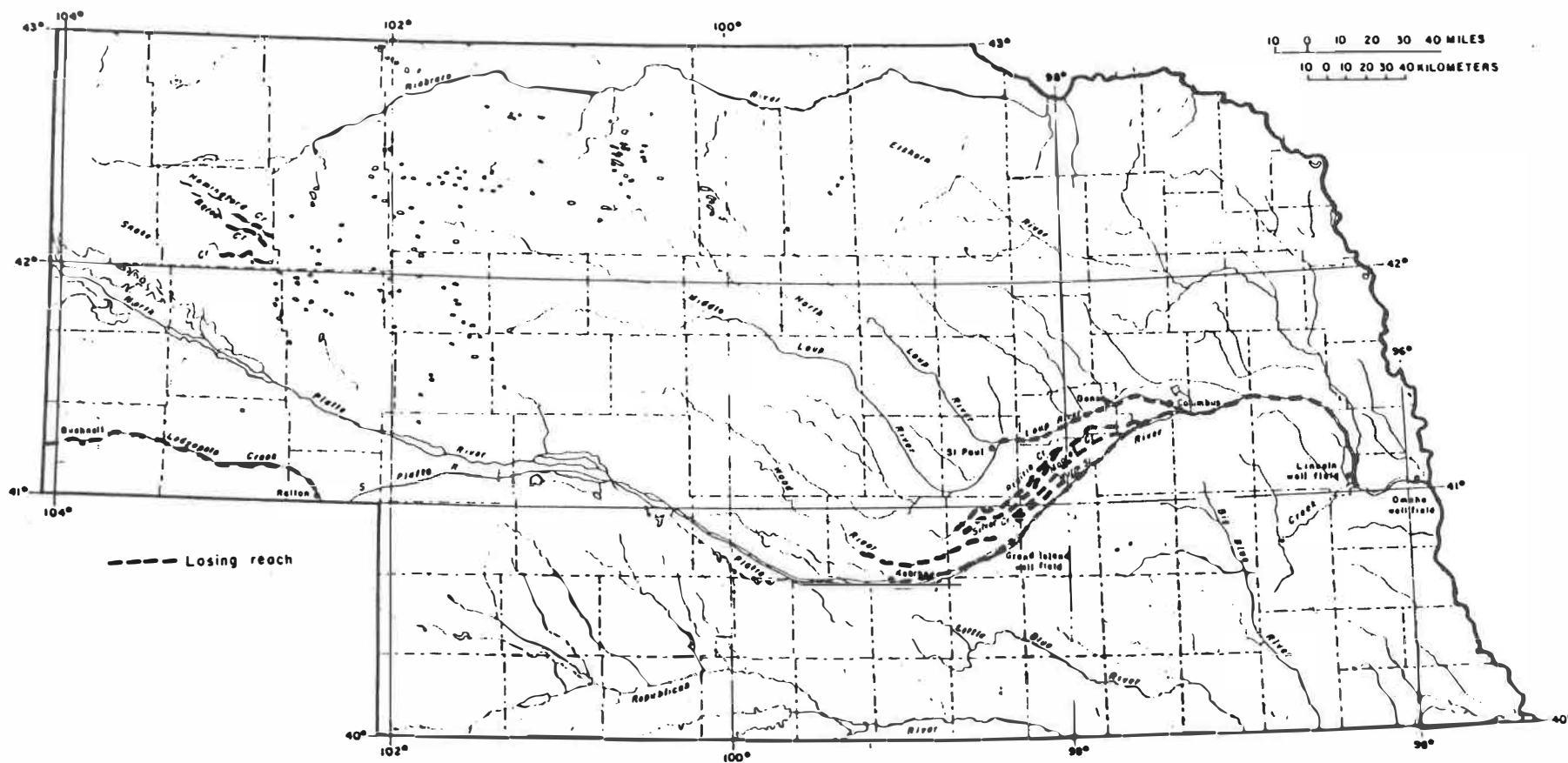
GROUNDWATER RESERVOIR AREAS

- | AREA | NAME |
|------|-------------------------|
| I | SHELL CREEK RESERVOIR |
| II | PLATTE VALLEY RESERVOIR |
| III | UPLANDS RESERVOIR |
| IV | TODD VALLEY RESERVOIR |



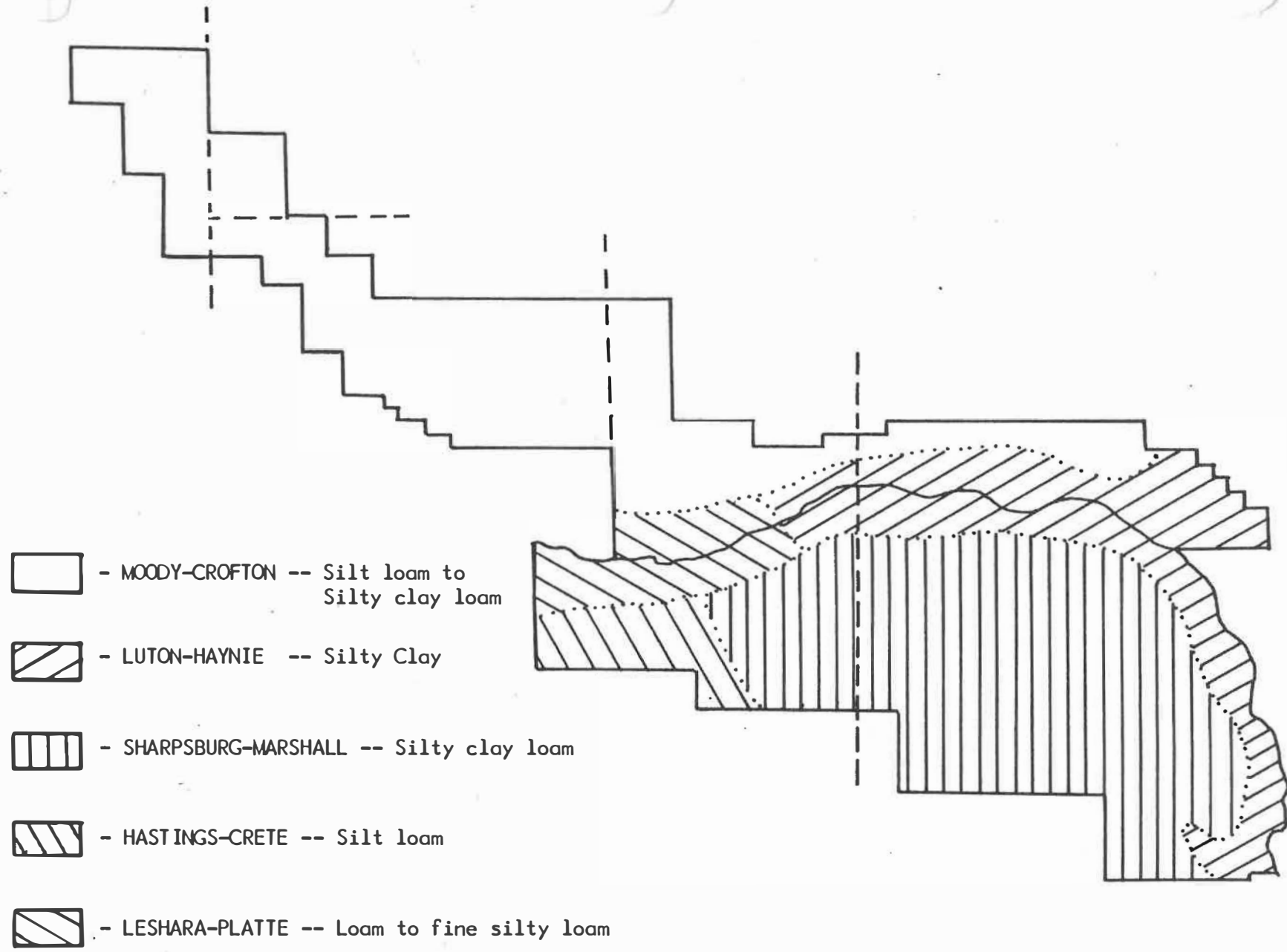
LOCATION





LOSING STREAMS

Source: Policy Issue Study on Supplemental Water Supplies, Nebraska Natural Resources Commission, 1984, From the Material Supplied by Conservation and Survey Division, University of Nebraska.



SOIL ASSOCIATIONS IN THE LOWER PLATTE NORTH
NATURAL RESOURCES DISTRICT

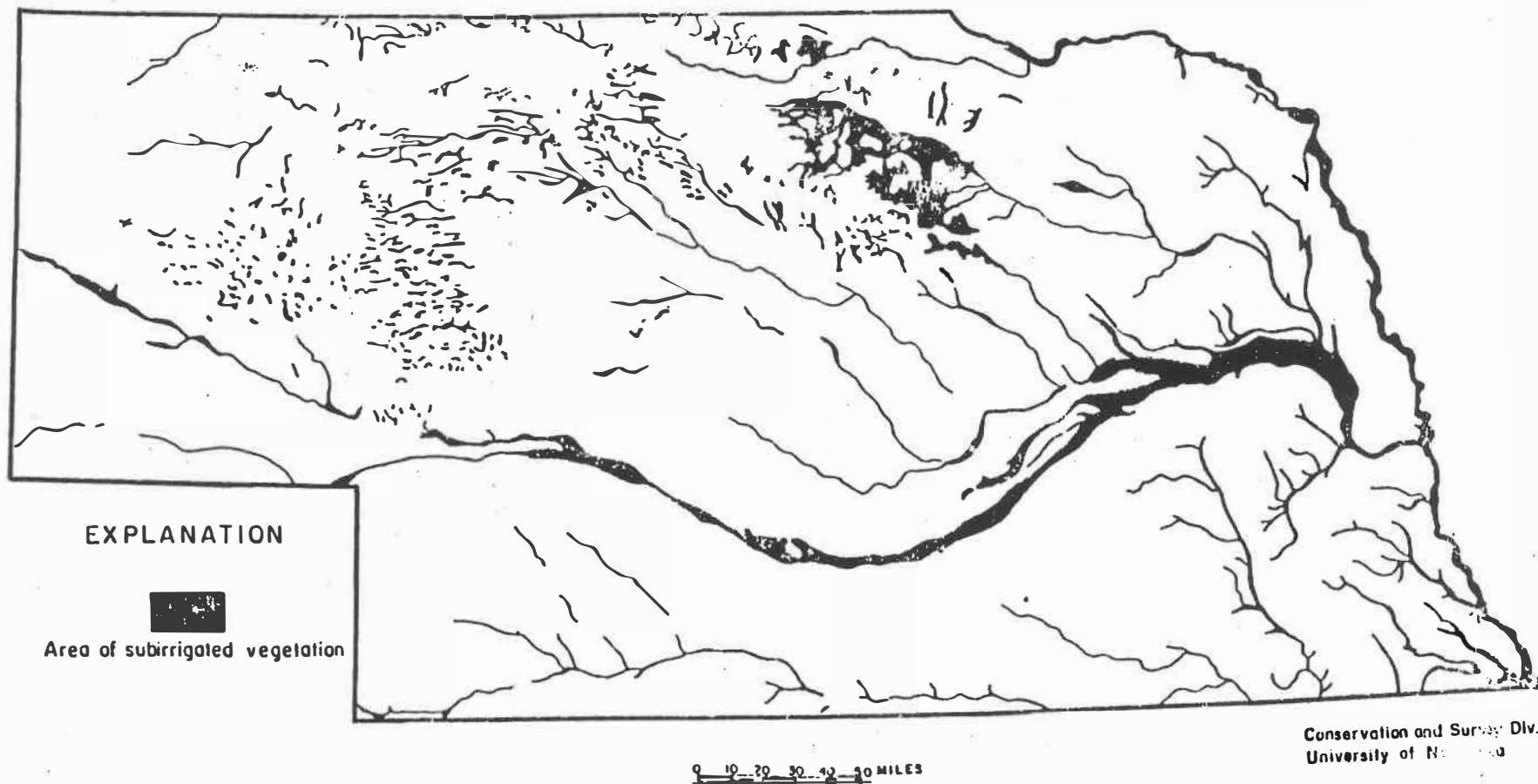
LOWER PLATTE NORTH NRD
THRU 02/93

SUMMARY OF REGISTERED WELLS
BY YEAR DRILLED

CUMULATIVE TOTALS BY COUNTY									YEARLY TOTALS BY COUNTY								
YEAR DRILLED	NUMBER OF REGISTERED WELLS								YEAR DRILLED	NUMBER OF REGISTERED WELLS							
	BOONE	BUTLR	COLFX	DODGE	MADIS	PLATT	SAUND	TOTAL		BOONE	BUTLR	COLFX	DODGE	MADIS	PLATT	SAUND	TOTAL
THRU 1940	0	22	27	47	0	1	3	100	THRU 1940	0	22	27	47	0	1	3	100
1941	0	23	45	56	0	2	3	129	1941	0	1	18	9	0	1	0	29
1942	0	25	49	60	0	3	5	142	1942	0	2	4	4	0	1	2	13
1943	0	28	50	62	0	3	5	148	1943	0	3	1	2	0	0	0	6
1944	0	30	53	70	0	4	6	163	1944	0	2	3	8	0	1	1	15
1945	0	31	54	73	0	4	6	168	1945	0	1	1	3	0	0	0	5
1946	0	34	56	77	0	4	6	177	1946	0	3	2	4	0	0	0	9
1947	0	36	64	81	0	4	6	191	1947	0	2	8	4	0	0	0	14
1948	0	40	69	84	0	4	6	203	1948	0	4	5	3	0	0	0	12
1949	0	40	70	91	0	5	11	217	1949	0	0	1	7	0	1	5	14
1950	0	42	74	96	1	5	12	230	1950	0	2	4	5	1	0	1	13
1951	0	42	75	101	1	5	12	236	1951	0	0	1	5	0	0	0	6
1952	0	43	78	105	1	5	12	244	1952	0	1	3	4	0	0	0	8
1953	0	48	81	113	1	5	13	261	1953	0	5	3	8	0	0	1	17
1954	0	73	109	140	5	10	28	365	1954	0	25	28	27	4	5	15	104
1955	0	118	157	180	7	28	48	538	1955	0	45	48	40	2	13	20	173
1956	11	181	228	329	12	77	90	928	1956	11	63	71	149	5	49	42	390
1957	16	216	258	419	14	91	140	1154	1957	5	35	30	90	2	14	50	226
1958	16	220	262	428	14	92	144	1176	1958	0	4	4	9	0	1	4	22
1959	16	221	268	431	14	95	146	1192	1959	0	1	6	3	0	4	2	16
1960	16	222	270	434	14	98	146	1200	1960	0	1	2	3	0	2	0	8
1961	16	229	277	438	14	102	147	1223	1961	0	7	7	4	0	4	1	23
1962	16	234	280	449	14	109	149	1251	1962	0	5	3	11	0	7	2	28
1963	16	236	285	452	15	116	154	1274	1963	0	2	5	3	1	7	5	23
1964	17	244	291	456	15	118	158	1299	1964	1	3	6	4	0	2	4	25
1965	18	249	296	458	15	123	160	1319	1965	1	5	5	2	0	5	2	20
1966	19	262	317	465	15	126	168	1372	1966	1	13	21	7	0	3	8	53
1967	20	272	343	488	16	133	178	1450	1967	1	10	26	23	1	7	10	78
1968	23	285	353	508	17	151	181	1518	1968	3	13	10	20	1	18	3	68
1969	27	302	370	531	17	167	192	1606	1969	4	17	17	23	0	16	11	88
1970	31	318	396	554	17	192	217	1725	1970	4	16	26	23	0	25	25	119
1971	36	336	410	575	20	215	238	1828	1971	5	18	14	21	3	21	21	133
1972	39	352	418	584	23	230	256	1902	1972	3	16	8	9	3	17	18	74
1973	42	361	424	594	23	237	263	1944	1973	3	9	6	10	0	7	7	42
1974	53	383	432	623	24	255	277	2047	1974	11	22	8	29	1	16	14	103
1975	67	406	458	675	27	304	345	2282	1975	14	23	26	52	3	49	68	235
1976	78	430	488	732	30	373	450	2581	1976	11	24	30	57	3	69	105	299
1977	81	480	522	770	30	420	545	2848	1977	3	50	34	38	0	47	95	267
1978	81	490	534	782	30	427	557	2901	1978	0	10	12	12	0	7	12	53
1979	84	500	547	788	30	435	574	2959	1979	3	10	13	6	0	8	17	57
1980	88	529	566	797	31	448	590	3049	1980	4	29	19	9	1	13	16	91
1981	100	539	583	811	34	470	627	3164	1981	12	10	17	14	3	22	37	115
1982	102	543	587	816	34	472	636	3190	1982	2	4	4	5	0	2	9	26
1983	103	543	587	820	34	474	642	3203	1983	1	0	0	4	0	2	6	13
1984	103	547	590	823	34	478	648	3223	1984	0	4	3	3	0	4	6	20
1985	105	549	593	826	34	479	651	3237	1985	2	2	3	3	0	1	3	14
1986	105	550	594	829	34	480	654	3246	1986	0	1	1	3	0	1	3	9
1987	106	550	600	835	34	482	657	3264	1987	1	0	6	6	0	2	3	18
1988	106	553	620	844	34	486	668	3311	1988	0	3	20	9	0	4	11	47
1989	108	563	643	864	34	500	702	3414	1989	2	10	23	20	0	14	34	103
1990	111	569	653	896	42	514	727	3512	1990	3	6	10	32	8	14	25	98
1991	113	572	662	911	45	519	744	3566	1991	2	3	9	15	3	5	17	54

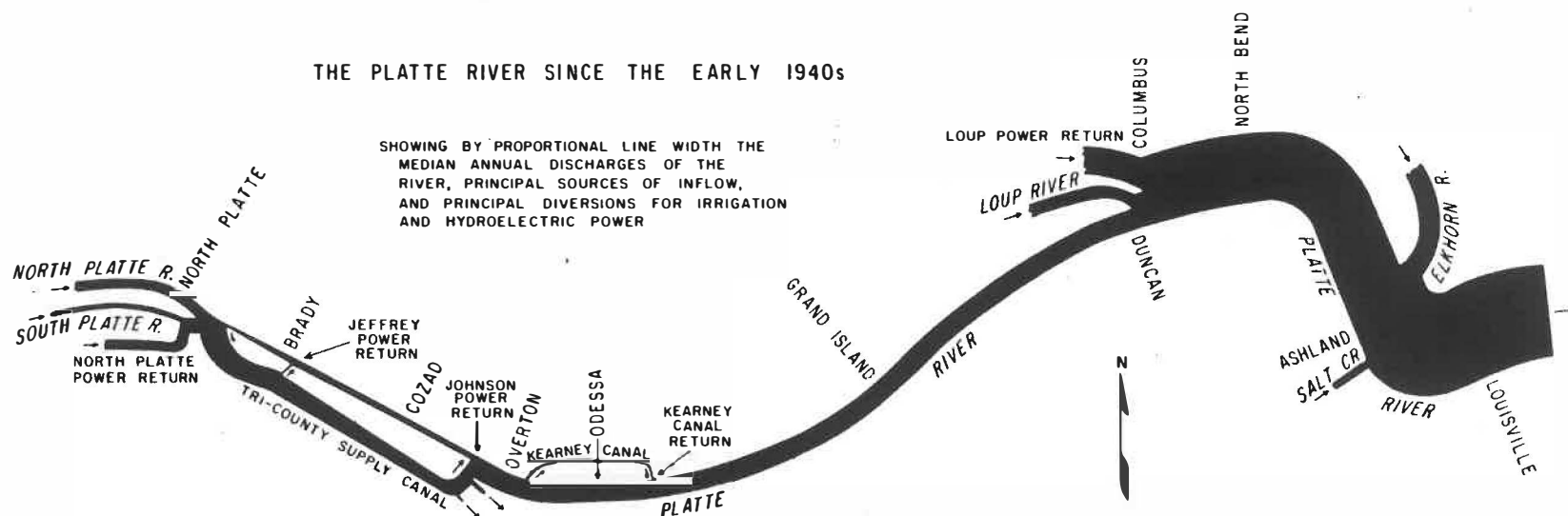
1992	113	578	674	925	46	532	758	3626
02/1993	113	578	674	925	46	532	758	3626
YEAR NOT KNOWN	0	2	3	5	0	3	4	17

1992	0	6	12	14	1	13	14	60
02/1993	0	0	0	0	0	0	0	0
YEAR NOT KNOWN	0	2	3	5	0	3	4	17
TOTAL	113	580	677	930	46	535	762	3643

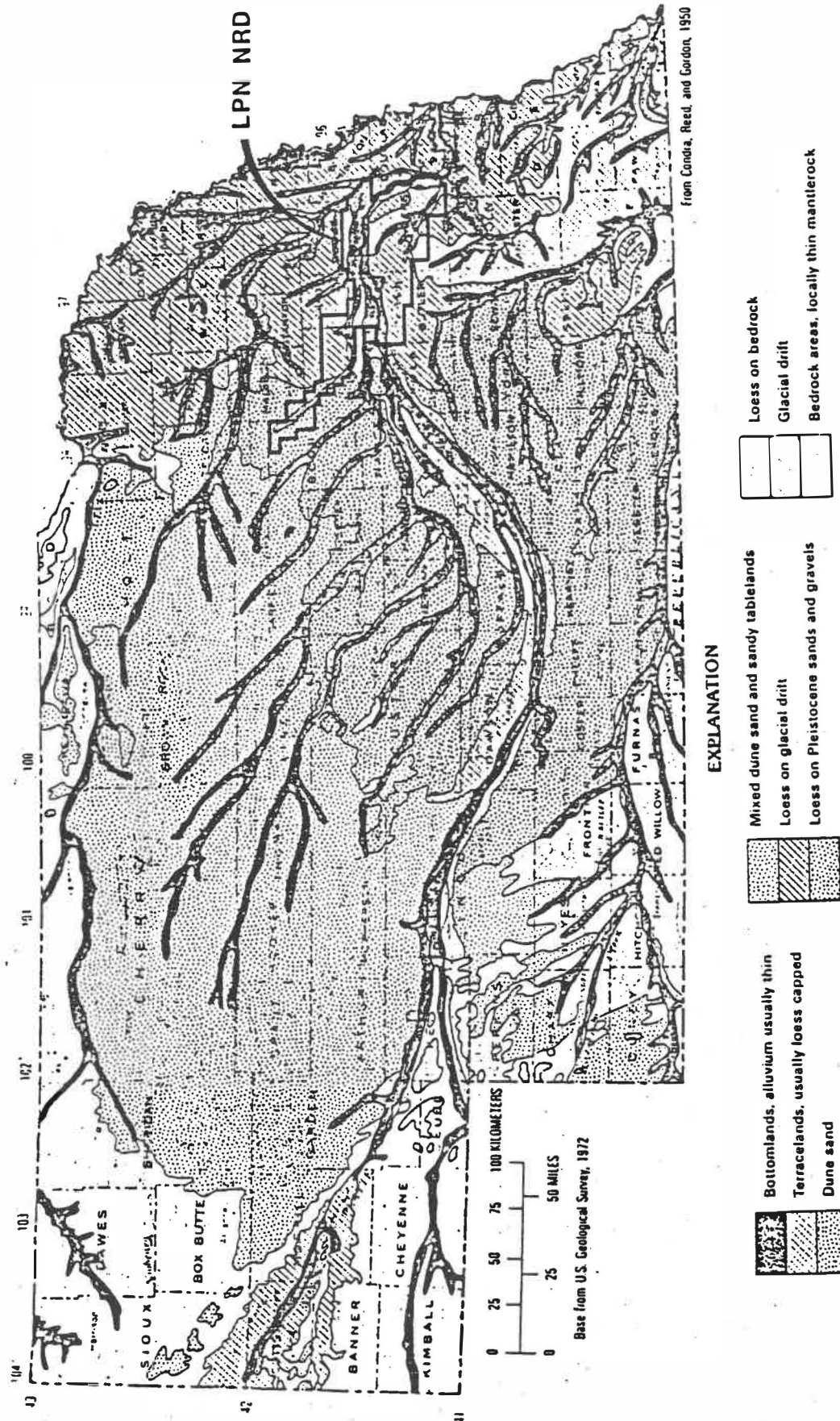


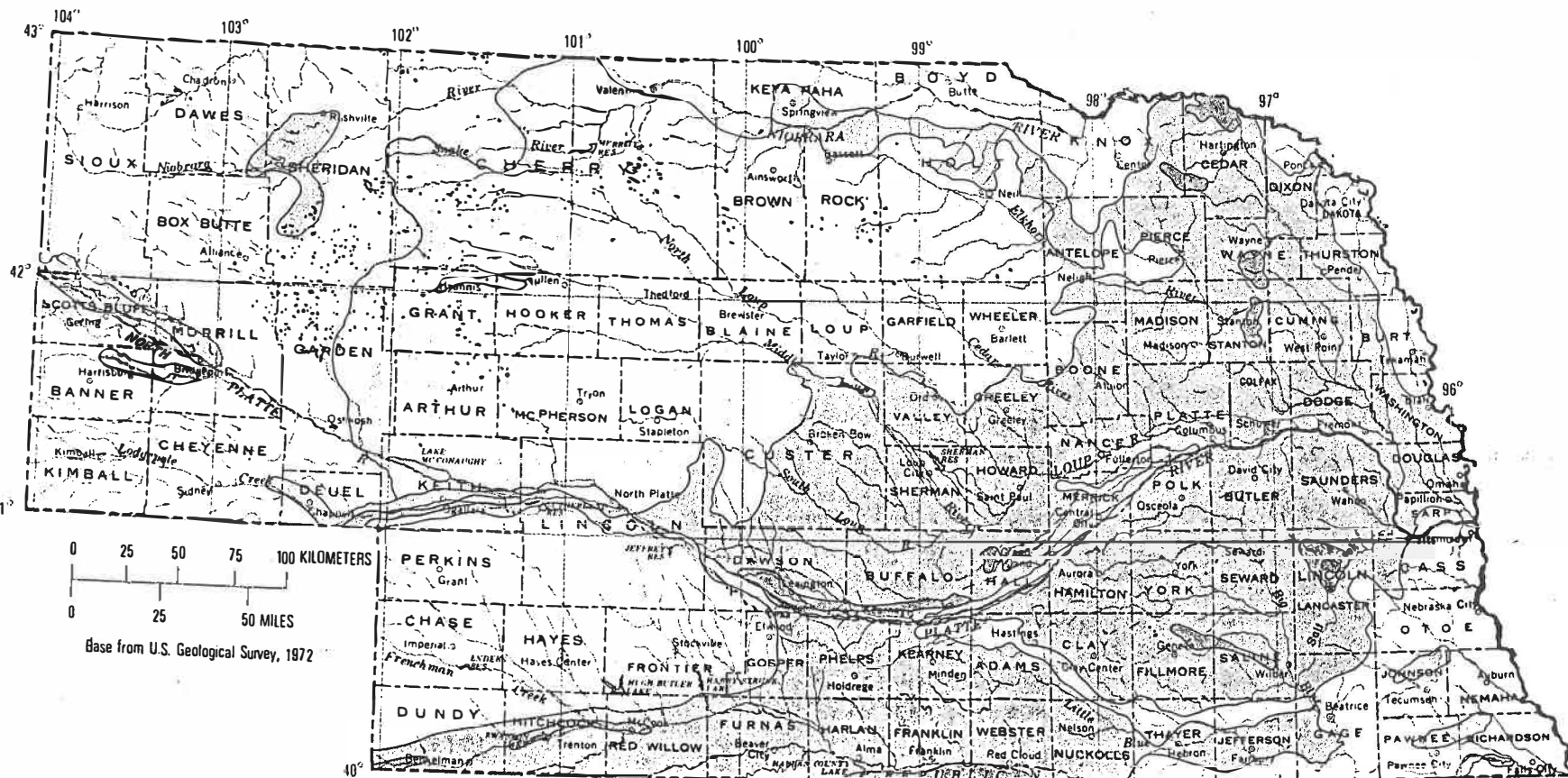
Principal Areas of Subirrigated Vegetation

Source: Shaffer, F.B., Availability and Use of Water in Nebraska, 1970.
Nebraska Water Survey Paper #31, Conservation and Survey Division,
University of Nebraska-Lincoln, 1972.

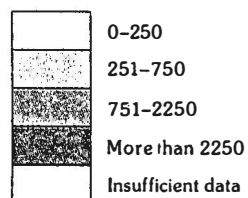


From: Bentall, "Nebraska's Platte River -
A Graphic Analysis of Flows"

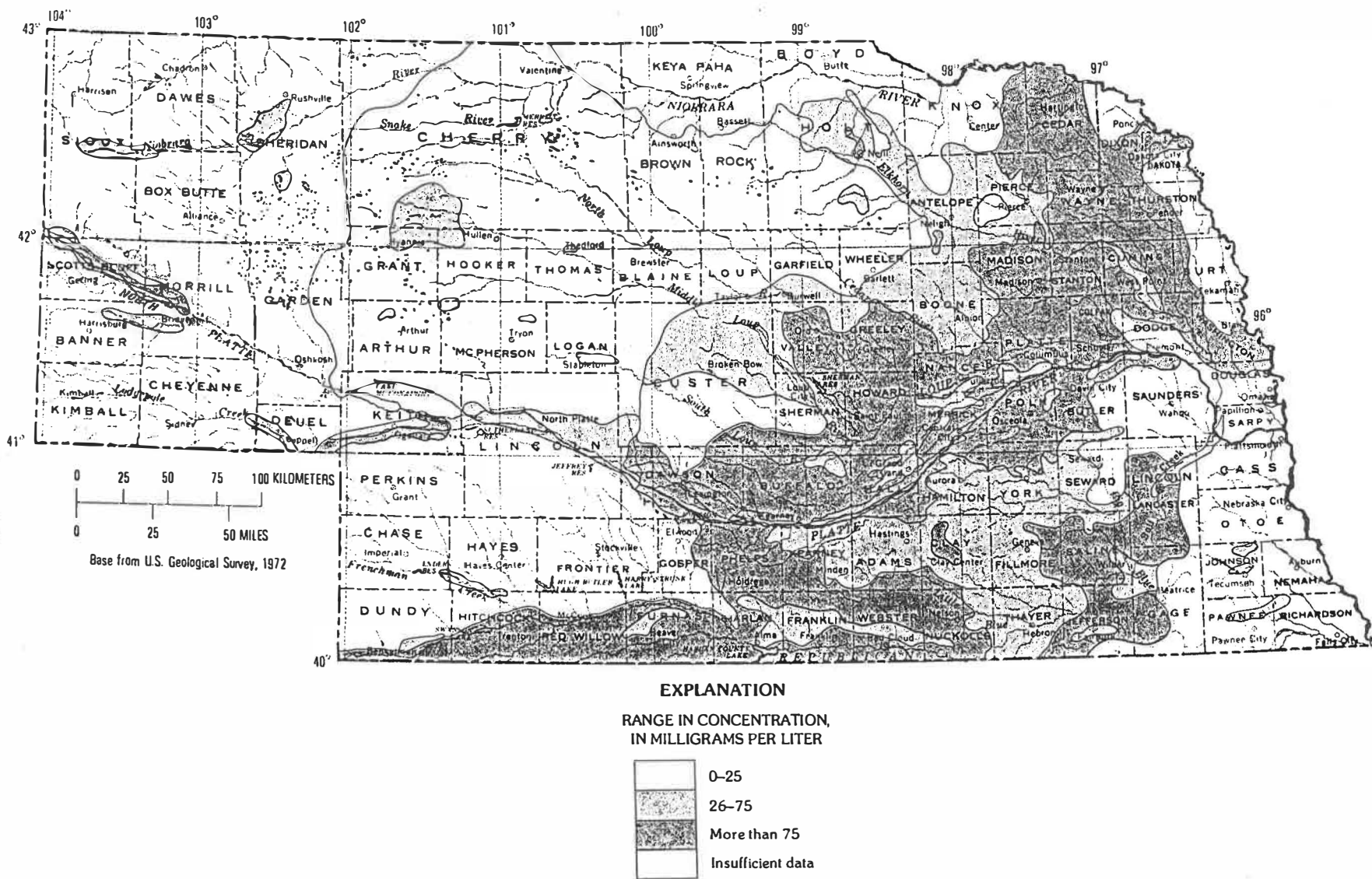




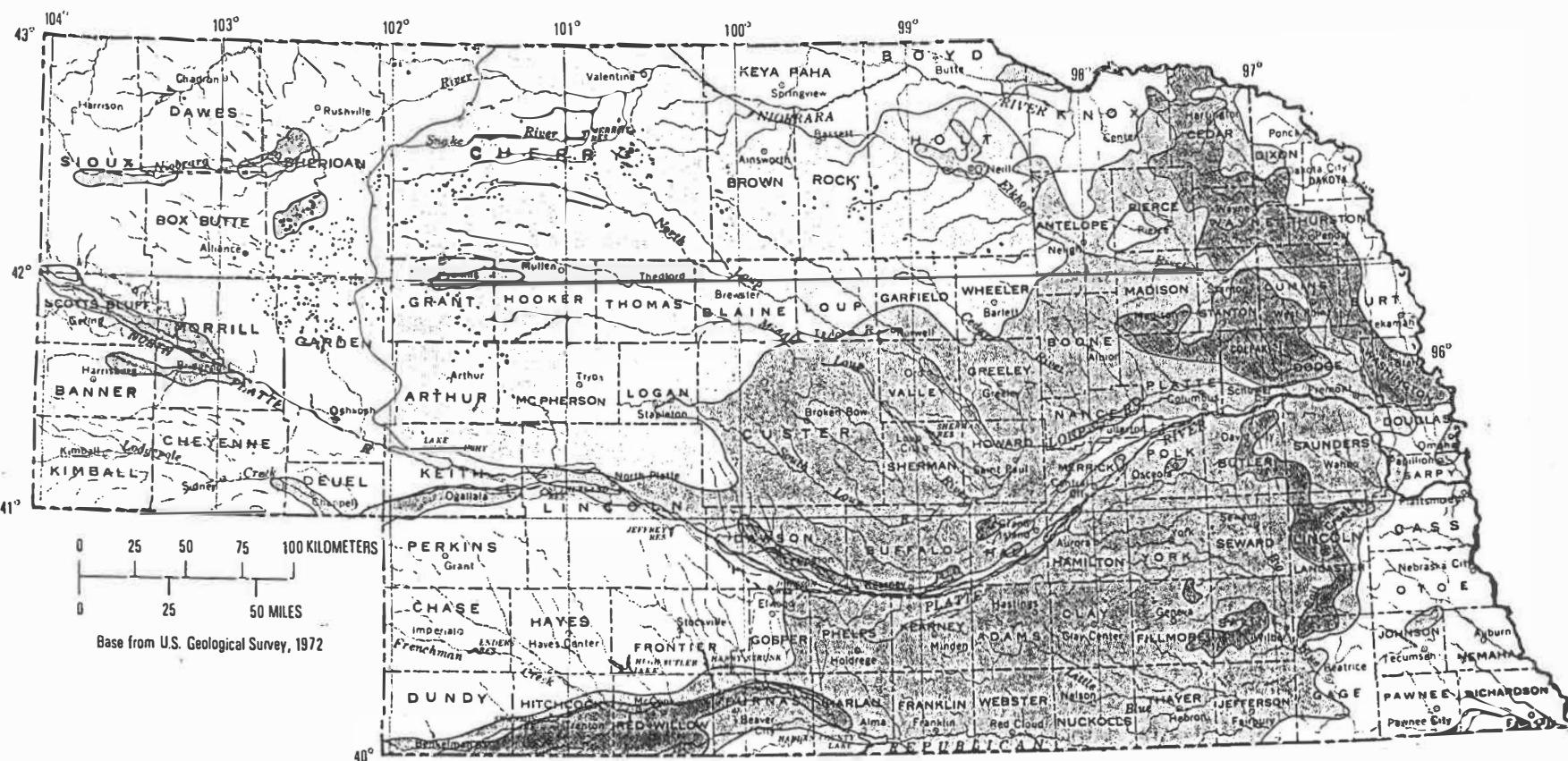
EXPLANATION
 RANGE IN CONCENTRATION,
 IN MILLIGRAMS PER LITER



Map showing dissolved-solids concentrations in water from Holocene and Pleistocene aquifers.

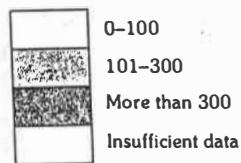


Map showing calcium concentrations in water from Holocene and Pleistocene aquifers.



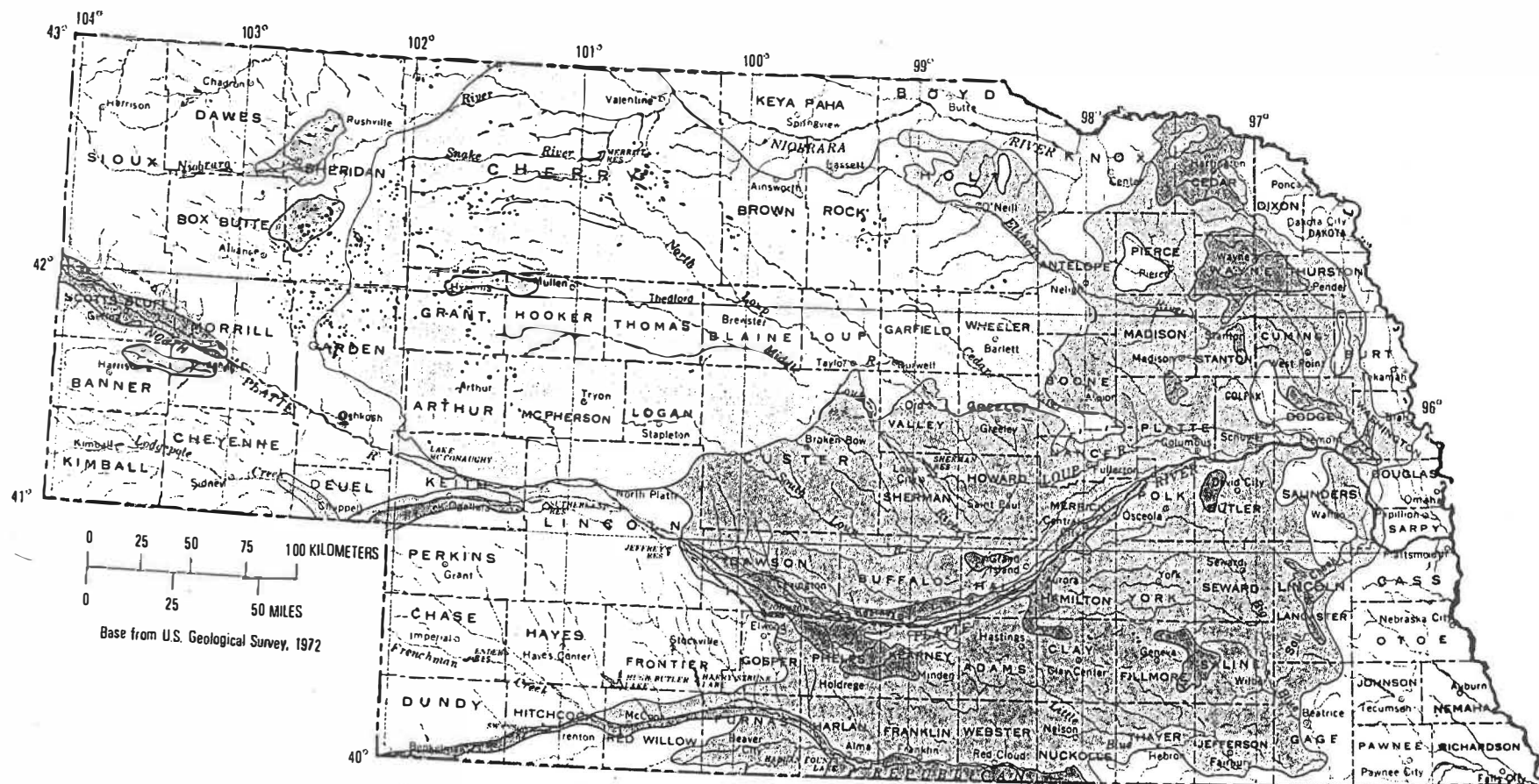
EXPLANATION

RANGE OF ALKALINITY AS CALCIUM CARBONATE,
IN MILLIGRAMS PER LITER

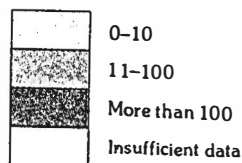


Map showing alkalinity of water from Holocene and Pleistocene aquifers.

From: Engerb, "Appraisal of Data for Groundwater Quality in Nebraska" USGS, 1984



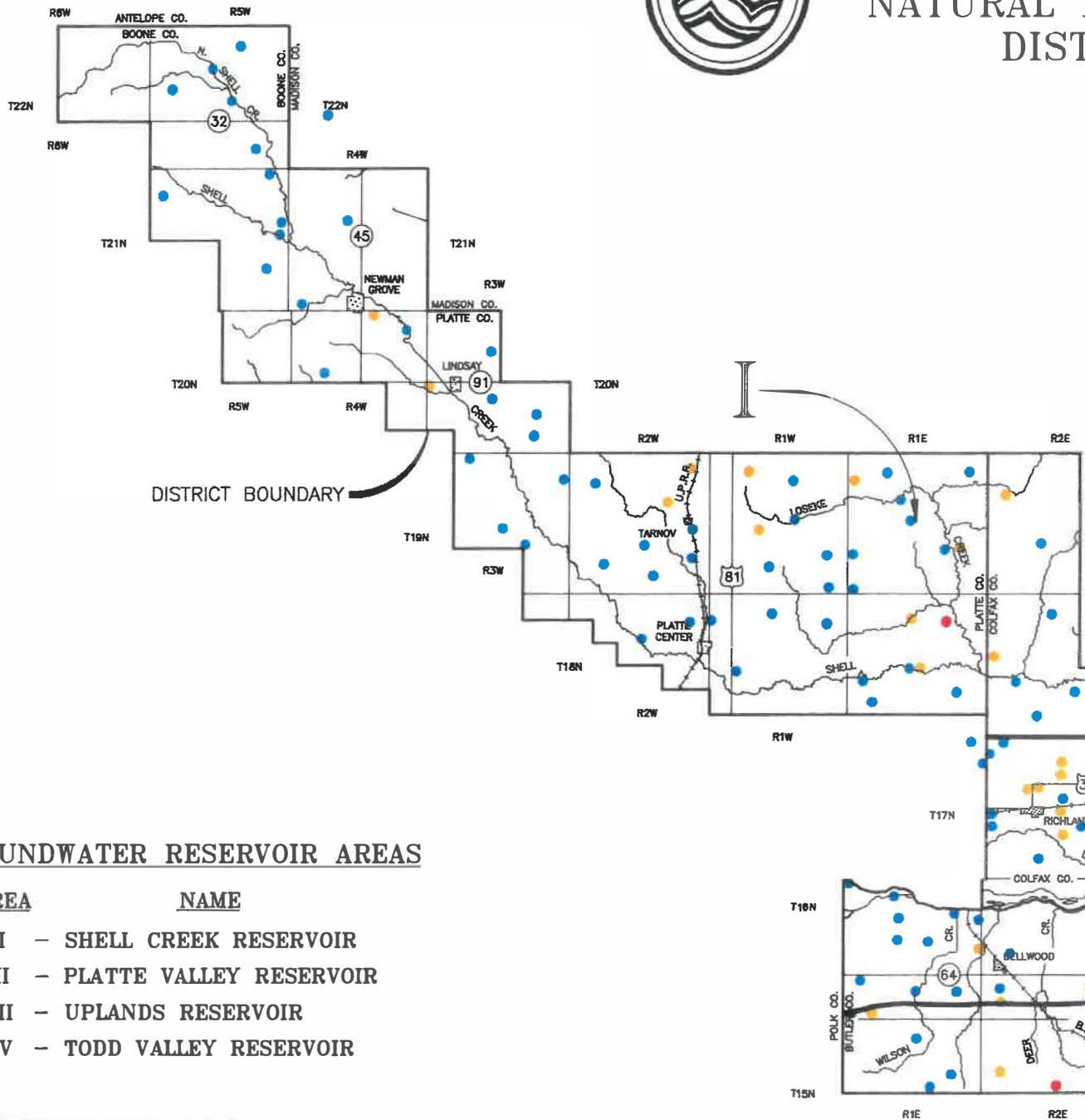
EXPLANATION
RANGE IN CONCENTRATION,
IN MILLIGRAMS PER LITER



Map showing sulfate concentrations in water from Holocene and Pleistocene aquifers.

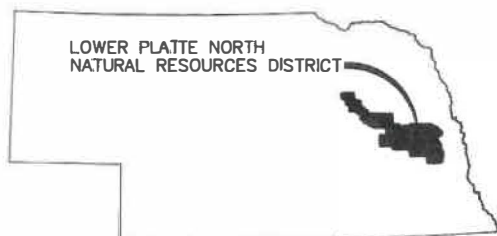


LOWER PLATTE NATURAL RESOURCES DISTRICT

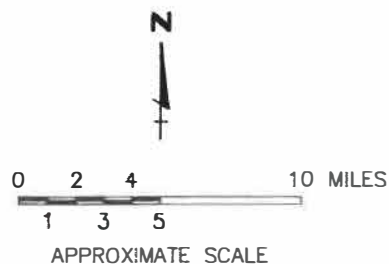


GROUNDWATER RESERVOIR AREAS

AREA	NAME
I	SHELL CREEK RESERVOIR
II	PLATTE VALLEY RESERVOIR
III	UPLANDS RESERVOIR
IV	TODD VALLEY RESERVOIR



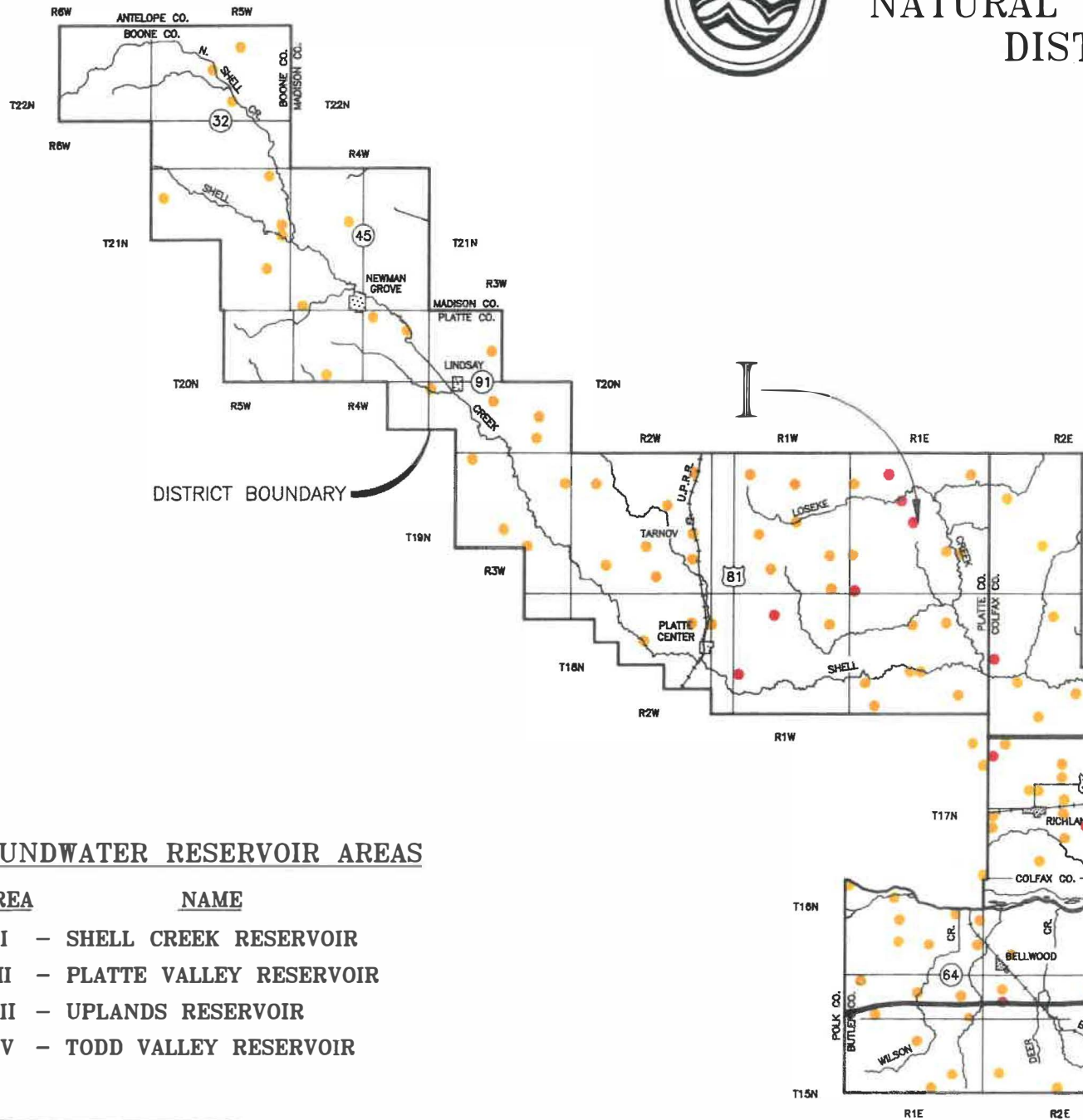
LOCATION



Source: 1987
Lower
Nebras
UN-L

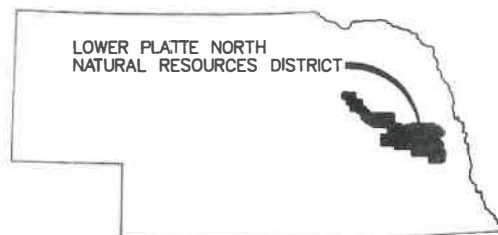


LOWER PLATTE NATURAL RESOURCES DISTRICT

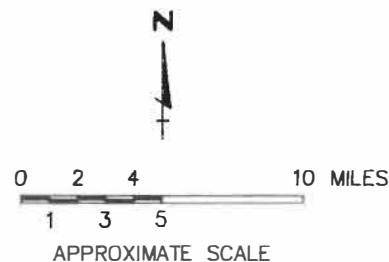


GROUNDWATER RESERVOIR AREAS

AREA	NAME
I	SHELL CREEK RESERVOIR
II	PLATTE VALLEY RESERVOIR
III	UPLANDS RESERVOIR
IV	TODD VALLEY RESERVOIR

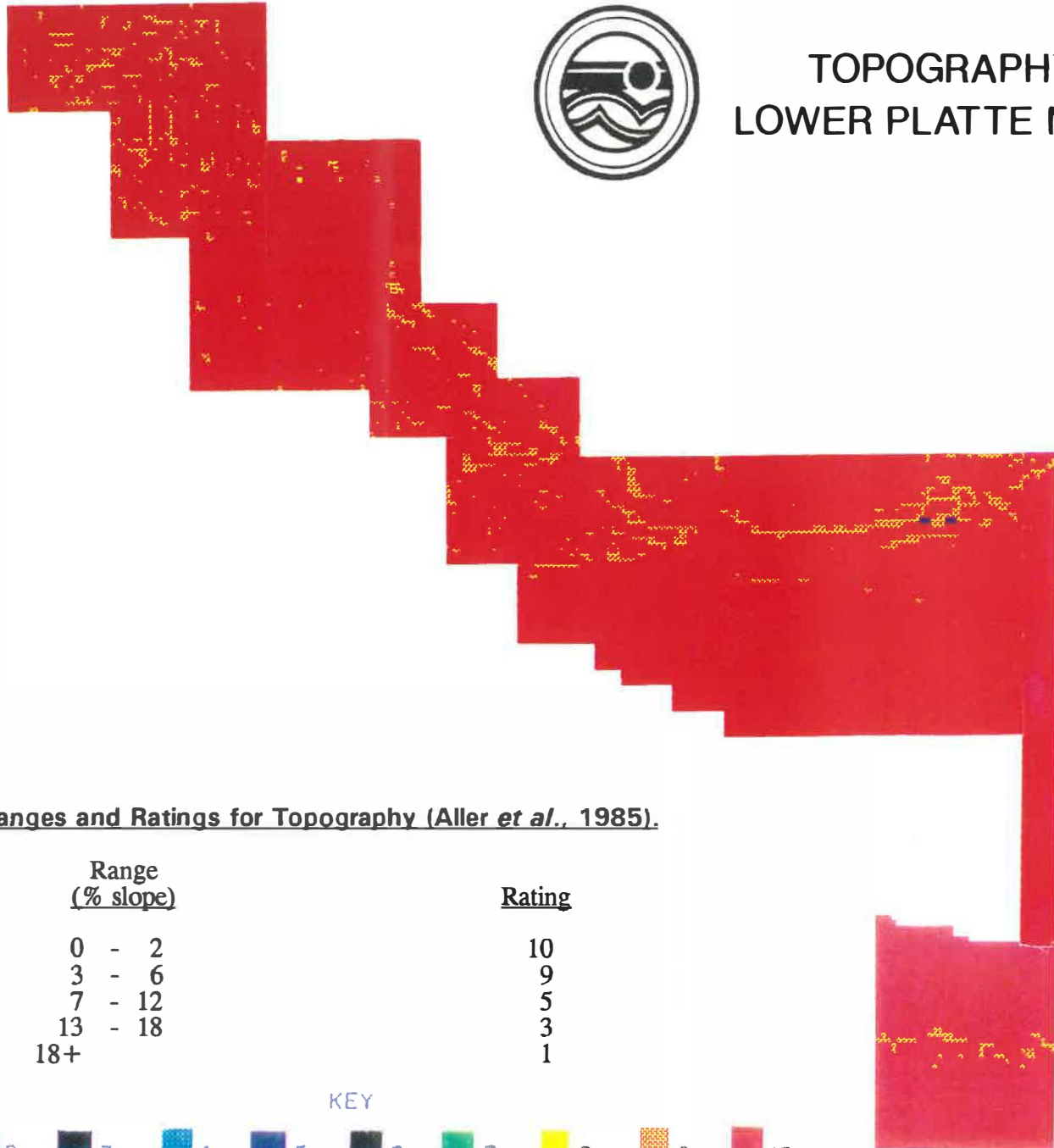


LOCATION



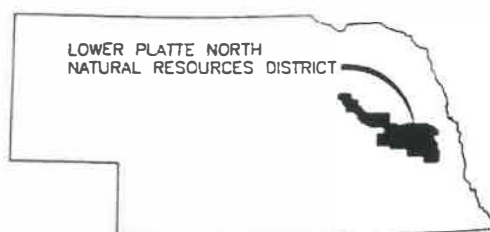


TOPOGRAPHY LOWER PLATTE NORTH



Ranges and Ratings for Topography (Aller et al., 1985).

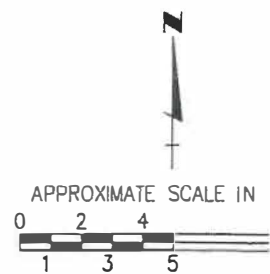
<u>Range (% slope)</u>	<u>Rating</u>
0 - 2	10
3 - 6	9
7 - 12	5
13 - 18	3
18+	1



LOWER PLATTE NORTH
NATURAL RESOURCES DISTRICT

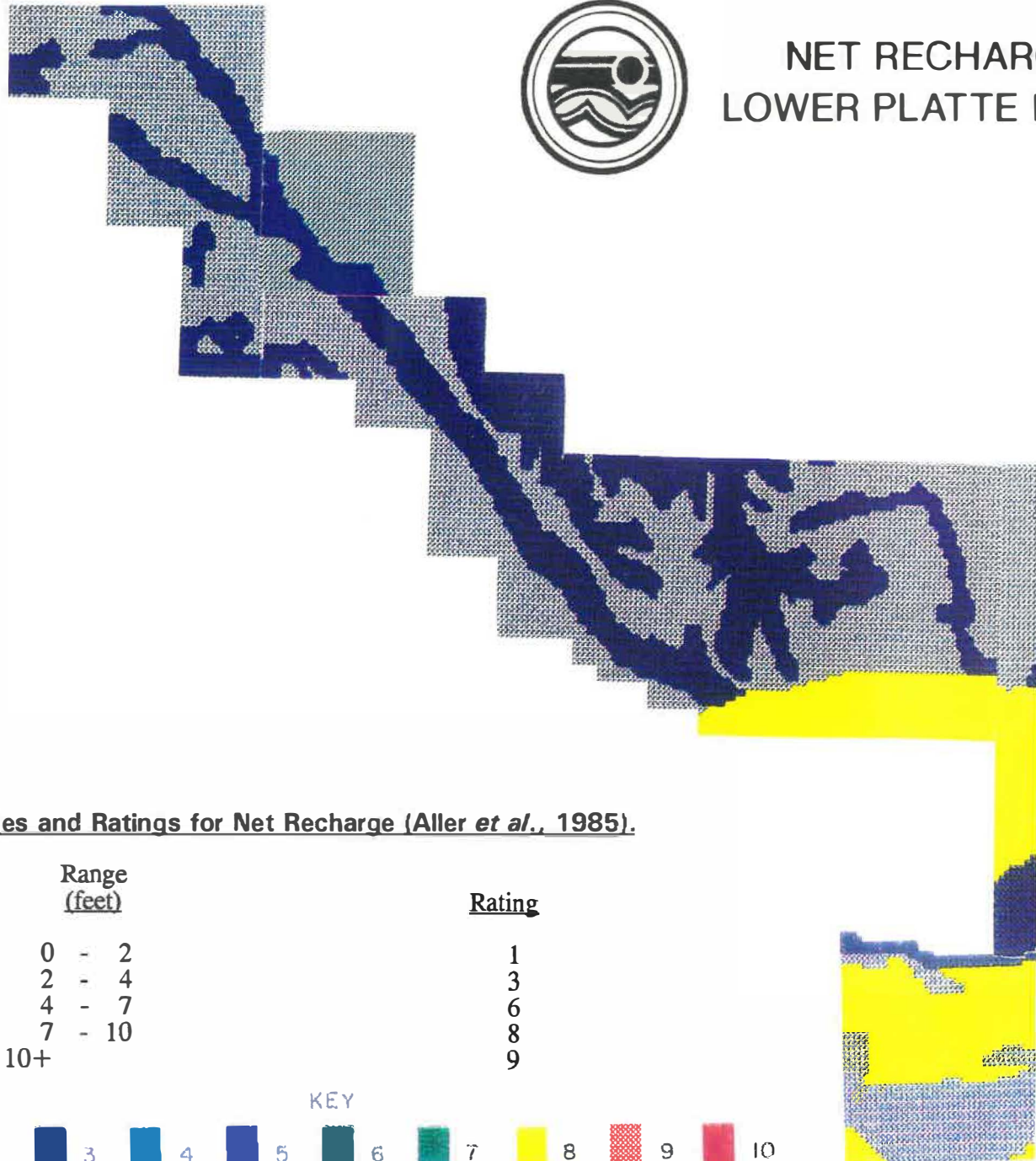
LOCATION

HWS
Consulting Group Inc.



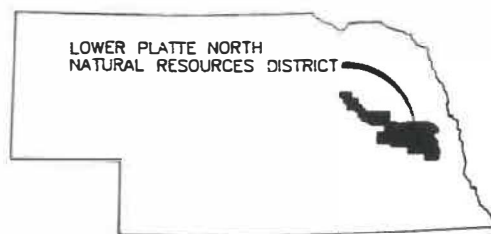
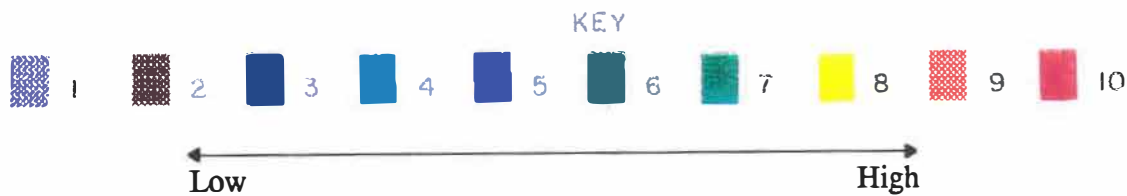


NET RECHARGE LOWER PLATTE NORTH



Ranges and Ratings for Net Recharge (Aller *et al.*, 1985).

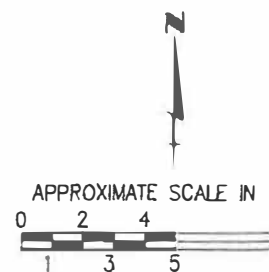
Range (feet)	Rating
0 - 2	1
2 - 4	3
4 - 7	6
7 - 10	8
10+	9



LOWER PLATTE NORTH
NATURAL RESOURCES DISTRICT

LOCATION

HWS
Consulting Group, Inc.





SOILS LOWER PLATTE

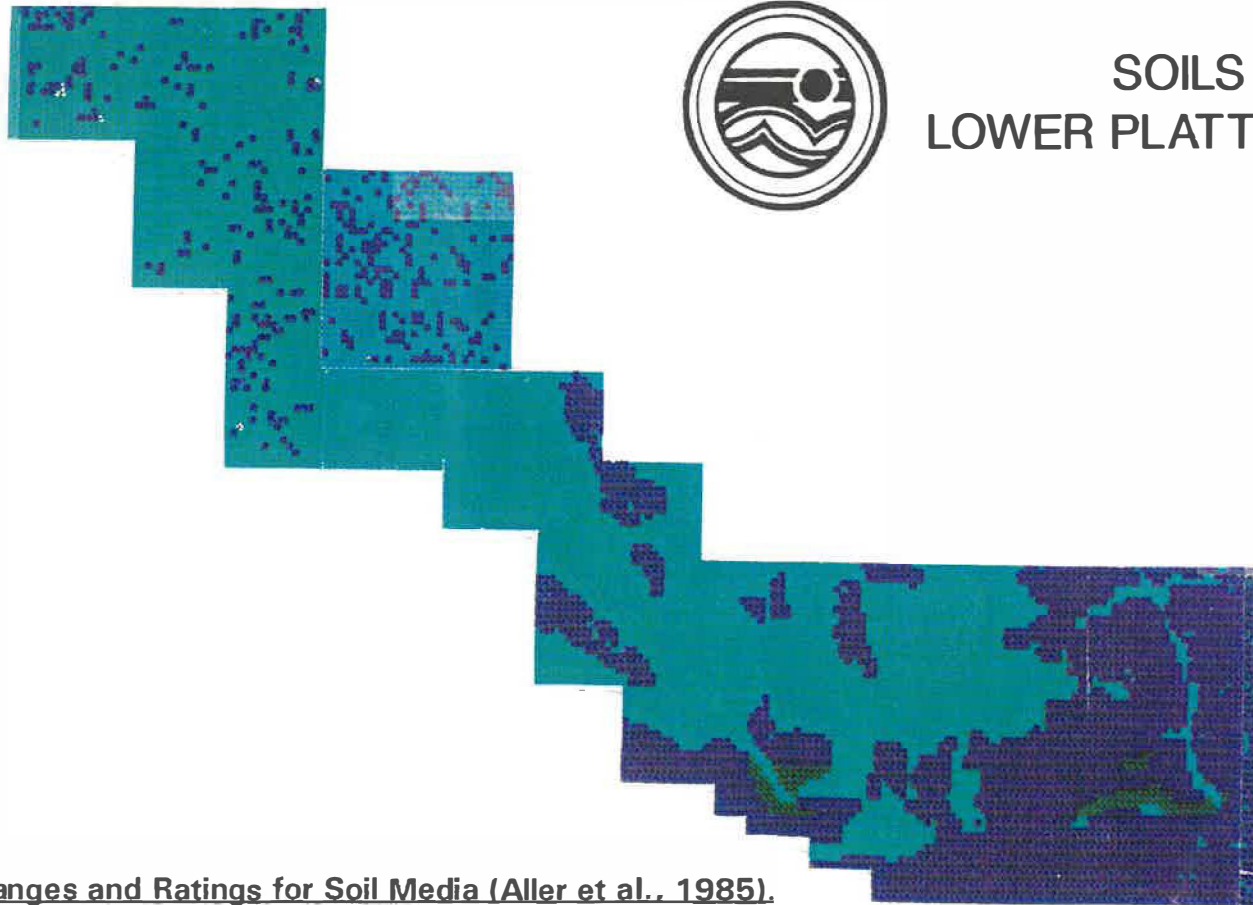


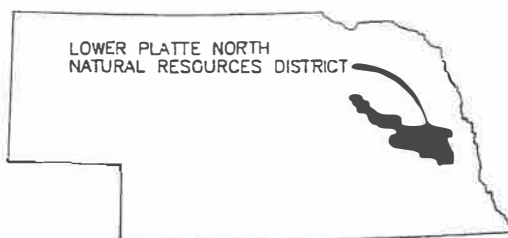
Table A-6. Ranges and Ratings for Soil Media (Aller et al., 1985).

<u>Range</u>	<u>Rating</u>
Thin or absent	10
Gravel	10
Sand	9
Peat	8
Shrinking and/or aggregated clay	7
Sandy loam	6
Loam	5
Silty loam*	4
Clay loam**	3
Muck	2
Nonshrinking and nonaggregated clay	1

*Sandy clay loam and silt also were given a rating of 4.

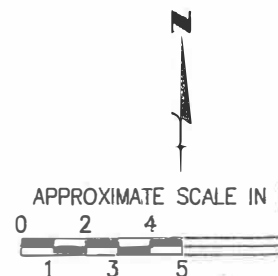
**Silty clay, sandy clay, and silty clay loam also were given a rating of 3.

KEY



LOCATION

HWS
Consulting Group Inc.



LOWER PLATTE NORTH
NATURAL RESOURCES

INTERMEDIATE UNSATURATED S LOWER PLATTE N



Assignment of Ratings for Vadose Zone.

Range	Rating
Clay	2
Silty clay, sandy clay, gravelly clay	3
Clayey silt	4
Silt	5
Sandy silt	6
Sand	7
Sand and gravel	8

Ranges and Ratings for Impact of Vadose Zone Media (Aller *et al.*, 1985).

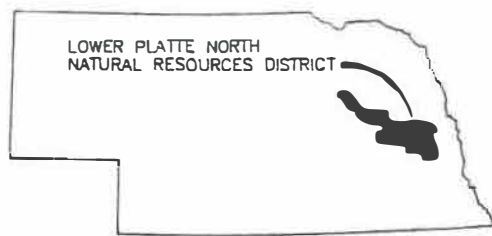
Range	Rating	Typical Rating
Silt/Clay	2 - 6	3
Shale	2 - 5	3
Limestone	2 - 7	6
Sandstone	4 - 8	6
Bedded limestone, sandstone, shale	4 - 8	6
Sand and gravel with significant silt and clay	4 - 8	6
Metamorphic/igneous	2 - 8	4
Sand and gravel	6 - 9	8
Basalt	2 - 10	9
Karst limestone	8 - 10	10

KEY



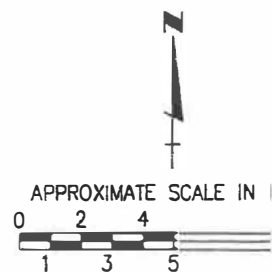
Thick

Thin



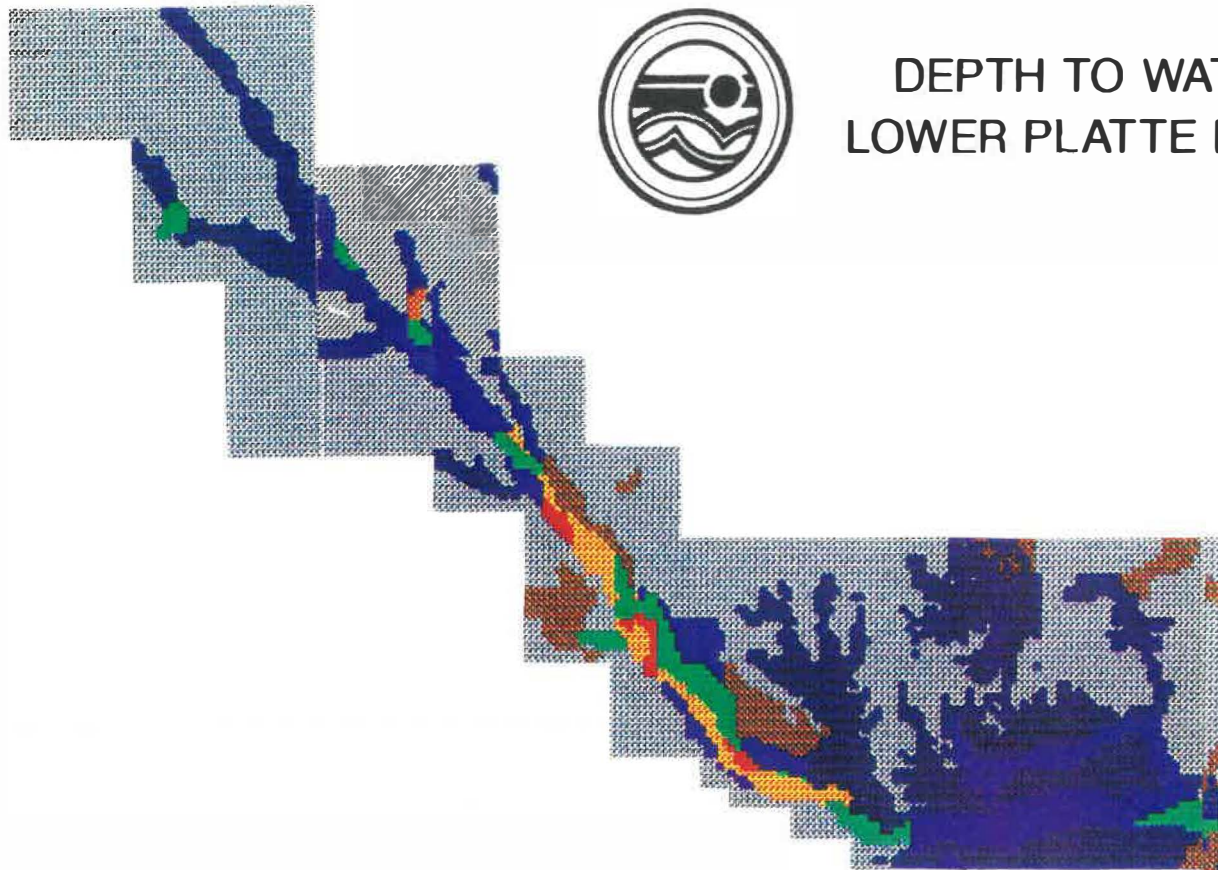
LOCATION

HWS
Consulting Group Inc.



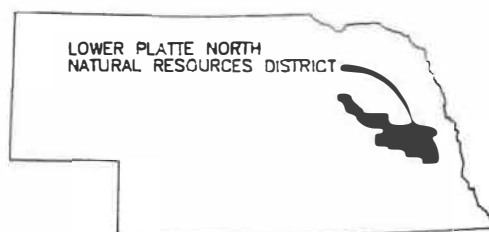


DEPTH TO WATER LOWER PLATTE NORTH



Ranges and Ratings for Depth to Water (Aller et al., 1985).

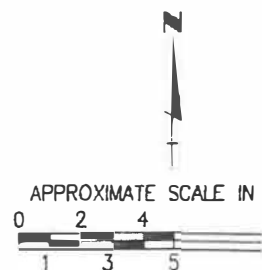
Range (feet)	Rating
0 - 5	10
5 - 15	9
15 - 30	7
30 - 50	5
50 - 75	3
75 - 100	2
100+	1



LOWER PLATTE NORTH
NATURAL RESOURCES DISTRICT

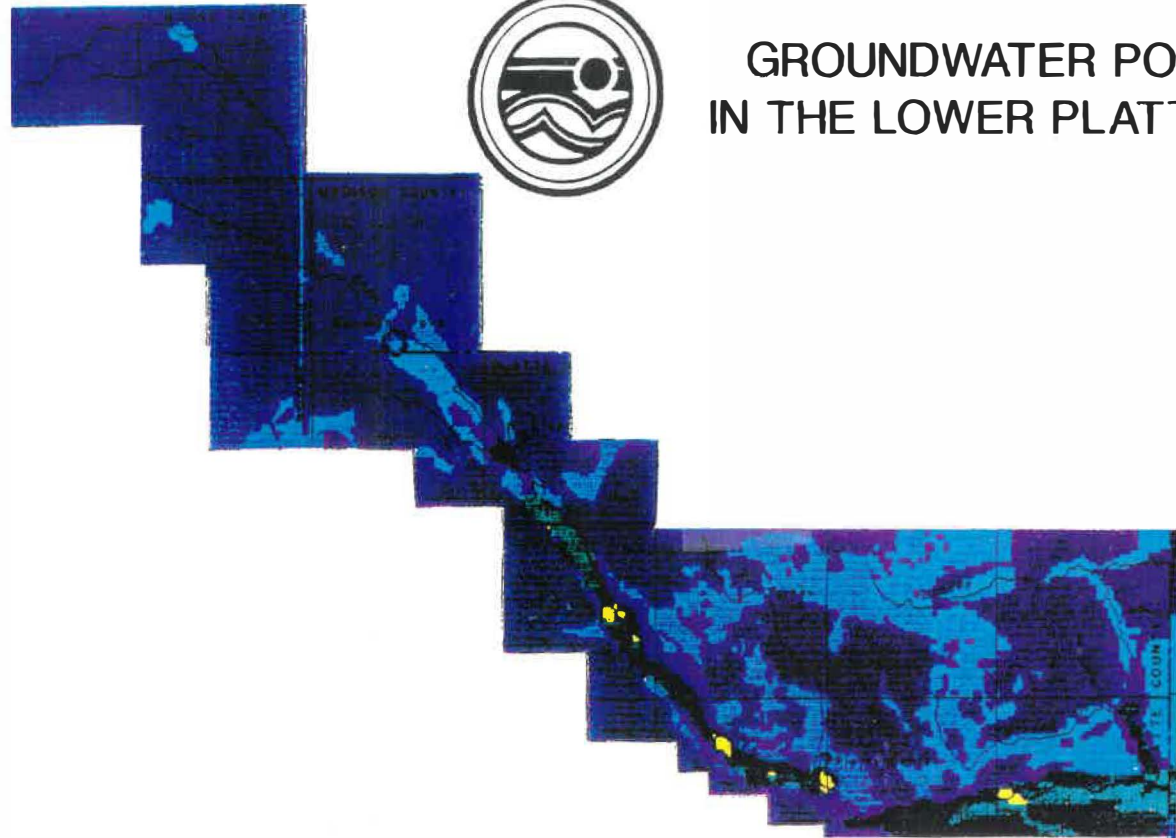
LOCATION

HWS
Consulting Group, Inc.

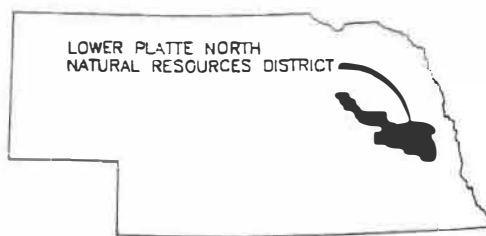
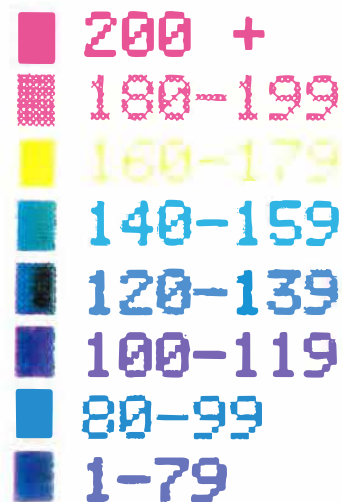




GROUNDWATER POTENTIAL IN THE LOWER PLATTE

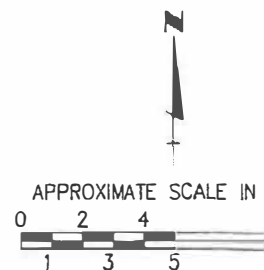


The DRASTIC Index is subdivided into eight ranges and each range is depicted by a different color. The warm colors, red, orange, and yellow, depict areas where the potential for contamination is highest. These are the areas with the highest DRASTIC Indices. The dark colors, royal blue, turquoise, and dark blue, portray areas least vulnerable to contamination and within these areas the corresponding DRASTIC Index is below 120. The greens represent the middle values between 120 and 159.



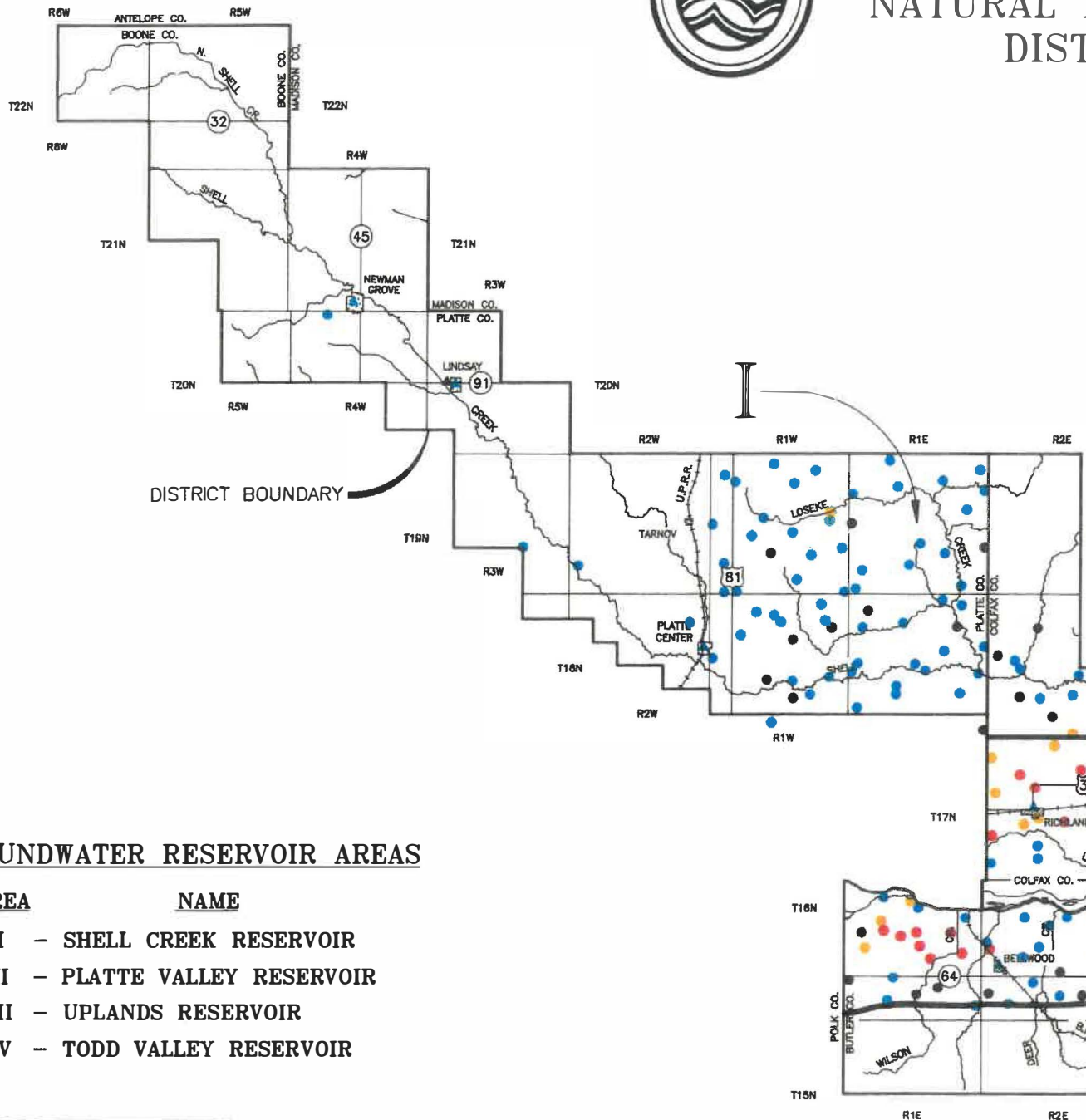
LOCATION

HWS
Consulting Group, Inc.



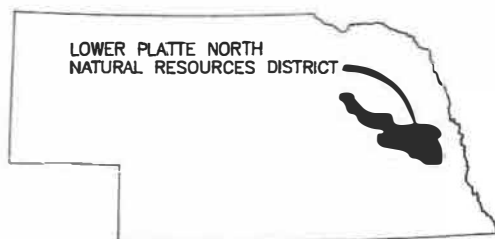


LOWER PLATTE NATURAL RESOURCES DISTRICT

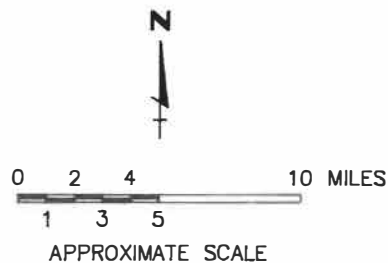


GROUNDWATER RESERVOIR AREAS

AREA	NAME
I	SHELL CREEK RESERVOIR
II	PLATTE VALLEY RESERVOIR
III	UPLANDS RESERVOIR
IV	TODD VALLEY RESERVOIR



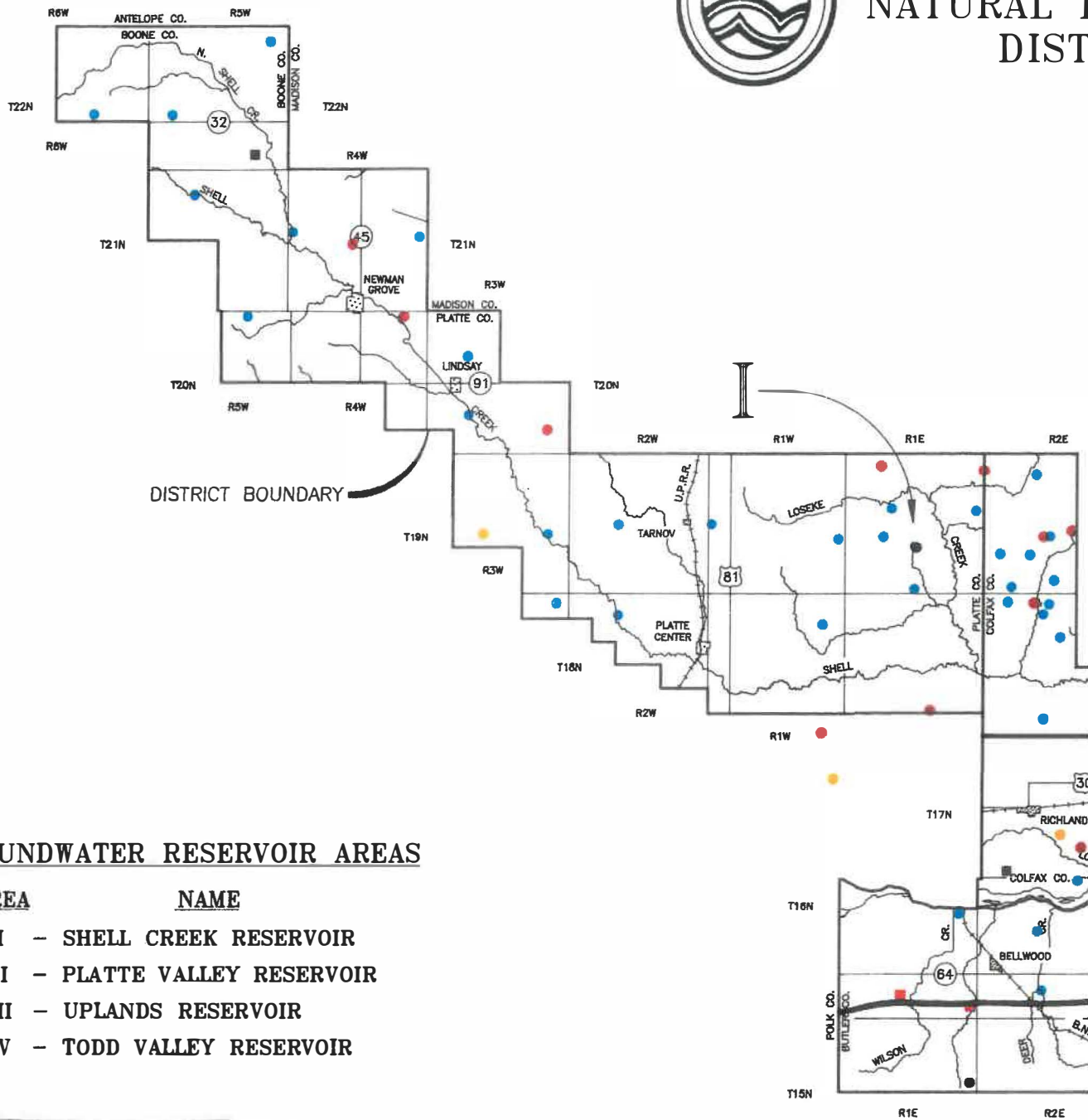
LOCATION



Source: Lower Platte
Nebraska
R.F. Spalding

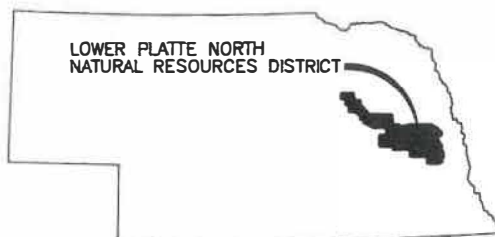


LOWER PLATTE NATURAL RESOURCES DISTRICT

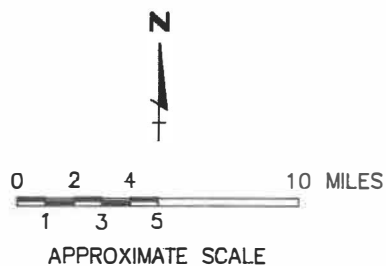


GROUNDWATER RESERVOIR AREAS

- | AREA | NAME |
|------|-------------------------|
| I | SHELL CREEK RESERVOIR |
| II | PLATTE VALLEY RESERVOIR |
| III | UPLANDS RESERVOIR |
| IV | TODD VALLEY RESERVOIR |



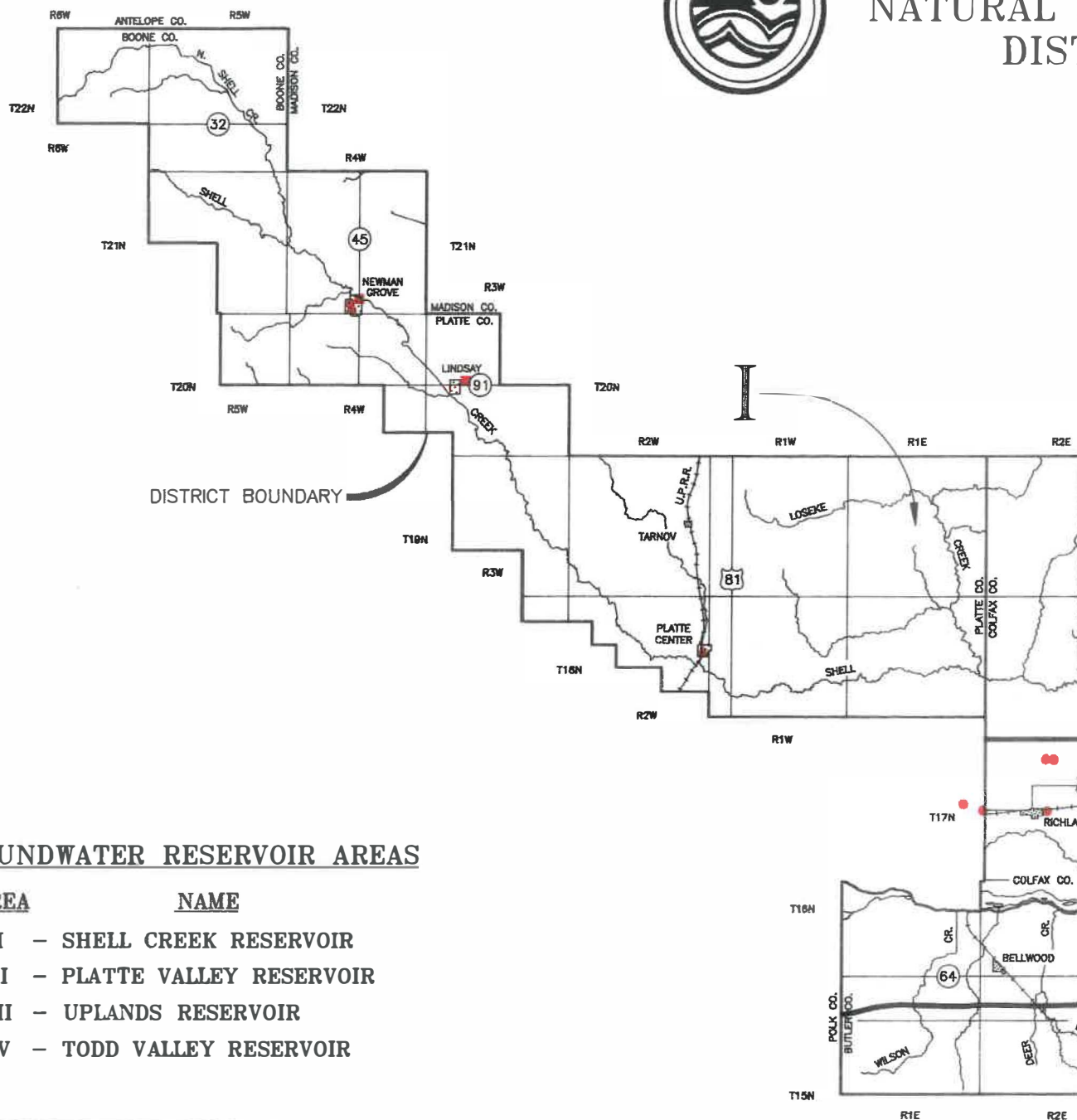
LOCATION



Source: Lower Pl
Nebraska
R.F. Spal

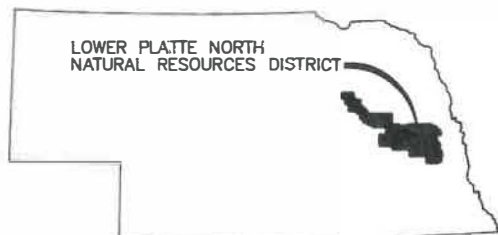


LOWER PLATTE NATURAL DIST

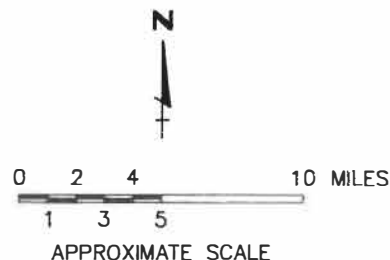


GROUNDWATER RESERVOIR AREAS

AREA	NAME
I	SHELL CREEK RESERVOIR
II	PLATTE VALLEY RESERVOIR
III	UPLANDS RESERVOIR
IV	TODD VALLEY RESERVOIR



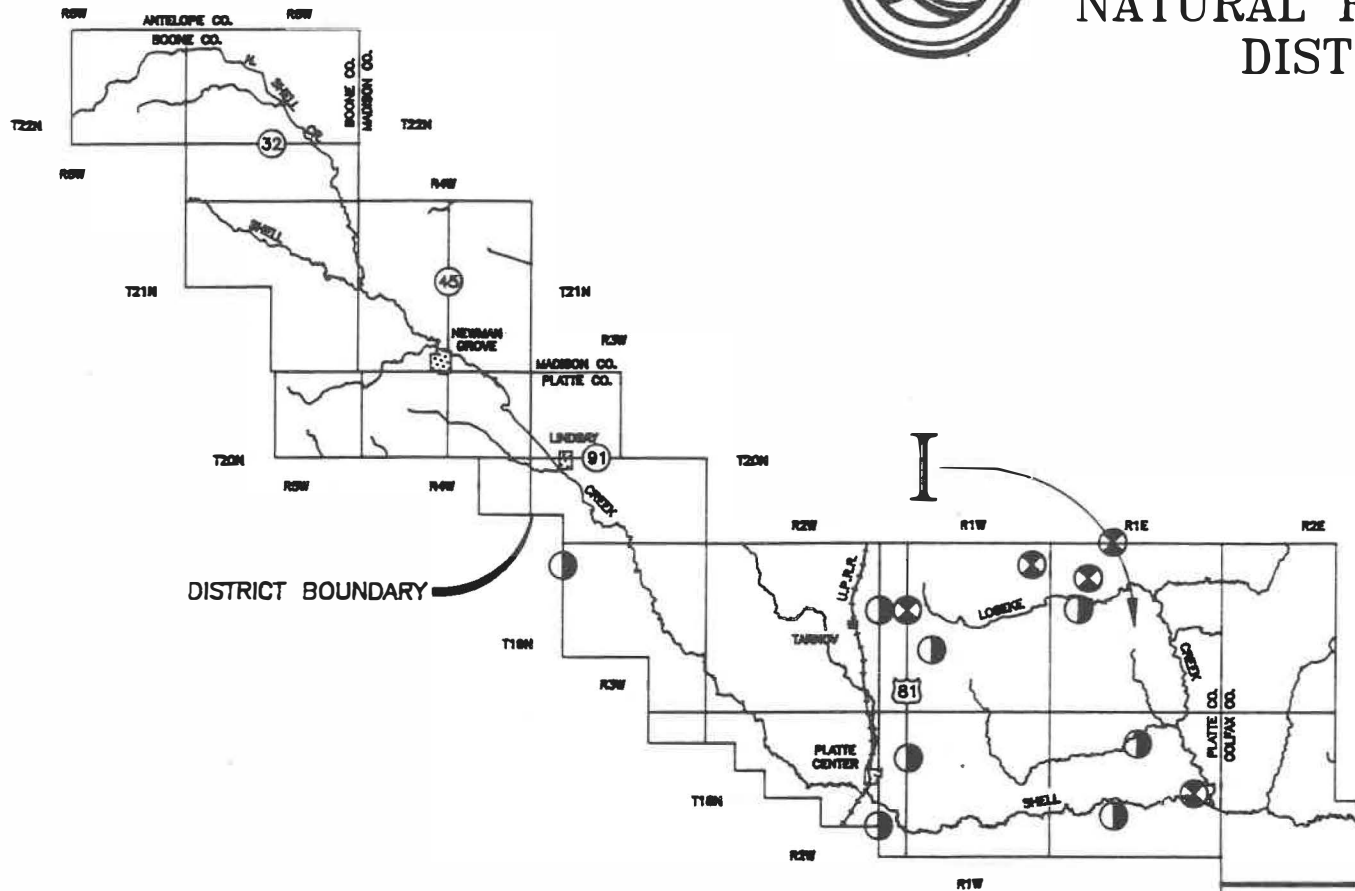
LOCATION



Source: Nebraska [
Nebraska [
U.S. Enviro



LOWER PLAT NATURAL R DIST

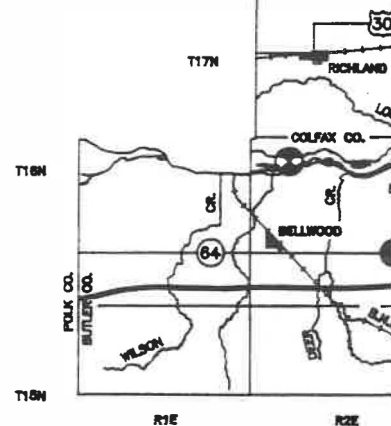
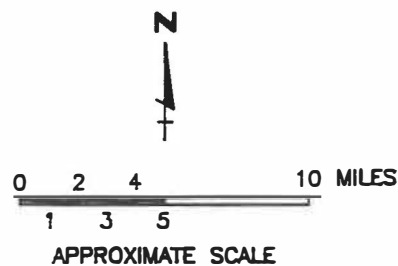


GROUNDWATER RESERVOIR AREAS

AREA	NAME
I	SHELL CREEK RESERVOIR
II	PLATTE VALLEY RESERVOIR
III	UPLANDS RESERVOIR
IV	TODD VALLEY RESERVOIR

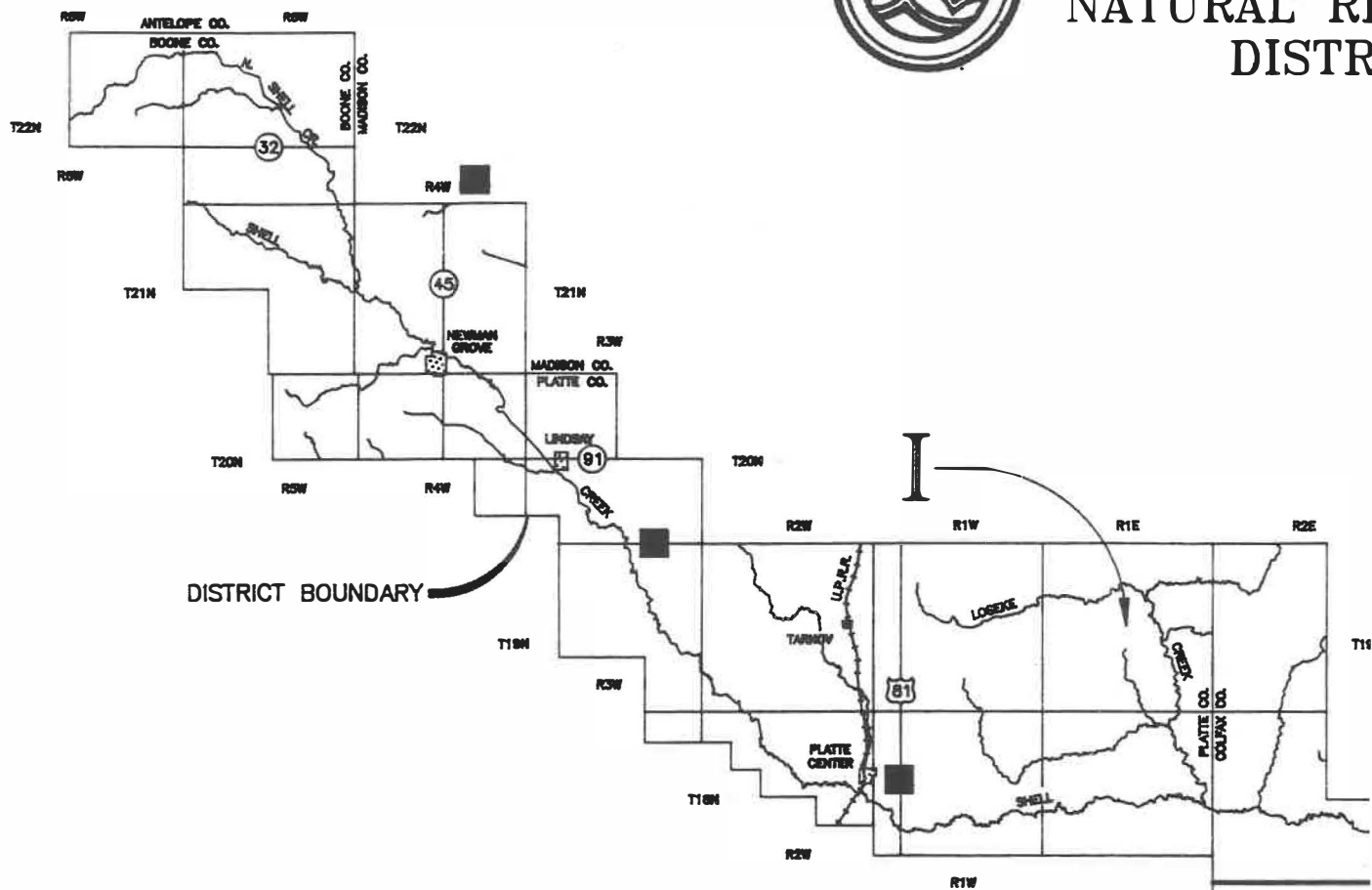


LOCATION





LOWER PLAT NATURAL RI DISTR

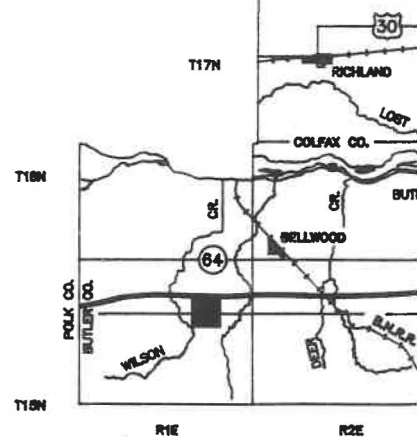
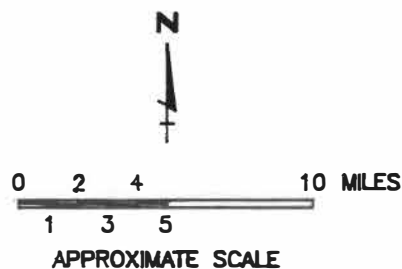


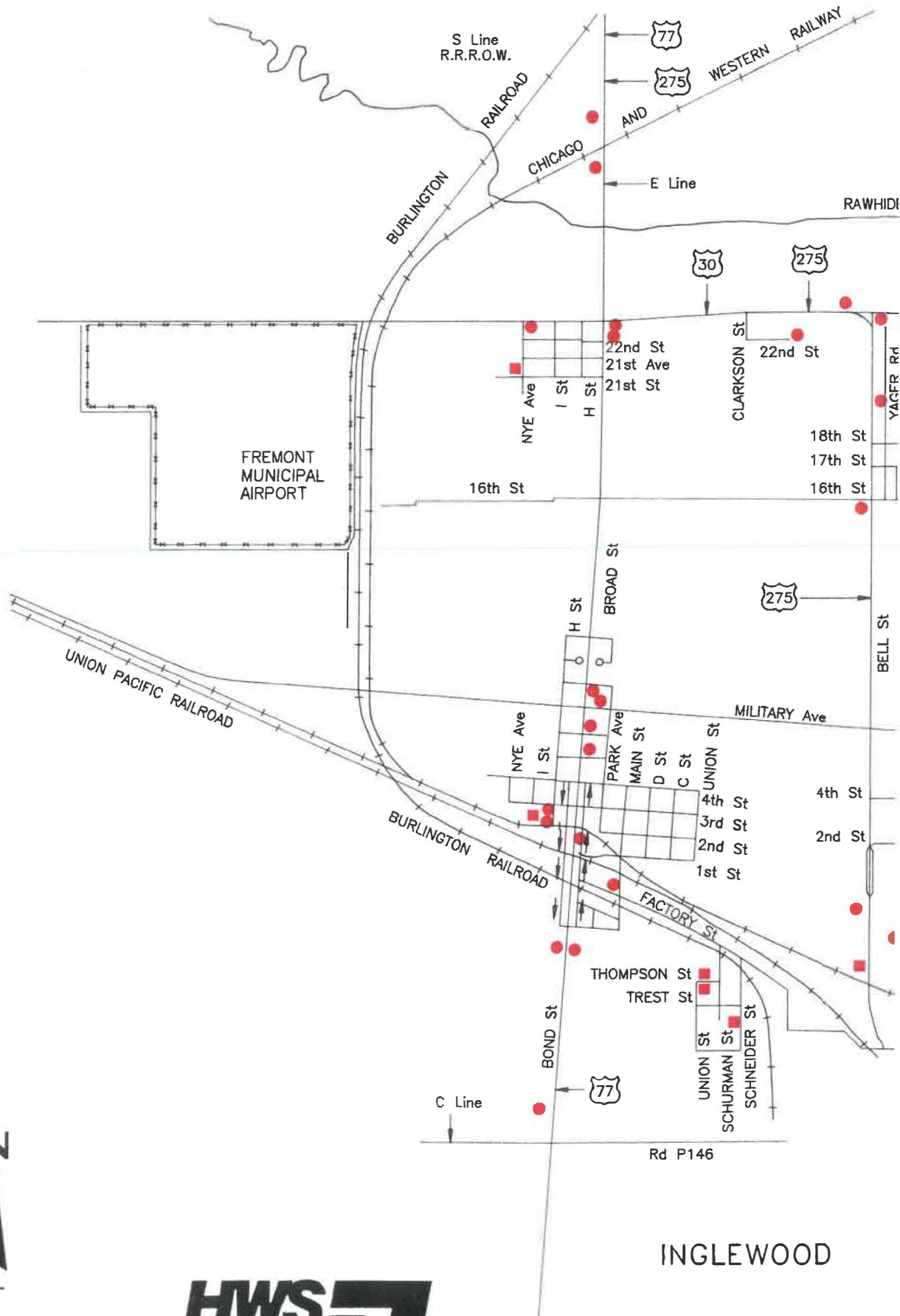
GROUNDWATER RESERVOIR AREAS

AREA	NAME
I -	SHELL CREEK RESERVOIR
II -	PLATTE VALLEY RESERVOIR
III -	UPLANDS RESERVOIR
IV -	TODD VALLEY RESERVOIR



LOCATION





NOT TO SCALE

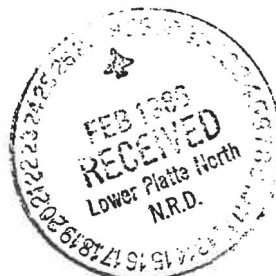
APPENDIX B



STATE OF NEBRASKA

ROBERT KERREY • GOVERNOR • J. MICHAEL JESS • DIRECTOR

February 27, 1986



IN REPLY REFER TO:

Richard Sabata, Chairman
Lower Platte North NRD
P. O. Box 258
David City, Nebraska 68632

Dear Rich,

Along with four other state agencies, Lee Becker and I have reviewed your Board's Ground Water Management Plan. I am generally impressed with it and believe it should be approved. This letter is my approval.

Copies of the various agency review comments are enclosed for your reference and use. As for me, several of Dayle Williamson's comments echo my thoughts. To a degree, several items in Part VIII of the plan are vague. What significance should area residents see in relating three management planning areas to the numerous provisions narrated in Part VIII?

Your Board's plan is one of the most ambitious ones I have reviewed. You have my support and a wish for "good luck" in carrying out its provisions.

Sincerely,

DEPARTMENT OF WATER RESOURCES

J. Michael Jess
Director

JMJ:ch

Enclosures (4)

cc: Gordon Kissel

cc/enc: Jack Daniel

Vince Dreeszen

Dennis Grams

Dayle Williamson



University of
Nebraska
Lincoln

Institute of Agriculture and Natural Resources

Conservation and Survey Division
113 Nebraska Hall
901 North 17th Street
Lincoln, NE 68588-0517
Telephone (402) 472-3471



Geological and Natural Resources Surveys



DATE: February 19, 1986

TO: Lee Becker
Nebraska Department of Water Resources

FROM: Bob Kuzelka

RE: Review of the Lower Platte North NRD Groundwater Management Plan

The rationale for setting a goal time frame of the "foreseeable future" which is neither finite or infinite was a lack of "data base information." For this plan to be acceptable, the district must identify when such a time frame will be set. They do not do this. On page 119 in the items 1.3 and 1.4 they approach such a point, but do not commit themselves to setting a time frame. Aside from this major problem the policy section of the report is quite comprehensive and well thought out.

A major technical problem with this plan is the definition of what is the district's principal aquifer and whether or not the Dakota is part of it. The principal aquifer can be defined as the district wants, however it must be consistent. Well yield is not a meaningful basis for determining how much water can be taken from an aquifer. It is a site specific parameter. The Plan confuses well yield with other hydrogeologic parameters. Transmissivity and saturated thickness are more useful as regional parameters. The discussion on pages 65 and 66 under section c makes medical statements on cancer causes and comments on the correlation between nitrate levels and pesticides and herbicides without references to information sources. Such sources should be cited.

The plan divides the NRD into three potential management areas. This concept is not developed nor even referenced in the policy section of the plan.



STATE OF NEBRASKA

ROBERT KERREY • GOVERNOR • GREGG F. WRIGHT, M.D., M.Ed. • DIRECTOR
Water & Waste Water Section 402 471-2541

February 13, 1986

Mr. H. Lee Becker, P.E.
State Hydrologist
Dept. of Water Resources
P.O. Box 94676
Lincoln, NE 68509



Dear Lee:

The Groundwater Management Plan for the Lower Platte North Natural Resources District has been reviewed. The following comments are offered for your consideration:

1. Groundwater contamination resulting from manufacturing and commercial activities have adversely affected the municipal wells in Lindsay, Bruno, Morse Bluff, and Mead. Contamination sources involve acid waste disposal, petroleum waste, volatile organic chemical, and nitrate fertilizer handling. It should be recognized that similar situations could occur in any community that permits incompatible land uses to encroach on protected well locations.
2. It is our understanding that the Department of Defense plans a groundwater investigation in an area that might have been affected by storage operations south and east of Mead. It is possible the contamination from this area could influence the quality of water used by the City of Lincoln as a source of supply.

Thank you for the opportunity of commenting on this plan.

Sincerely,

Jack L. Daniel, Director
Env. Health & Hsng. Surveillance

JLD/cvw



STATE OF NEBRASKA

NATURAL RESOURCES COMMISSION

301 CENTENNIAL MALL SOUTH • P.O. BOX 94876 • LINCOLN, NEBRASKA 68509-4876 • PHONE (402)471-2081

February 13, 1986

Mr. H. Lee Becker
State Hydrologist
Department of Water Resources
P.O. Box 94676
Lincoln, Nebraska 68509-4676



RECEIVED

FEB 14 1986

DEPARTMENT OF
WATER RESOURCES

Dear Lee:

We have completed our review of the Lower Platte North Groundwater Management Plan, 1985. We believe the plan ought to be approved by the Department of Water Resources. For the most part the plan is quite well done. Two particular strengths lie in the thoroughness of the information about the groundwater supply and the extent of the commitment made by the NRD for future activity. However, we do believe the plan is subject to improvement. Some suggestions are noted below.

1. The plan could address the items required by statute in a more thorough manner.

The plan makes at least some reference to each of the 15 items required by the statute, but treatment of a few of the items is minimal. Included is information regarding item (5), relating to crop water needs; item (9), as it relates to supply augmentation programs; item (10), relating to the availability of supplemental water supplies; item (11), concerning the opportunities to integrate and coordinate different water sources; and item (15), relating to the relative economic values of different groundwater uses. However, we believe the coverage provided is sufficient for approval of the plan at this point, especially considering the fact that no groundwater management or control areas are now proposed.

The manner in which the groundwater reservoir life goal is stated is confusing. The terms "perpetual" and "foreseeable future" are both used in the goal. The narrative portions of the plan suggest that the district may not have intended a goal of perpetuity and also that it intends, with additional data collection, to eventually establish a goal for a finite period of time. Since the district seems to place more importance on the "foreseeable future" part of the goal for now, the plan could conceivably be disapproved as being inconsistent with statutory requirements. Our opinion is that the manner in which the goal has been structured to include the term "perpetual" makes it statutorily sufficient, even if somewhat confusing.

2. In some instances the plan could better project future problems and better define programs or actions to deal with the problems.

The plan mentions one source of information on potential quantity problems, but rejects it as being inadequate. However, this information and other projections indicate there is a potential problem. The NRD has outlined a system for identifying problems in the future, but they do not indicate how they would deal with those problems.

The plan does not specify any criteria, or "trigger mechanisms" for consideration of management areas. It has numerous proposed programs to accomplish the goals and policies, but many of these programs are too general to show what is intended. Several work items hint at promotion of fertilizer management practices, but this topic isn't specifically addressed. There also are many other work items that say they will "develop" or "study" something. Some effort should be made to assess the cost and assign priorities to these activities, because some of the studies will be very expensive.

In spite of missing some of the key items mentioned above, the district has done a thorough job of identifying action items for the future. The implementation time schedule on pages 124 and 125 is an excellent idea in that it can produce a definite district commitment to the goals and objectives set forth. Although some of the individual action items are not sufficiently specific, the detail necessary will be added in the near future if the district maintains its stated time table.

We will be happy to meet with district officials or staff if they would like to discuss any of the above comments. If you have any questions, please let us know.

Sincerely,

A handwritten signature in dark ink, appearing to read "Dayle E. Williamson", written in a cursive style.

Dayle E. Williamson
Director of Natural Resources



STATE OF NEBRASKA

ROBERT KERREY • GOVERNOR • DENNIS GRAMS • DIRECTOR

February 12, 1986

Mr. Lee Becker, State Hydrologist
Department of Water Resources
P.O. Box 94676
Lincoln, NE 68509



RECEIVED
FEB 13 1986
DEPARTMENT OF
WATER RESOURCES

Dear Mr. Becker:

The Department has reviewed the Lower Platte North Natural Resources District Ground Water Management Plan and offers the following comments.

The reference "Conservation and Survey Division, 1980" listed in preparation of Figure 20 is titled in the list of references (page 126) as "General Soil Map of Fremont Area - Nebraska." Is that correct? Also, the reference "Freeze and Cherry, 1979" mentioned on page 49 needs to be added to the reference list.

The last paragraph under section C. Groundwater Quality states the need for ground water quality monitoring at the UNL experimental station at Mead because of the potential for contamination of well fields adjacent to the Platte River. However, the potential threat to wells along the Platte River is not as great as that to wells closer to or adjacent to the Field Lab. A map showing the location of the Field Lab with respect to municipal supply wells in the area would be helpful.

If you have any questions regarding these comments, please contact Gale Hutton, Water Quality Division Chief.

Sincerely,

Dennis Grams, P.E.

BR/krs



DEPARTMENT OF PUBLIC WORKS

December 18, 1985

Mr. Raymond L. Hartung
General Manager
Lower Platte North Natural Resources District
North Hiway 15
David City, NE 68632

re: Lower Platte North NRD -
Groundwater Management Plan

Dear Mr. Hartung:

The Lincoln Water System greatly appreciates having had the opportunity to review your draft Groundwater Management Plan. The Lincoln Water System concurs with your District's foresight and desire for protecting Nebraska's groundwater by setting forth a goal in your management plan which would provide for a perpetual groundwater reservoir, addressing both quantity and quality of this natural resource.

As a significant user of groundwater within your District, the Lincoln Water System would offer the following comments, questions, and/or concerns:

1. If conditions arise necessitating the implementation of a groundwater control area, to whom would fall the responsibility of setting the limits on water use for each entity in a control area? What types of priorities will be set forth for water use within those control areas? Recommend that the "municipal water use" should have the same priority as "domestic water use".

2. We are interested in working with not only the Lower Platte North but also the Lower Platte South and Papio Districts in developing a systematic meeting process on groundwater management. A coordinated groundwater management and monitoring plan would provide us the necessary and pertinent data to assure that the existing groundwater reservoirs are being properly managed. One of the areas in which we would have an interest in working with the districts would be in setting up a monitoring well system. There are some monitoring wells in existence in our wellfields at the Ashland facility. We would be interested and willing to work with the NRD's, NRC, and USGS to:

a) establish a systematic and properly spaced series of monitoring wells within our facility and throughout the District,

b) accurately gauge groundwater levels,

c) adequately monitor the quality of the groundwater throughout the Todd Valley.

4. We are interested in several technical aspects of the monitoring program or management system such as:

a) What type of criteria will be implemented to monitor the management of the district?

b) Adequate control of chemigation is necessary. Chemical application to surrounding farm ground should be monitored. A positive assurance that these chemicals are not being fed directly back into the groundwater reservoir can be provided through the use of a "reduced pressure backflow preventor"

c) What type of production or irrigation well spacing might be recommended?

d) What regulations will be implemented to determine:

1) Proposed withdrawal allocations

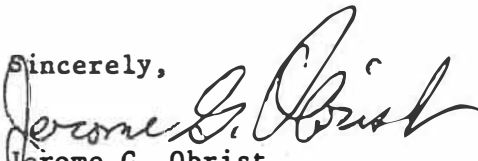
2) Type of measurement in the various irrigation wells

3) Irrigation scheduling, etc. in groundwater control areas?

We will join with any municipality (such as Omaha or Fremont) or State agency that has an interest in working together for the common purpose of managing and protecting our most important natural resource in the state, water.

I thank you for the opportunity to review your plan and look forward to working with you in the future.

Sincerely,



Jerome G. Obrist

Chief Engineer of Water Works

RF/JGO/CSD323

cc: R. Erixson
B. Michaelson
R. Figard
G. DeFoil

LOWER PLATTE NORTH

Natural
Resources
District

North Highway 15, David City, Nebraska 68632 - Phone (402) 367-3103

January 21, 1986

Mr. Jerome G. Obrist
Chief Engineer of Water Works
Department of Public Utilities
County/City Building
Lincoln, NE 68508

RE: Lower Platte North NRD
Groundwater Management Plan

Dear Mr. Obrist:

I thank you for your letter concerning the Lower Platte North NRD Groundwater Management Plan, and shall attempt to answer your questions as best I am able.

(1) Who would set limits on water use in a control area?

The Lower Platte North NRD Board of Directors would set the limits with concurrence of the State Department of Water Resources. The district would also work with all involved.

(2) What types of priorities will be set forth for water use within those control areas?

We cannot answer this until the problems are known and the alternate type measures of control or management are determined.

Your recommendation concerning municipal and domestic water use priority would be given considerable discussion.

Mr. Jerome G. Obrist
January 21, 1986
Page 2

(3) Item number 2 of your letter expressed an interest in working together to; arrange systematic meetings on groundwater management; establish a systematic and properly spaced series of monitoring wells; accurate gauging of groundwater levels; and adequately monitor the quality of the groundwater in the Todd Valley.

The systematic meeting on groundwater is a necessity. I think the Lower Platte South NRD is presently arranging such an organizational meeting.

The staff is now in the process of establishing both a groundwater level and a groundwater quality monitoring network. Most of the groundwater level wells have been sampled for the past season. This coming summer will be the beginning of the water quality network sampling.

(4) What type of criteria will be implemented to monitor the management of the district (technical aspects of the monitoring program)?

We have been working with the U.S. Geological Survey and the Department of Environmental Control to develop the most equitable system that will provide meaningful results. Exact criteria or chemical constituents have not been determined.

(5) What type of production or irrigation well spacing might be recommended? and What regulations will be implemented?

I cannot answer these questions at the present time. A problem must first be defined, it cause determined and then corrective measures will be implemented.

I hope this provides some answers to your questions and look forward to your comments on program development. It is essential that all agencies and groups work together to develop proper programs.

Sincerely,


Raymond L. Hartung,
General Manager

C: Glen Johnson, LPSNRD
Jerry Wehrspann, Papio NRD

bp

APPENDIX C

DEFINITION OF GROUND WATER - RELATED TERMS

Aquifer - a water-bearing stratum of rock or sediment capable of yielding supplies of water.

Aquifer, Confined (or Artesian) - an aquifer overlain by a low permeability layer or layers, in which pressure head will force water to rise above the aquifer in which it is contained.

Aquifer, Perched - an aquifer containing unconfined ground water separated from an underlying body of ground water by an unsaturated zone.

Aquifer, Principal - the aquifer or combination of related aquifers in a given area which is the important economic source of water to wells--has been used, perhaps inaccurately, as synonymous with ground water reservoir.

Aquifer, Secondary - any aquifer other than the principal aquifer that is not the main source of water to wells in a given area e.g. includes perched aquifers, the Chadron Formation, the Dakota Sandstone in some areas, and several Paleozoic units.

Aquifer, Unconfined (or Water Table) - an aquifer in which the upper limit is the water table rather than an impermeable layer.

Bedrock - sequences of consolidated rock which outcrop at the surface or which underlie unconsolidated earth materials.

Chemigation - the application of crop nutrients or pesticides through an irrigation system.

Ground Water - water occupying voids within the saturated zone of a geologic stratum. This saturated zone is to be distinguished from an unsaturated or aeration zone where voids are filled with water and air.

Ground Water Model - a model designed to represent a simplified version of an actual, complex ground water system; may be mathematical or physical.

Hardness - the amount of certain dissolved minerals in water. Carbonate hardness refers to the hardness caused by calcium and magnesium bicarbonate; noncarbonate hardness is caused by calcium sulfate, calcium chloride, magnesium sulfate, and magnesium chloride in water.

Head - the height of a column of water, supported by static pressure, above a standard datum (usually mean sea level).

Hydraulic Conductivity - the capacity of a porous material to transmit water under a unit hydraulic gradient through a unit area. A measure of an aquifer's ability to transmit water.

Hydrograph - a graph which illustrates a specific hydrologic parameter such as water level, discharge, or velocity as a function of time.

Irrigation Efficiency - the rate at which water enters the soil under specified conditions.

Leaching - the downward transport of dissolved minerals in a soil by percolating water.

Loess - a wind deposited silt having little or no stratification.

Non-Point Source Pollution - pollution from diffuse sources where no one point of release can be identified.

Operator - shall mean that person having the most direct control over the day to day farming operation of the land concerned.

Parts Per Million (ppm) - a measure of the concentration of dissolved material in terms of a weight ratio. Roughly equivalent to milligrams per liter (mg/L).

Percolation - the downward movement of water through soil or other earth materials.

pH - a logarithmic measure of the relative acidity of water. Below 7 is increasingly acidic, 7 is neutral, and above 7 is increasingly alkaline (basic).

Piezometric (Potentiometric) Surface - the upper level to which a water level rises in a tightly cased well.

Point Source Pollution - pollution from discrete, identifiable locations which can usually be measured directly or otherwise quantified.

Pollution - the process of contaminating air, water, and land with impurities to a level that is undesirable.

Porosity - the proportion, commonly stated as a percentage, of the total volume of a rock material that consists of pore space or voids.

Precipitation - water in the form of hail, mist, rain, sleet, or snow that falls to the earth's surface.

Pressure Head - the height of a column of water which can be supported by the pressure at a given point.

Recovery of a Pumped Well - the rise of a water level in a well towards its pre-pumping elevation, which occurs after pumping ceases.

Reservoir (Ground Water) - for any given area the subsurface storage space between the water table and the base of the principal aquifer--includes one or more aquifers and any associated fine-grained material (usually excludes any perched aquifer).

Soil - the upper layer of earth which can be cultivated and in which plants grow.

Static Water Level - the water level in a well before pumping occurs.

Transmissivity - a rate which quantifies the ability of an aquifer to transmit water.

Unsaturated Zone - porous earth materials which contain both air and water in their pore spaces. Sometimes called the vadose zone.

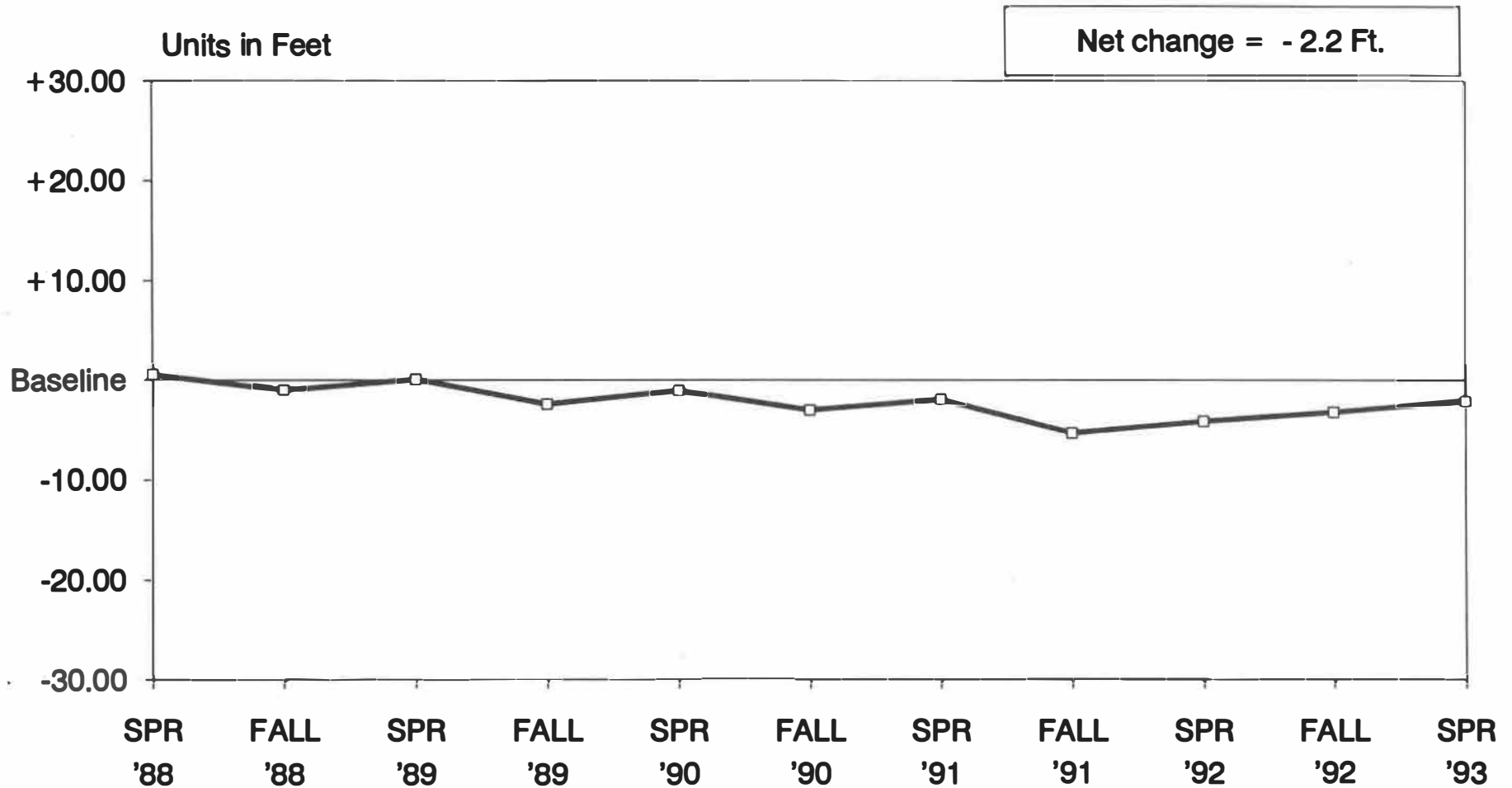
Vadoze Zone - the unsaturated zone below the land surface and above the water table.

Water Table - the level below which the subsurface is saturated with water and at which the pressure head equals atmospheric pressure. A parameter associated with unconfined aquifers.

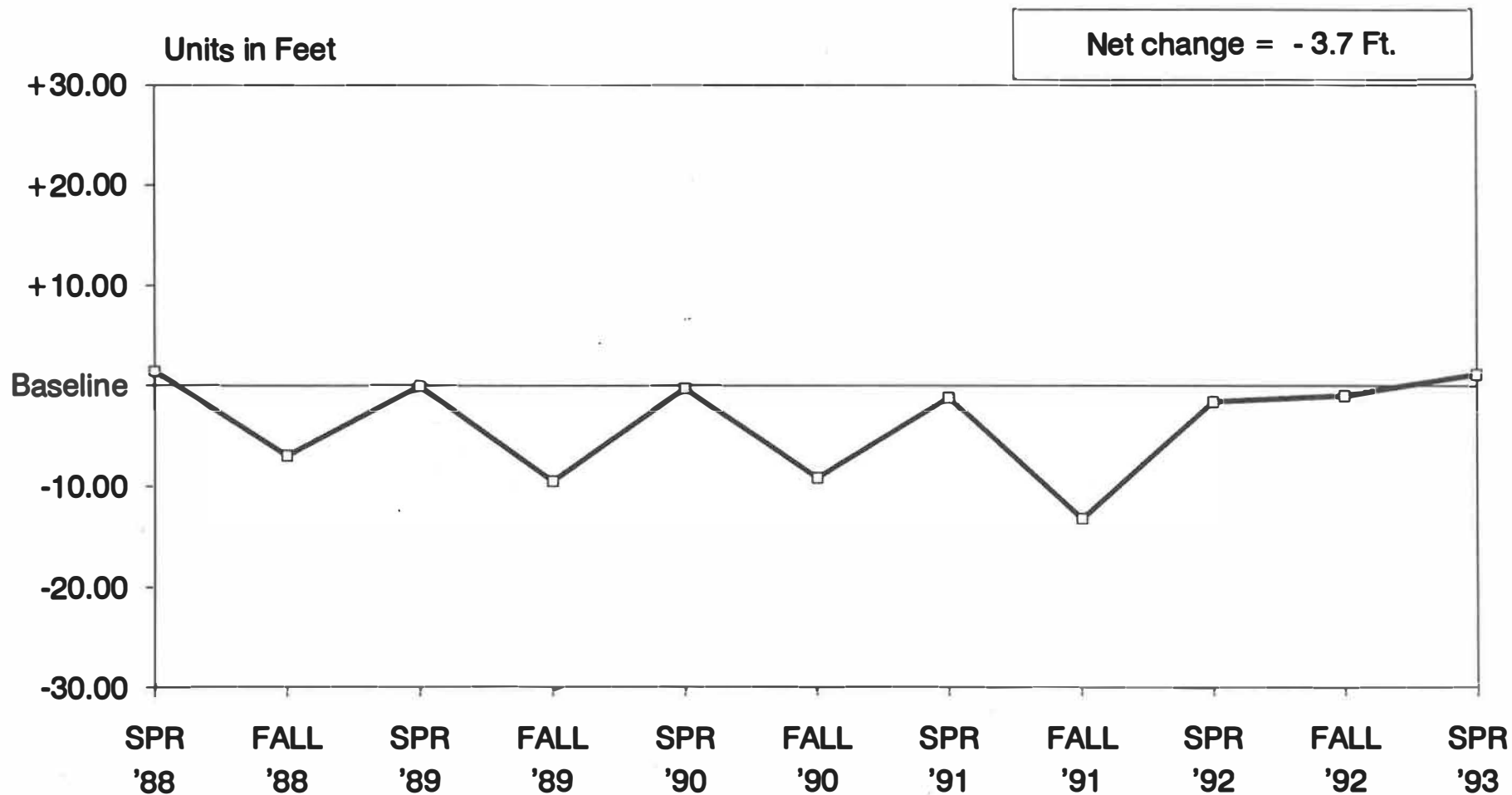
Zone of Saturation - porous earth materials, in which, all pore-spaces are filled with water.

APPENDIX D

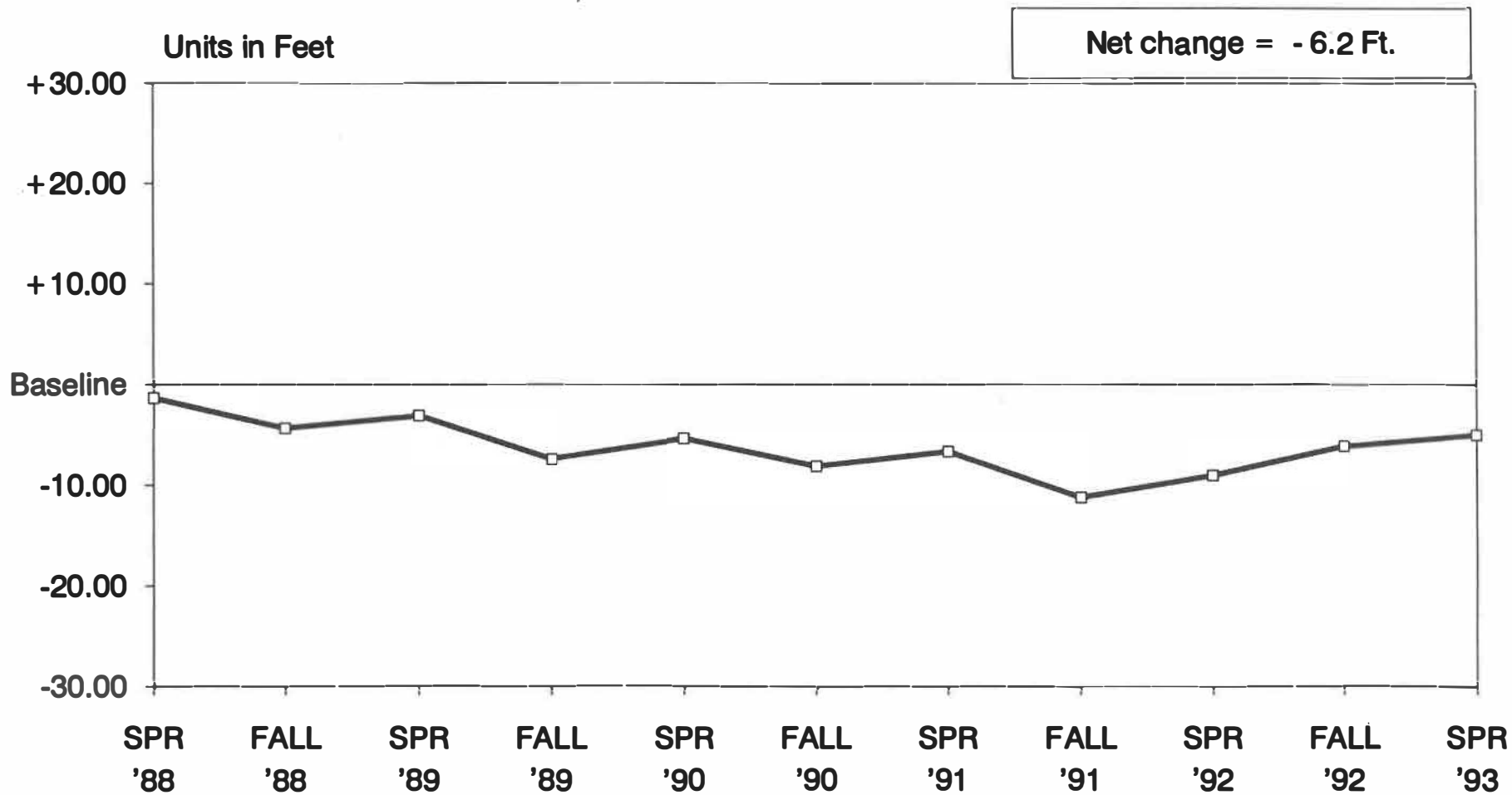
Changes in Water Levels Since 1987 (Baseline)
Well: 1 22N-5W- 4AADC Boone Co. Shell Cr. Aquifer



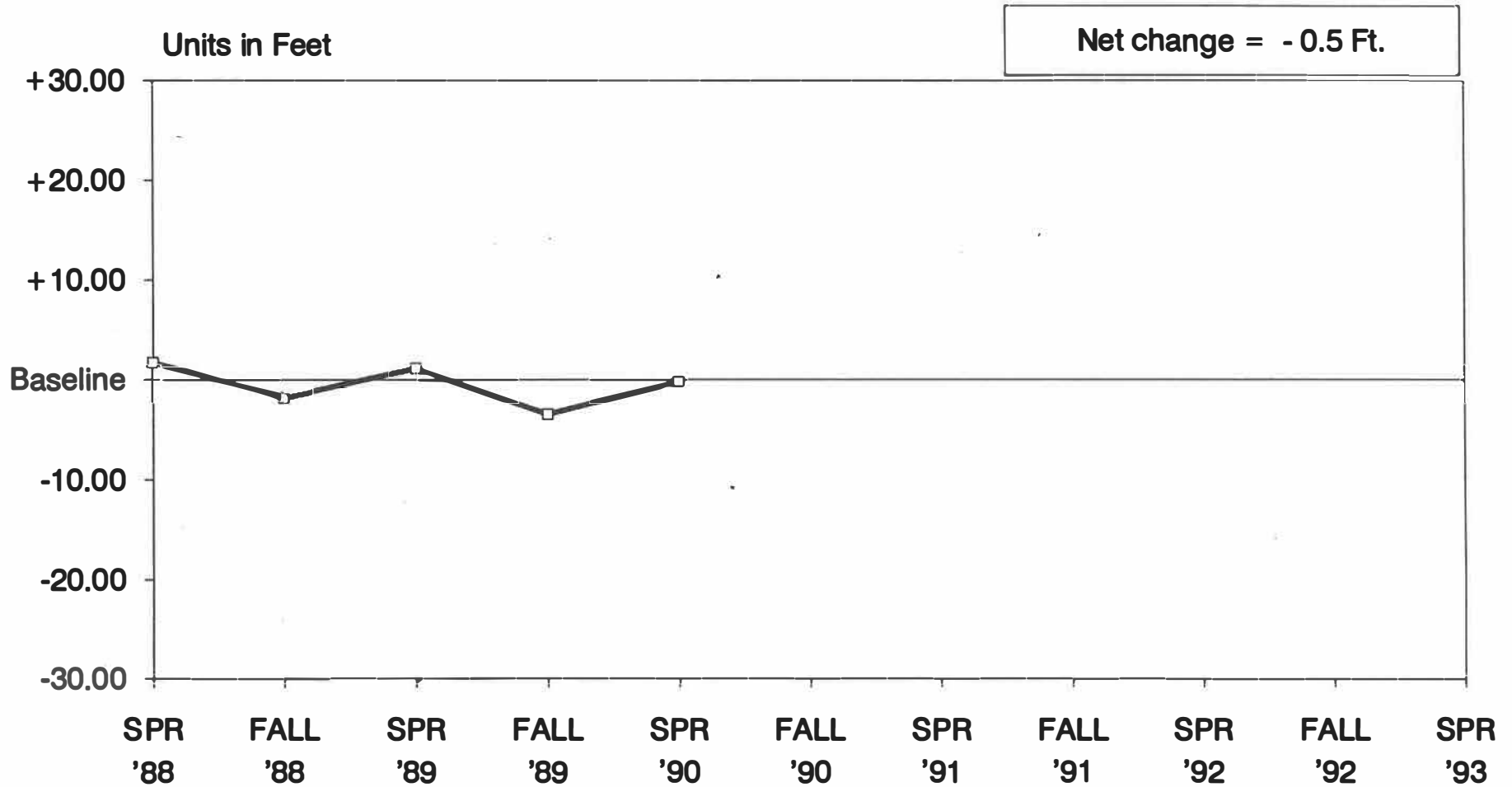
Changes in Water Levels Since 1987 (Baseline)
Well: 2 21N-5W- 9AABD Boone Co. Shell Cr. Aquifer



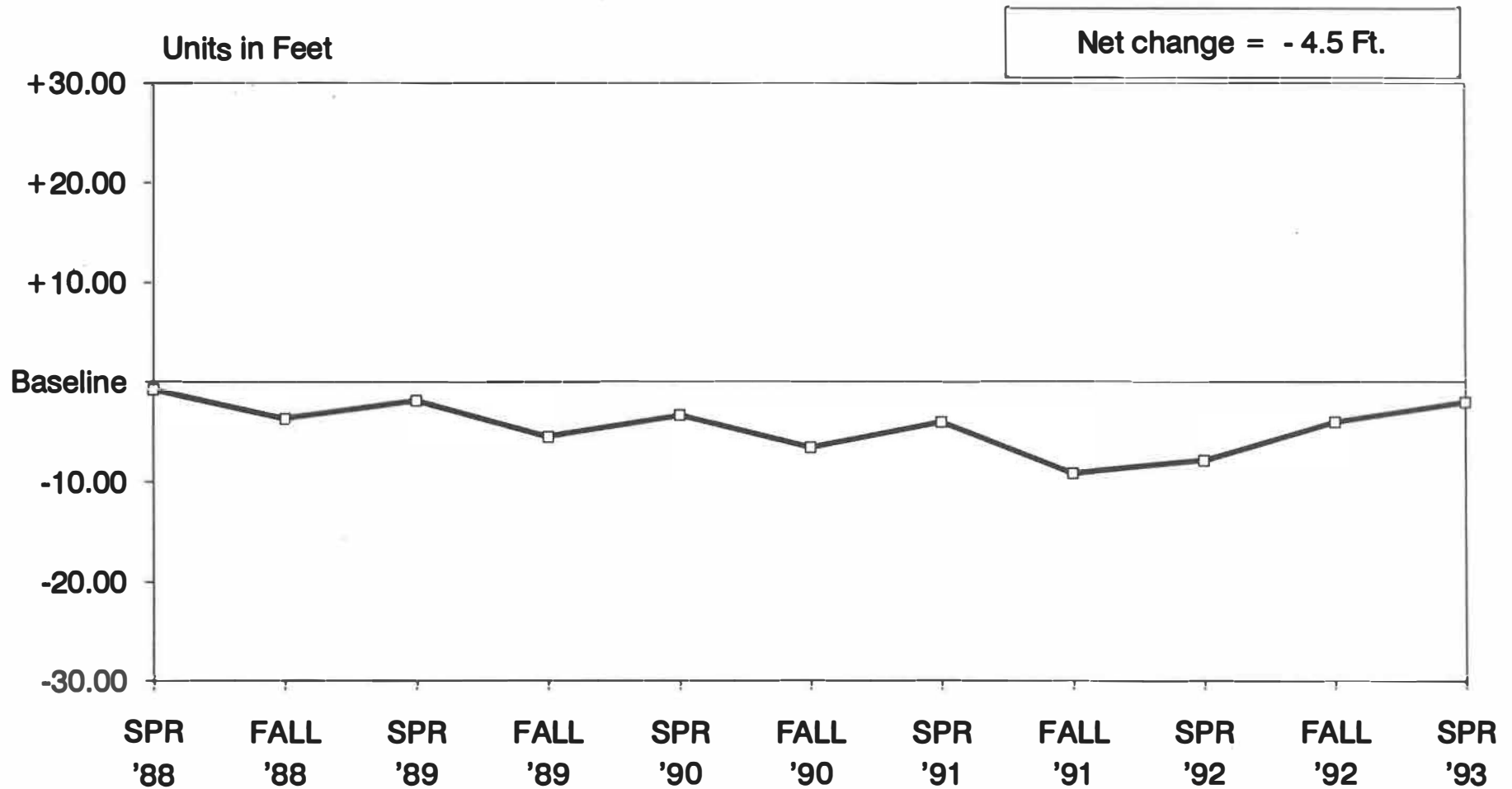
Changes in Water Levels Since 1987 (Baseline)
Well: 3 20N-4W- 1CDDA Platte Co. Shell Cr. Aquifer



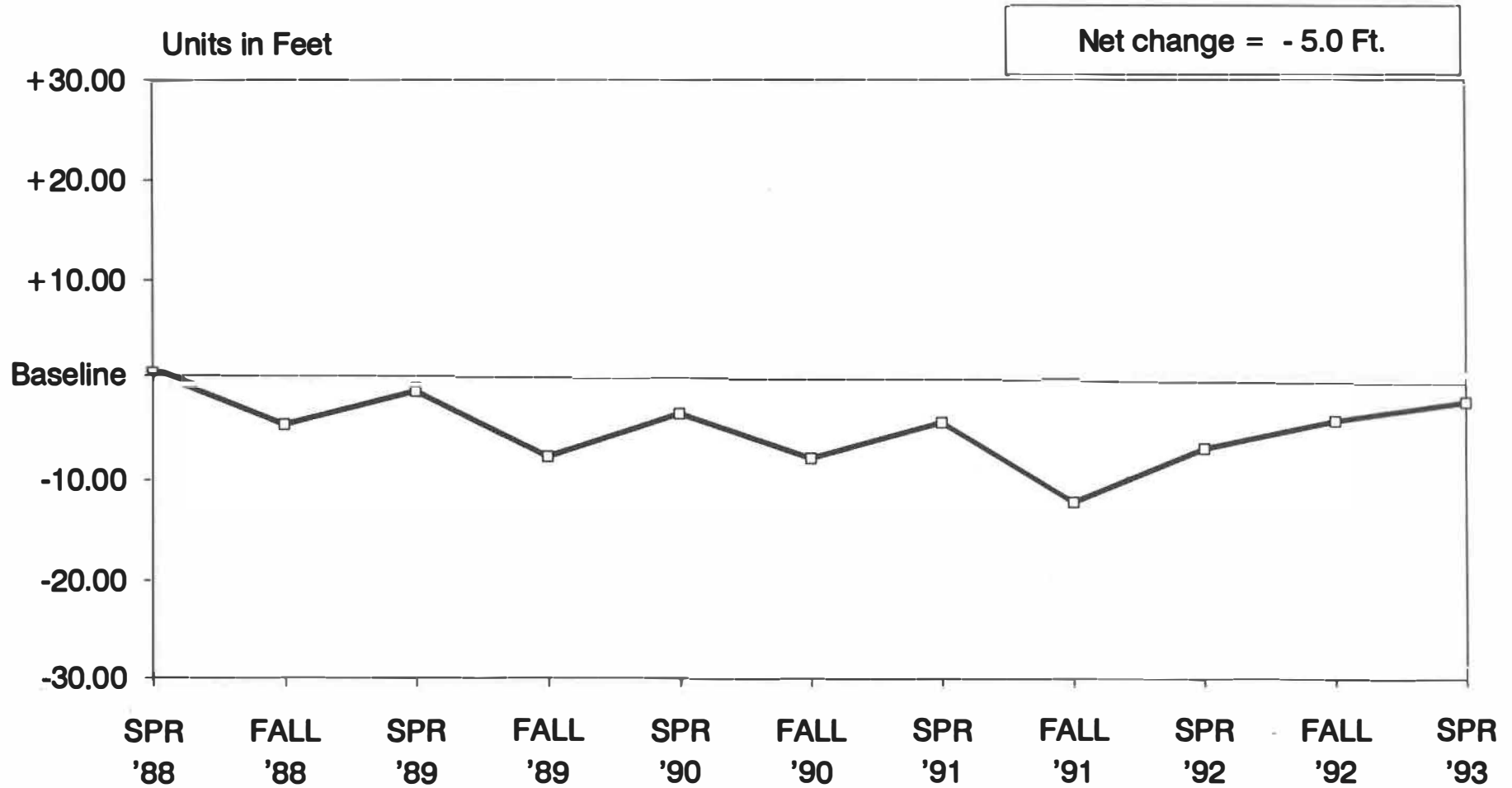
Changes in Water Levels Since 1987 (Baseline)
Well: 4 20N-5W-12ADBB Boone Co. Shell Cr. Aquifer



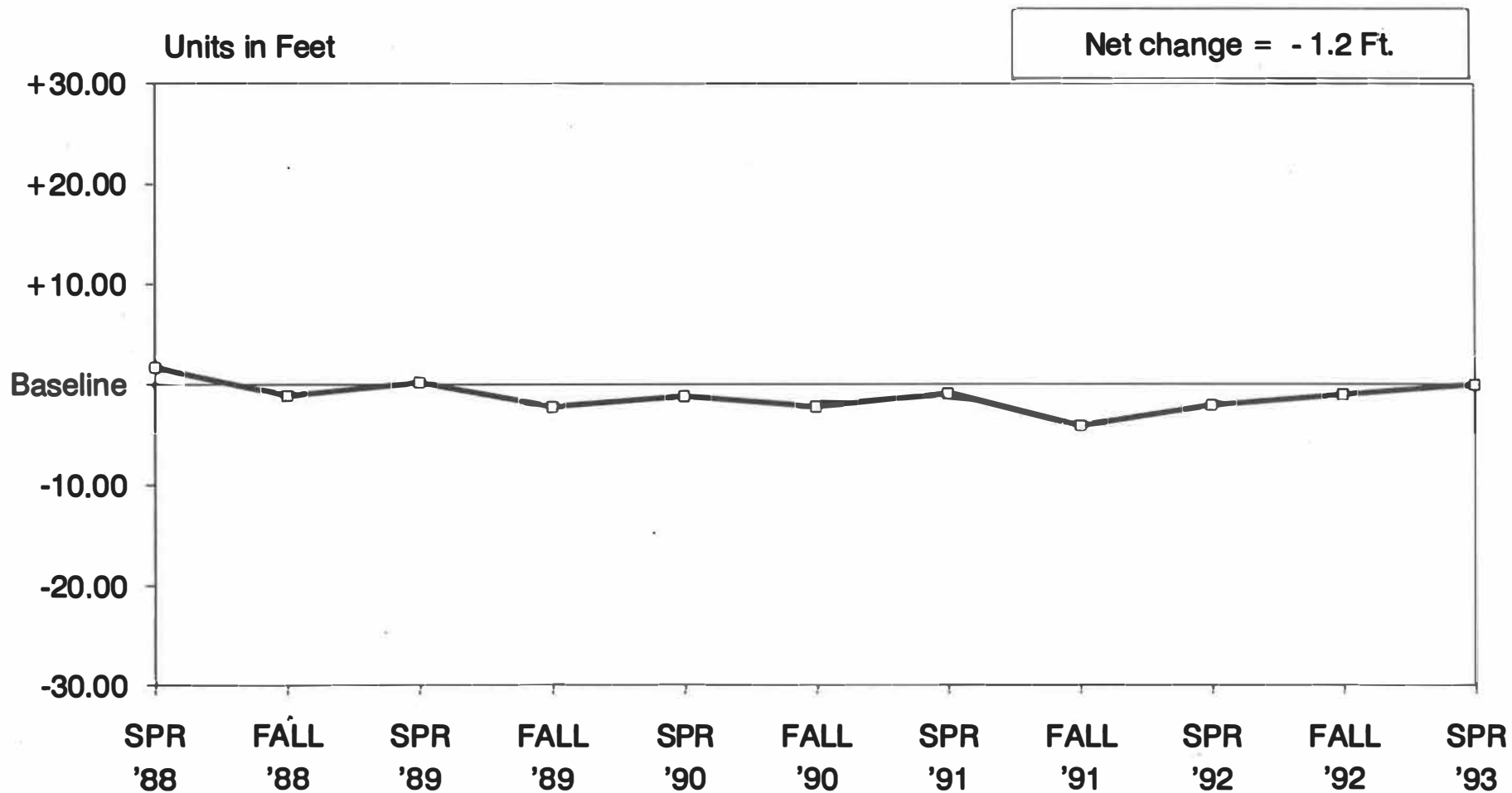
Changes in Water Levels Since 1987 (Baseline)
Well: 5 20N-4W-13DBDD Platte Co. Shell Cr. Aquifer



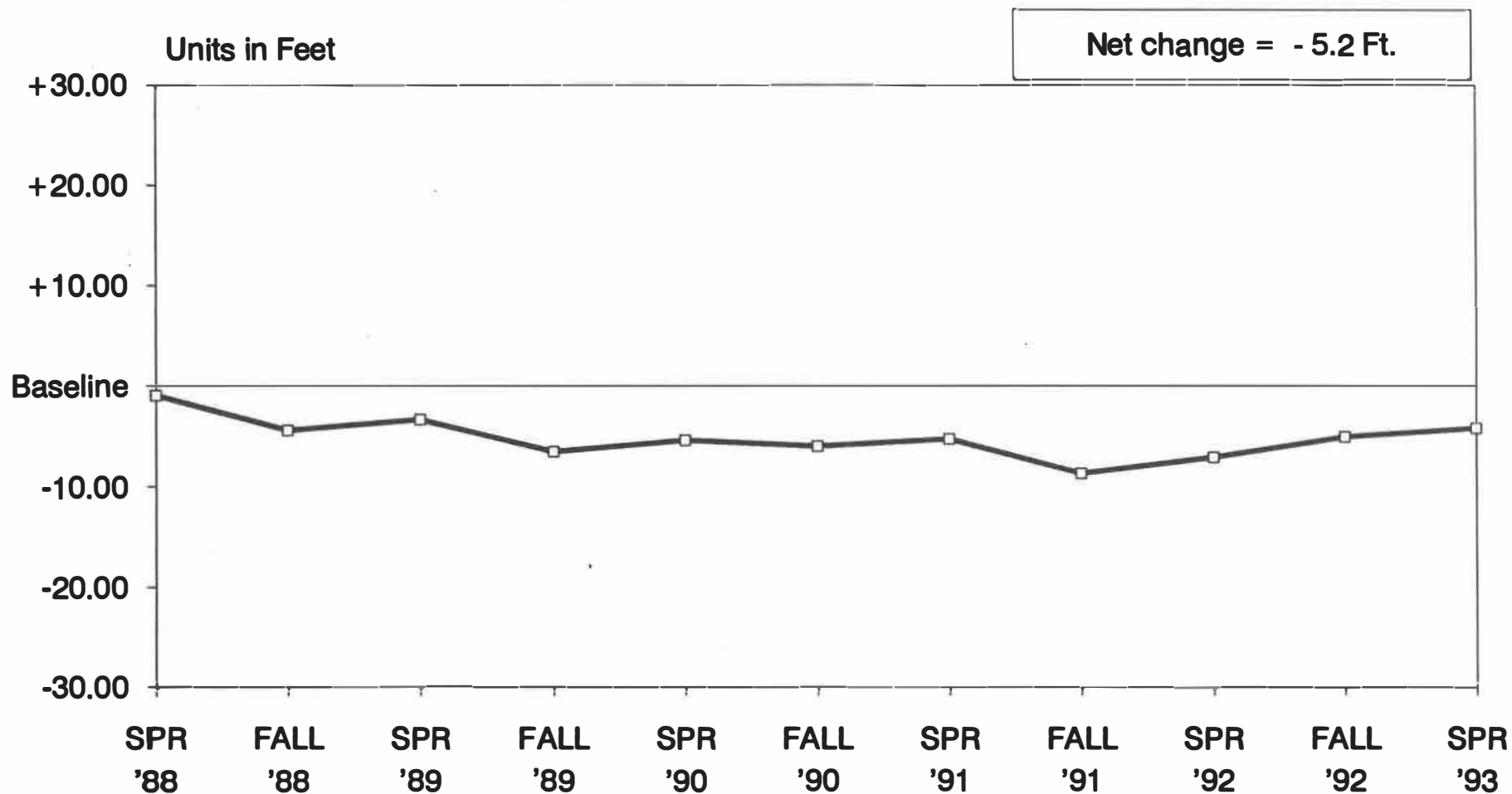
Changes in Water Levels Since 1987 (Baseline)
Well: 6 20N-3W-22DDCC Platte Co. Shell Cr. Aquifer



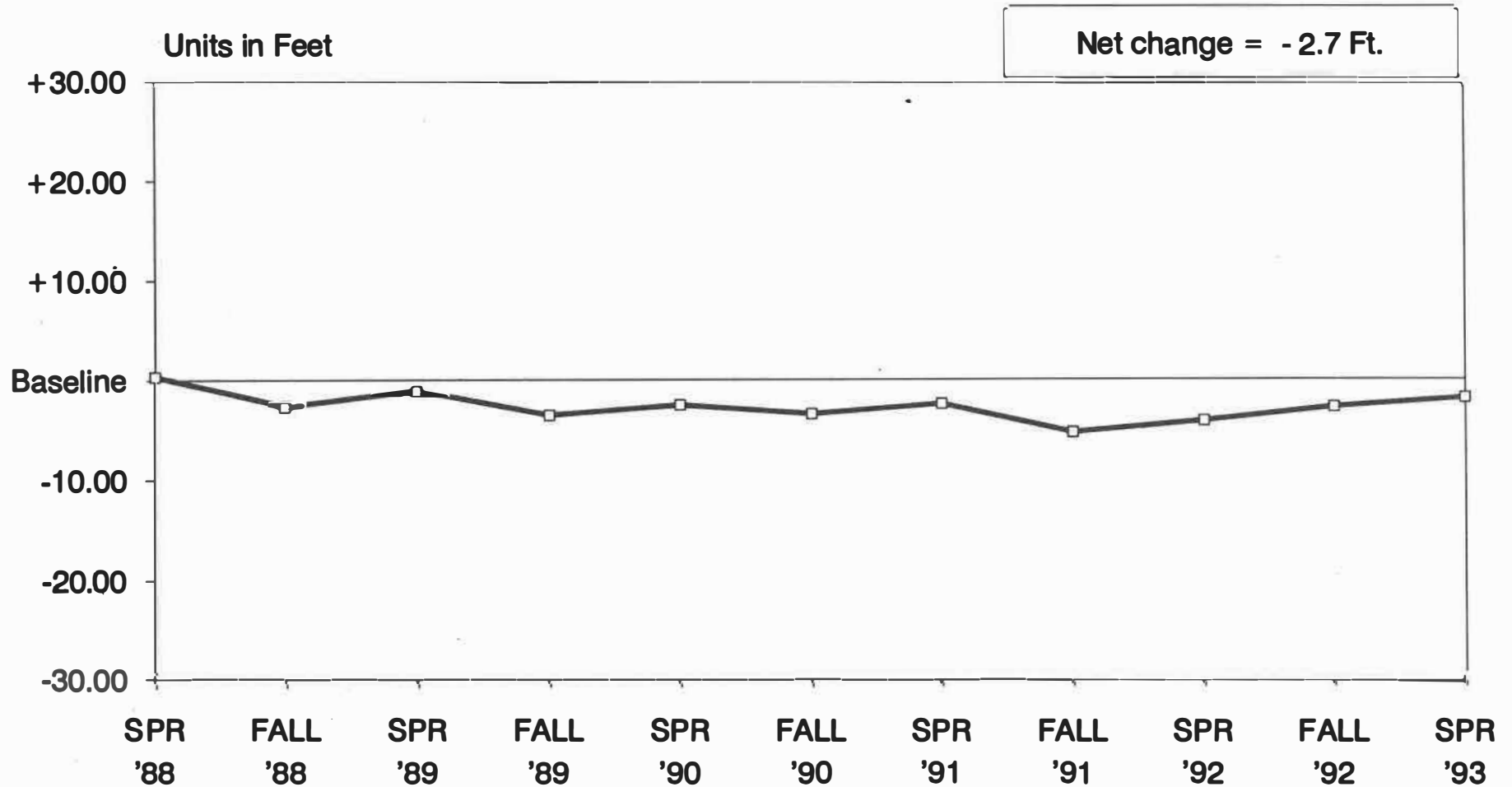
Changes in Water Levels Since 1987 (Baseline)
Well: 7 19N-3W-11BABA Platte Co. Shell Cr. Aquifer



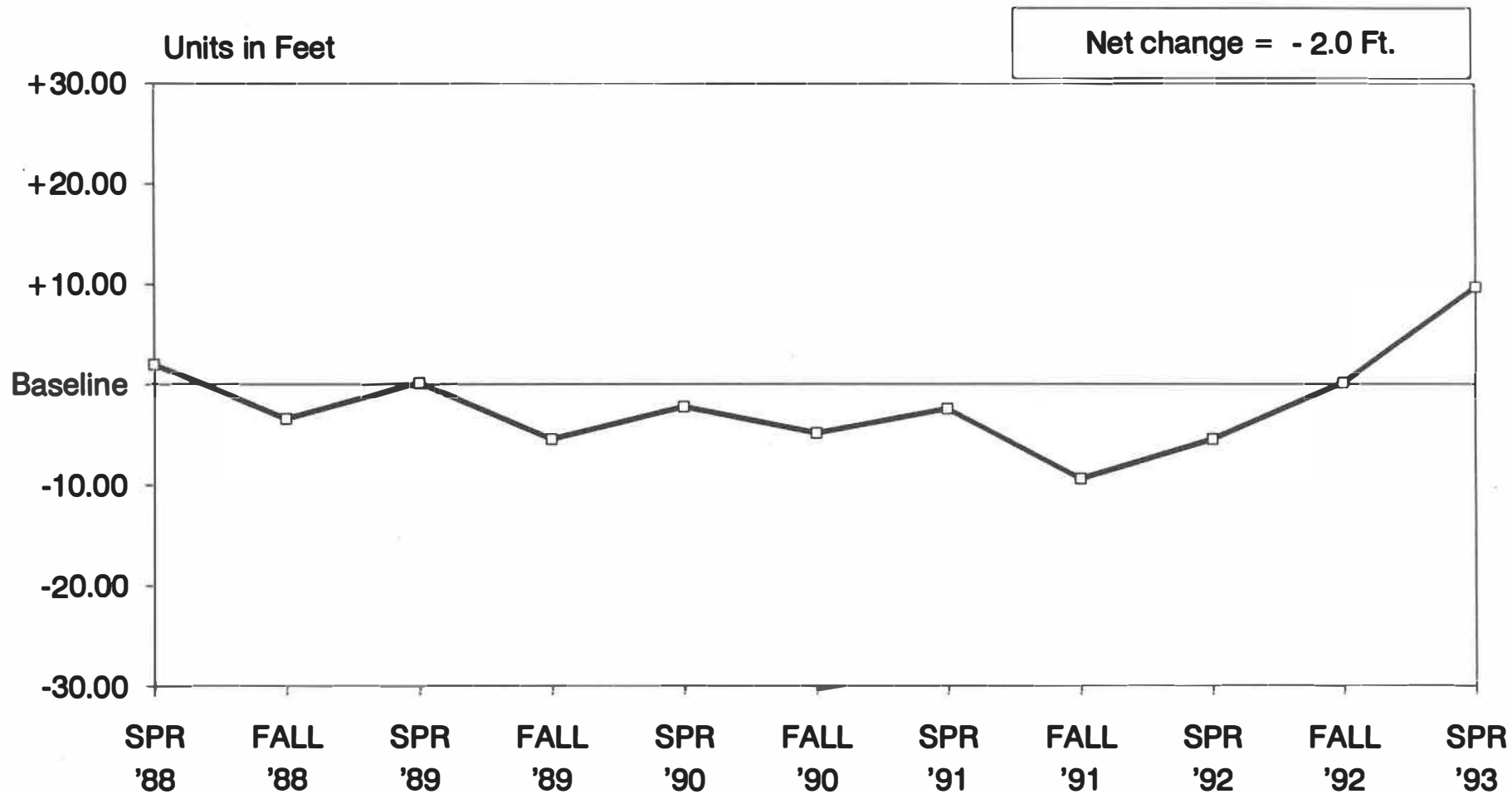
Changes in Water Levels Since 1987 (Baseline)
Well: 8 18N-2W- 6CBAA Platte Co. Shell Cr. Aquifer



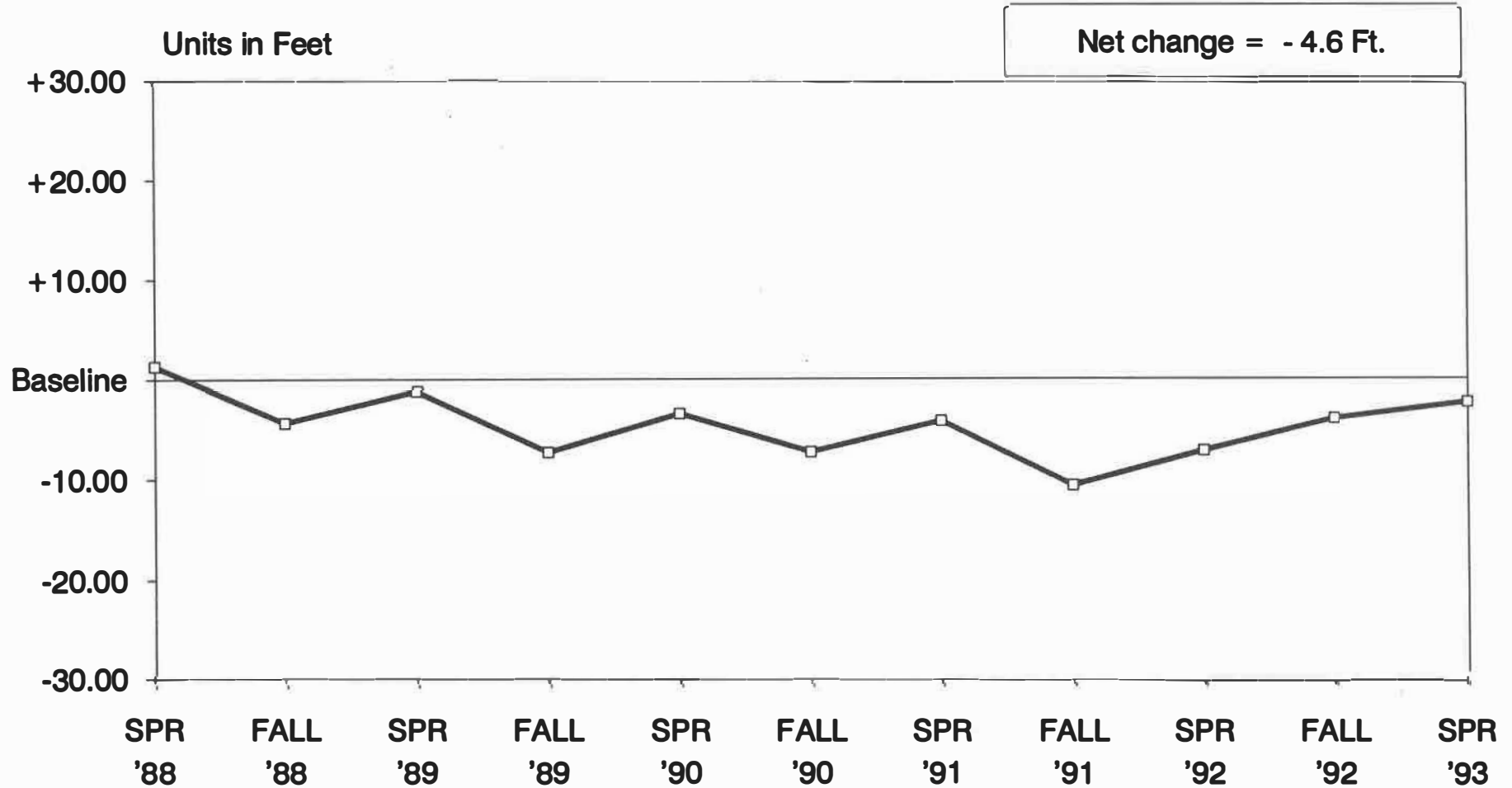
Changes in Water Levels Since 1987 (Baseline)
Well: 9 19N-2W-29DBCD Platte Co. Shell Cr. Aquifer



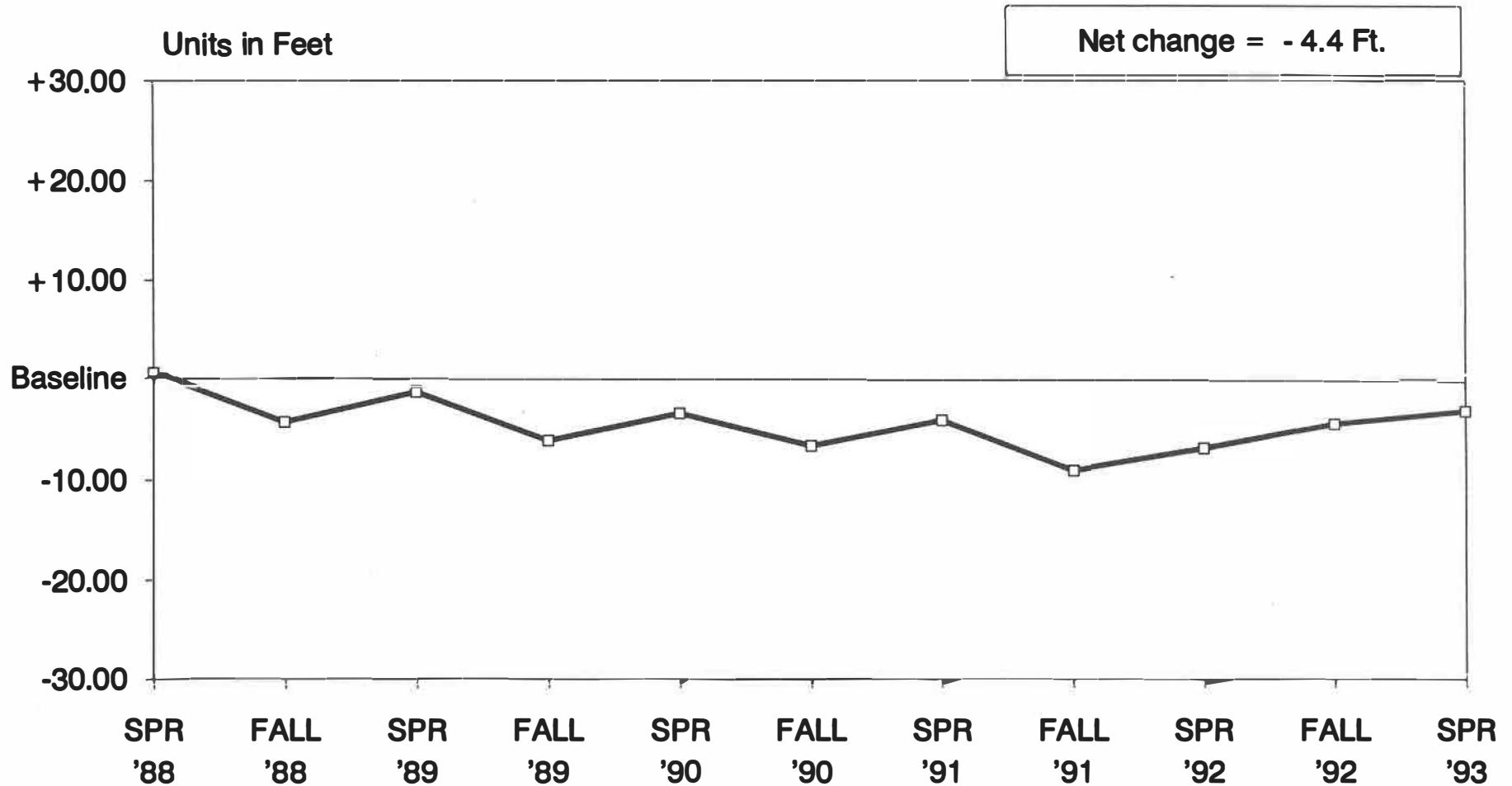
Changes in Water Levels Since 1987 (Baseline)
Well: 10 19N-2W- 3BDAA Platte Co. Shell Cr. Aquifer



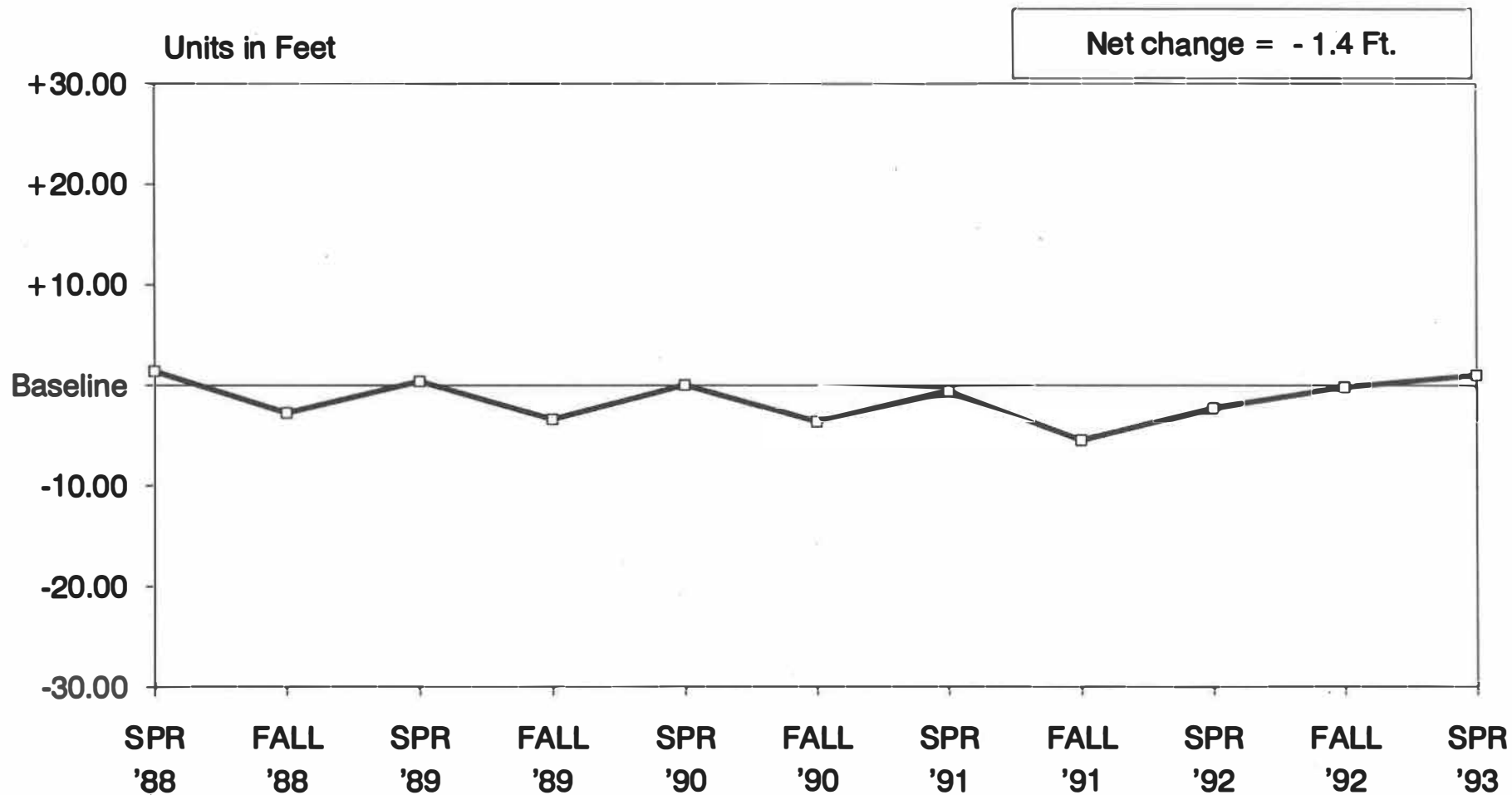
Changes in Water Levels Since 1987 (Baseline)
Well: 11 19N-1W-28ABBC Platte Co. Shell Cr. Aquifer



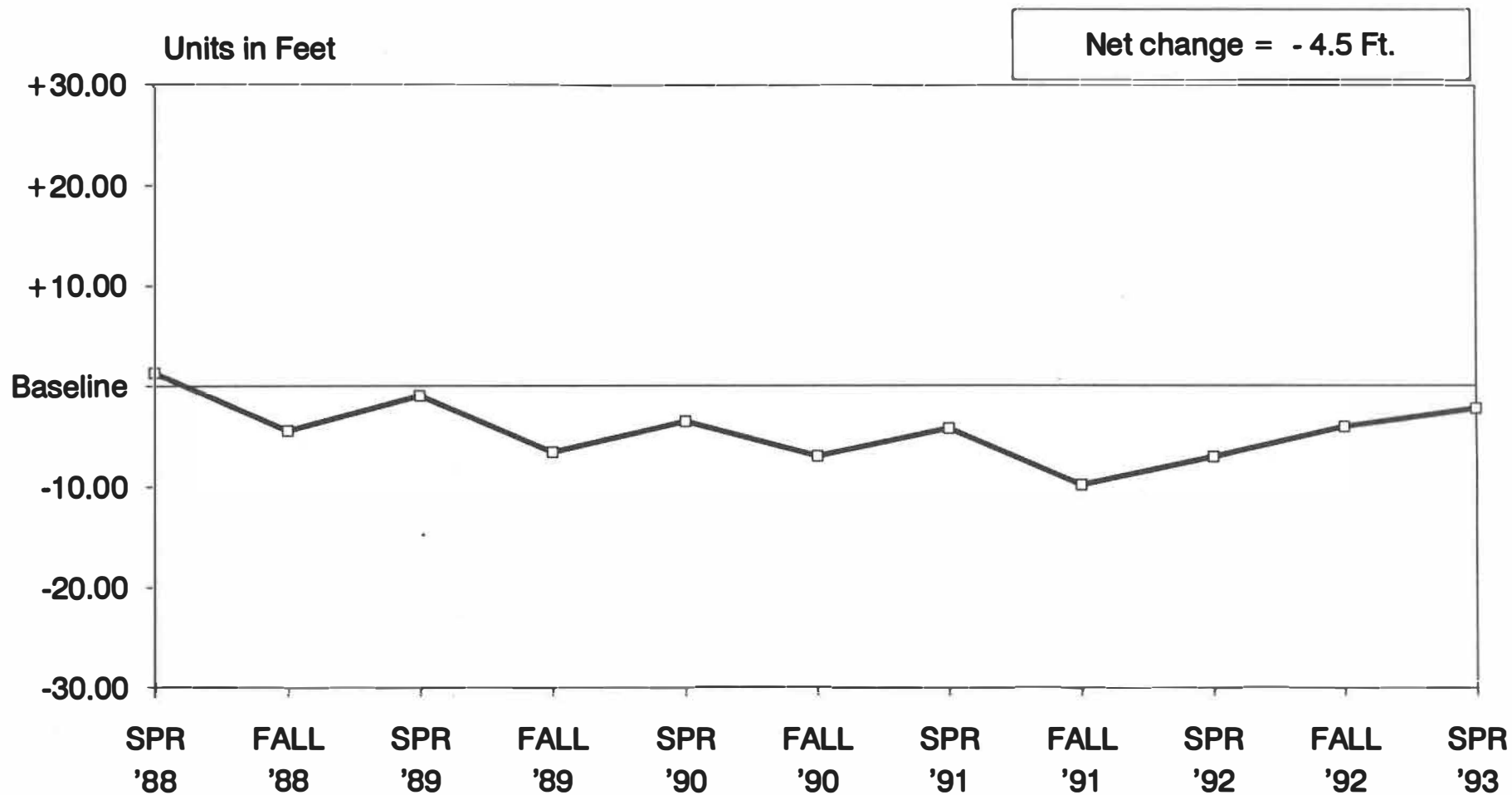
Changes in Water Levels Since 1987 (Baseline)
Well: 12 19N-1W-25CABB Platte Co. Shell Cr. Aquifer



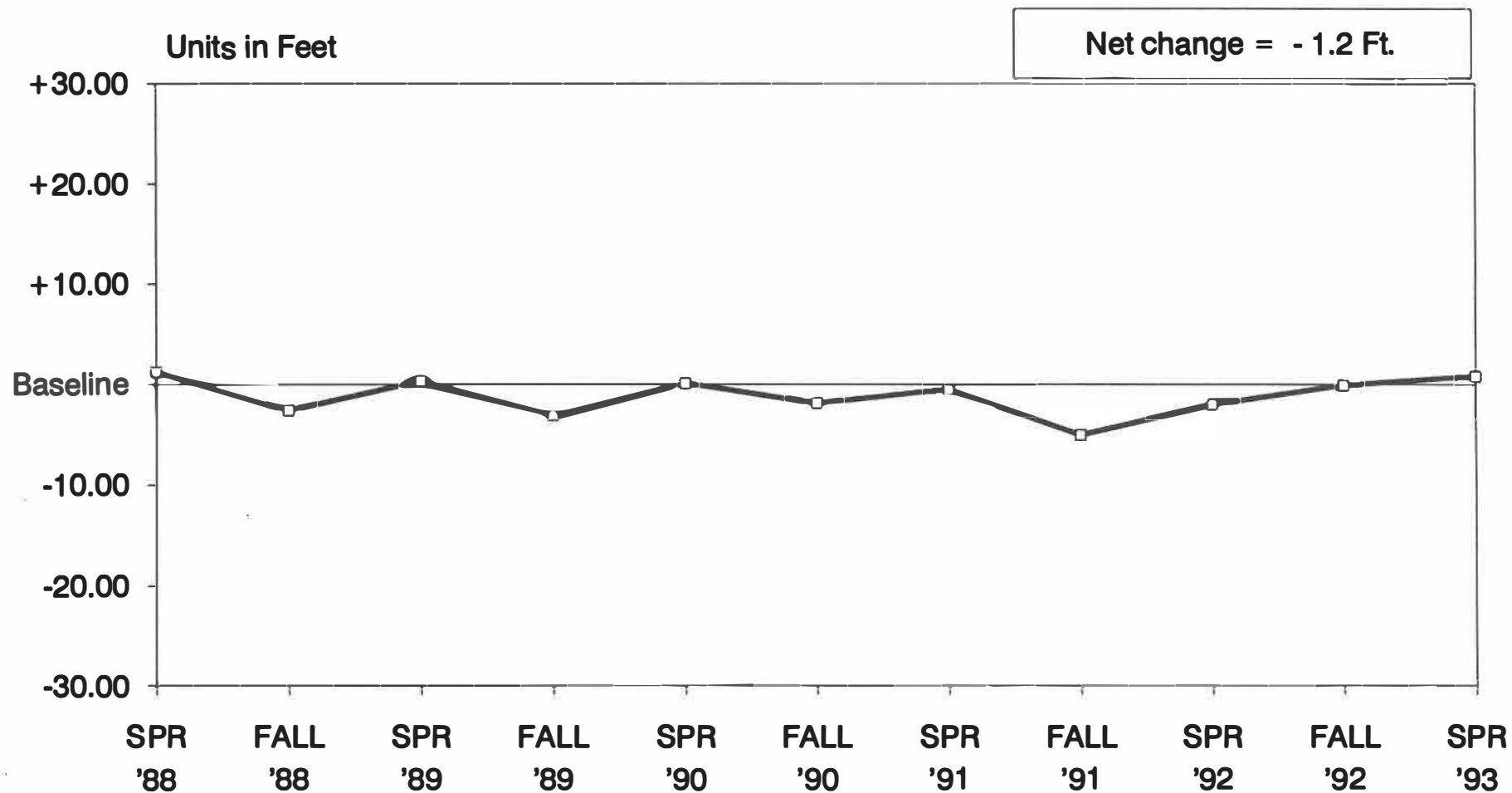
Changes in Water Levels Since 1987 (Baseline)
Well: 13 19N-1E-29CDAB Platte Co. Shell Cr. Aquifer



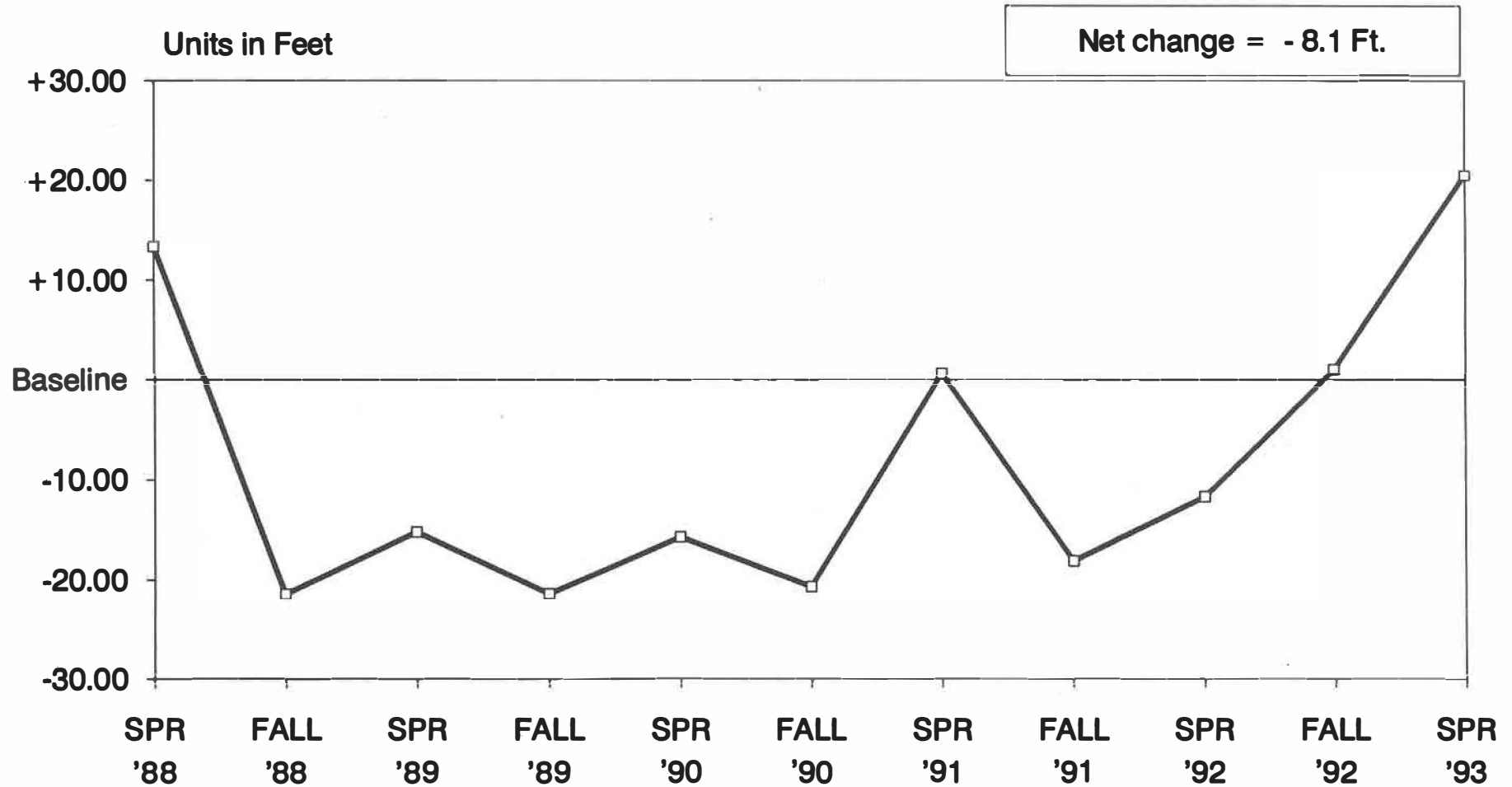
Changes in Water Levels Since 1987 (Baseline)
Well: 14 19N-1W-12CDBB Platte Co. Shell Cr. Aquifer



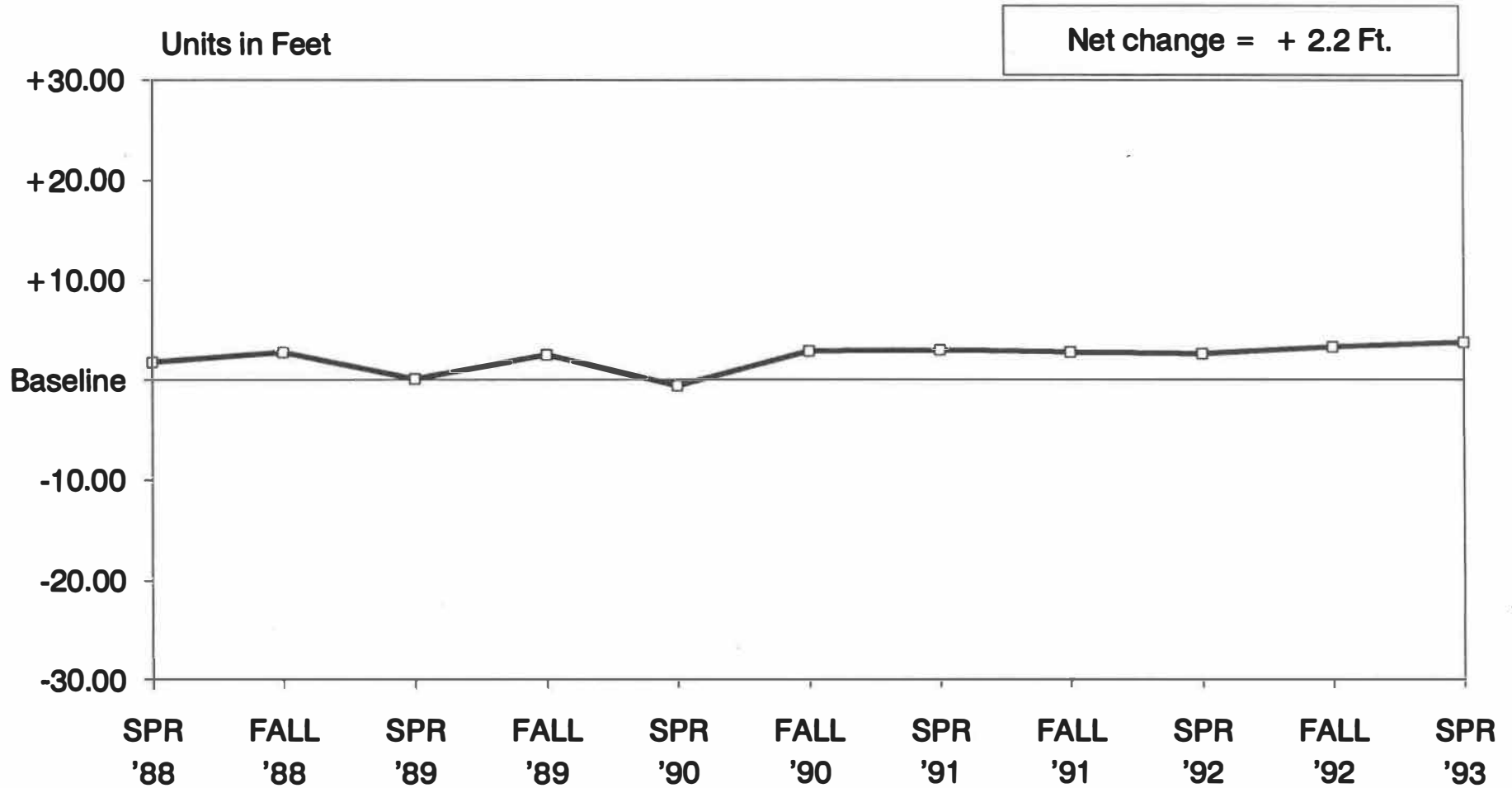
Changes in Water Levels Since 1987 (Baseline)
Well: 15 19N-1E- 9BCDC Platte Co. Shell Cr. Aquifer



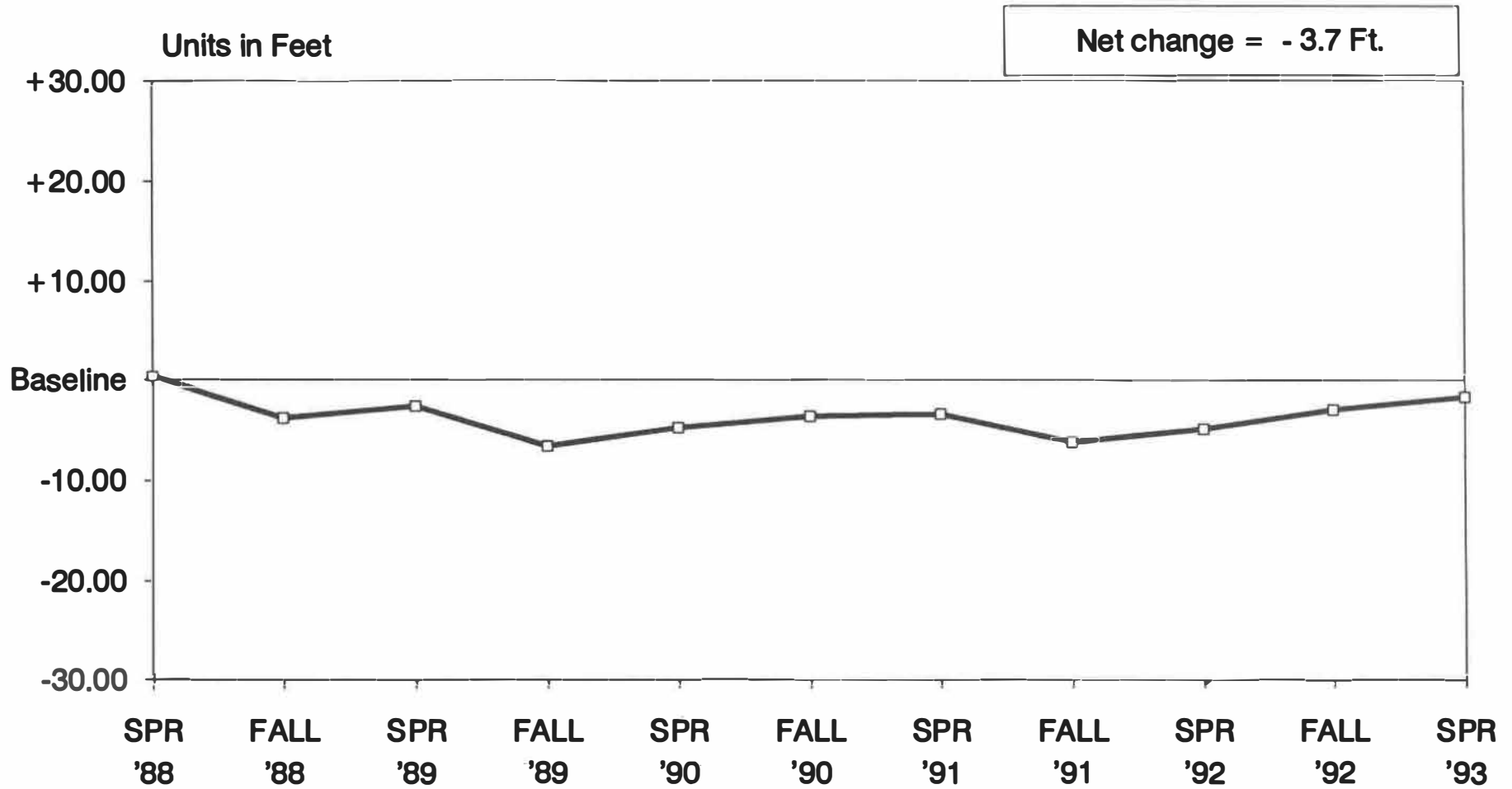
Changes in Water Levels Since 1987 (Baseline)
Well: 16 19N-2E- 7DAAA Colfax Co. Shell Cr. Aquifer



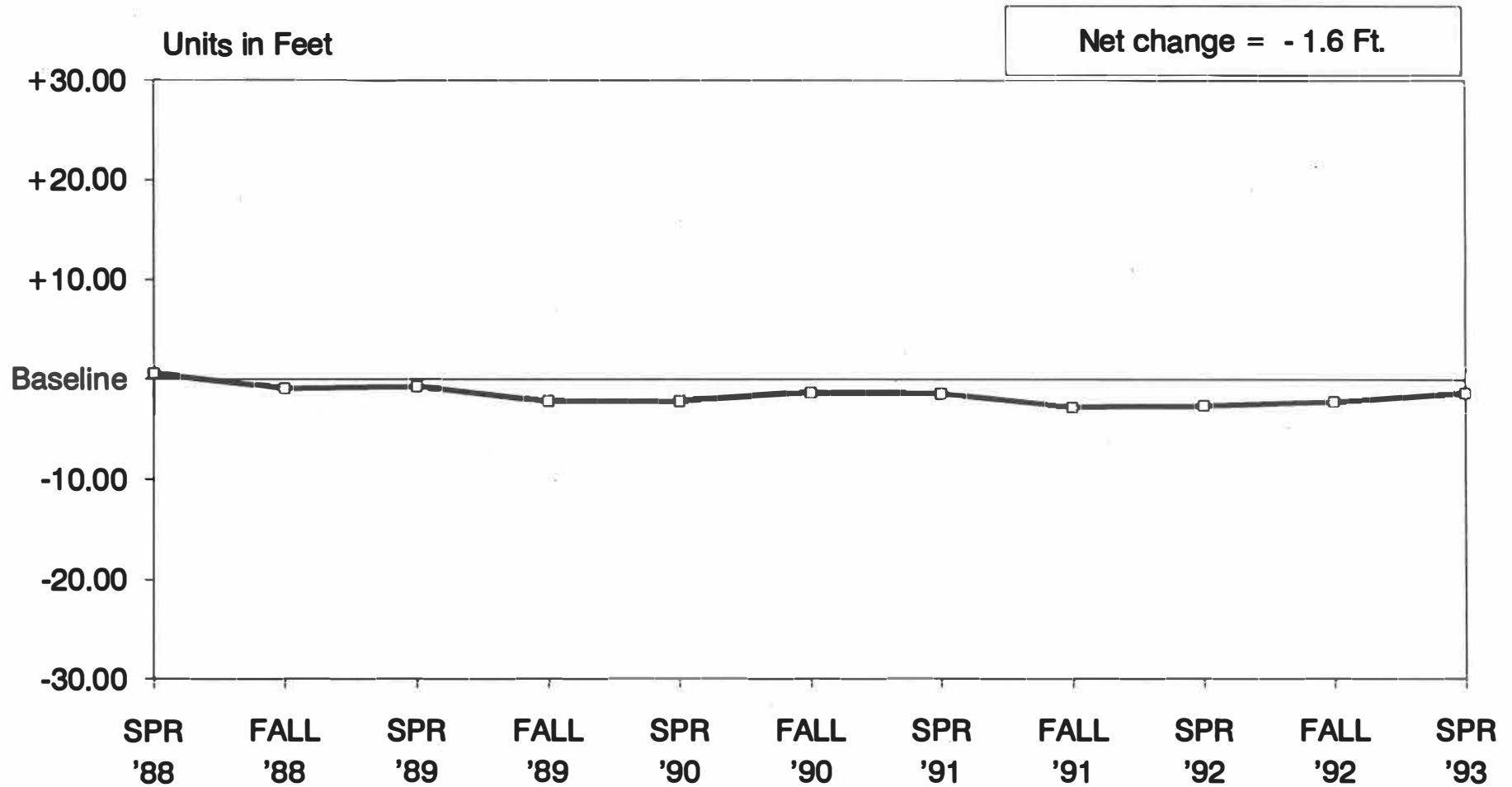
Changes in Water Levels Since 1987 (Baseline)
Well: 17 19N-1E-26DABD Platte Co. Shell Cr. Aquifer



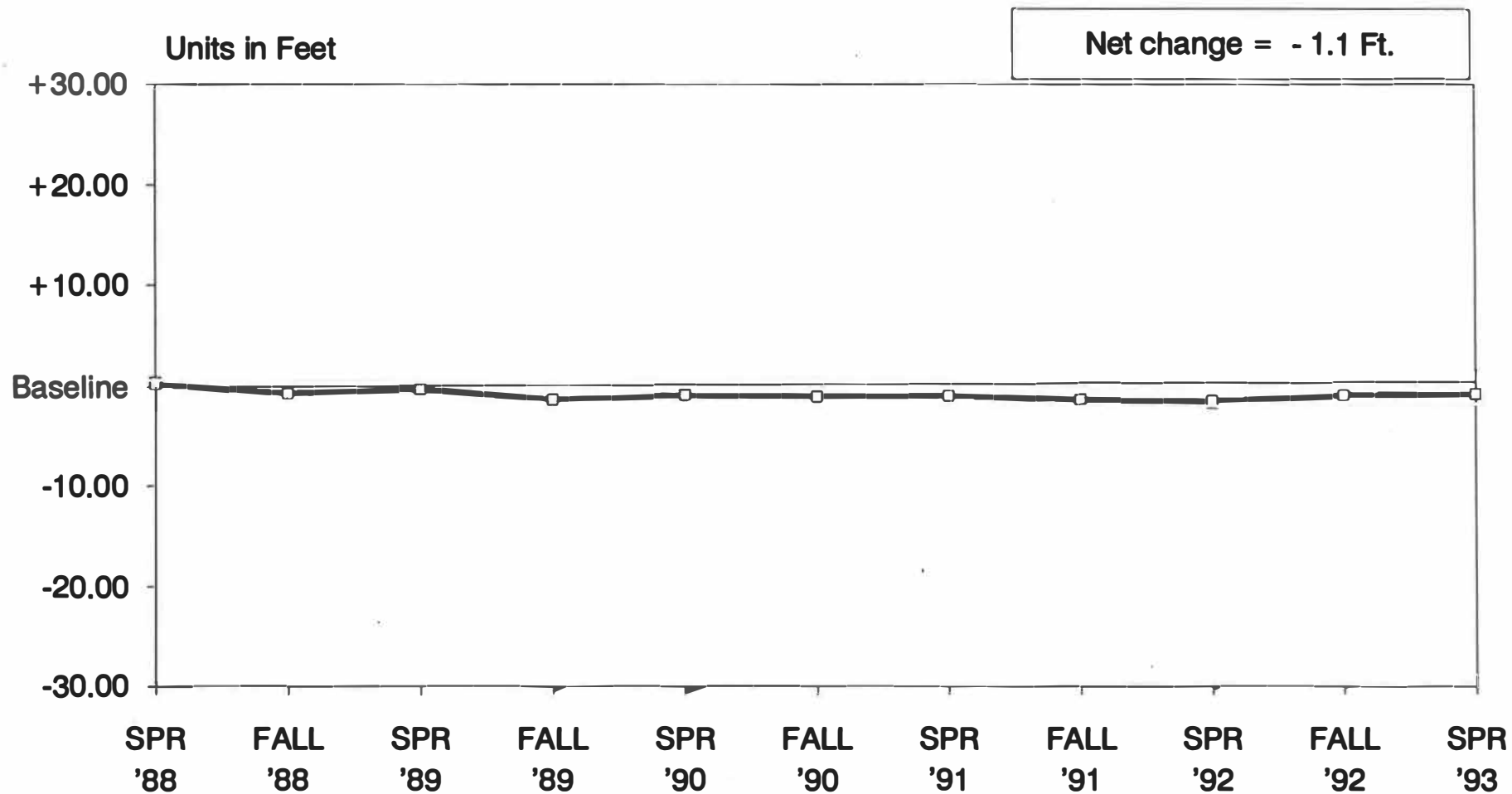
Changes in Water Levels Since 1987 (Baseline)
Well: 18 18N-1E- 9BABA Platte Co. Shell Cr. Aquifer



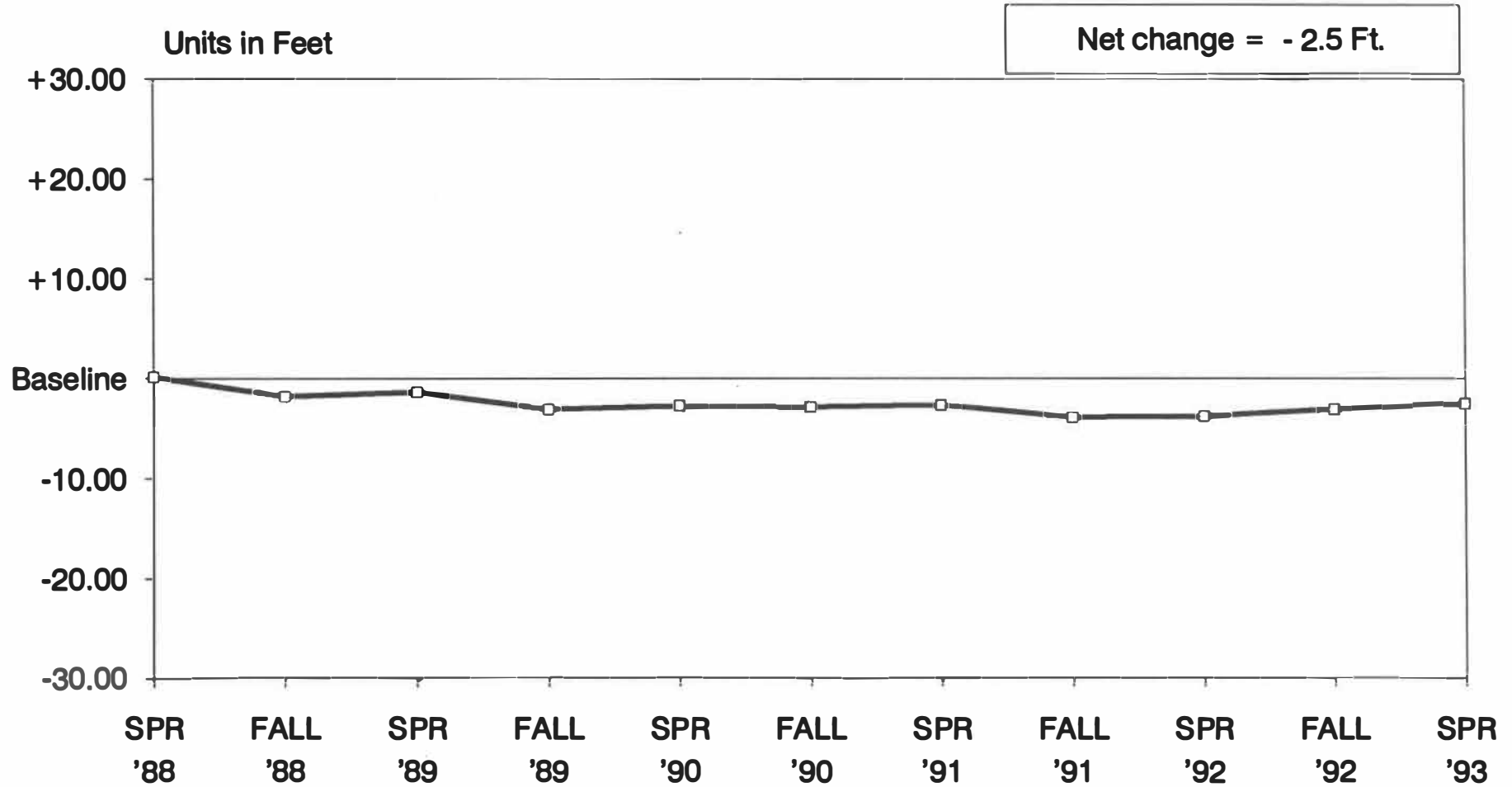
Changes in Water Levels Since 1987 (Baseline)
Well: 19 18N-1E-23BCCC Platte Co. Shell Cr. Aquifer



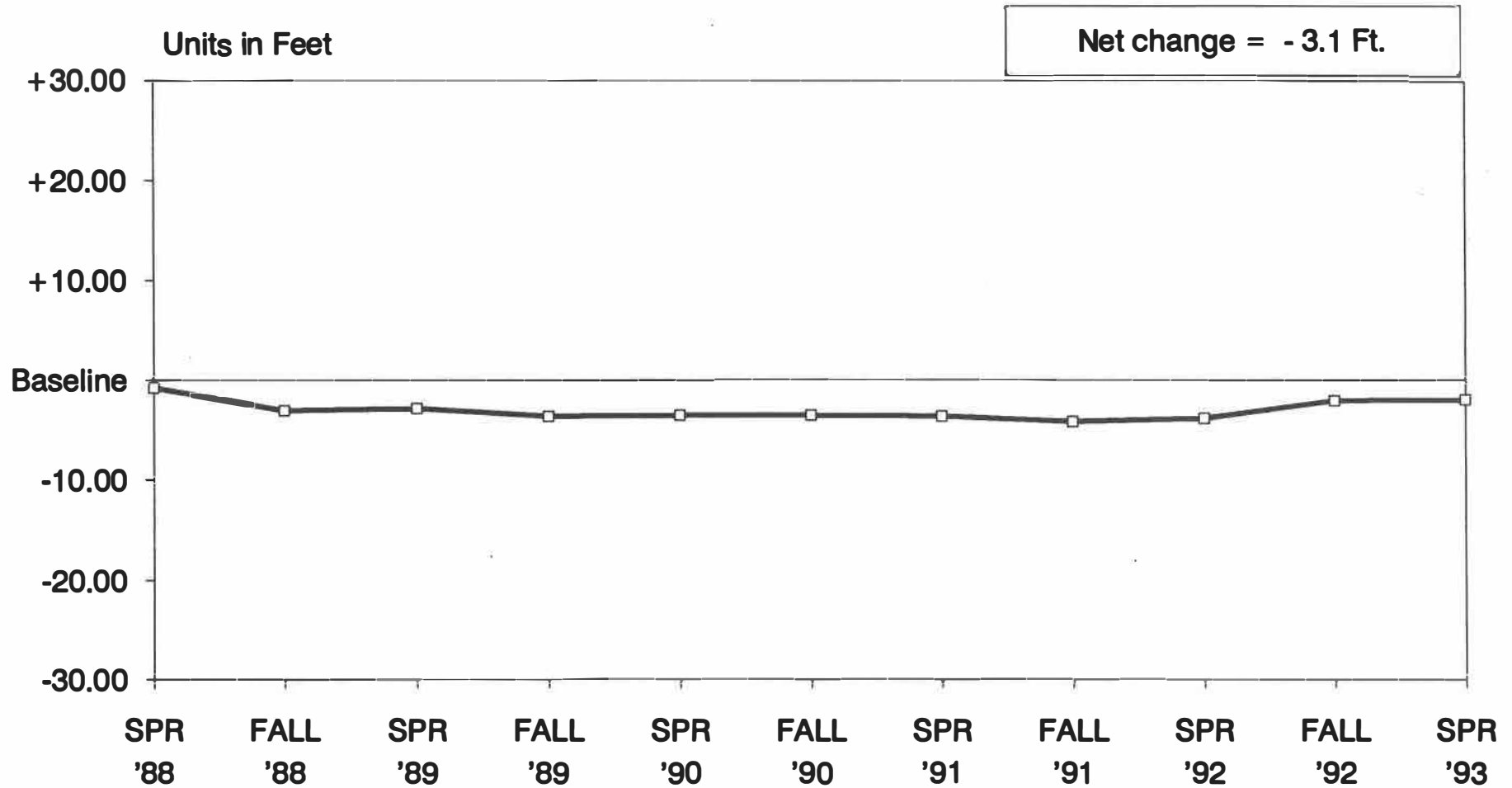
Changes in Water Levels Since 1987 (Baseline)
Well: 20 18N-2E-24CAAB Colfax Co. Shell Cr. Aquifer



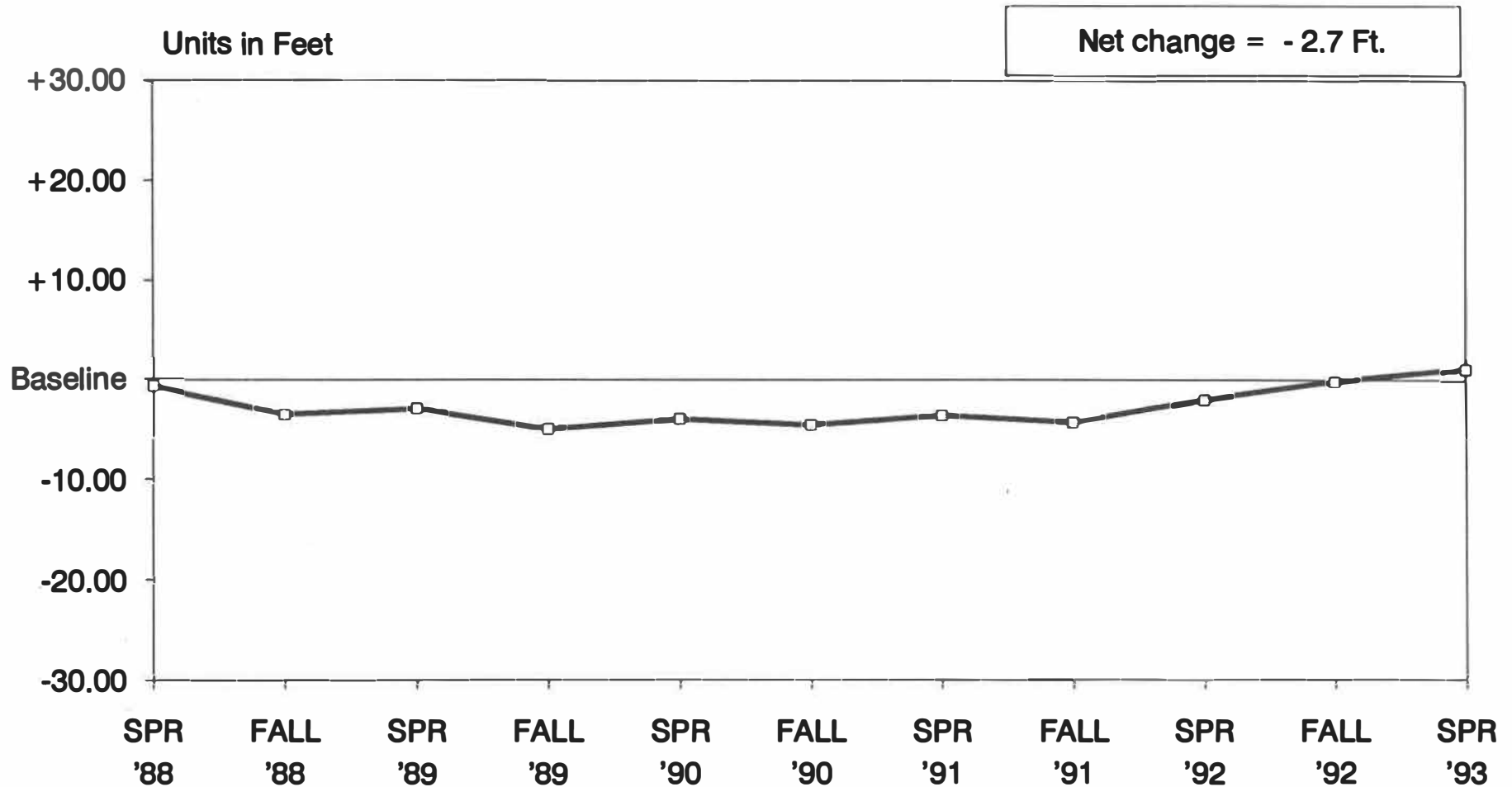
Changes in Water Levels Since 1987 (Baseline)
Well: 21 18N-2E-33AACB Colfax Co. Shell Cr. Aquifer



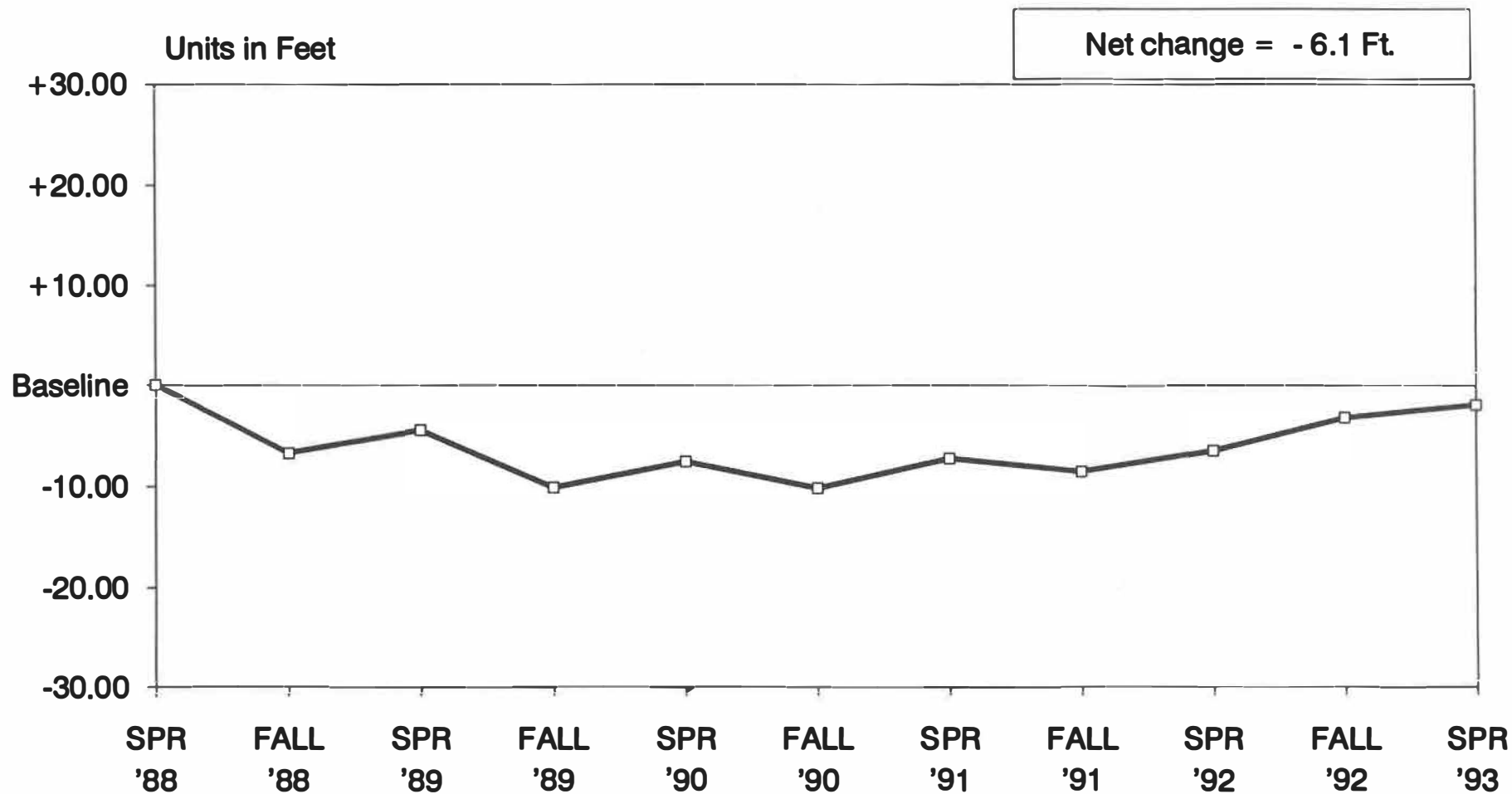
Changes in Water Levels Since 1987 (Baseline)
Well: 22 17N-2E-16BABB Colfax Co. Platte V. Aquifer



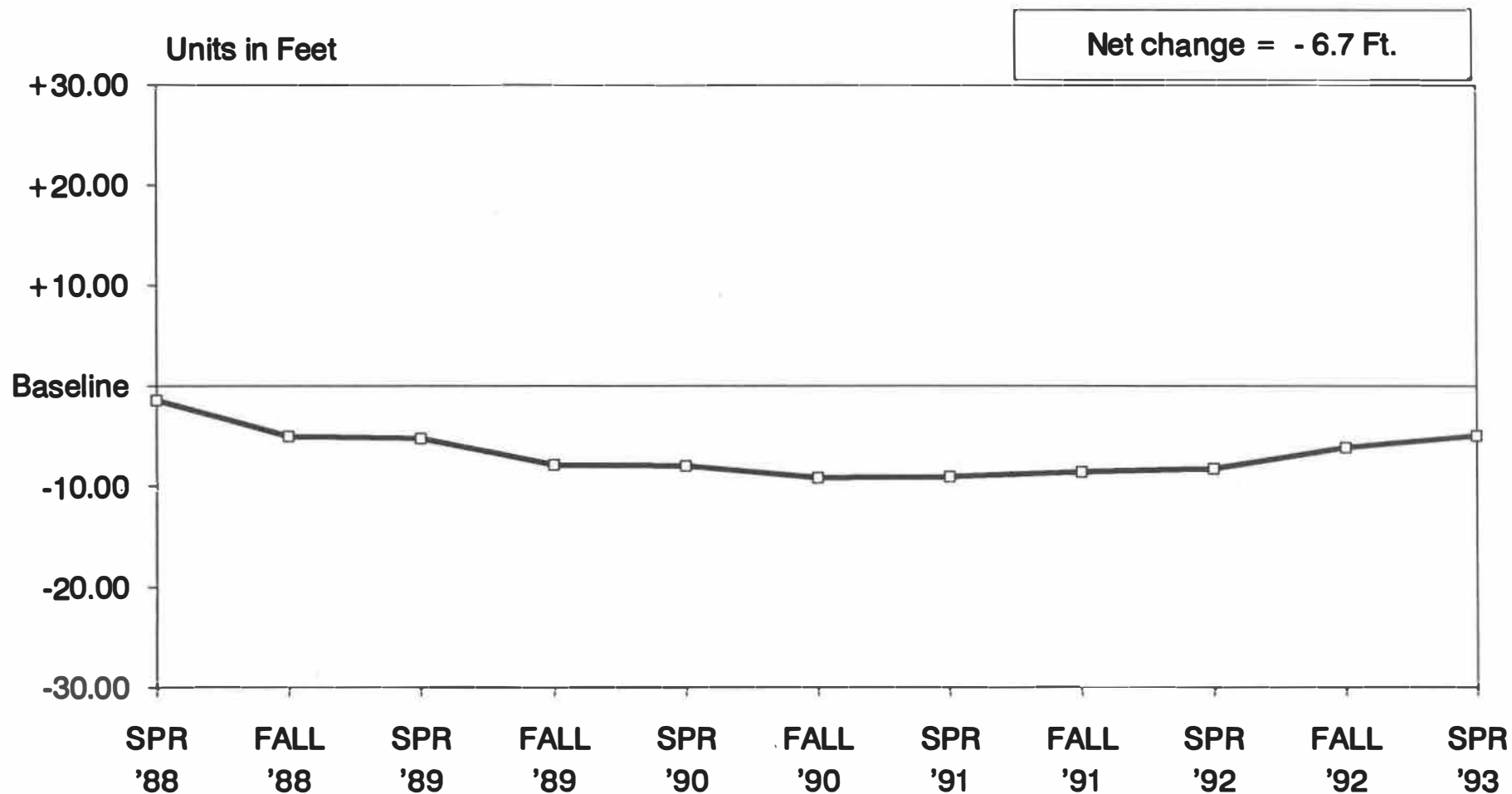
Changes in Water Levels Since 1987 (Baseline)
Well: 23 16N-1E-17CBCC Butler Co. Platte V. Aquifer



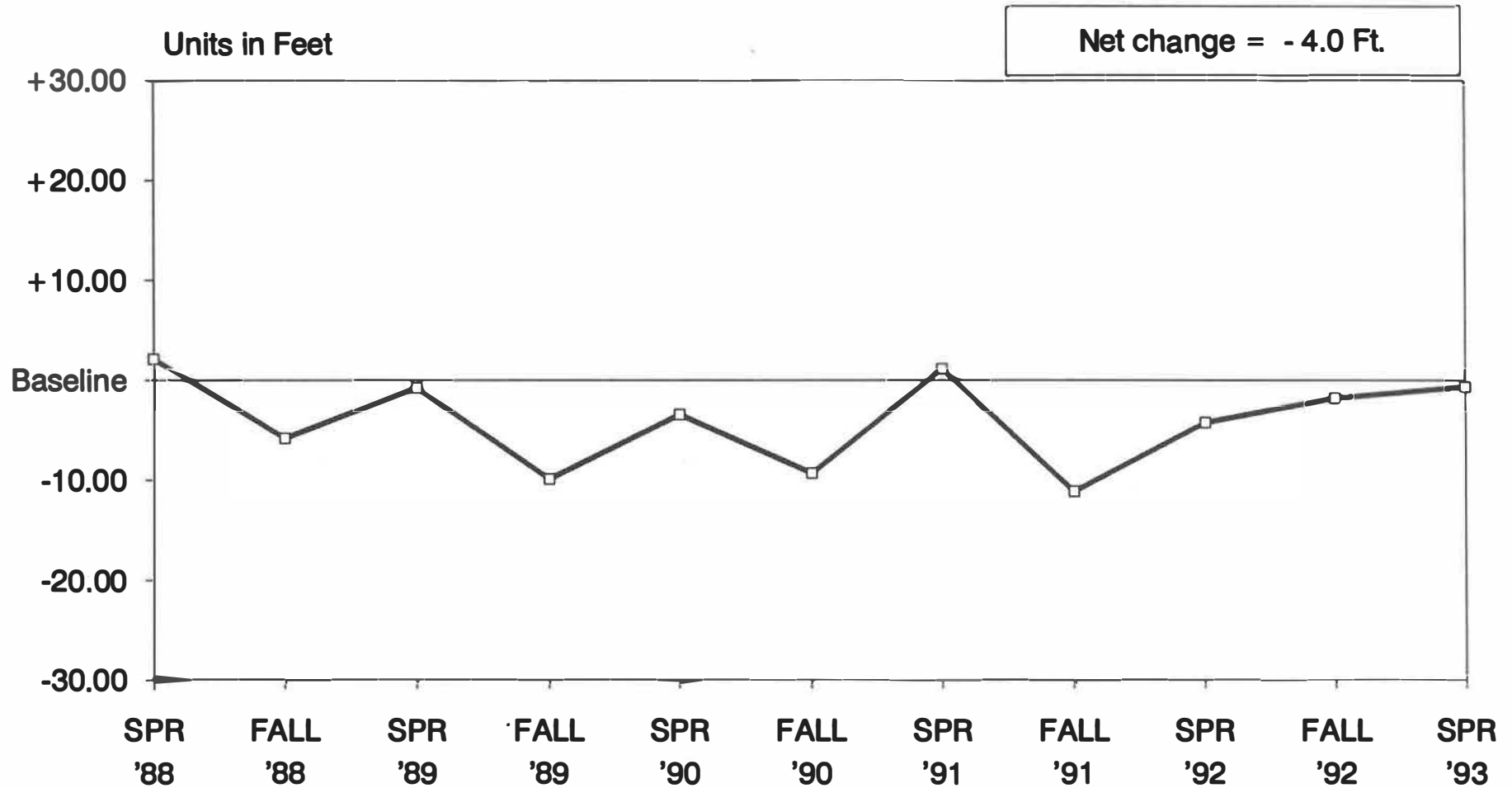
Changes in Water Levels Since 1987 (Baseline)
Well: 24 16N-1E-32AAAD Butler Co. Platte V. Aquifer



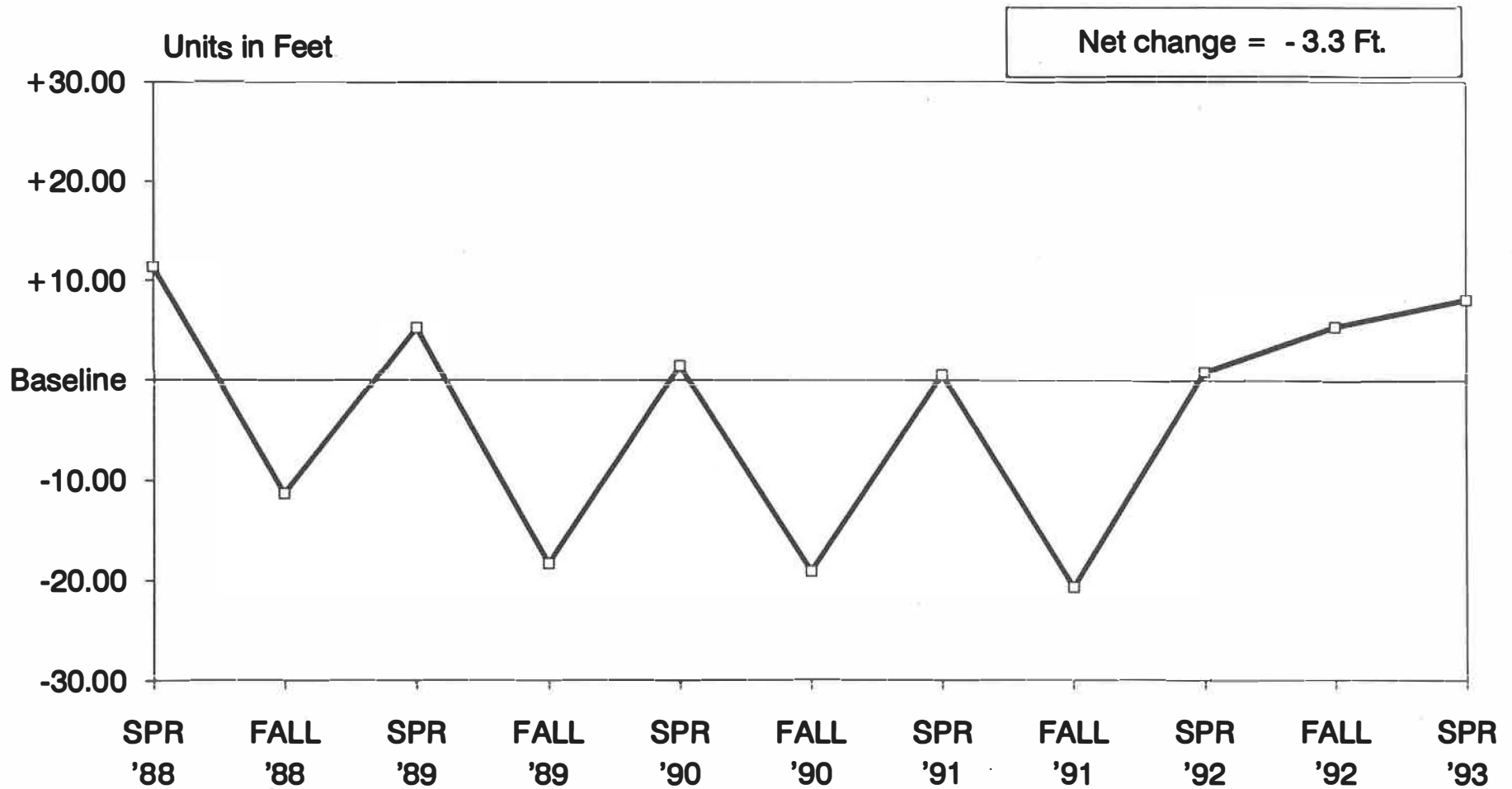
Changes in Water Levels Since 1987 (Baseline)
Well: 25 16N-2E-19CCAD Butler Co. Platte V. Aquifer



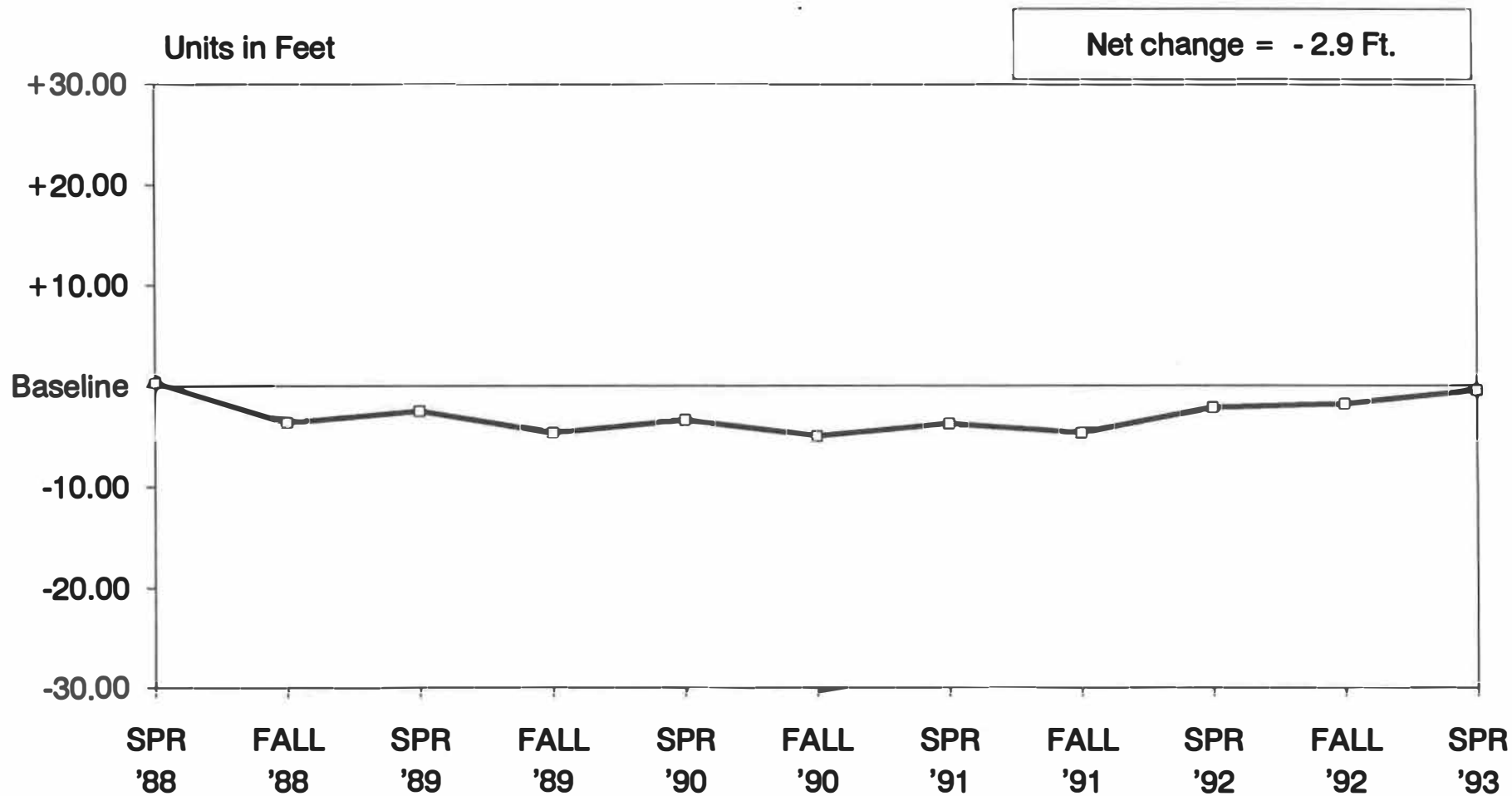
Changes in Water Levels Since 1987 (Baseline)
Well: 26 15N-1E-12CDDC Butler Co. Uplands Aquifer



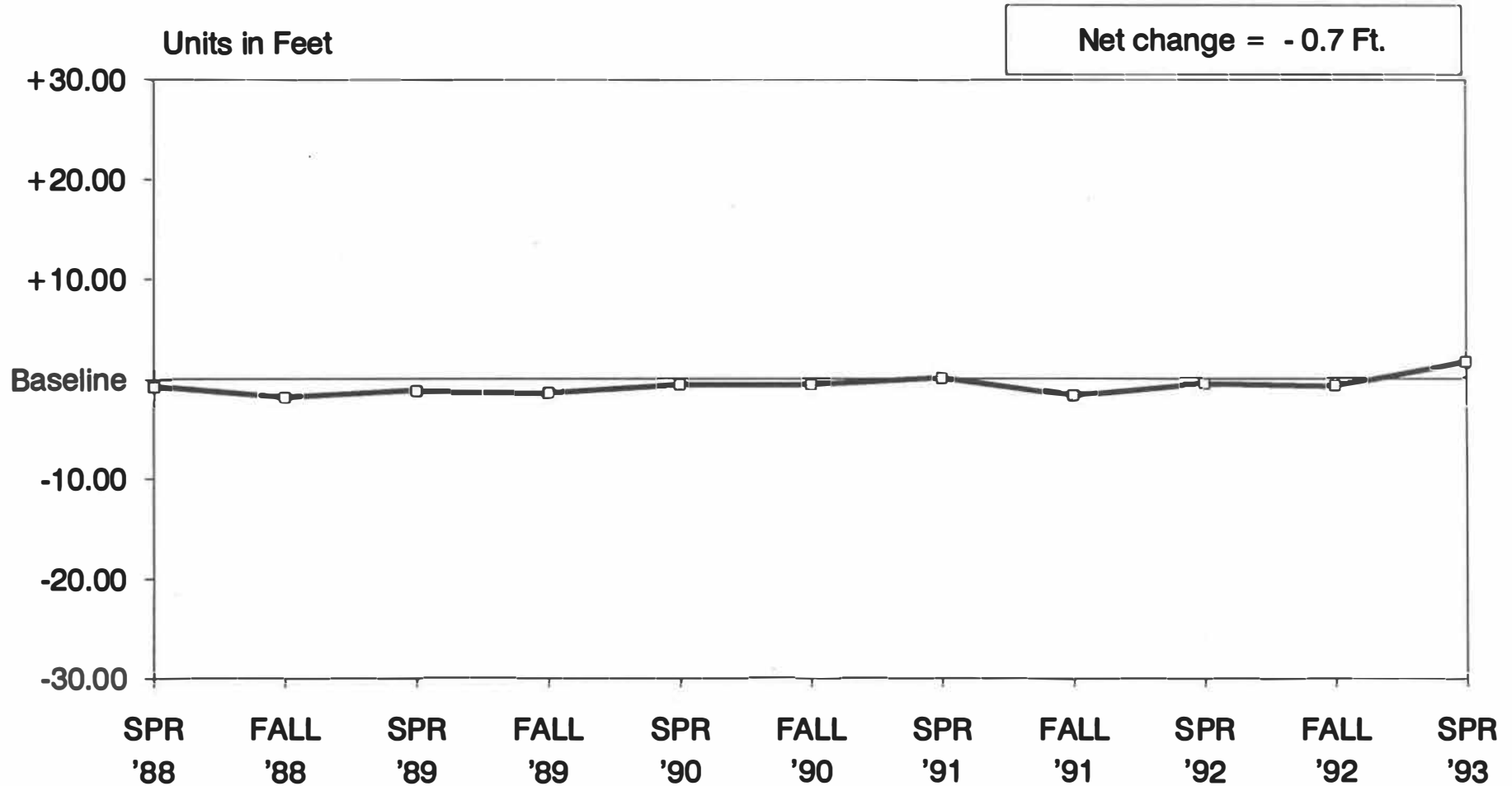
Changes in Water Levels Since 1988 (Baseline)
Well: 27 15N-2E-14AABC Butler Co. Uplands Aquifer



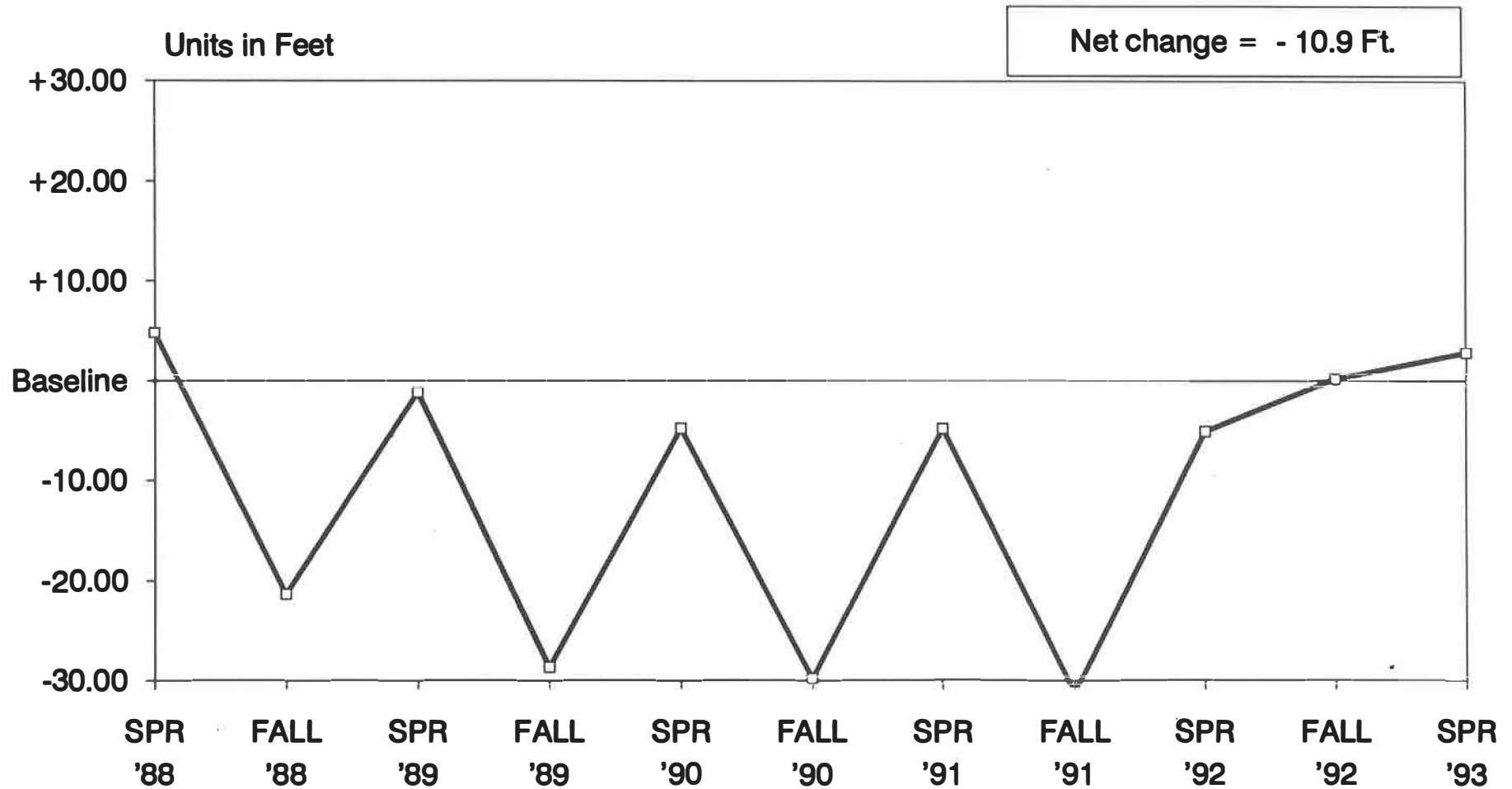
Changes in Water Levels Since 1987 (Baseline)
Well: 28 16N-3E-17DABA Butler Co. Platte V. Aquifer



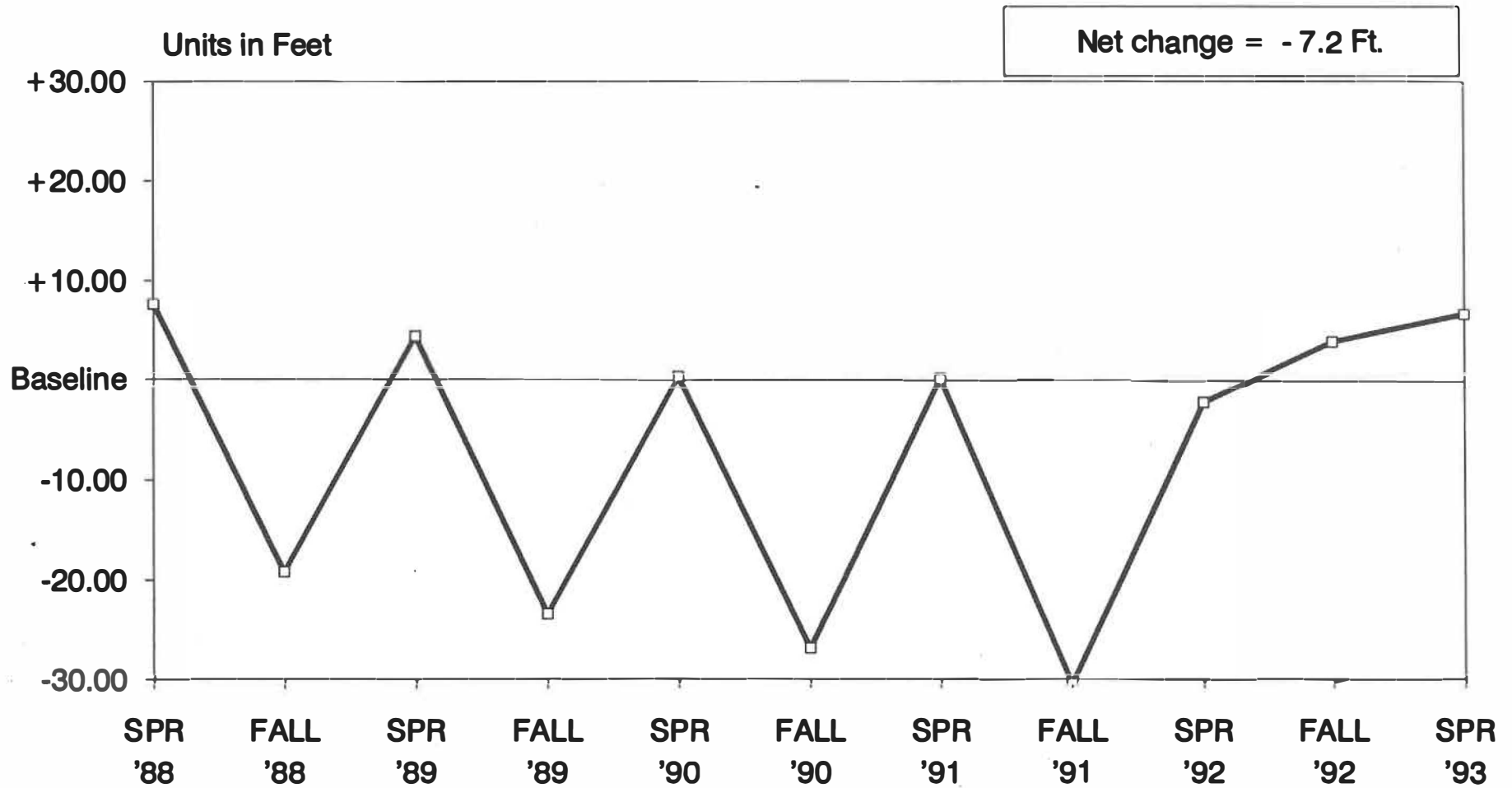
Changes in Water Levels Since 1987 (Baseline)
Well: 29 17N-3E-24CCCC Colfax Co. Platte V. Aquifer



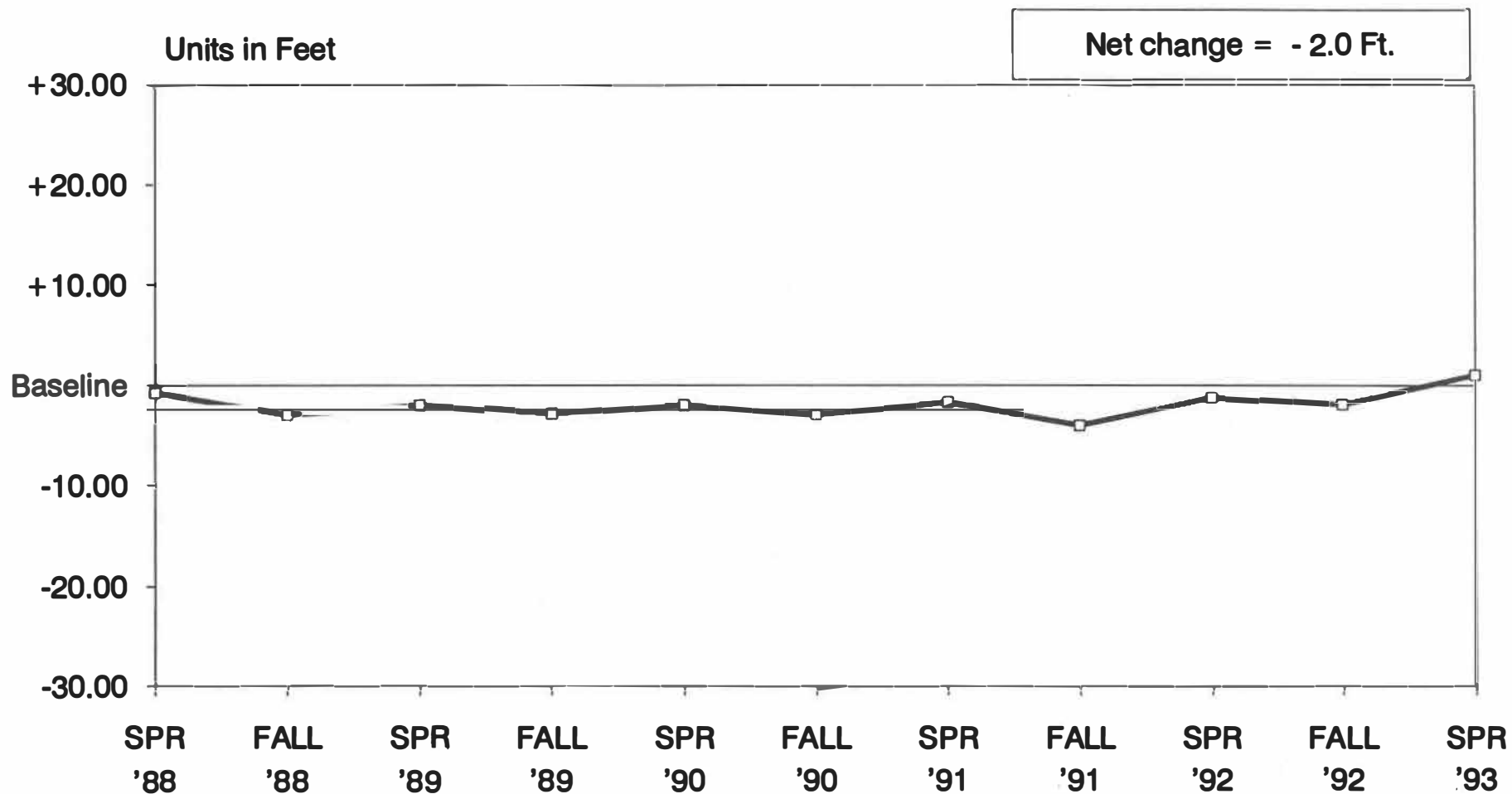
Changes in Water Levels Since 1987 (Baseline)
Well: 30 15N-3E-21ACBB Butler Co. Uplands Aquifer



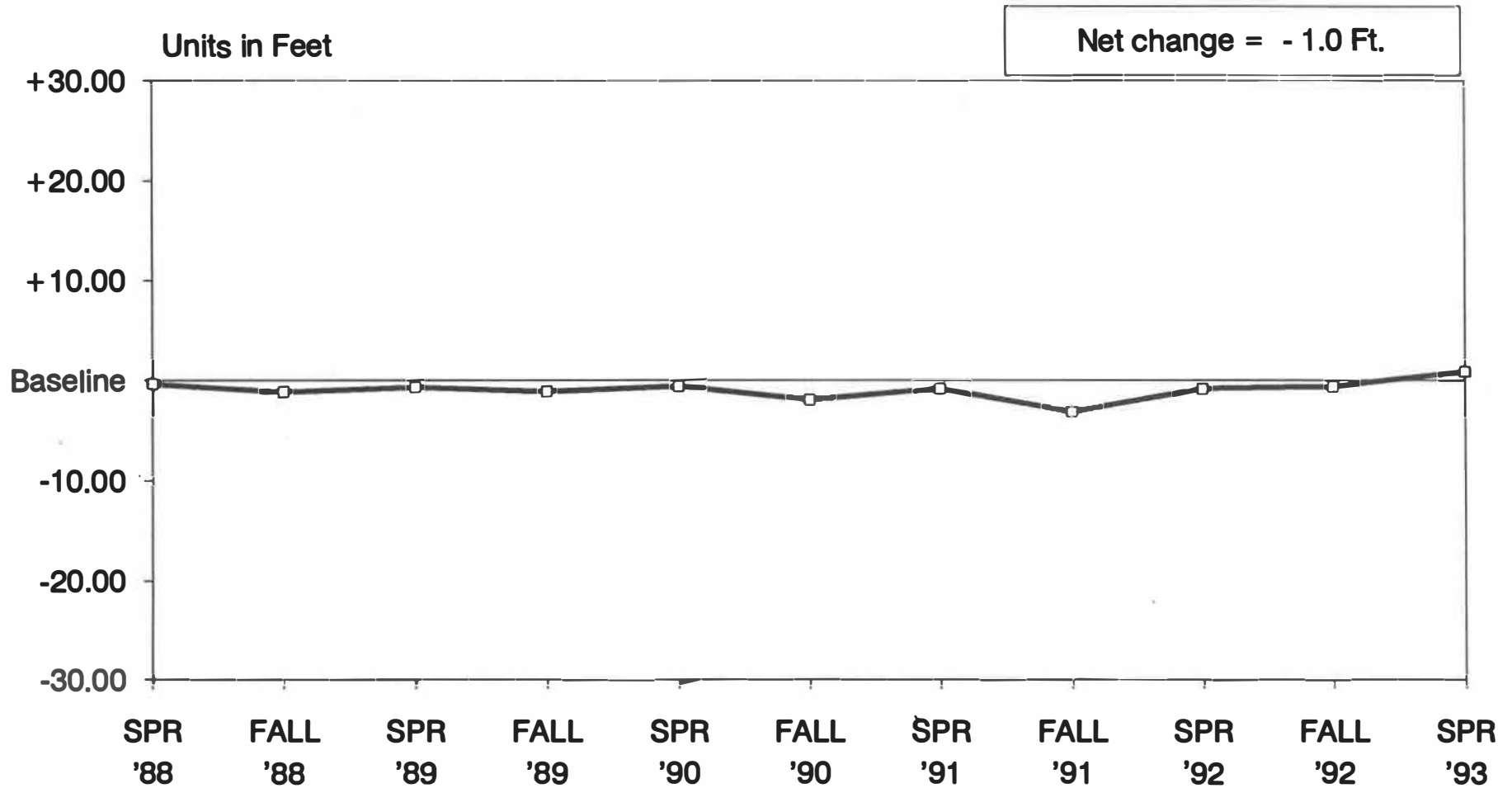
Changes in Water Levels Since 1987 (Baseline)
Well: 31 15N-4E-33CBDA Butler Co. Uplands Aquifer



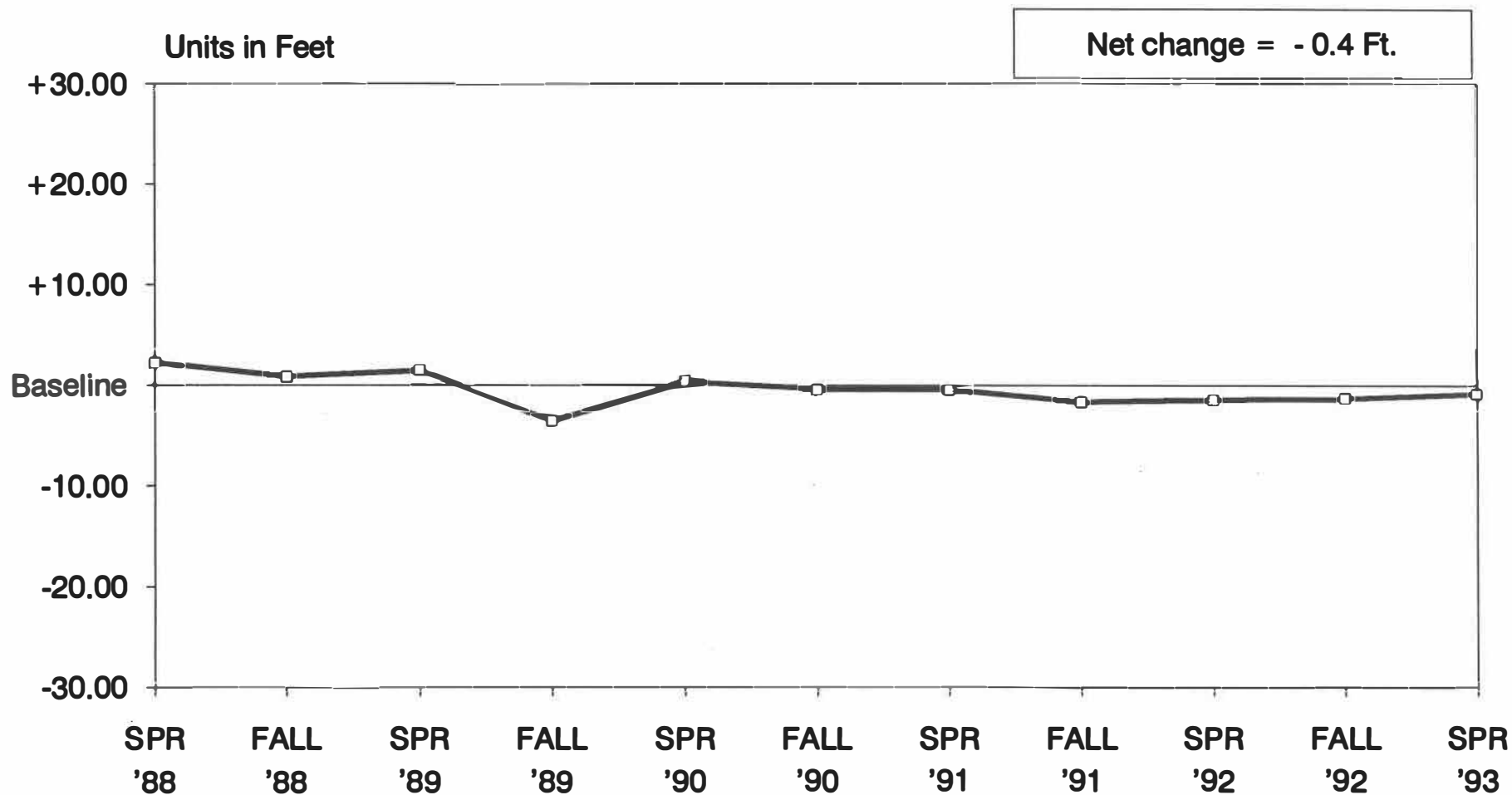
Changes in Water Levels Since 1987 (Baseline)
Well: 32 17N-5E- 5CCCC Dodge Co. Platte V. Aquifer



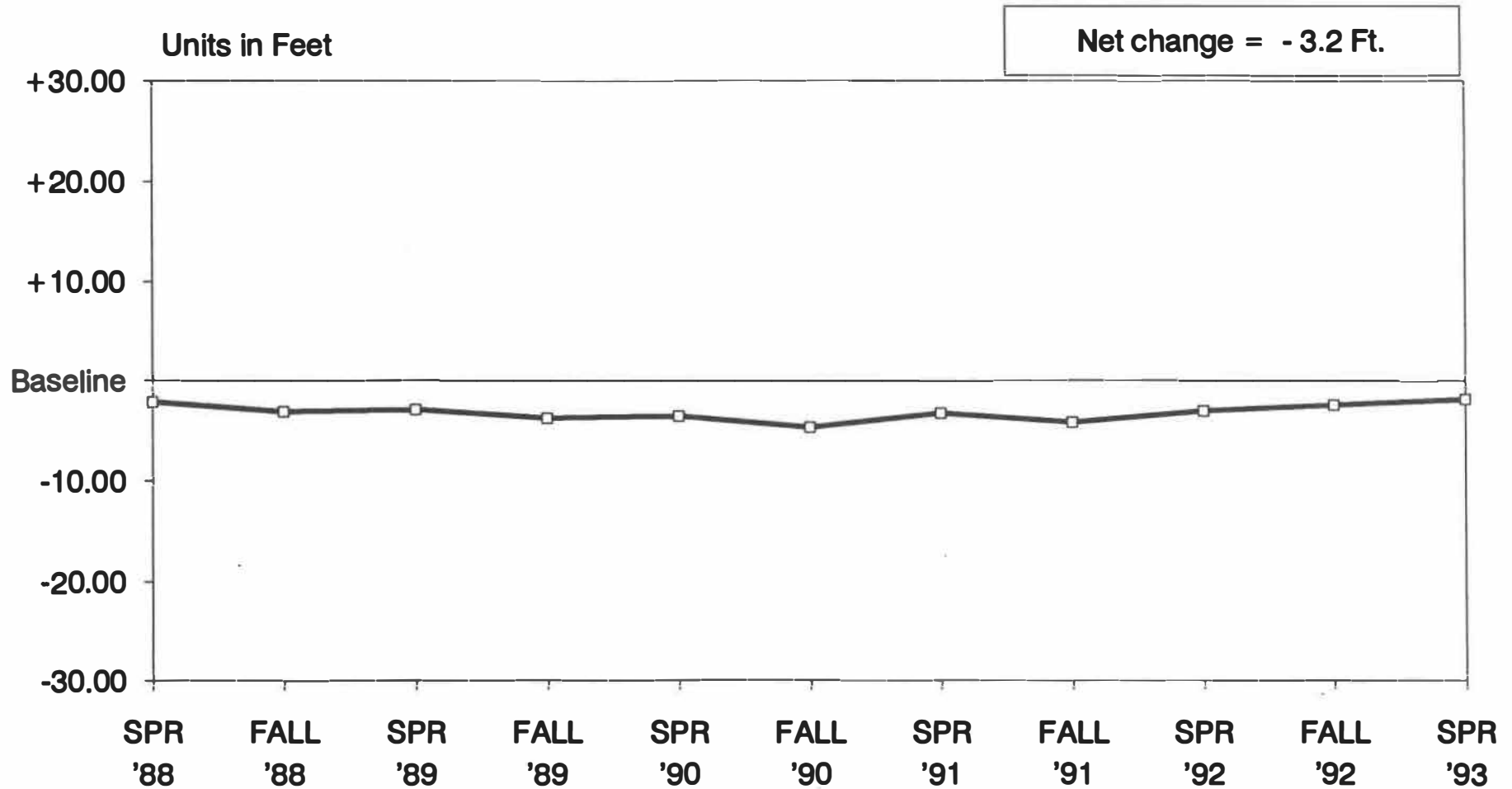
Changes in Water Levels Since 1987 (Baseline)
Well: 33 18N-5E-22DCCB Dodge Co. Platte V. Aquifer



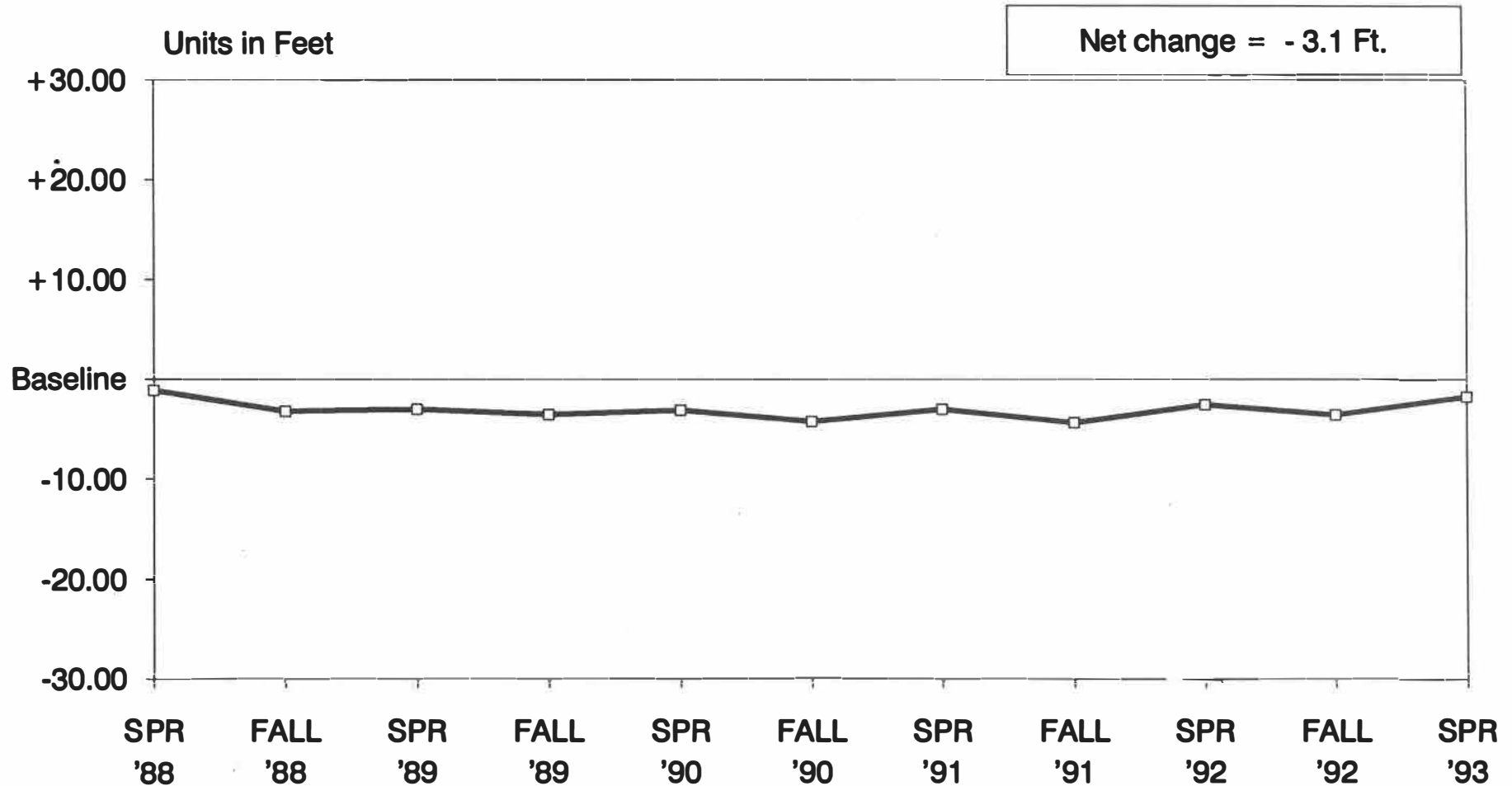
Changes in Water Levels Since 1987 (Baseline)
Well: 34 14N-6E- 6AACD Saunders Co. Uplands Aquifer



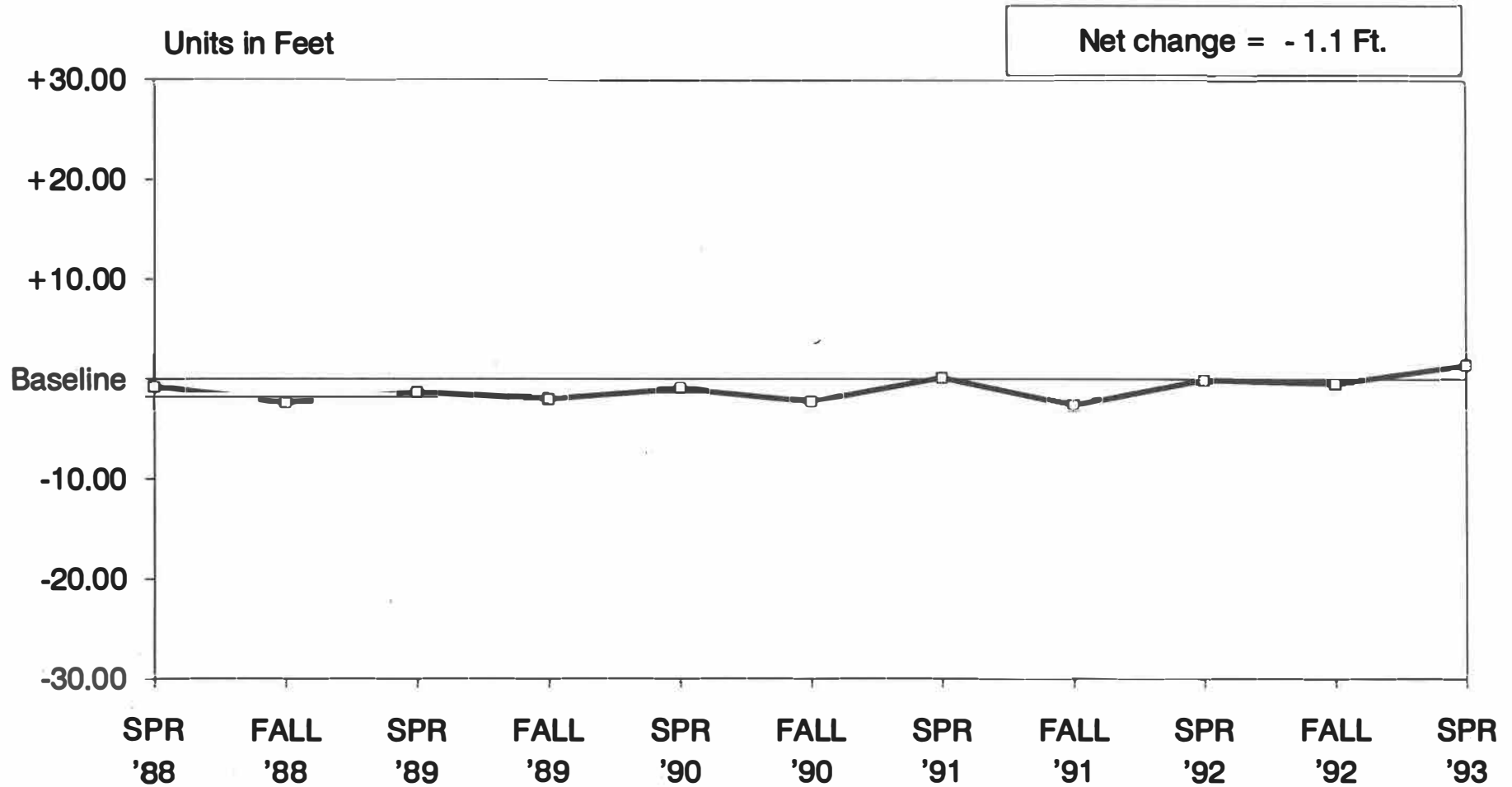
Changes in Water Levels Since 1987 (Baseline)
Well: 35 14N-6E-18DDBC Saunders Co. Uplands Aquifer



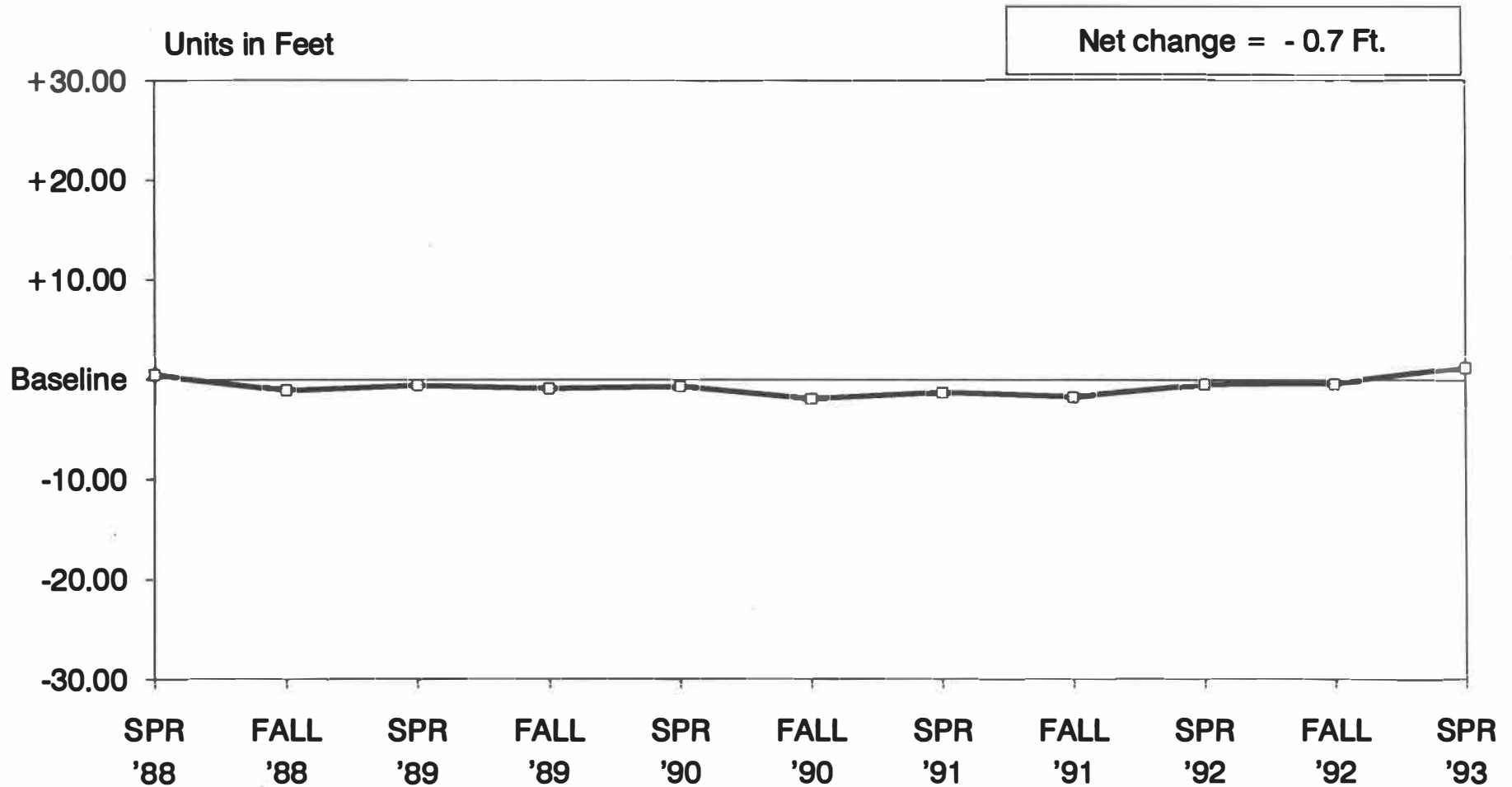
Changes in Water Levels Since 1987 (Baseline)
Well: 36 14N-7E-17BACB Saunders Co. Uplands Aquifer



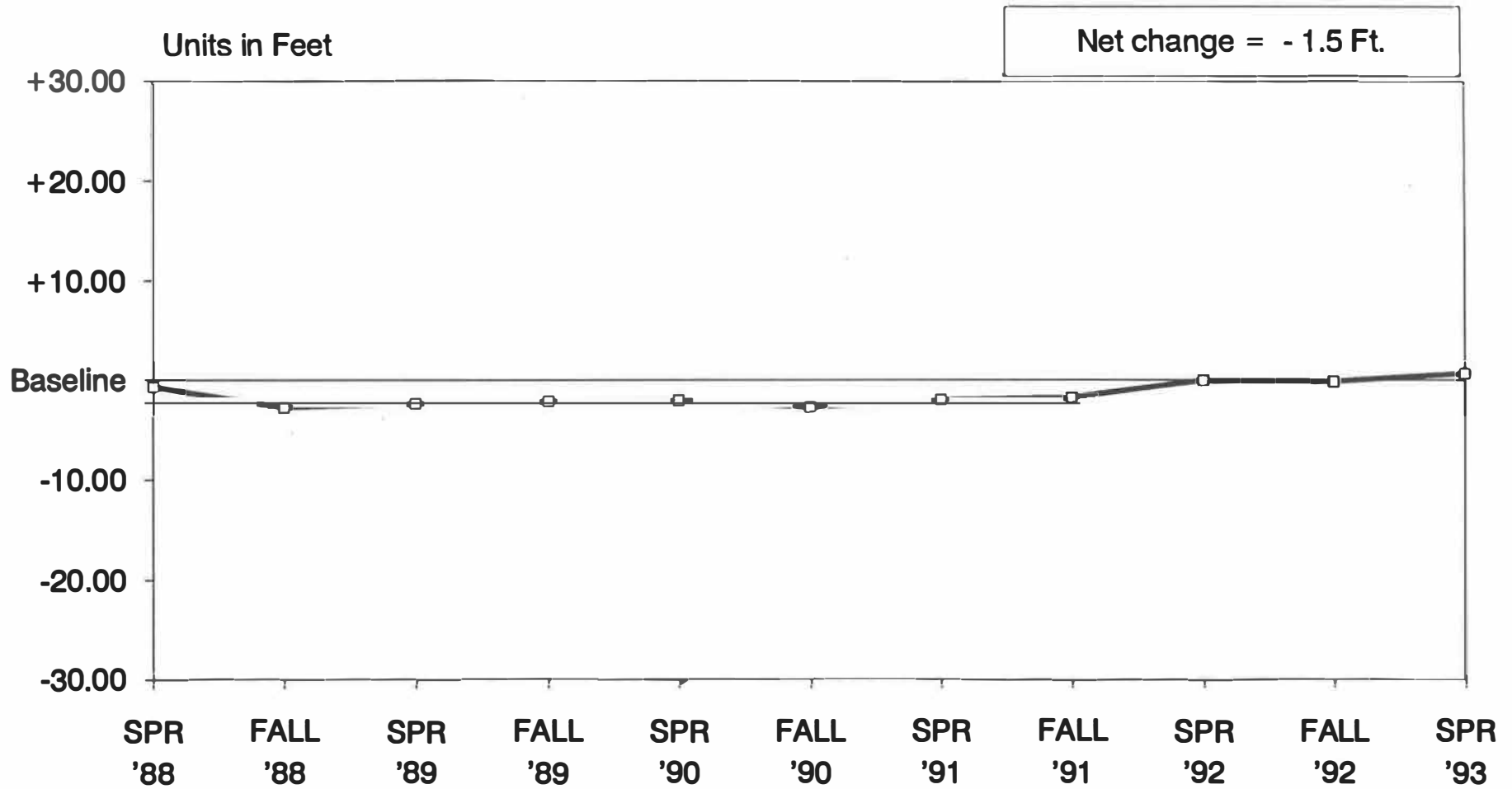
Changes in Water Levels Since 1987 (Baseline)
Well: 37 17N-6E-10BCBB Dodge Co. Platte V. Aquifer



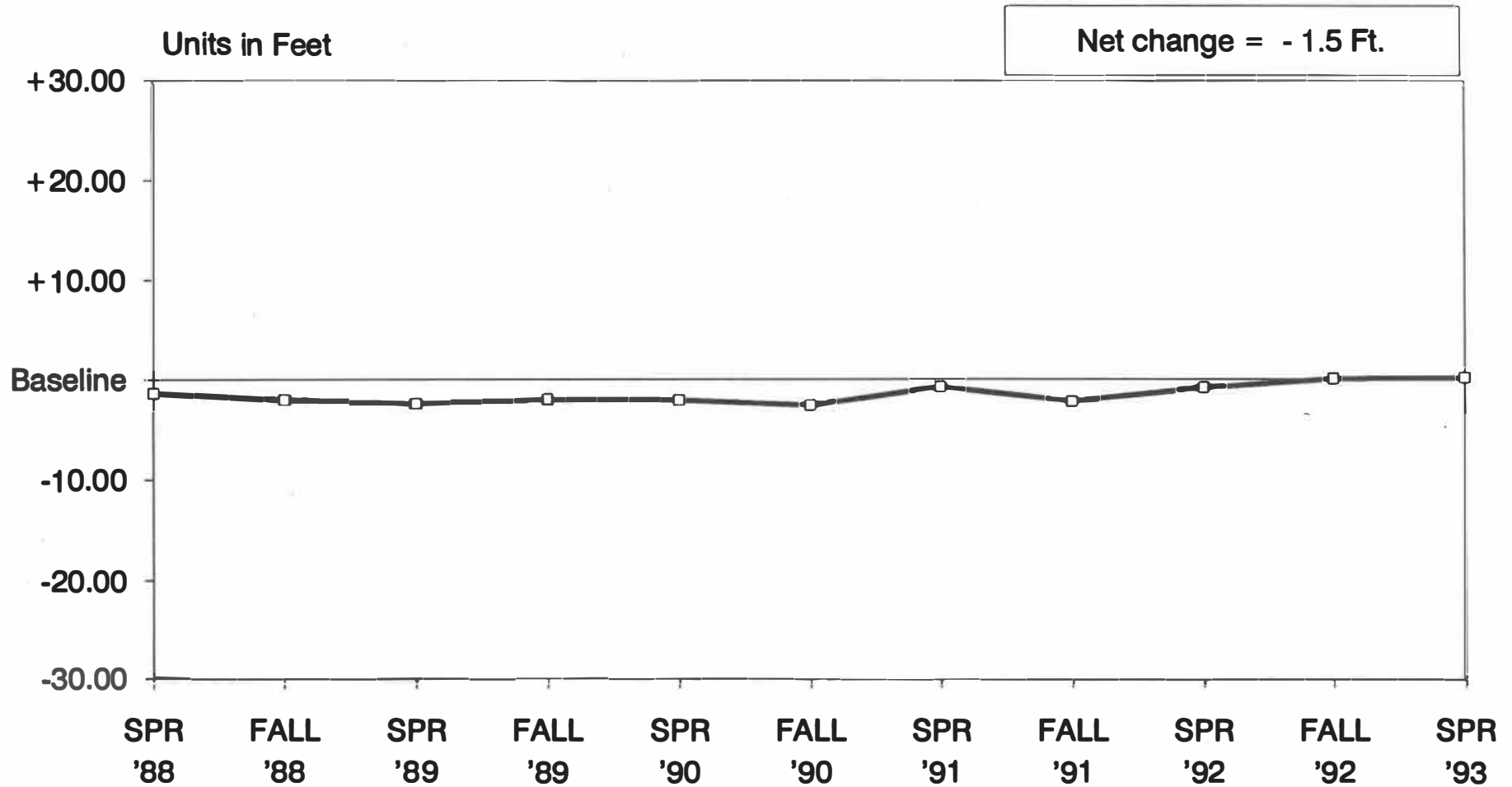
Changes in Water Levels Since 1987 (Baseline)
Well: 38 17N-5E-19CCCB Saunders Co. Platte V. Aquifer



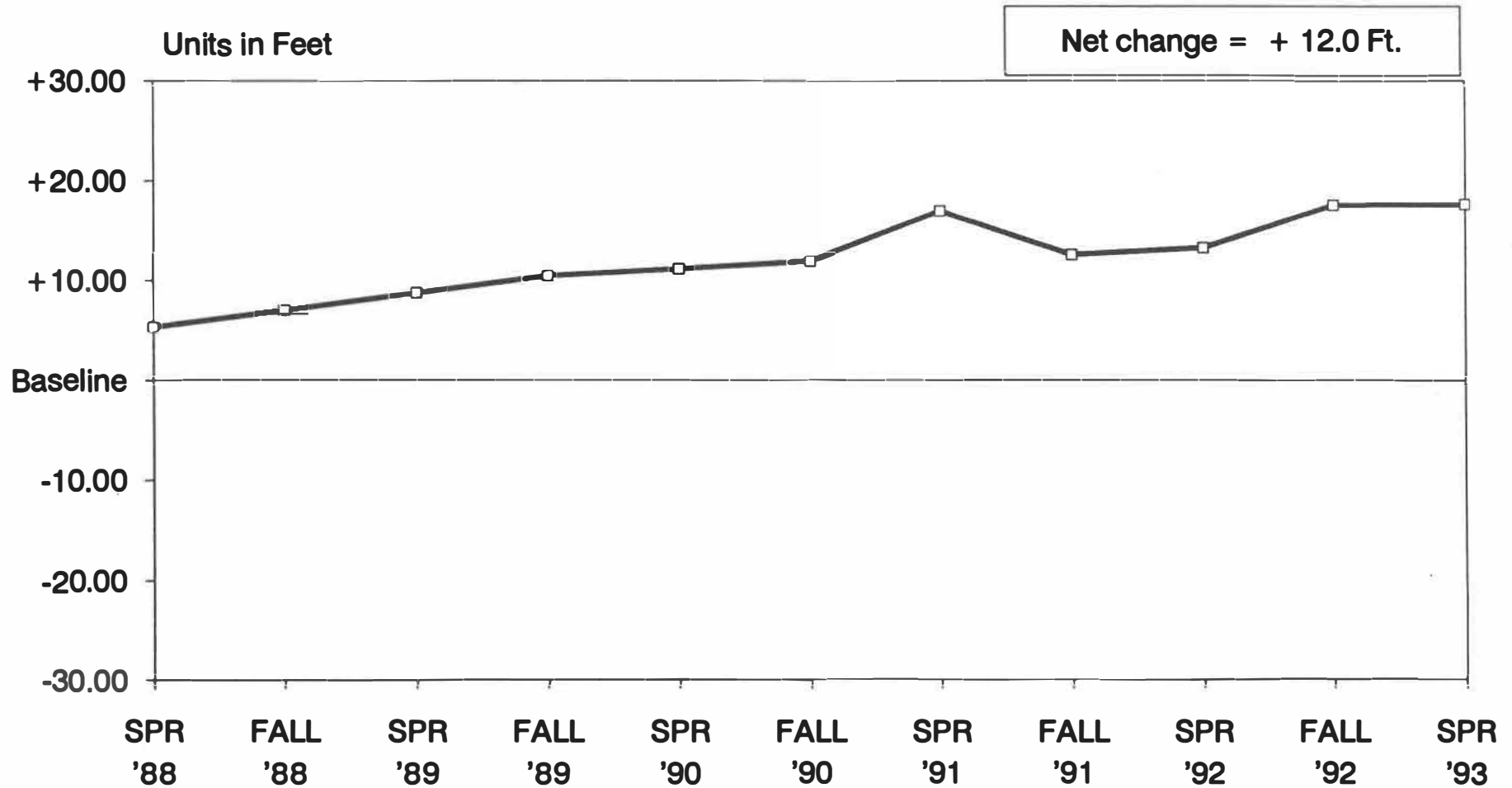
Changes in Water Levels Since 1987 (Baseline)
Well: 39 17N-8E- 8CCCC Dodge Co. Platte V. Aquifer



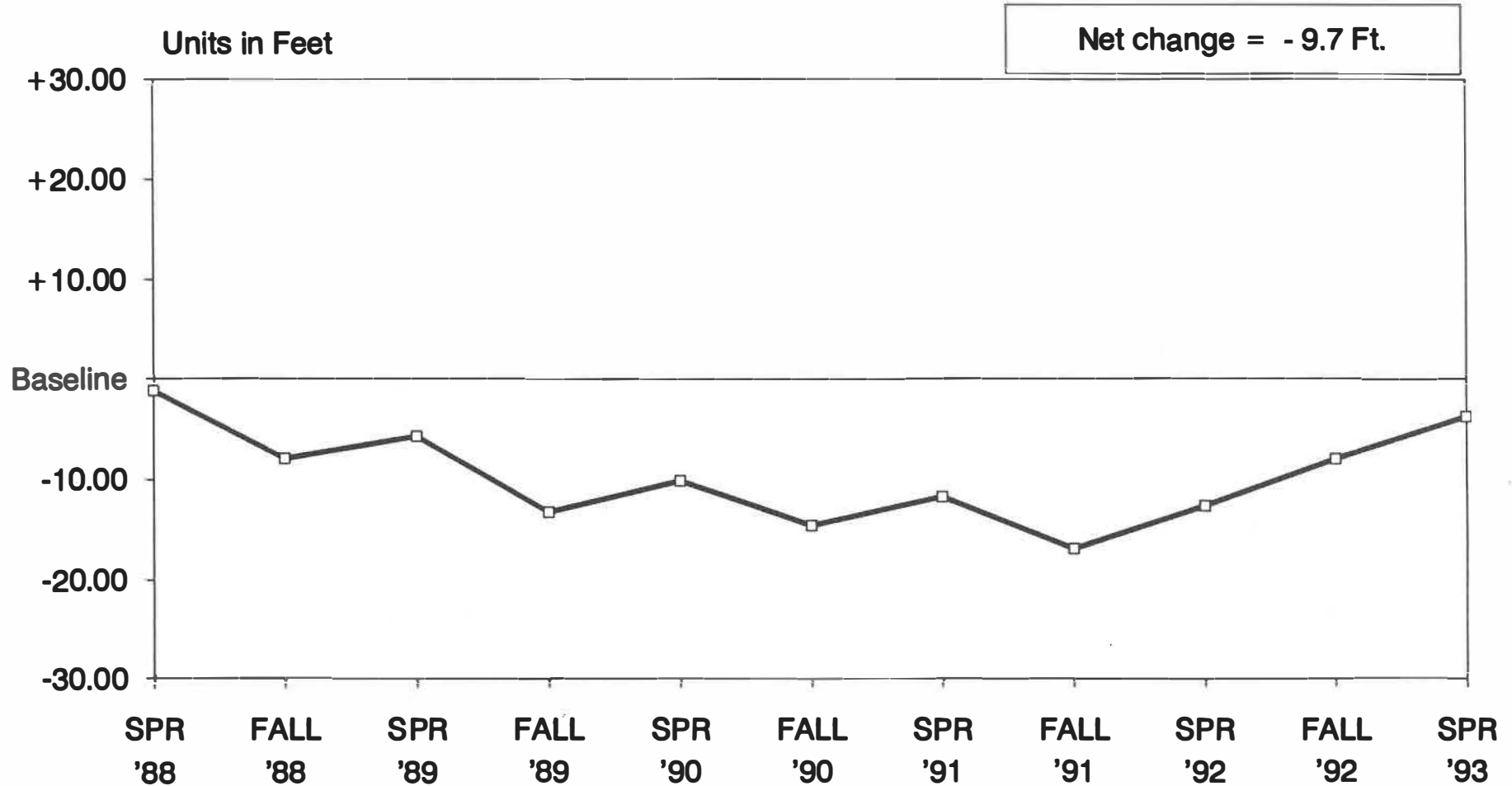
Changes in Water Levels Since 1987 (Baseline)
Well: 40 18N-8E-36CBBB Dodge Co. Platte V. Aquifer



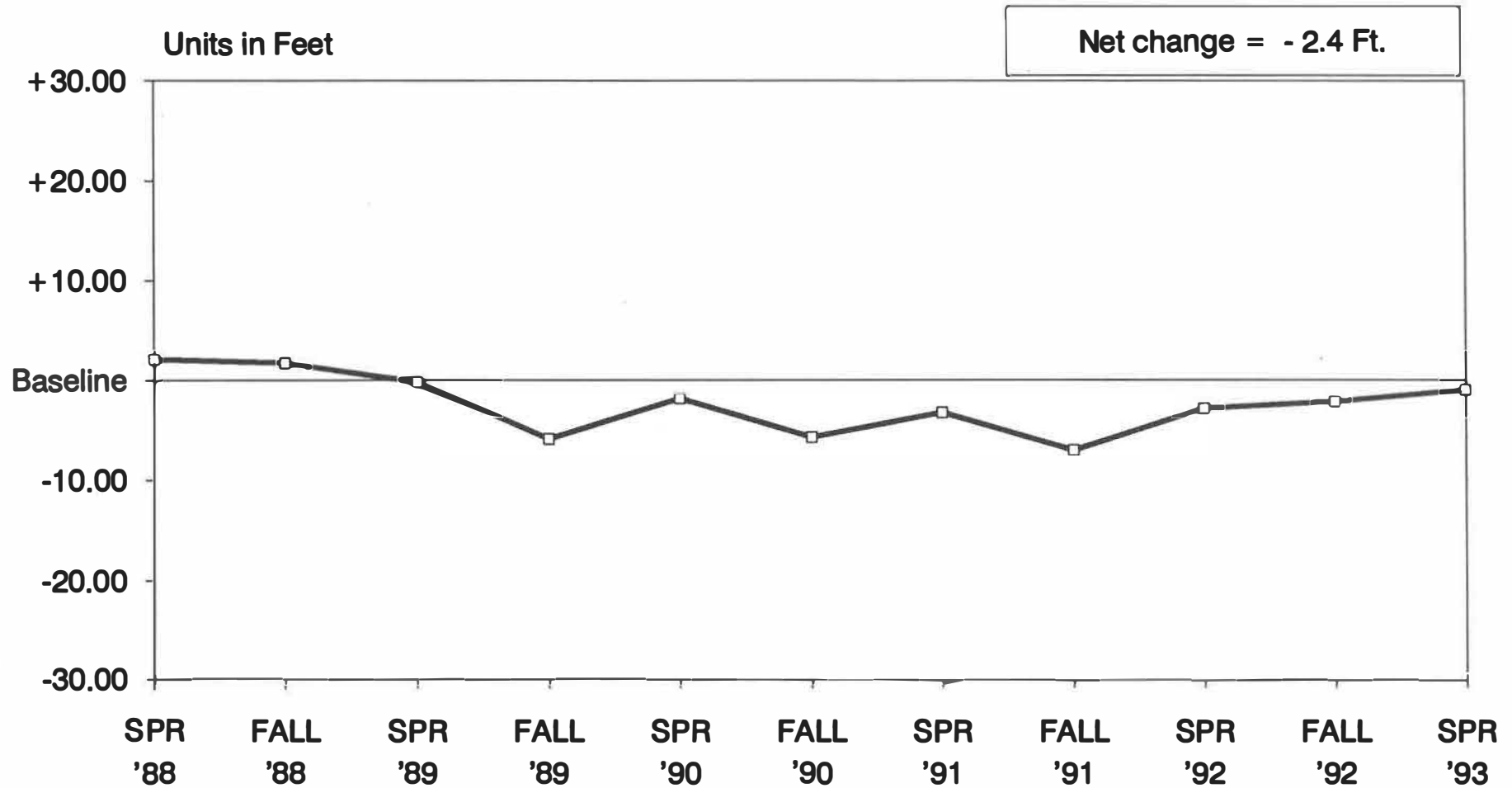
Changes in Water Levels Since 1987 (Baseline)
Well: 41 15N-5E- 9AACB Saunders Co. Uplands Aquifer



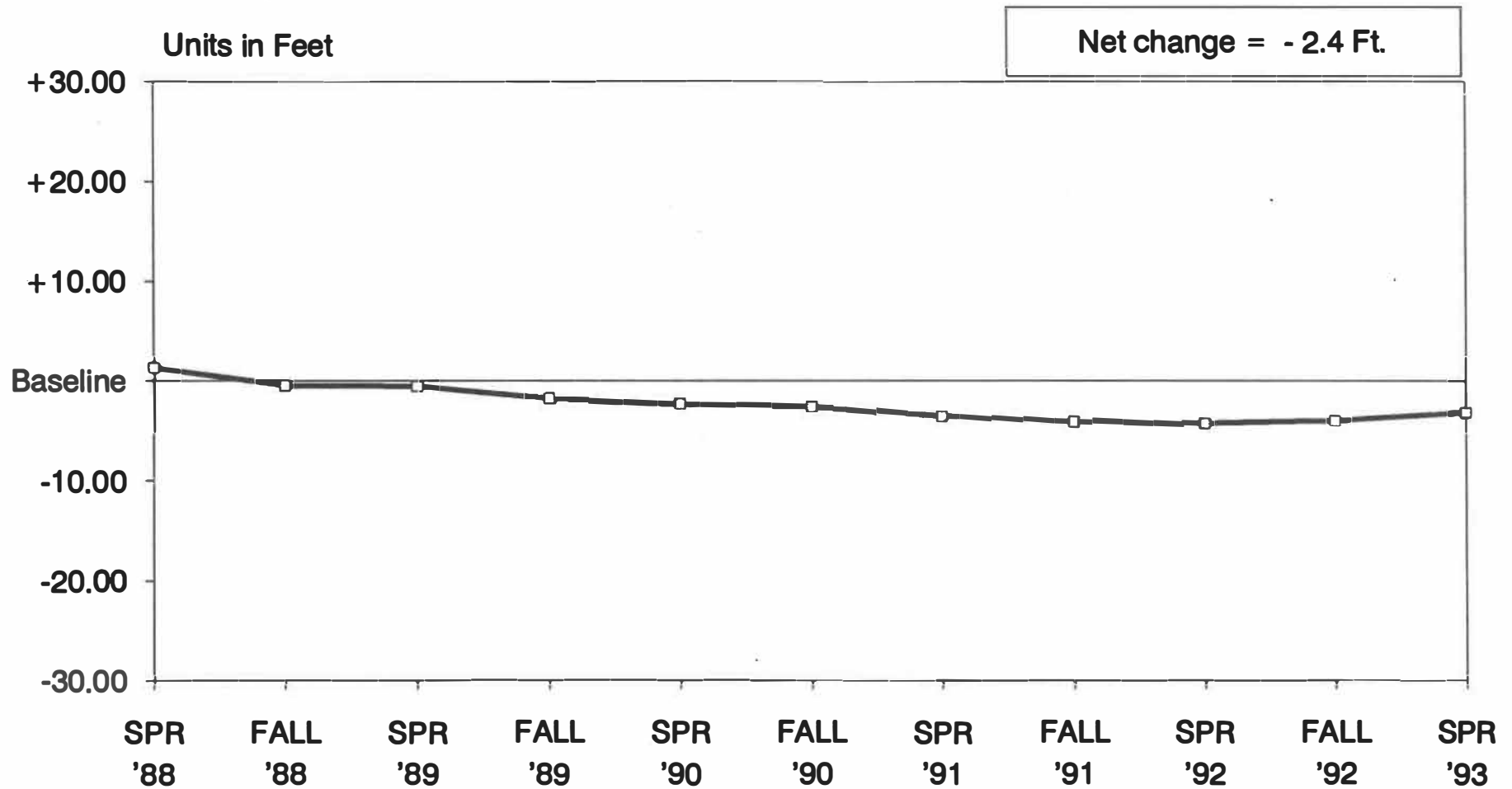
Changes in Water Levels Since 1987 (Baseline)
Well: 42 16N-6E- 7AABB Saunders Co. Uplands Aquifer



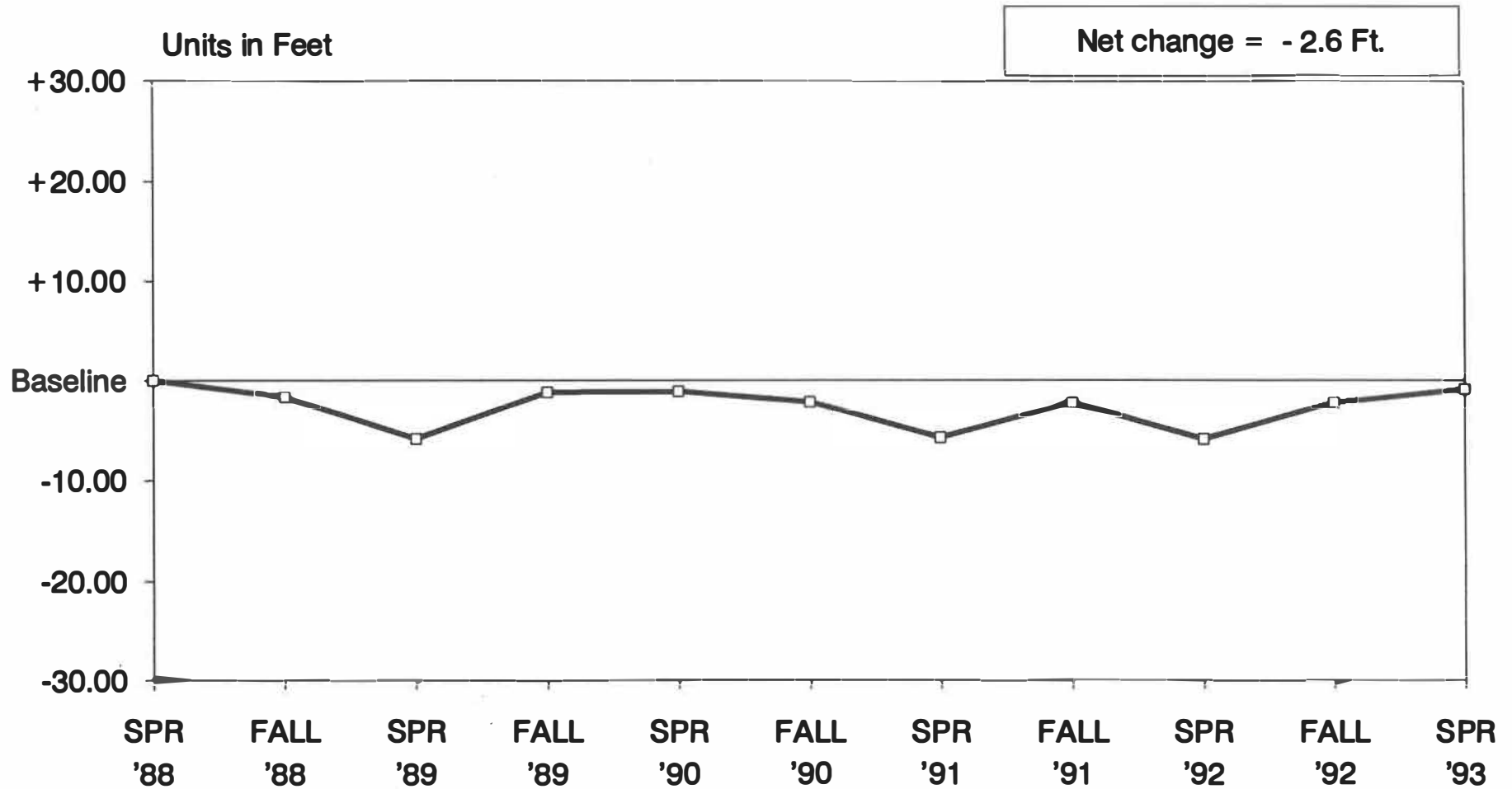
Changes in Water Levels Since 1987 (Baseline)
Well: 43 17N-7E-36AACC Saunders Co. Uplands Aquifer



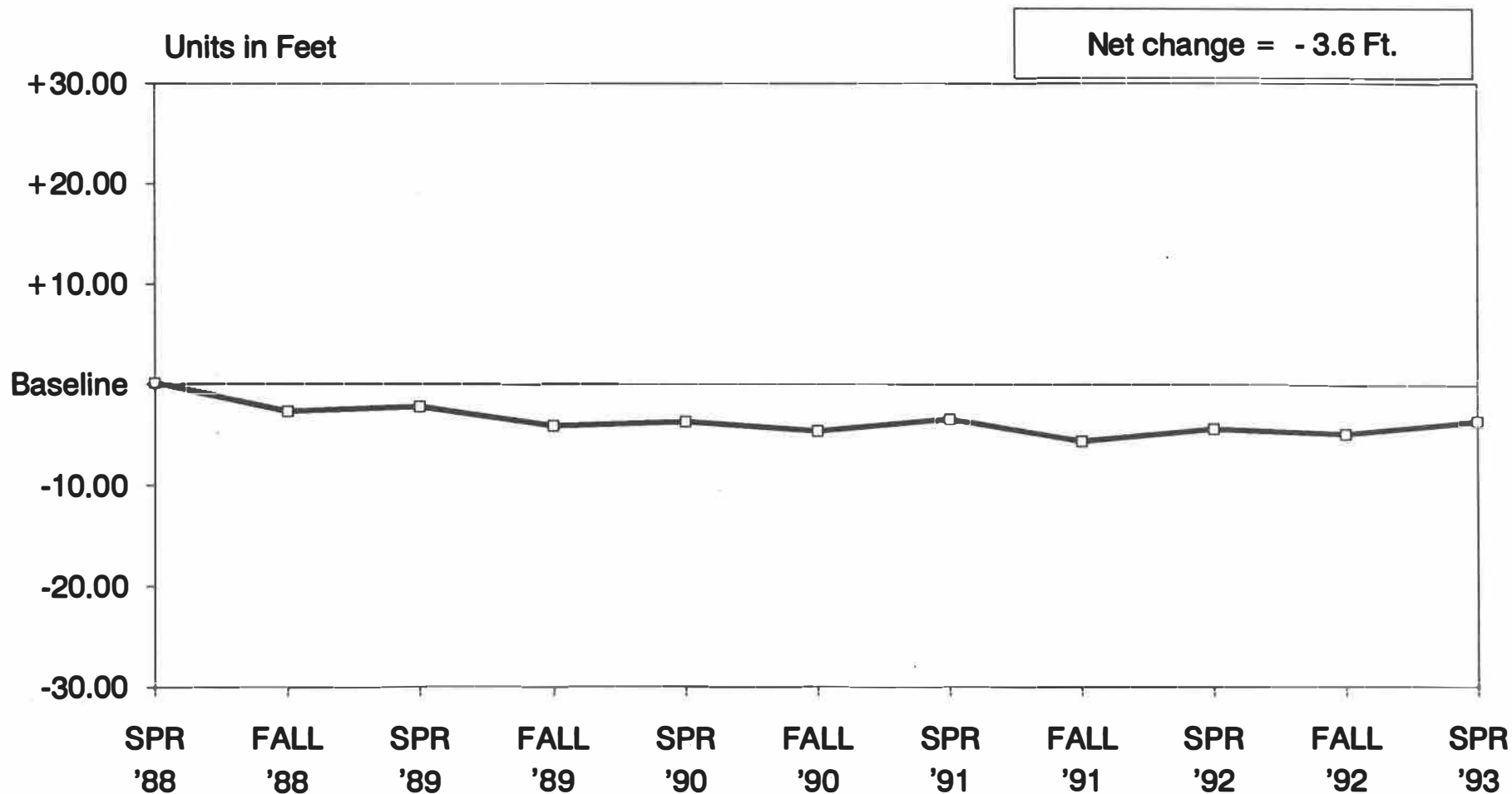
Changes in Water Levels Since 1987 (Baseline)
Well: 44 16N-8E-22CDAA Saunders Co. Uplands Aquifer



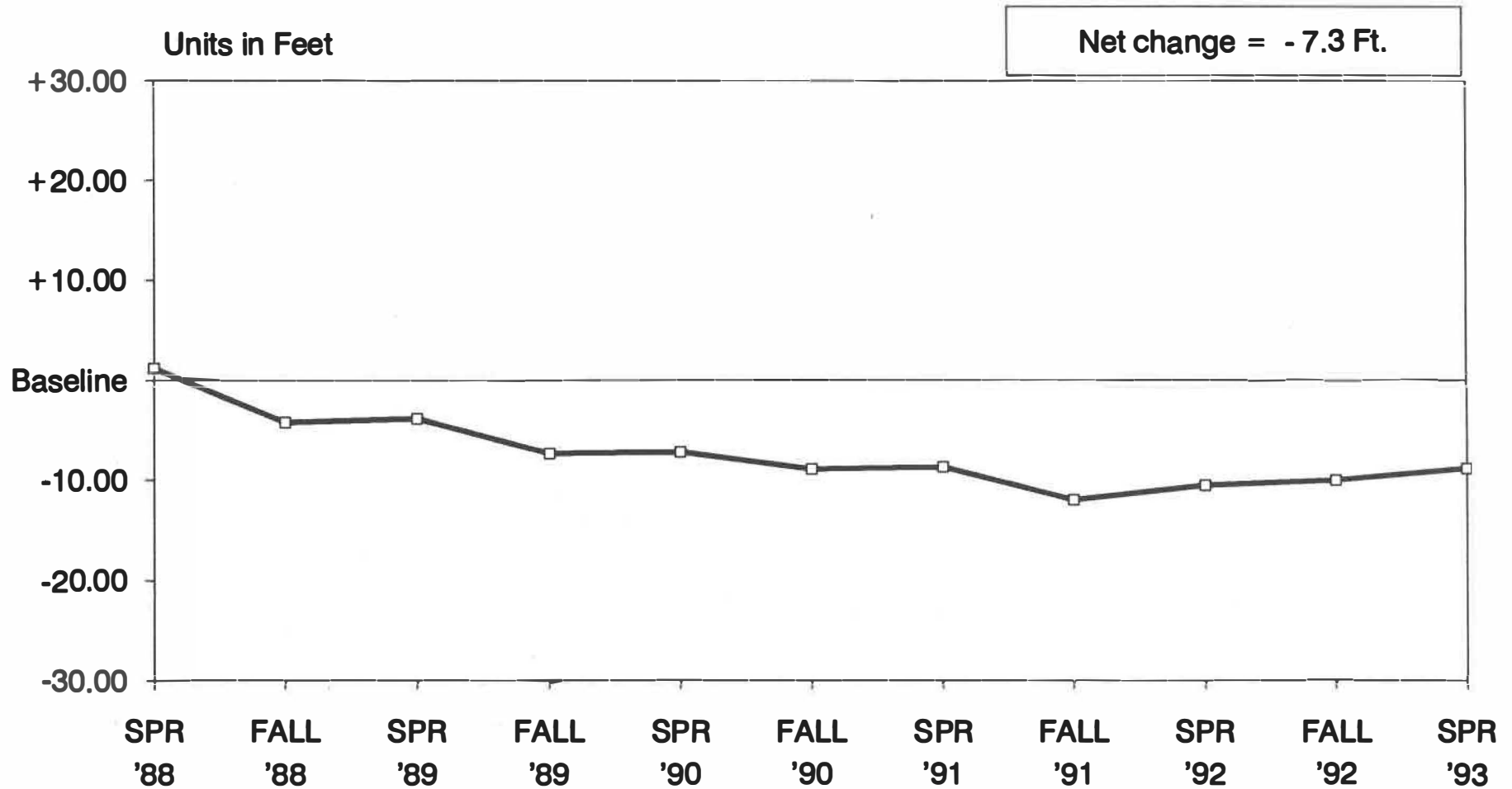
Changes in Water Levels Since 1987 (Baseline)
Well: 46 16N-9E-29CDAA Saunders Co. Uplands Aquifer



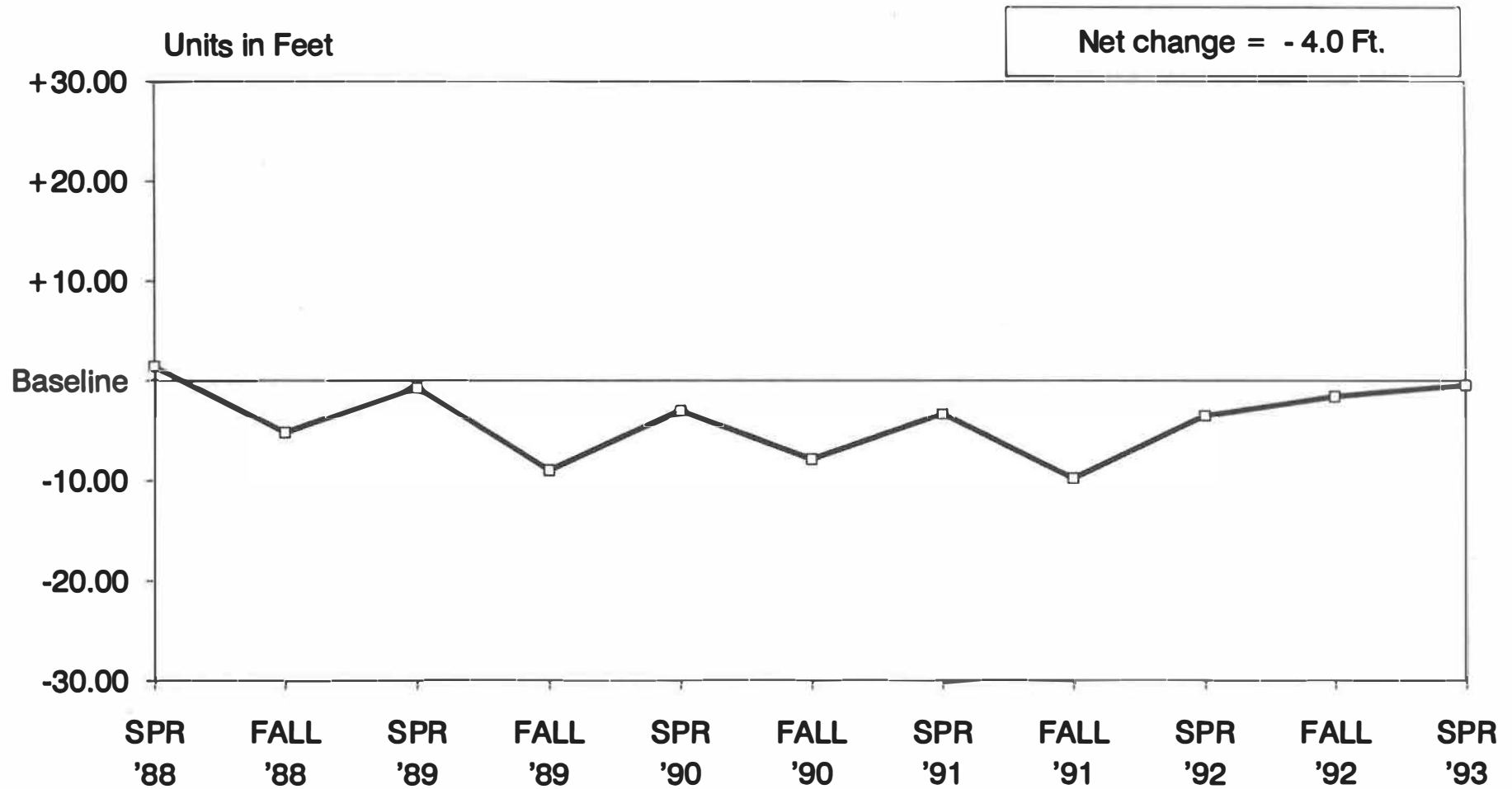
Changes in Water Levels Since 1987 (Baseline)
Well: 47 15N-9E-22CDBB Saunders Co. Uplands Aquifer



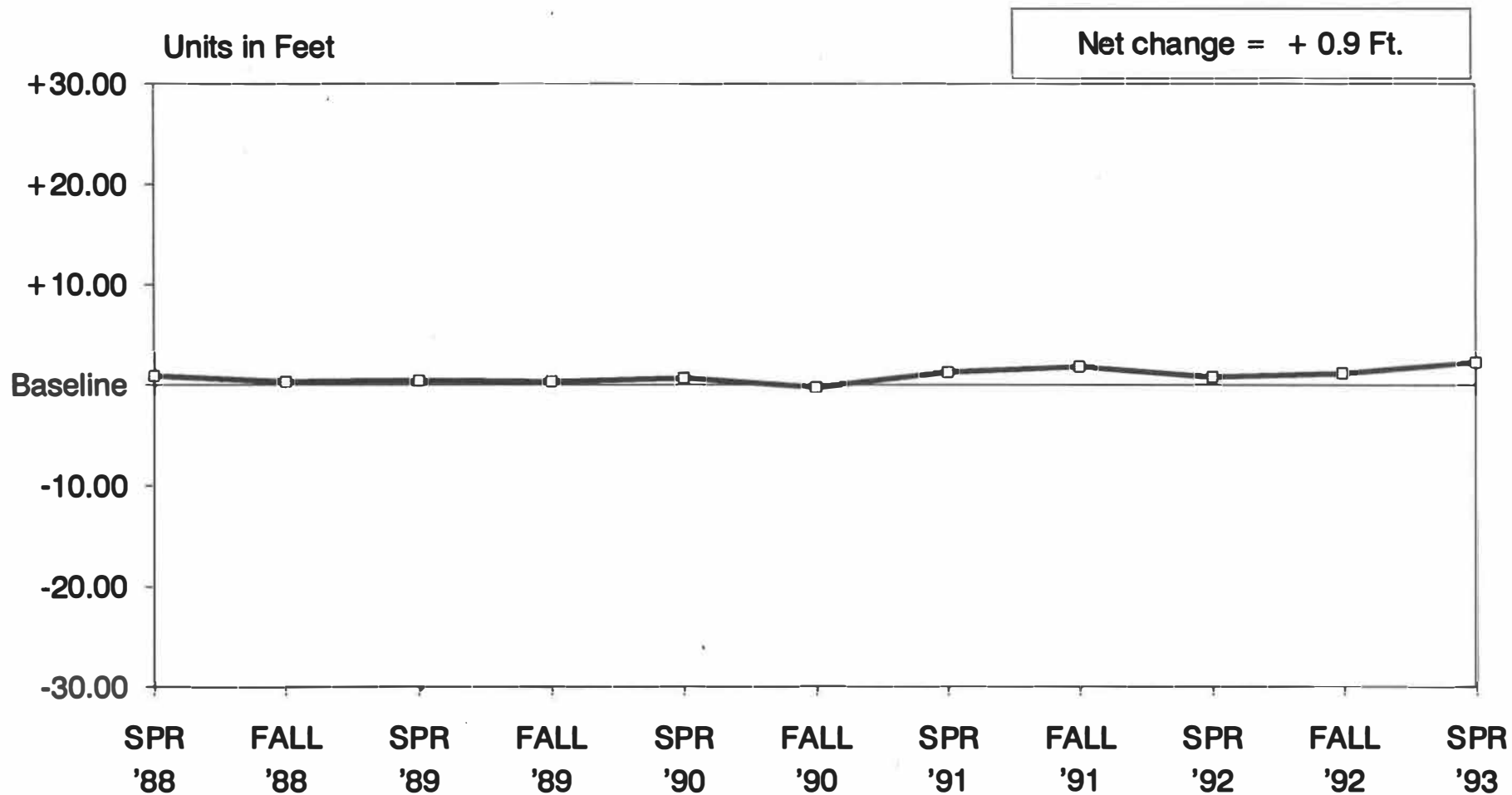
Changes in Water Levels Since 1987 (Baseline)
Well: 48 15N-8E-13DAAB Saunders Co. Uplands Aquifer



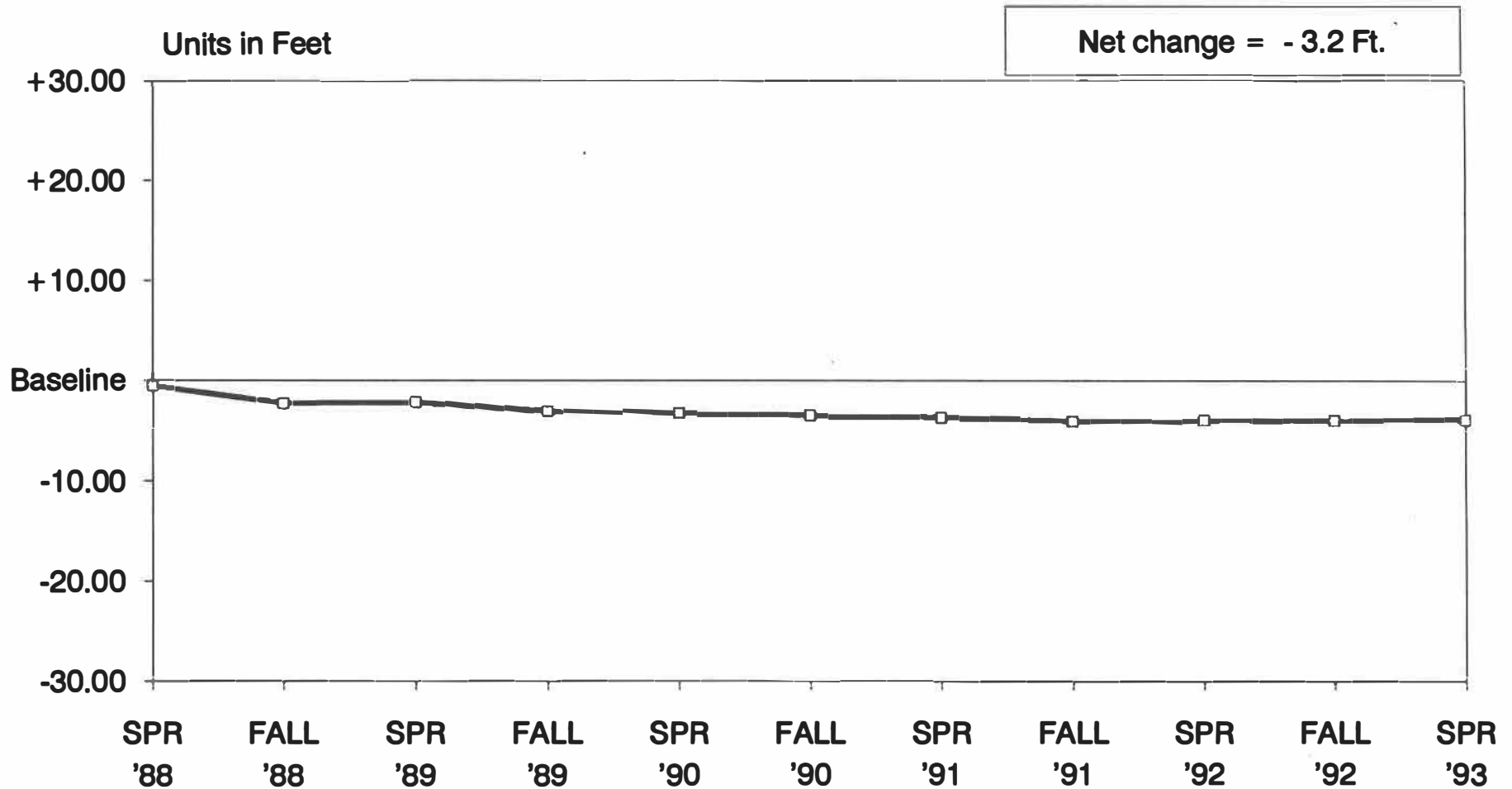
Changes in Water Levels Since 1987 (Baseline)
Well: 49 15N-1E-16DACC Butler Co. Uplands Aquifer



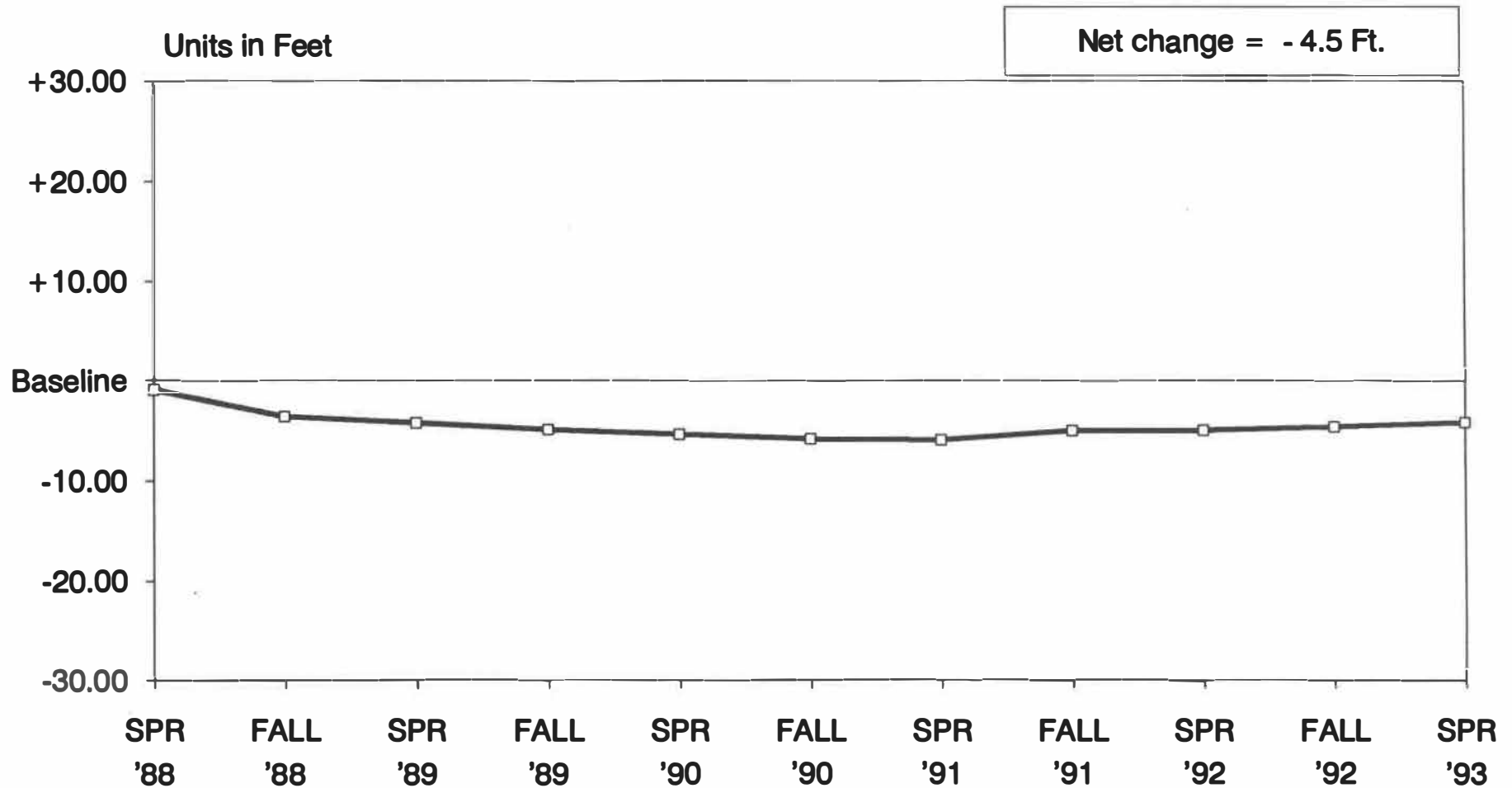
Changes in Water Levels Since 1987 (Baseline)
Well: 50 17N-6E-21CABB Saunders Co. Platte V. Aquifer



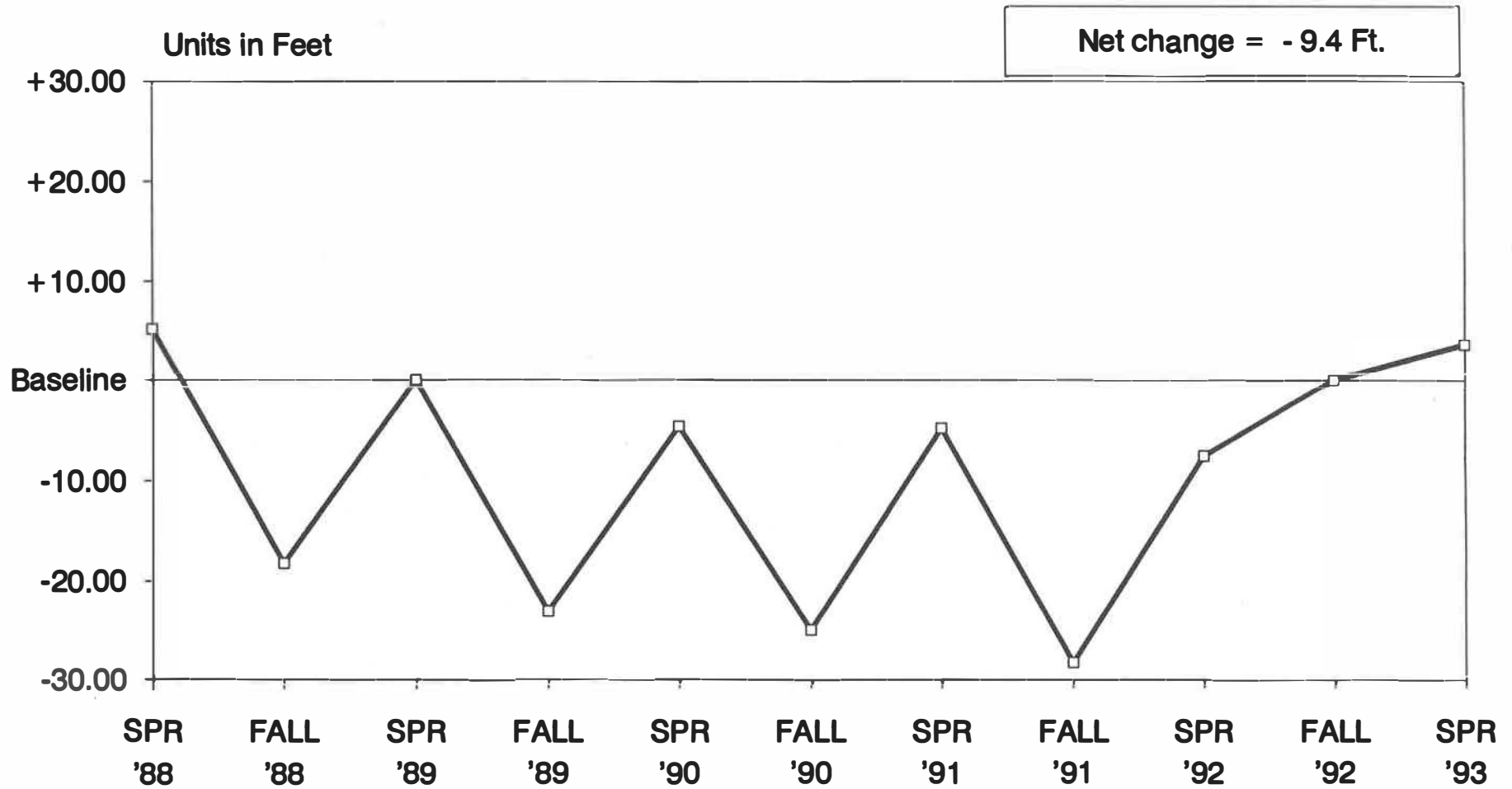
Changes in Water Levels Since 1987 (Baseline)
Well: 51 14N-8E-27BAAB Saunders Co. Todd V. Aquifer



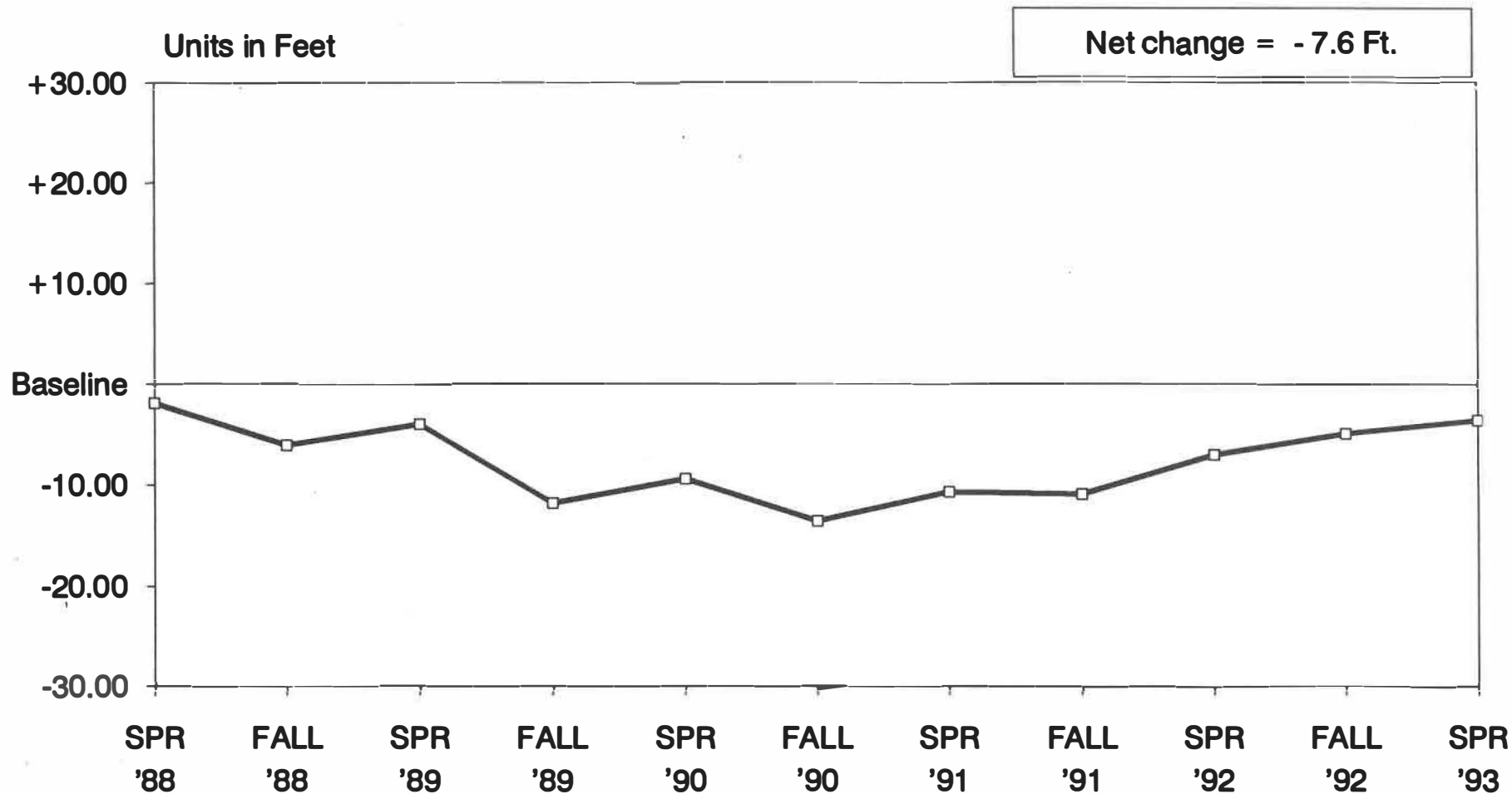
Changes in Water Levels Since 1987 (Baseline)
Well: 52 15N-7E- 3CABB Saunders Co. Todd V. Aquifer



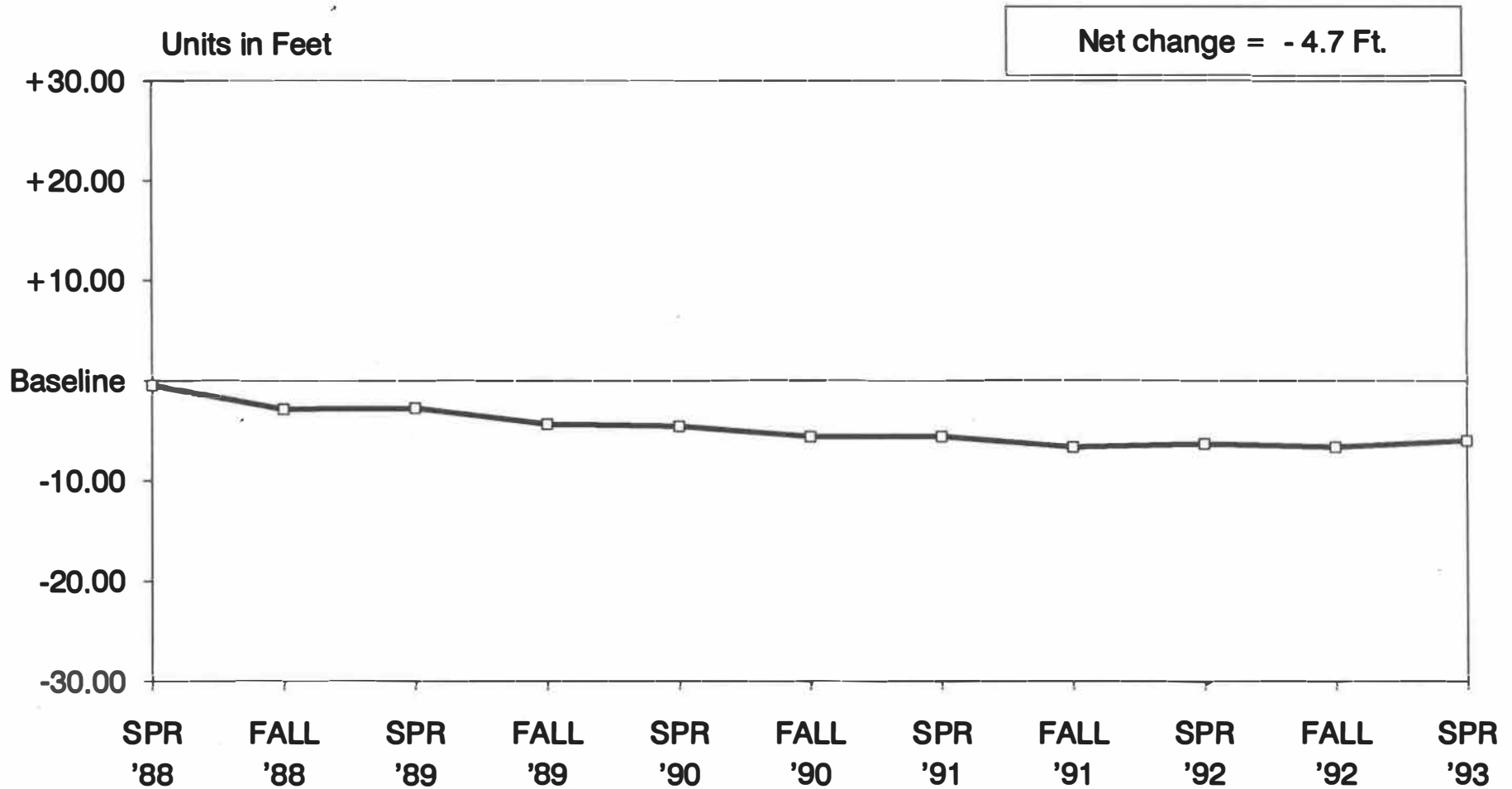
Changes in Water Levels Since 1987 (Baseline)
Well: 53 16N-4E-32DAAA Butler Co. Uplands Aquifer



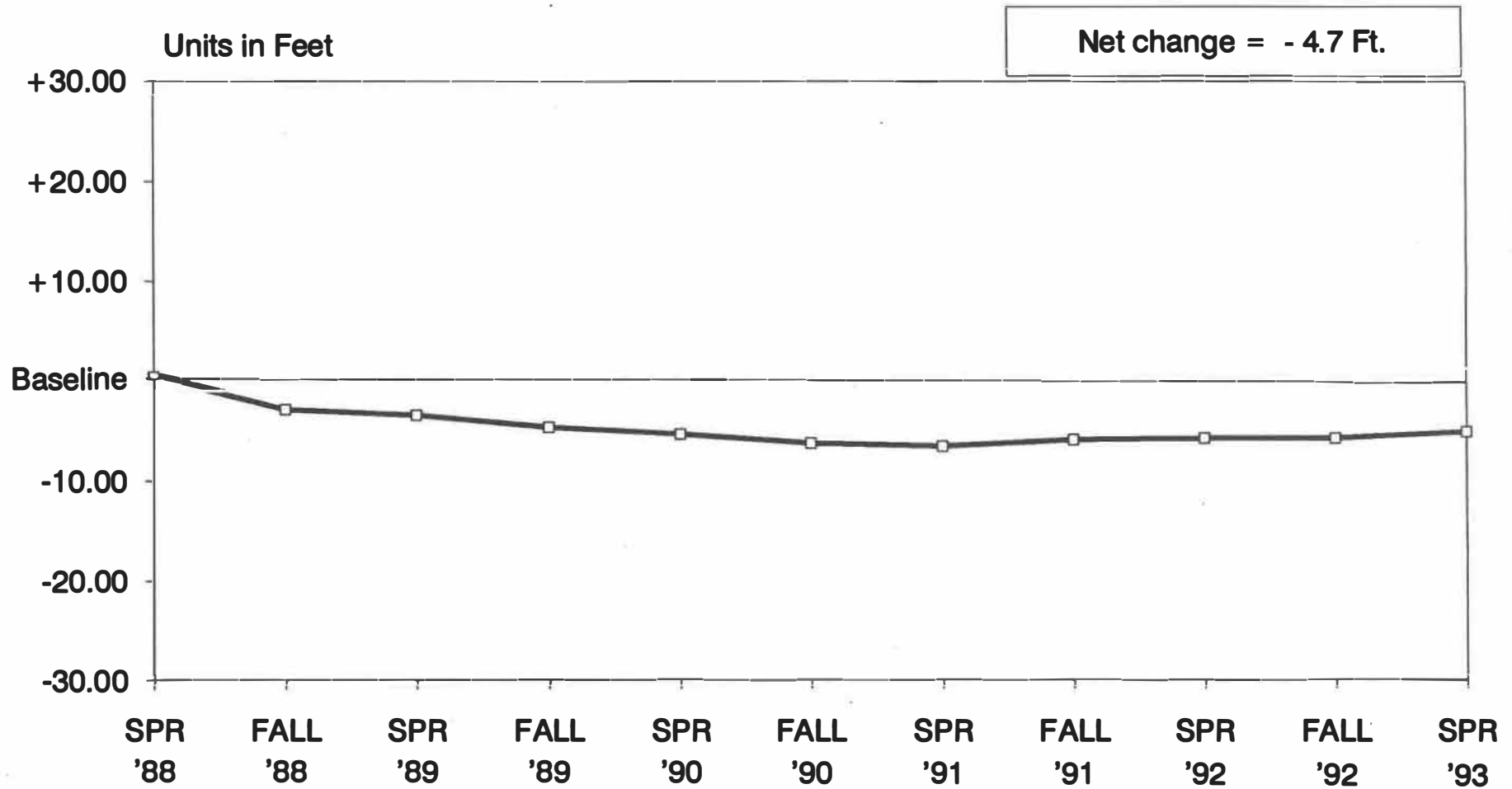
Changes in Water Levels Since 1987 (Baseline)
Well: 54 16N-6E-34CDBA Saunders Co. Uplands Aquifer



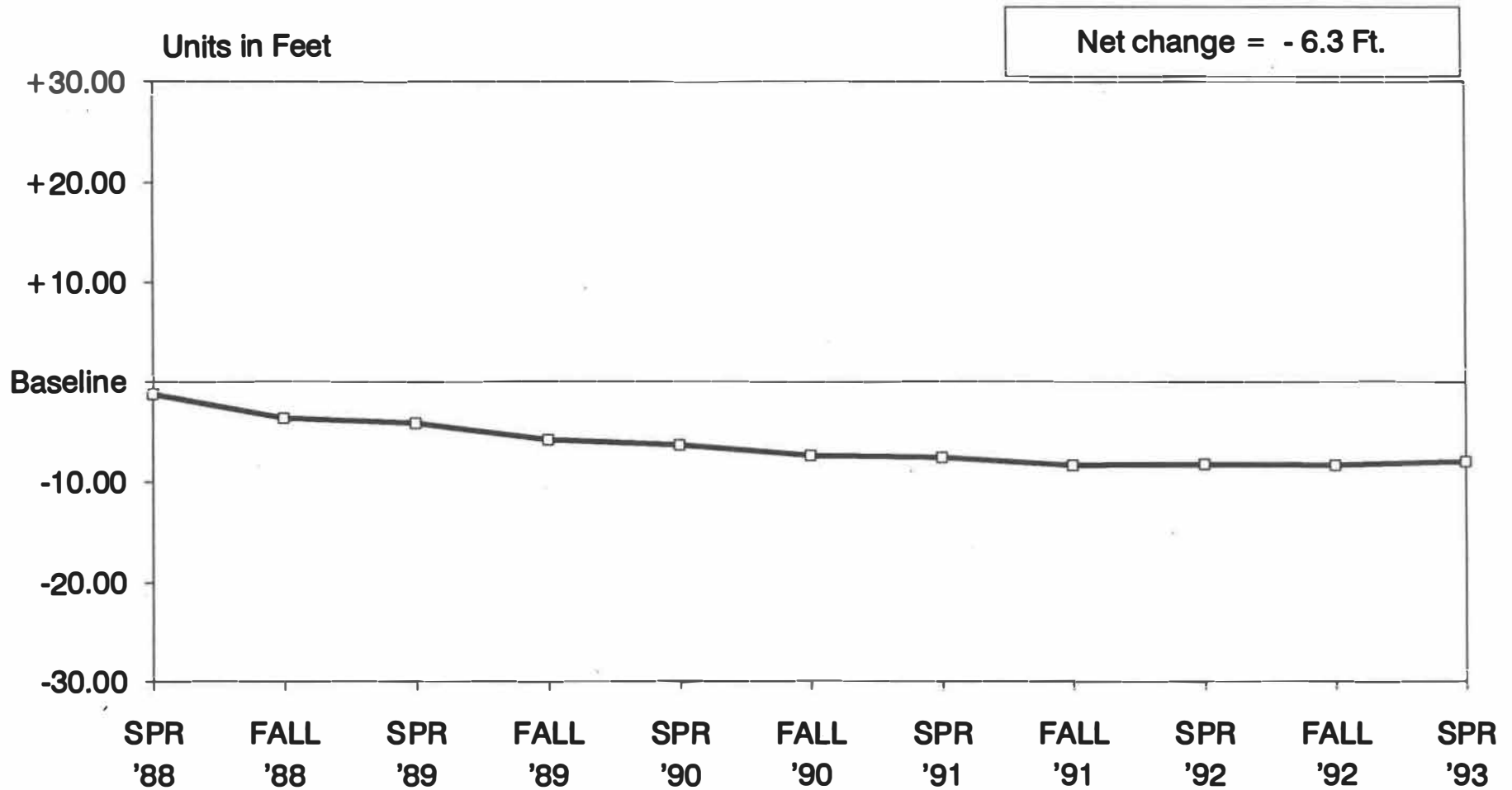
Changes in Water Levels Since 1987 (Baseline)
Well: 55 15N-9E-30CCCD Saunders Co. Todd V. Aquifer



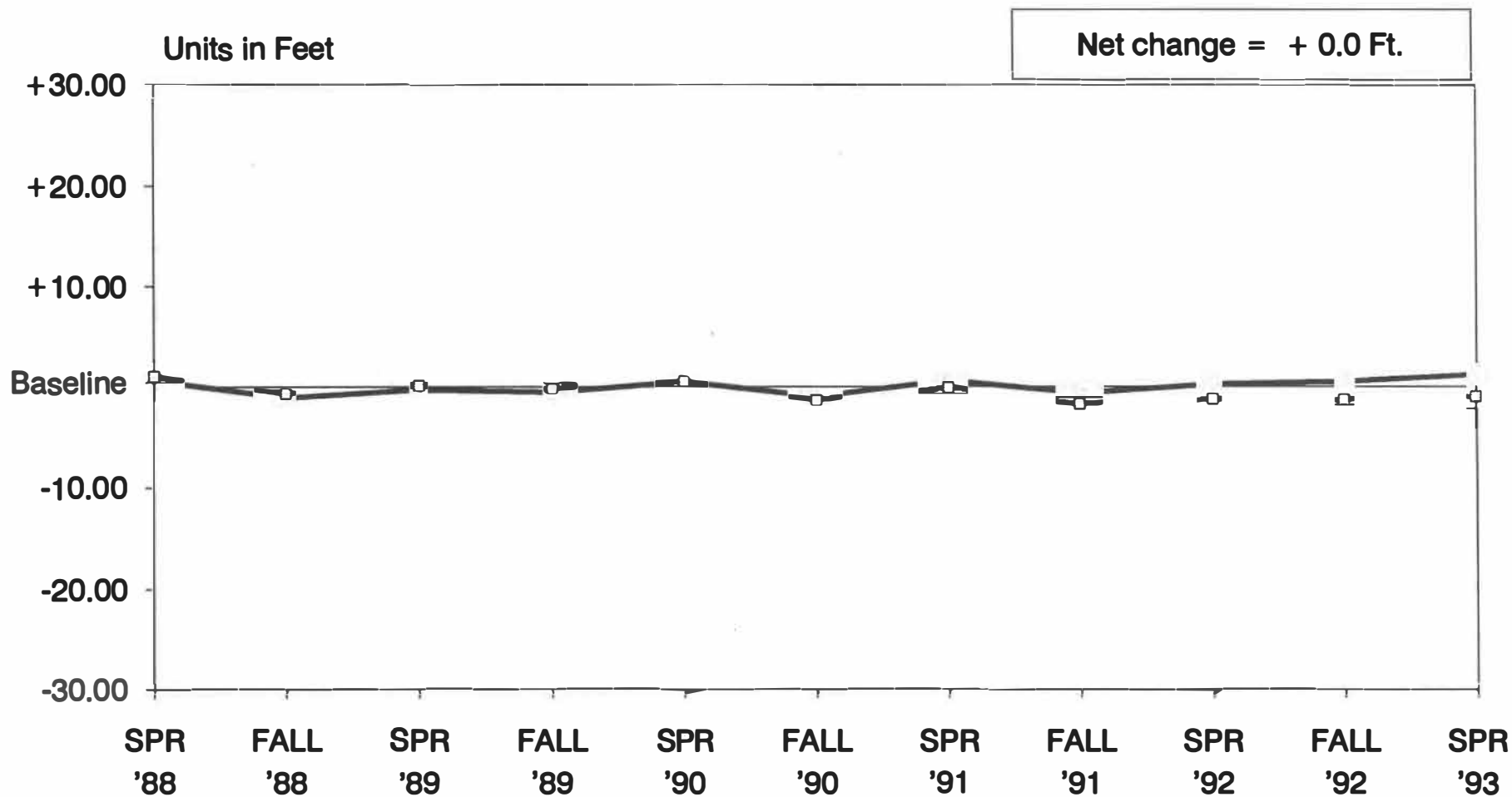
Changes in Water Levels Since 1987 (Baseline)
Well: 56 16N-7E-17ADBB Saunders Co. Todd V. Aquifer



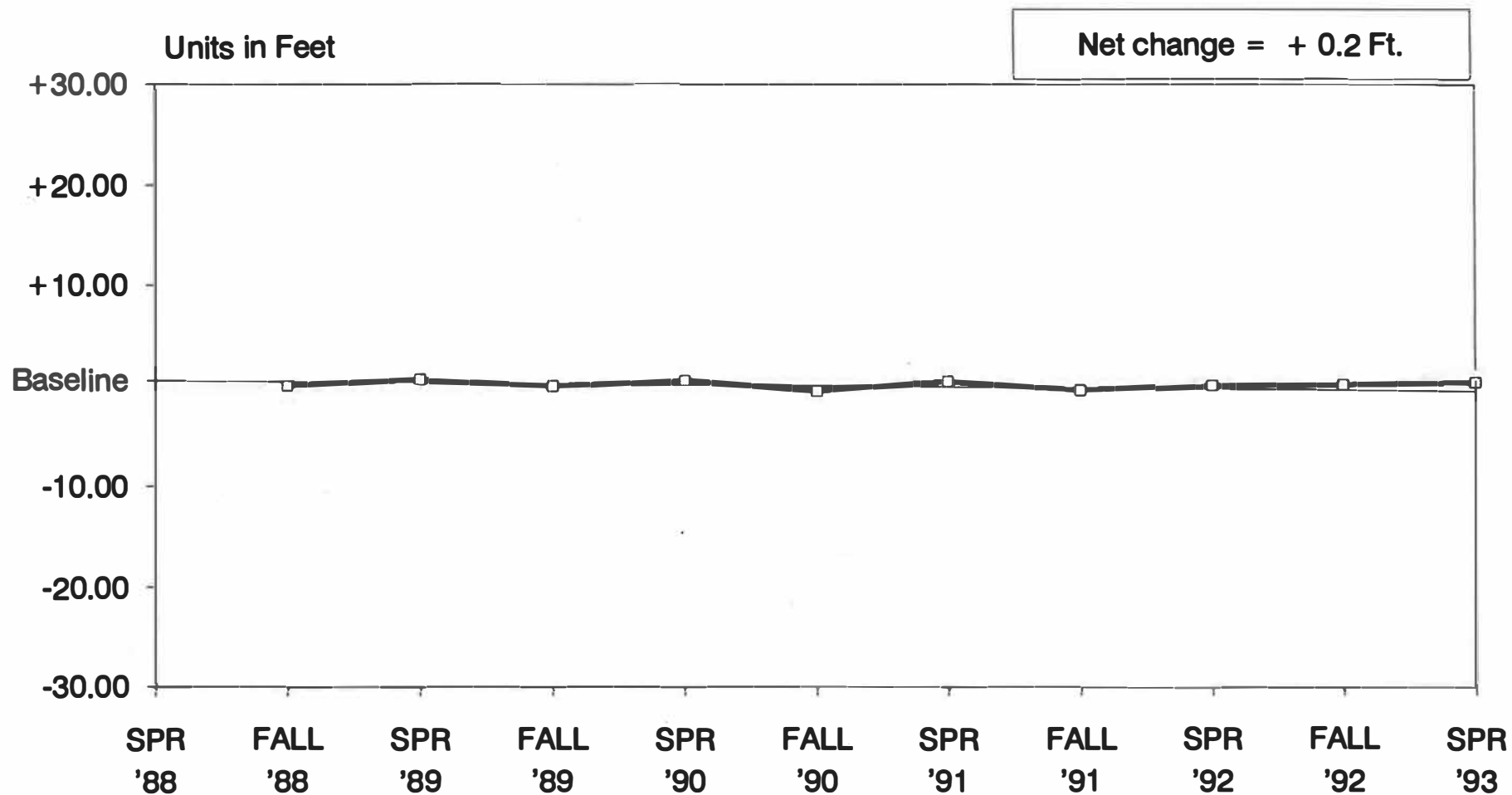
Changes in Water Levels Since 1987 (Baseline)
Well: 57 15N-7E-36DDBB Saunders Co. Todd V. Aquifer



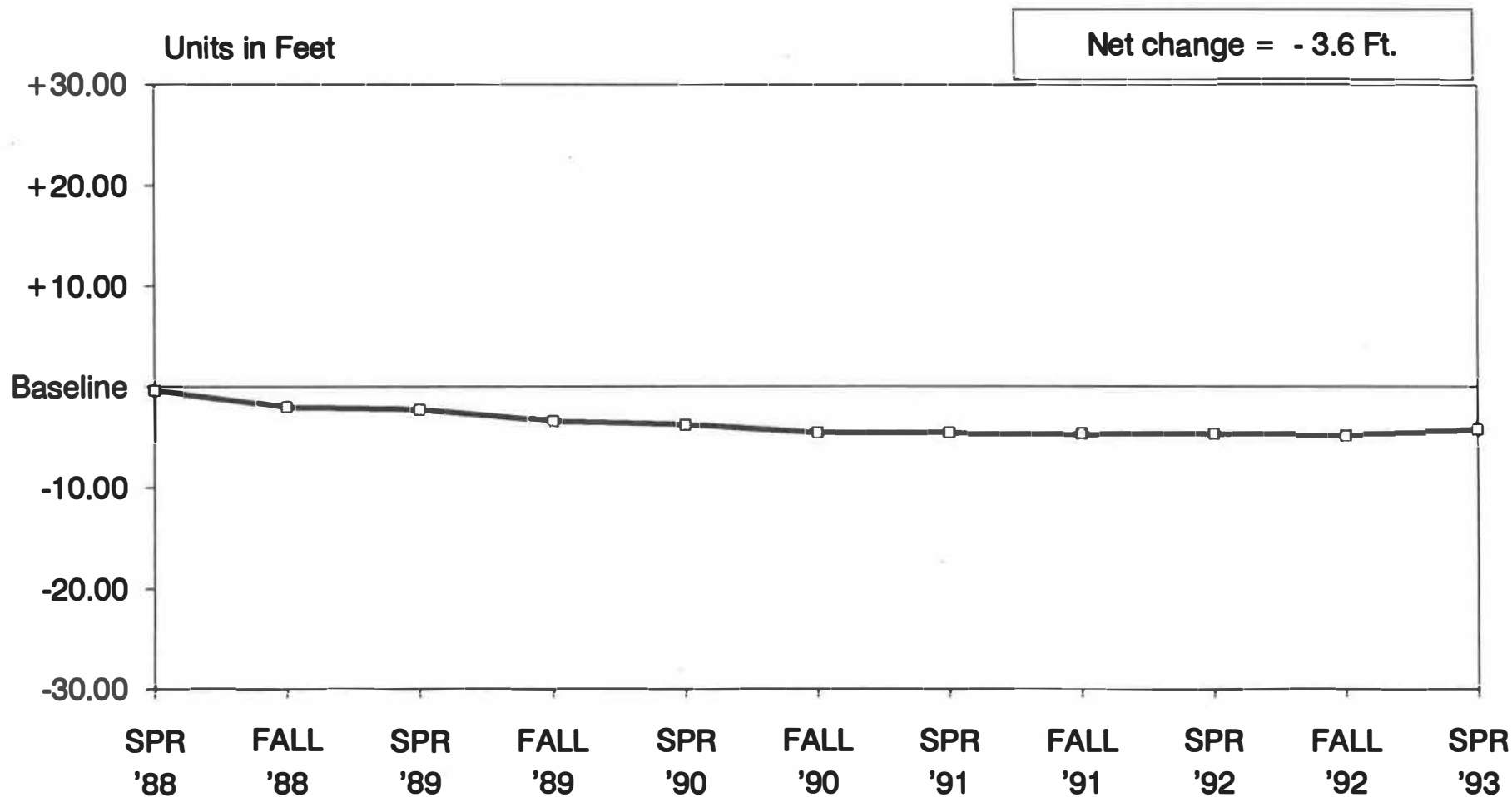
Changes in Water Levels Since 1987 (Baseline)
Well: 58 14N-9E-13AACA Saunders Co. Platte V. Aquifer



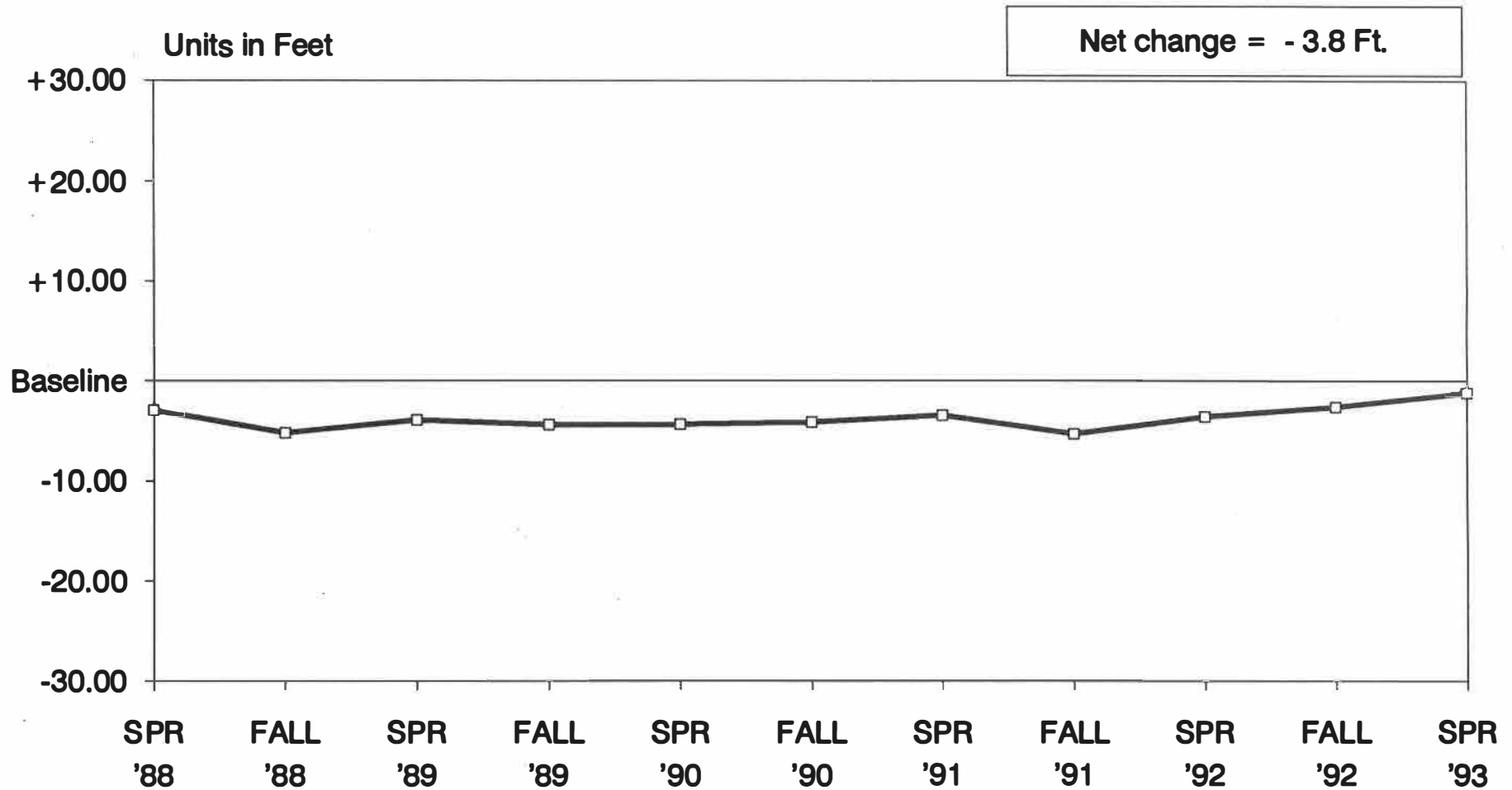
Changes in Water Levels Since 1989 (Baseline)
Well: 59 14N-9E-26CBAB Saunders Co. Platte V. Aquifer



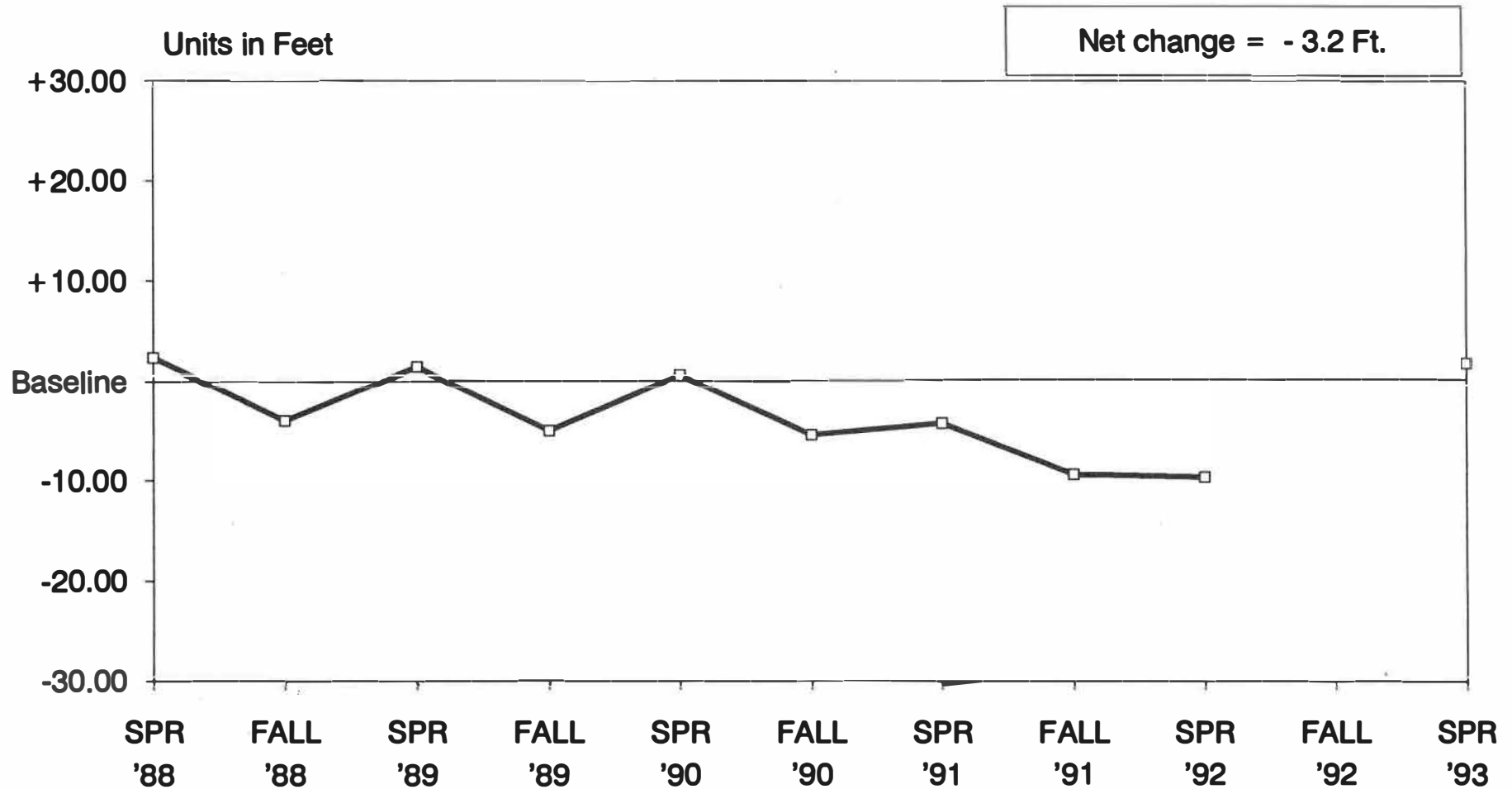
Changes in Water Levels Since 1987 (Baseline)
Well: 60 13N-9E-16BDBA Saunders Co. Todd V. Aquifer



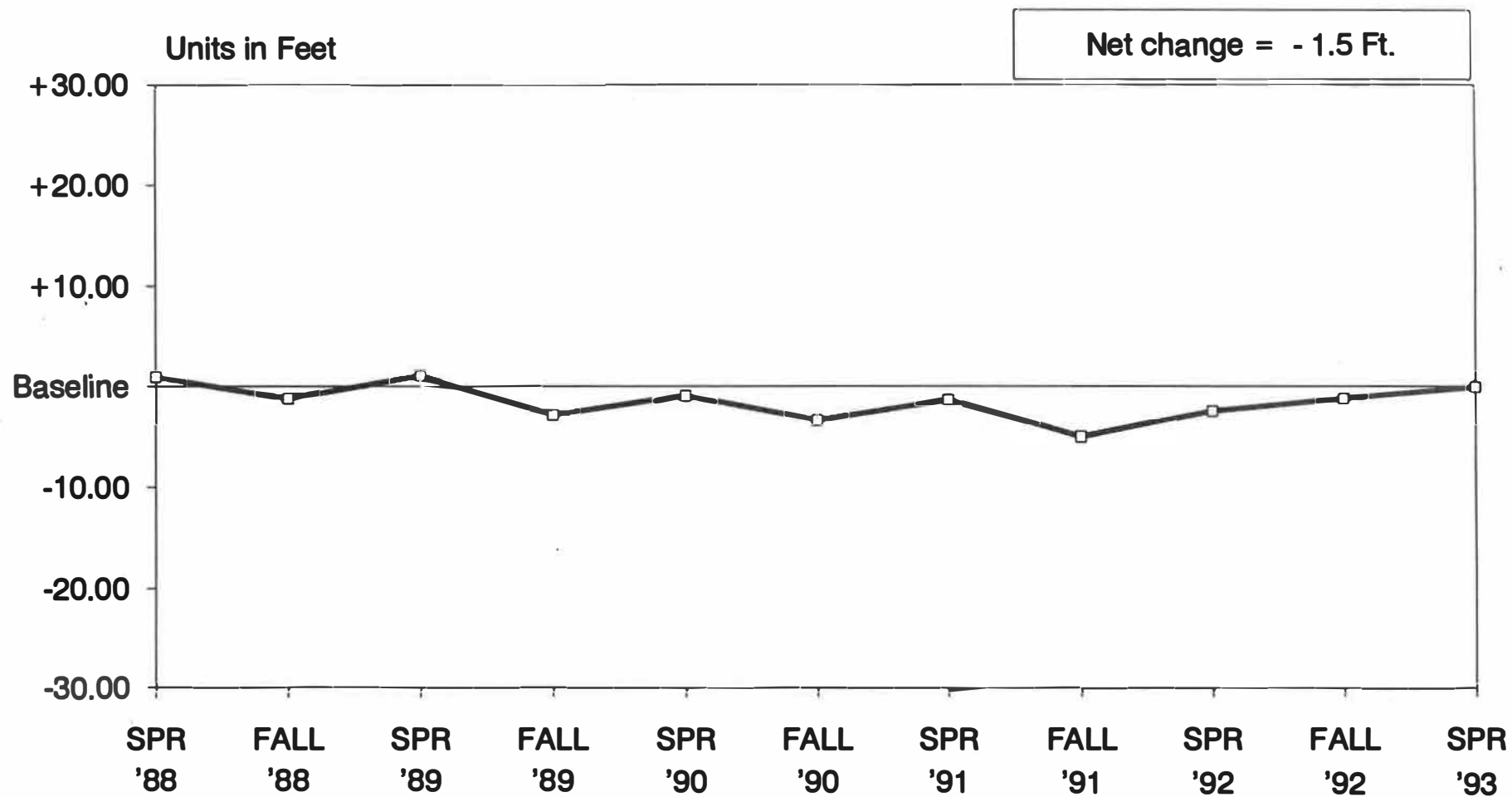
Changes in Water Levels Since 1987 (Baseline)
Well: 61 17N-3E- 9CCBB Colfax Co. Platte V. Aquifer



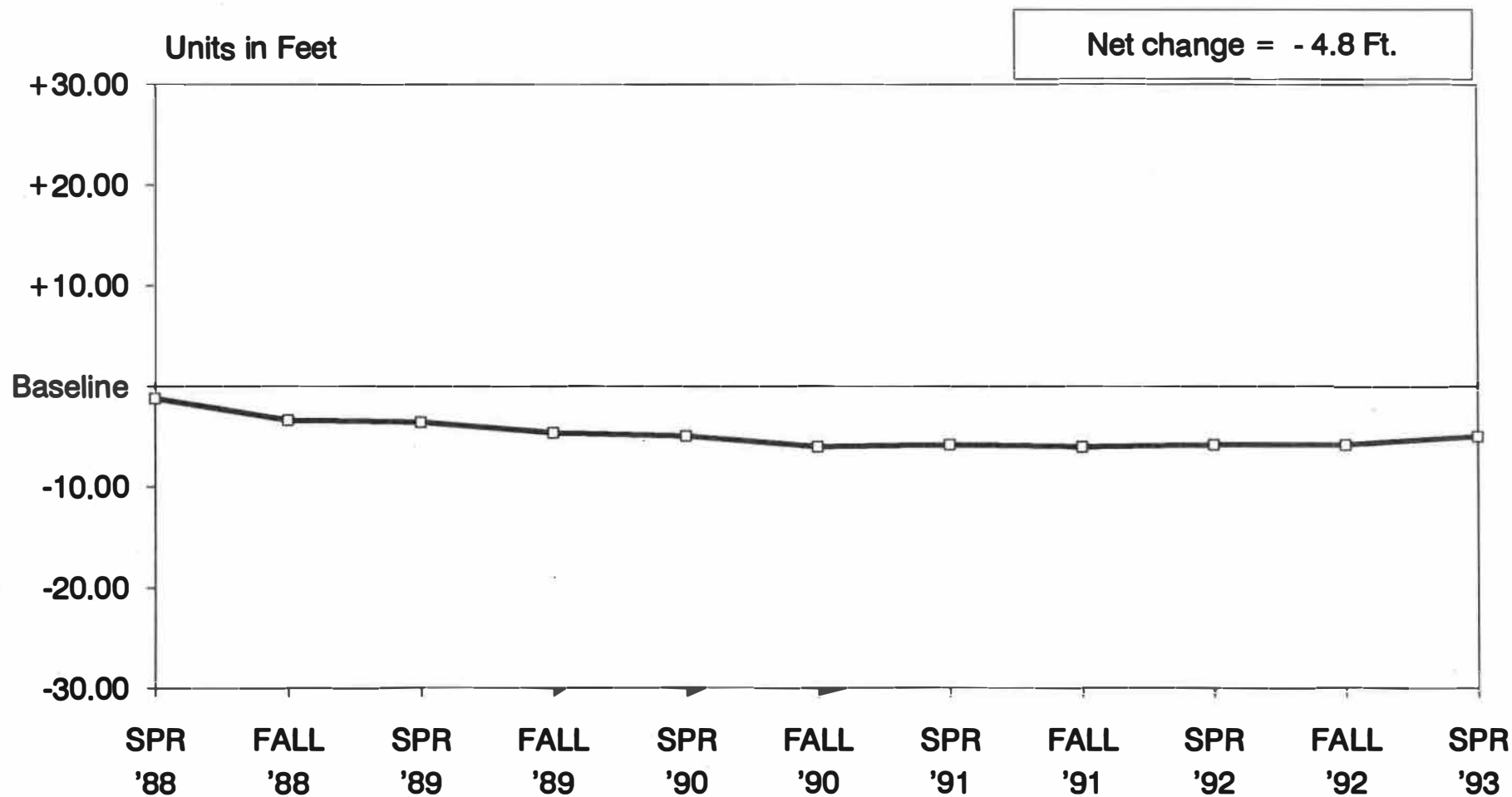
Changes in Water Levels Since 1987 (Baseline)
Well: 62 21N-4W- 9BDCC Madison Co. Shell Cr. Aquifer



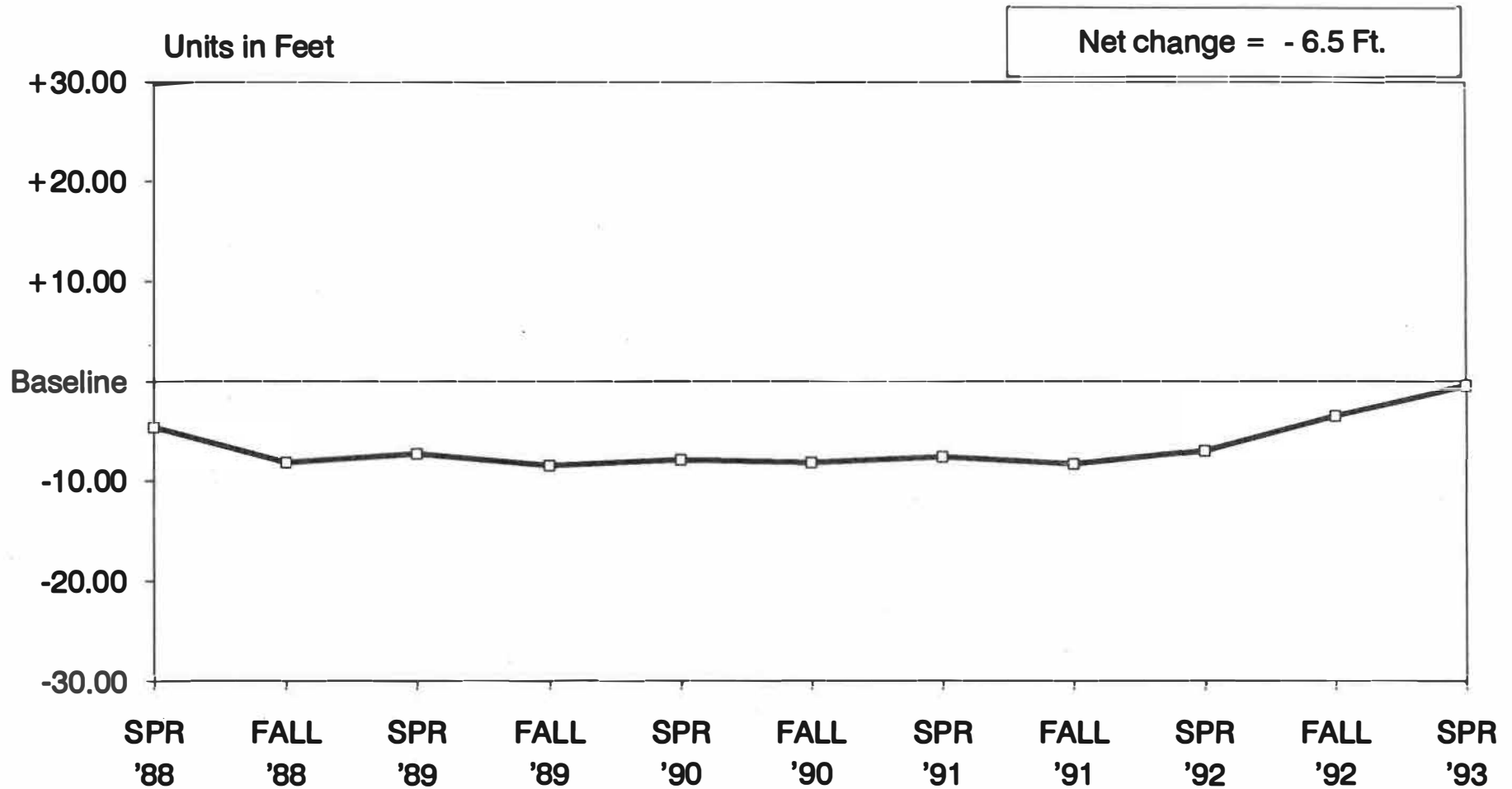
Changes in Water Levels Since 1987 (Baseline)
Well: 64 18N-1W- 5DCAA Platte Co. Shell Cr. Aquifer



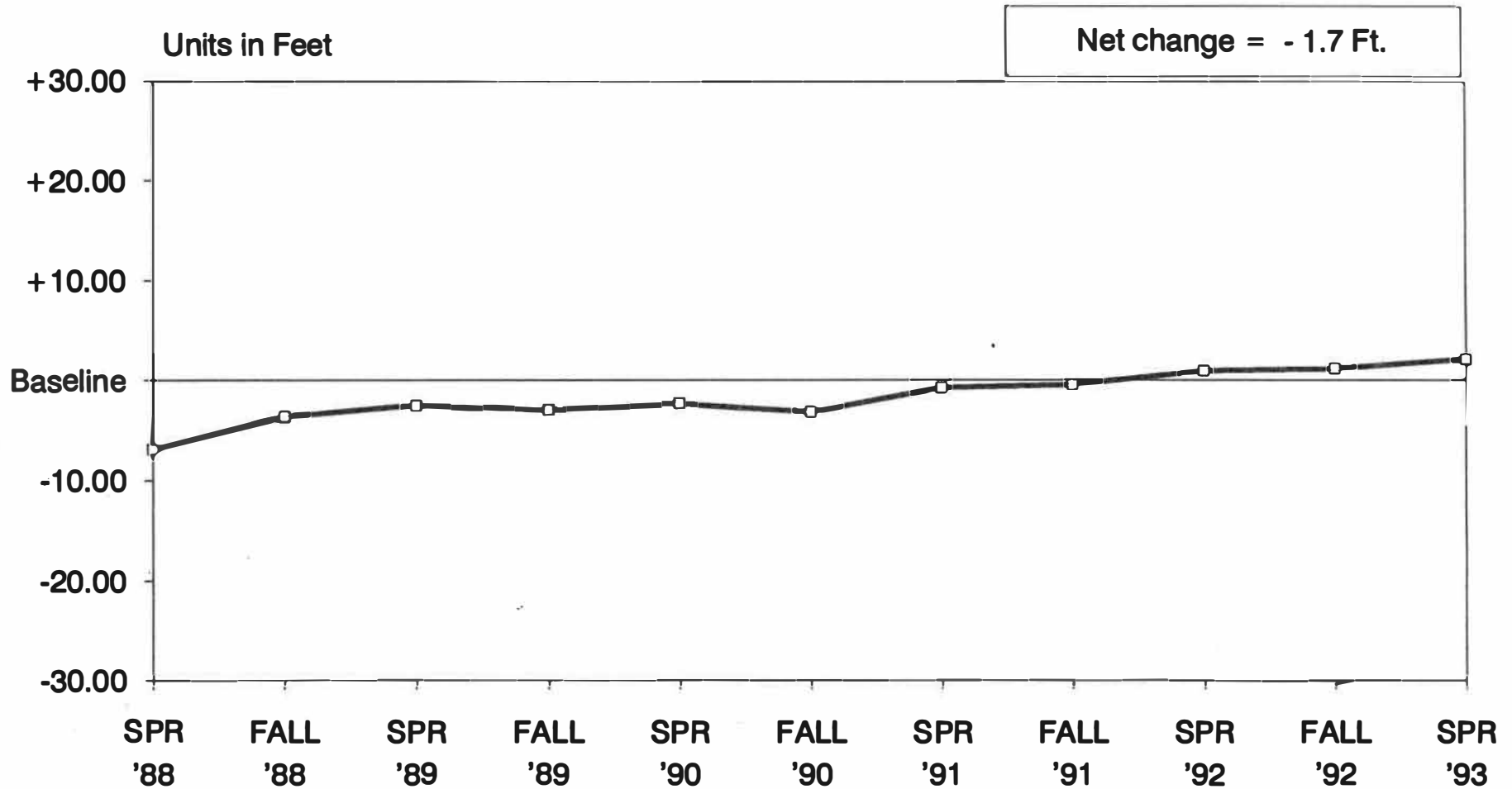
Changes in Water Levels Since 1987 (Baseline)
Well: 65 15N-6E-25BBDD Saunders Co. Uplands Aquifer



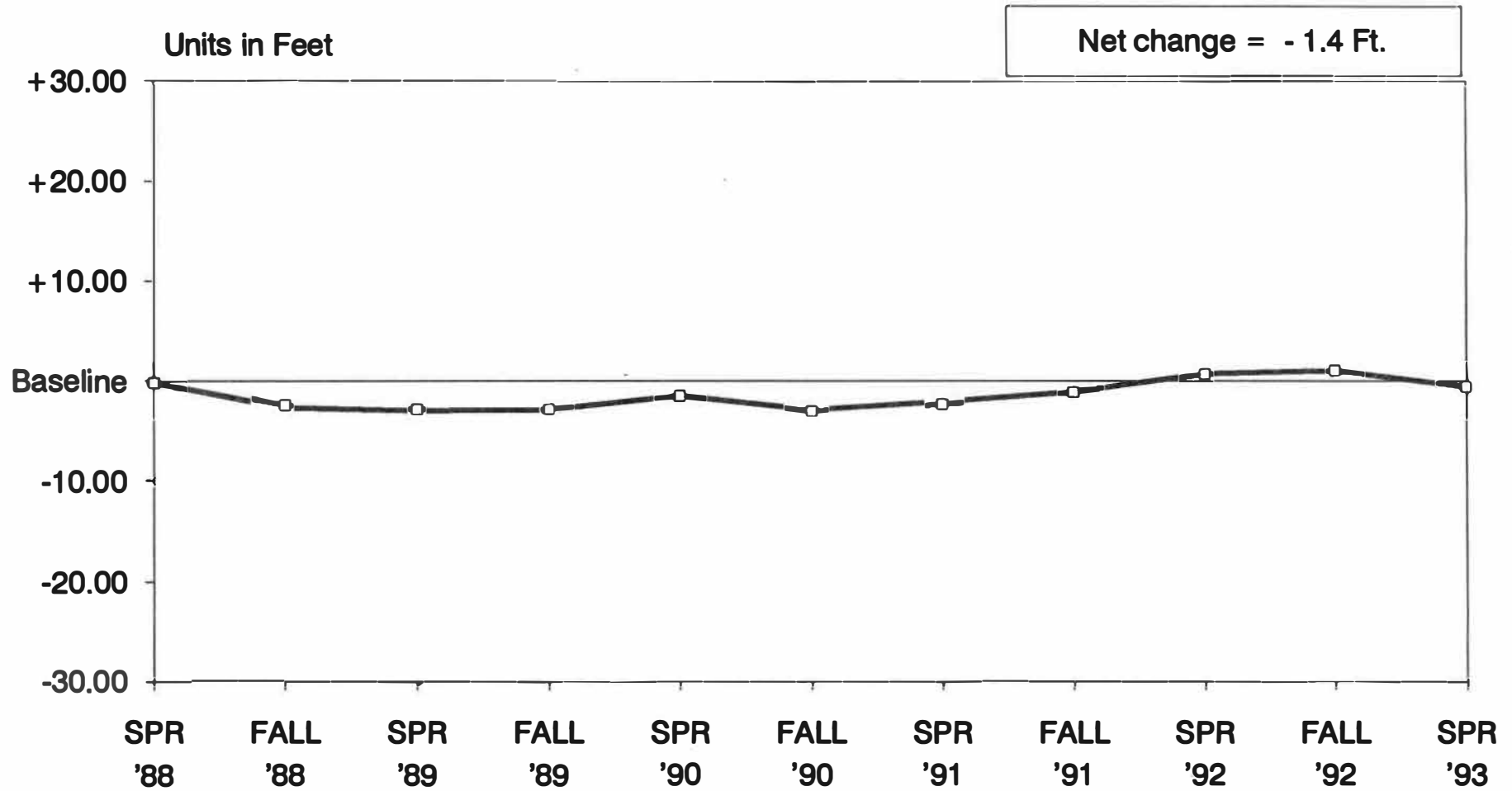
Changes in Water Levels Since 1987 (Baseline)
Well: 66 18N-6E-26CCDD Dodge Co. Platte V. Aquifer



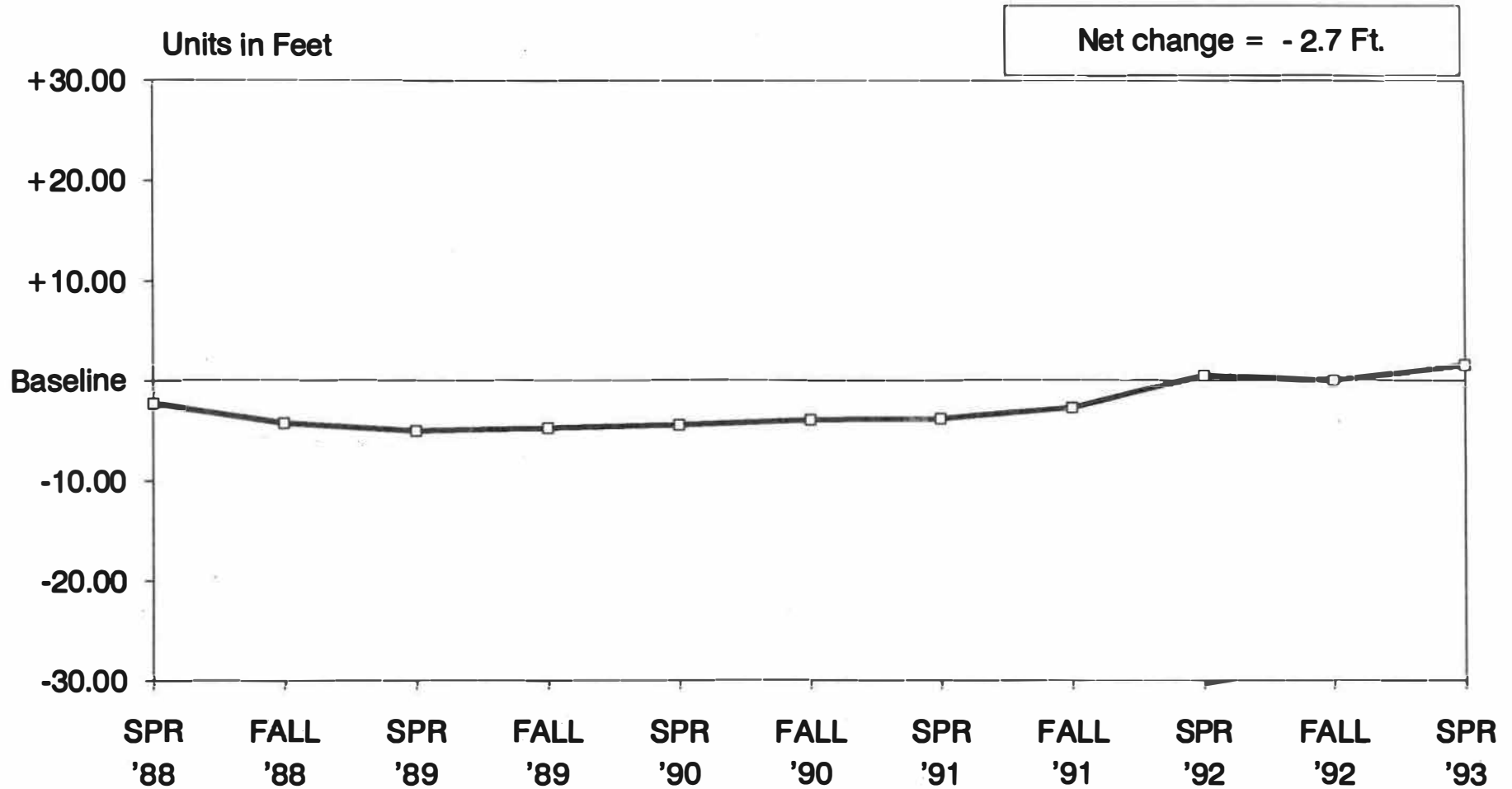
Changes in Water Levels Since 1987 (Baseline)
Well: 67 17N-8E-14CCAB Dodge Co. Platte V. Aquifer



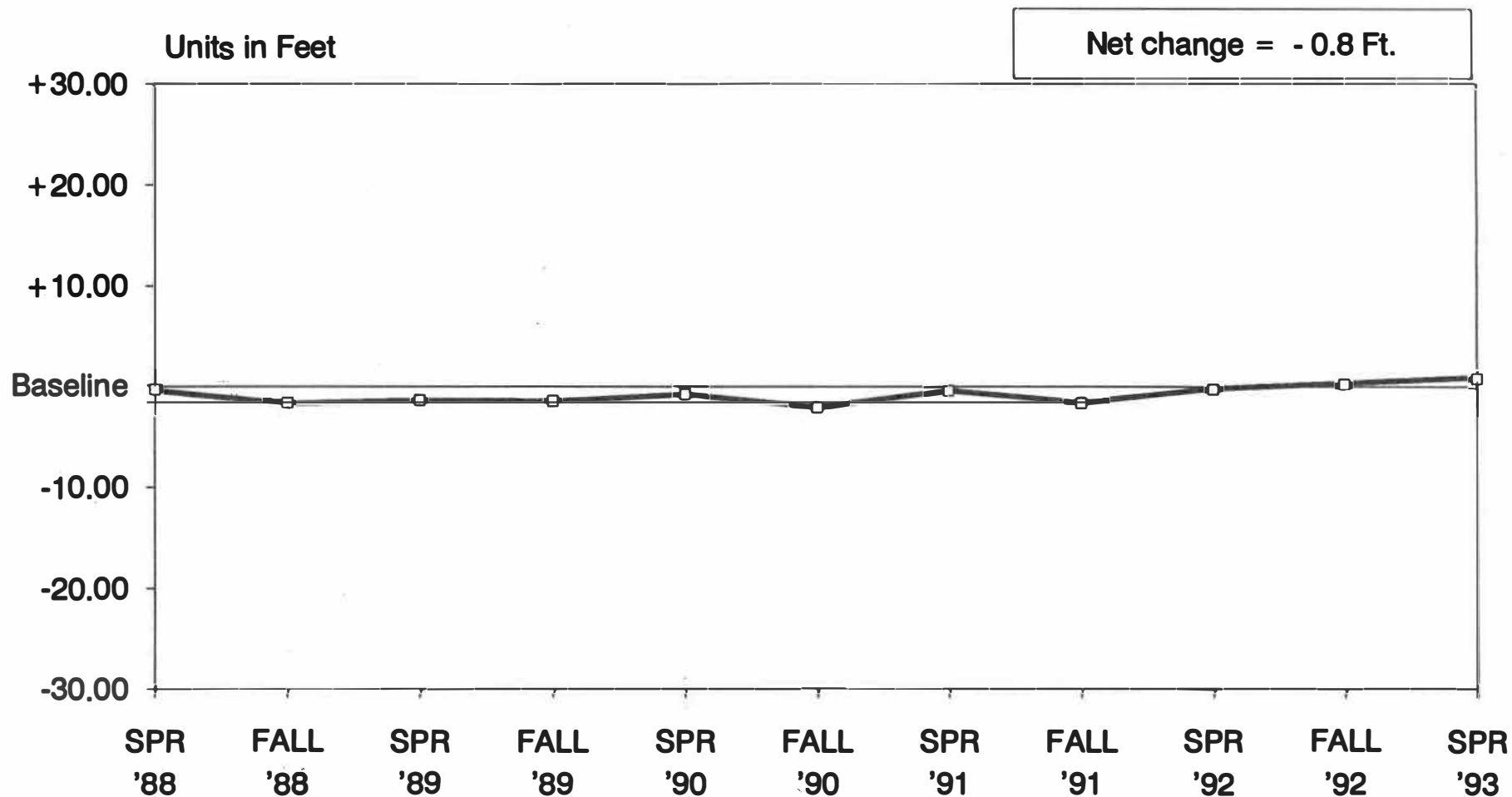
Changes in Water Levels Since 1987 (Baseline)
Well: 68 17N-9E-19DDDD Dodge Co. Platte V. Aquifer



Changes in Water Levels Since 1987 (Baseline)
Well: 69 17N-9E- 7CCBB Dodge Co. Platte V. Aquifer



Changes in Water Levels Since 1987 (Baseline)
Well: 70 17N-9E-28ABCD Dodge Co. Platte V. Aquifer



STATE OF NEBRASKA



E. Benjamin Nelson
Governor

January 24, 1995

DEPARTMENT OF WATER RESOURCES

J. Michael Jess
Director

JAN 25 1995

CSD

IN REPLY REFER TO:

Don Kavan
Lower Platte North NRD
P.O. Box 126
Wahoo, Nebraska 68066

Dear Mr. Kavan,

Examination of your Board's 1994 Ground Water Management Plan has been completed. In addition to input from this agency's staff, the comments of five other agencies were reviewed. Copies of comments from the five agencies are enclosed. The deficiencies identified are significant enough to render the plan insufficient for approval.

Endangered Species

Through earlier efforts of NARD and others, we understand certain understandings and agreements for endangered species considerations were reached with Game and Parks Commission staff. Unfortunately, the Commission has identified deficiencies in your Board's language regarding threatened and endangered species. To meet the requirements of § 37-435, R.R.S., 1943, as amended, the plan must be revised to address these concerns.

Quantity

The District has developed a fairly comprehensive set of triggers and actions based on percent decline of saturated thickness. The method of setting triggers according to aquifer type is creative. However, more discussion is needed to explain what is meant by "taking into account climatic variables" and "comparable year well levels". Does the Board intend to somehow adjust the quantity triggers according to each year's climatic conditions? If so, the protocol for this adjustment must be discussed in detail.

On pages 89 and 90 are statements that the district will require volume metering for all wells with a capacity of more than 100 gallons per minute. Such a requirement does not comply with § 46-666(4) which permits different management area provisions only for different categories of ground water use or different portions of the management area. Water well capacity is not listed as one of the reasons that a district may vary the provisions of management area controls. This control measure must be modified or eliminated to comply with § 46-666(4).

Quality

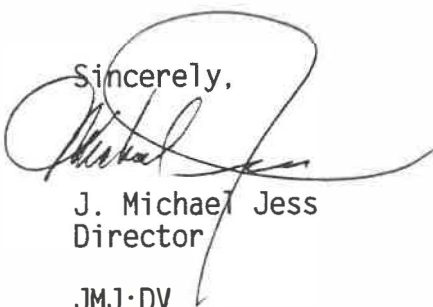
As with the discussion of water quantity above, language on page 85 requiring nitrogen analysis on wells pumping greater than 100 gpm must be changed to comply with § 46-666(4).

While not a matter strictly requiring revision, language on page 84 should be refined to better explain the protocol for setting management phase boundaries. From exhibit 9, and Department registration records, it is evident that portions of the district would not be considered for management phase areas because they lack ten high capacity wells in a nine mile area. This scheme suggests that significant acreage would be exempt from district controls.

Also noted are inconsistencies in the number of wells included in the District's monitoring network. Page 28 shows that 116 wells are being monitored and page 65 shows 79 wells in the network. Revisions of the plan should include an accurate description of the monitoring network.

With the exception of the problems outlined above, the overall quality and style of your Board's plan is commendable.

Sincerely,



J. Michael Jess
Director

JMJ:DV

cc/enc:

Randy Wood
Jack Daniel
Dayle Williamson
Perry Wigley
Ross Lock
Raymond Hartung



University of
Nebraska
Lincoln

Institute of Agriculture and Natural Resources

Conservation and Survey Division
113 Nebraska Hall
901 North 17th Street
P.O. Box 880517
Lincoln, NE 68588-0517
(402) 472-3471

Geological and Natural Resources Surveys



January 20, 1995

Dale R. Vagts
Ground Water supervisor
Department of Water Resources
301 Centennial Mall South
4th Floor
P.O. Box 94676
Lincoln, NE 68509-4676

RE: Lower Platte North NRD 1994 Groundwater Management Plan

Dear Dale:

Enclosed are comments on the above referenced plan by Frank Smith and Scott Summerside of our staff.

With the changes noted, we recommend approval.

Sincerely,

Perry B. Wigley
Director

PBW/bm

January 18, 1995

TO: Perry Wigley
FROM: Scott Summerside
RE: Lower Platte North NRD Groundwater Management Plan

I have reviewed the Revised 1994 Groundwater Management Plan for the Lower Platte North Natural Resource District and I find it to be generally acceptable.

The "background chapters" regarding physical description of the NRD in terms of the geology, groundwater flow system, etc... contains some grammatical errors, a few misleading statements and minor inaccuracies. Nevertheless, I do not believe that the plan should be rejected on this basis. Chapter 11, what I view as "the actual plan", describes in detail how the NRD will monitor ground-water quantity and quality as well as what management or regulatory steps it will take when certain conditions or "trigger levels" are reached. It is my opinion that the plan shows a greater level of responsibility towards the goal of wise management of the ground-water resources; therefore, I recommend that the plan be approved.

STATE OF NEBRASKA



E. Benjamin Nelson
Governor

DEC 19 1994

DEPARTMENT OF ENVIRONMENTAL QUALITY

Randolph Wood

Director

Suite 400, The Atrium

1200 'N' Street

P.O. Box 98922

Lincoln, Nebraska 68509-8922

Phone (402) 471-2186

RECEIVED

JAN 20 1995

DEPARTMENT OF
WATER RESOURCES

Mr. Michael Jess, Director
Nebraska Department of Water Resources
301 Centennial Mall South
Lincoln, NE 68509-4676

REFERENCE: Lower Platte North Natural Resources District Revised Ground
Water Management Plan (second review)

Dear Mike:

The Nebraska Department of Environmental Quality (NDEQ) has reviewed the resubmittal of the Lower Platte North Natural Resources District's (LPNNRD) ground water management plan. We referred to our previous comments of November 29, 1993 when reviewing this newly revised plan.

Many positive changes are seen in this October, 1994 version of the LPNNRD's Ground Water Management Plan. The major problems seen in the previous version have been addressed, for the most part. Minor details will, by necessity, need to be addressed by the District when they implement their planned Ground Water Management Area. We feel the plan meets the requirements of LB 51 and recommend approval.

The attached pages include our specific comments concerning the referenced document. If you have any questions, please contact Marty Link of our Ground Water Section at 471-0096.

Sincerely,

A handwritten signature in dark ink, appearing to read "Randolph Wood".

Randolph Wood, P.E.
Director

RW/ml1

cc: John Miyoshi, Lower Platte North NRD

Review Comments
Lower Platte North Ground Water Management Plan

This review of Lower Platte North Natural Resources District's (LPNNRD) Ground Water Management Plan, submitted to state agencies for review in October, 1994, is based on comments made in November, 1993. Different staff reviewed the original submittal, but I will try to address the same issues as were brought up previously. I did not look at quantity issues in detail.

1) Identify levels of ground water contamination.

Lower Platte North NRD has good maps of nitrate and other constituents in ground water from sampling results, 1986 to 1993. This and the defined areas ("reservoirs") targeted for baseline sampling will be a good basis to judge ground water quality. Although some work has been done on pesticide screening and sampling, the results are not given or mapped.

The monitoring network is described as 3 irrigation wells/township as fixed wells (sampled during each sampling event) and 3 wells/township as random wells (changes from the last sampling event). Since the district is approximately 1800 square miles in area, and there are at least 50 townships (probably more, because of boundary lines), this means about 150 "fixed" wells and 150 "random" wells (my figures). These will be sampled every 2-3 years (dependent on budget and weather), not sampling all the "reservoirs" in any given year. There is not a clear indication, however, of how long it will take to cover the entire network. It is also not defined as to how sampling more intensively (p.58) will be accomplished as problems arise (nor is it defined as to what constitutes a problem).

LPNNRD mentions using the sample analysis done by landowners in the Ground Water Management Area in the monitoring network. While it is good to consider these results, I do not believe they can substitute for results from sampling done by trained NRD staff with knowledge of ground water. Central Platte and Tri-Basin staff sample hundreds of wells, despite annual submittal of water quality results from farm operators.

2) Identify sources of ground water contamination.

The LPNNRD has a good handle on land use practices which can lead to nonpoint source contamination and specific facilities and operations which are or are potentially point sources of contamination. Septic tanks and feedlots are explained, such that general public utilizing this document will get a better understanding of these potential problems.

3) Establish ground water quality goals:

The plan states the following (p.74) goal: "Assure adequate quantity and quality of stream flow, groundwater, and surface reservoirs within the district for beneficial uses as prescribed by law." Two other goals are presented that tie into and support this first one, for groundwater reservoir life: "To provide a sustained ground water supply of quality water adequate to support reasonable and beneficial uses, and maintain long-term quality yields" (p.77) and, for management systems development, "Provide a system of groundwater management to support the ground water reservoir life goal, based upon an adequate technical foundation and public awareness of groundwater issues." (p.78). These goals are supported by the objectives following each goal, and by the entire document's intent.

4) Identify long-term solutions to prevent levels of ground water contaminants from becoming too high and to reduce high levels sufficiently to eliminate health hazards. Recommend practices to stabilize, reduce, and prevent ground water contamination.

Upon approval of this Ground Water Management Plan, the entire District will be declared a Ground Water Management Area (GWMA) within two years. A phased approach is given, with well defined boundary setting mechanisms (p.84). Nitrate, pesticides, and other human originated nonpoint source contaminants will be considered. I have only a couple of questions/comments about the boundary setting procedures. 1) How is a problem area identified? This has to do with the monitoring network and baseline information previously gathered, but in the section (section 8, p.58) describing this, it was not clear how problem areas were to be "sampled more intensively". Also, the area must have concentrations at the trigger level a minimum of two consecutive sampling events. Is a sampling event the regularly scheduled network sampling which may happen only every 2-3 years? Or will district staff come back to an area a month later and sample? 2) On page 84, second full paragraph, it is implied that Wellhead Protection Areas are established due to nonpoint source pollution. Wellhead Protection Areas are determined independently of contamination. I applaud the District's idea of allowing a smaller minimum size for trigger action when a Public Water Supply is involved.

The proposed controls for the GWMA are generally pretty good. I think as it gets closer to actual implementation of the Phase I controls, the District will need to define topics to be covered in their education program in much greater detail. I am especially pleased to see the District tackling the calibration of fertilizer application equipment. One criticism I do have is that in Phase II, organic fertilizers (manure products) must be applied taking into account the soil and water credits available, whereas commercial fertilizer does not fall under the same constraints. Commercial fertilizer has timing and soil type constraints. I feel both organic and commercial fertilizer application rates need to take into account soil and water credits, and a realistic yield goal (not mentioned in plan).

There seems to be some contradiction between Phase III controls text (p.87) and Table 9, which summarizes Phases and Control Requirements. The last diamond (♦) on page 87 states "The application of fertilizer (>50 lb/ac) would be required to be calibrated to the results of soil and water tests and monitored for compliance." Table 9, #19 states "Require fertilizer monitors on all applications greater than 50 lb/ac". Is this saying the same thing? Table 9 appears to be referring to the calibration of equipment again (as in Phase II, Table 9 #13; p.86, second to last diamond).

5) General Comments.

While there are still a few problems with this plan, I think there is enough detail and explanation of the important issues to merit approval. The monitoring network is explained, the triggering and boundary setting process is given (maybe more detail is needed on problem area definitions), and there is a pretty good explanation of the controls that are planned for the GWMA. Items that aren't clear or detailed enough will be straightened out, by necessity, by the time the GWMA is implemented. LPNNRD has done a great job presenting maps, geologic, and ground water information in this plan. I recommend its approval.

STATE OF NEBRASKA

DEPARTMENT OF HEALTH
Mark B. Horton, M.D., M.S.P.H.
Director



E. Benjamin Nelson
Governor

MEMO

To: Dale Vagts, Department of Water Resources
From: Jack L. Daniel, Department of Health *JLD*
Date: December 22, 1994
Subject: Lower Platte North NRD's 1994 Groundwater Management Plan

The referenced plan appears to have adequately covered groundwater quality according to our reviewer, Mr. Tom Michels; however, specific reference to the following Department of Health regulations would be appreciated.

- Wellhead encroachment regulations (Title 179 NAC 2)
- Well abandonment regulations (Title 178 NAC 12)

Thank you for the opportunity to comment.

J.M.
JLD:TM:dm

RECEIVED

DEC 30 1994

DEPARTMENT OF
WATER RESOURCES



Nebraska Game and Parks Commission

2200 N. 33rd St. / P.O. Box 30370 / Lincoln, NE 68508-0370 / 402-471-0641 / Fax: 402-471-5528

December 20, 1994

Dale Vagts
Ground Water Supervisor
Department of Water Resources
301 Centennial Mall South
Lincoln, Nebraska 68509

RECEIVED

DEC 22 1994

DEPARTMENT OF
WATER RESOURCES

Dear Dale:

The Lower Platte North Natural Resources District's ground water management plan had been reviewed. The following changes need to be made before a "no adverse effect" opinion can be issued.

- 1) While the potential occurrence of prairie white fringed orchid in the District is noted in the plan, no mention is made that this species could be affected by groundwater levels.
- 2) A statement needs to be added that acknowledges potential impact, positive or negative, on the orchid from groundwater management activities proposed in the plan.
- 3) While the NRD indicates that it will evaluate the need for modification of its plan to reduce adverse effects, they need to specify that **such modifications will include actions that they could take to reduce adverse effects on the orchid by maintaining a groundwater level that will help sustain this species.**

The three changes as described above that we are recommending are consistent with the language developed by the NRD and Commission committee and outlined in a March, 1994 Commission memo to the NRD's. I have included a copy of this memo for you to include with your correspondence to the Lower Platte North.

Sincerely,

Ross A. Lock
Wildlife Diversity Program Manager
Wildlife Division

RAL/me
Enc.



Nebraska Game and Parks Commission

2200 N. 33rd St. / P.O. Box 30370 / Lincoln, NE 68503-0370 / (402) 471-0641

MEMORANDUM

TO: (one to each NRD District Manager)

FROM: WES SHEETS, ASSISTANT DIRECTOR

DATE: MARCH 2, 1994

SUBJECT: GROUND WATER MANAGEMENT PLANS AND ENDANGERED AND
THREATENED SPECIES

On January 25, 1994, Ross Lock, of my staff, attended the quarterly meeting of Natural Resource District Managers. His purpose was to explain the Game and Parks Commission's position intended to resolve the differences between the NRDs and the Commission on how endangered and threatened species are to be considered in groundwater management plans. He outlined language and identified information that, if included in the groundwater management plans, would facilitate approval of the plans by the Department of Water Resources. A committee of NRD managers, chaired by Glenn Johnson, was organized at that meeting to develop refinements in the language. The committee, that included the Upper Big Blue NRD (John Turnbull), Papio-Missouri River NRD (Jerry Bowen), Middle Niobrara NRD (Bob Hilske), Lower Elkhorn NRD (Stan Staab), Lower Platte South NRD (Glenn Johnson), and Ross Lock, met on February 4. Agreement was reached on four statements that describe how endangered and threatened species should be addressed in groundwater management plans that consider groundwater quantity. The group determined that groundwater management plans should include:

1. Recognition of the existence and/or potential existence of threatened species that may be affected by groundwater levels. Include lists of species and confirmed occurrences by counties. (Game and Parks Commission has provided this information to the NRDs).
2. Recognition that general protection of groundwater quantity and quality has many benefits including protecting the habitats of threatened species listed above.
3. Recognition that any groundwater management activities proposed in the plan may have some impact (positive or negative) on threatened species listed in the plan.

4. Should specific adverse effects on threatened species listed in the plan from changing groundwater levels be identified, the NRD acknowledges the potential need to modify groundwater management plans in the future. Such modifications should include actions within control or management areas consistent with the Nebraska Groundwater Management and Protection Act that could be taken by the NRDs to reduce adverse effects on species by maintaining a groundwater level that will help sustain these species.

The Nebraska Game and Parks Commission will submit the following statement to the Department of Water Resources after reviewing groundwater management plans containing the information described above:

Approval of the (specific NRD) groundwater management plan by the Department of Water Resources and subsequent management of groundwater quantity by the NRD will not, at this time, adversely effect endangered or threatened species or result in the modification or destruction of critical habitat. Should it be determined at some time in the future that an endangered or threatened species is being adversely effected by changes in groundwater levels, informal consultation would be reinitiated between the Department of Water Resources and the Game and Parks Commission. Consultation would address the conditions adversely effecting the species and how the groundwater management plan could be modified to include appropriate remedial actions that could be taken by the NRD. Participation of the appropriate NRD in the consultation would be necessary.

The proposed content of the groundwater management plans pertaining to endangered and threatened species and our statement as to the effects of managing groundwater quantity on the species as described above have been reviewed by the Department of Water Resources and will accomodate their approval of the plans.

Regarding NRD management plans that consider only groundwater quality, the Commission's response to the Department of Water Resources will remain unchanged; that approval of the plans by the Department of Water Resources and subsequent management of groundwater quality by the NRDs will not adversely effect endangered or threatened species. No changes or additions to the content of the management plans considering groundwater quality are necessary.

Following the February 4 meeting, a dialogue was initiated between Glenn Johnson and Ross Lock to address the need for future discussions between the NRDs and the Commission on unresolved issues. Glenn and Ross developed language that described the intent of future discussions. After review of the language by the rest of the committee,

it was agreed that the Nebraska Game and Parks Commission and the Natural Resources Districts will continue discussions to explore approaches to reducing the adverse impacts of groundwater level changes on the threatened species. The purpose of such discussions will be to develop cooperative research studies and projects that will determine cause-and-effect relationships; identify effective actions that could be taken by the NRDs and the Game and Parks Commission to reduce adverse effects to the threatened species; and develop appropriate amendments to the Nebraska Groundwater Management and Protection Act and other statutes that would facilitate the NRDs taking action to reduce adverse effects to the threatened species.

The efforts and cooperation of the NRD committee in developing this agreement are most appreciated. We will be seeking the guidance of this committee and encouraging their involvement in future discussions on the unresolved issues. We look forward to working with the committee and other NRDs. Should any of you have questions regarding the agreement or suggestions for future discussions, please contact Ross Lock (402/471-5438) or any of the NRD committee members.

RA/RL/me

cc: All Natural Resource District Managers
Gordon Kissel

STATE OF NEBRASKA



E. Benjamin Nelson
Governor

December 1, 1994

NATURAL RESOURCES COMMISSION

Dayle Williamson

Director

301 Centennial Mall South

P.O. Box 94876

Lincoln, Nebraska 68509-4876

Phone (402) 471-2081

Fax (402) 471-3132

RECEIVED

DEC 1 1994

DEPARTMENT OF
WATER RESOURCES

Mr. Dale R. Vagts
Ground Water Supervisor
Department of Water Resources
P.O. Box 94676
Lincoln, Nebraska 68509-4676

Dear Dale:

We have completed our review of the Revised 1994 Lower Platte North NRD Groundwater Management Plan. I recommend the Department of Water Resources approve the revised plan. I believe the revised plan addresses the three deficiencies identified in your Department's December 17, 1993 comment letter on the original plan. Namely: it includes further discussion of monitoring, addresses the Game and Parks Commission's concerns about the western prairie fringe orchid, and addresses more than just nitrates in its action plan. The District has also responded to our agency's most important comment on the earlier draft by providing more detail on the boundary setting process for its action plan. Overall, this is one of the best plans we have reviewed to date.

Despite the revisions to what was in most respects already a very good plan, we continue to believe there at least one aspect in which it needs improvement. I consider the District's groundwater reservoir life goal, which is retained in the current draft, to be a weak portion of the plan. As I noted in my November 19, 1993 comment letter on the previous plan, the use of the words "sustained" and "long term" in the same sentence leaves the reader confused about what is meant. The use of the words "long term" may arguably result in some difficulty in meeting the statutory requirement that the goal be established for a finite or infinite period of time. The goal also results in a problem in the District's Groundwater Quantity Action Plan. At certain triggers that plan results in acre-inch allocations and well spacing restrictions. However, in order to set those allocations and restrictions the NRD should have a water level or specified duration of use as its goal. The current goal doesn't lend clarity to that process.

We do have one very minor correction related to page 61 of the plan. Unless our staff is mistaken the Kobus landfill is in the Lower Platte North NRD. The NRD staff may wish to check that.

Overall, this is an excellent revision and I believe the Lower Platte North NRD is to be congratulated on a superb effort. If you have any questions, please let us know.

Sincerely,

A handwritten signature in cursive script that reads "Dayle".

Dayle E. Williamson
Director of Natural Resources

Lower Platte River Drought Contingency Plan Drought Mitigation Projects

Lower Platte River Consortium Meeting
January 17, 2023

Caitlin Kingsley, ESIII, Water Planning Division

Project Vote Results – May 6, 2022

Project	For	Against
Import Missouri River water to Bell Creek	6	0
Sherman Reservoir release (250 and 400 cfs)	7	0
Augmentation wellfield	4	0
Alluvial sandpit pumping	5	0
LWS-MUD interconnection	9	0
Middle Loup Canal recharge (historic operations)	3	3
Middle Loup Canal recharge (full hydropower right)	2	6
Skull Creek Reservoir	2	4
Pump Missouri River water into Bell Creek Reservoir	2	5
Bell Creek Reservoir	0	7

Discussion Questions

- Which projects are you still interested in/no longer interested in?
- What do you like/dislike about each project?
- Do you want to see new calculations for any projects? (\$ or cfs)
- What do you want to get out of a project?
- What other projects would you suggest that meet your needs/goals?
- **What are the next steps? What do you want to accomplish?**

Discussion Recap – November 17, 2022

- **Priorities identified:**
- Keeping water in the Platte River
 - Projects that produce ≥ 100 cfs at Ashland gage

Project	Pursue?	Obstacles/Uncertainties	Opportunities
Import Missouri River water to Bell Creek	No	Permitting Stream degradation Infrastructure	Recreation = community buy-in?
Sherman Reservoir release (2 scenarios)	Maybe	Farwell ID negotiations	Sherman Reservoir mound credit?
Augmentation wellfield/ Alluvial aquifer pumping	Maybe	Wellfield location Storage during high flow Availability during low flow	Fremont dewatering project JEDI lake
LWS-MUD Interconnection	-	1 of 7 options in LWS's Water 2.0 Project	Could reduce LWS reliance on Platte

Import Missouri River Water to Bell Creek

Volume Added at Source (Waterloo)		Volume Increase at Ashland		Cost	
Cumulative AF 15 days	Avg Daily cfs	Cumulative AF 15 days	Avg Daily cfs	Estimate	Per AF added at Ashland
59,400	100	46,300	80	\$76,572,840	\$1,654

Pros	Cons	Considerations/Uncertainties
• Secondary source of water outside of Platte River basin increase supply reliability • Operational every year & year-round	• Larger construction cost than many alternatives • Implementation: 5-10 years	• Future regulation on Missouri River • Well field siting

Sherman Reservoir Release

Volume Added at Source (St. Paul)			Volume Increase at Ashland		Cost	
Scenario	Cumulative AF 15 days	Avg Daily cfs	Cumulative AF 15 days	Avg Daily cfs	Estimate	Per AF added at Ashland
400 cfs	47,520	400	15,720	132	\$9,628,000	\$612
250 cfs	29,700	250	9,800	83	\$6,955,000	\$710

Pros	Cons	Considerations/Uncertainties
- Utilizes existing facilities (no construction cost) - Produces large volume of water on-demand - Historically Loup River supply adequate to fill reservoir yearly Implementation: 1-2 years	- Likely limitation on frequency of call on storage water - Significant conveyance losses from release point to Lower Platte River	- Requires cooperation and agreements with existing facility owners - Negotiations will dictate price - Cost estimates based on similar agreements in state

Augmentation Wellfield

Volume Added at Source (TBD)		Volume Increase at Ashland		Cost	
Cumulative AF 15 days	Avg Daily cfs	Cumulative AF 15 days	Avg Daily cfs	Estimate	Per AF added at Ashland
59,400	100	59,400	100	\$81,008,040	\$1,364

Pros	Cons	Considerations/Uncertainties
• Available every year & year-round • Can be located closer to critical reach to reduce losses compared to alternatives producing similar volumes upstream in the Basin	• Land & infrastructure costs make this one of the more expensive alternatives • Adds to overall depletions • Implementation: 5-10 years	• Siting to avoid interference with existing wells • Long-term reliability of aquifer

Alluvial Sandpit Pumping

Volume Added at Source (Leshara)		Volume Increase at Ashland		Cost	
Cumulative AF 15 days	Avg Daily cfs	Cumulative AF 15 days	Avg Daily cfs	Estimate	Per AF added at Ashland
14,850	100	14,850	100	\$5,980,000	\$403

Pros	Cons	Considerations/Uncertainties
- Minimal infrastructure costs (pumps from existing sandpits) - Utilizes existing sandpits Implementation: 1-2 years	- Limited operation window; pumping this close to the river may cause depletions that amplify impacts during extended drought - Likely limitation on number of calls allowed in a 20-year period	- Requires agreements with existing facility owners - Negotiations will dictate price - Cost estimates based on similar agreements in state - Amount of system improvement

LWS-MUD Interconnection

Pros	Cons	Considerations/ Uncertainties
• Directly and efficiently addresses drought impact on potable water supplies • Provides access to the drought-resistant Missouri River as a source • Implementation: 3-5 years	• Does not directly address low flow conditions on the Platte River during drought; however, may reduce pumping demands on municipal wells adjacent to the Platte during drought conditions • Infrastructure costs associated with linking finished water supplies	• Feasibility of linking water supplies (water chemistry, system hydraulics, legal framework, etc) • One of seven options in LWS's Water 2.0 Project

Water Quantity Assessment

Volume Added at Source				Volume Increase at Ashland		Cost Estimates from October 2018	
Alternative	Cumulative AF / 15 days	Avg Daily cfs	Where Added	Cumulative AF / 15 days	Avg Daily cfs	Cost Estimate	Cost per AF added at Ashland
Import Missouri River Water to Bell Creek	59,400	100	Waterloo	46,300	80	\$76,572,840	\$1,654
Sherman Release (400 cfs)	47,520	400	St. Paul	15,720	132	\$9,628,000	\$612
Sherman Release (250 cfs)	29,700	250	St. Paul	9,800	83	\$6,955,000	\$710
Alluvial Sandpit Pumping	14,850	100	Leshara	14,850	100	\$5,980,000	\$403
Augmentation Well-Field	59,400	100	TBD	59,400	100	\$81,008,040	\$1,364

Alternative	Pros	Cons	Considerations/ Uncertainties
Import Missouri River Water to Bell Creek	- Secondary source of water outside of Platte River basin increase supply reliability - Operational every year & year-round	- Larger construction cost than many alternatives Implementation: 5-10 years	- Future regulation on Missouri River - Well field siting
Sherman Release (400 cfs & 250 cfs)	- Utilizes existing facilities (no construction cost) - Produces large volume of water on-demand - Historically Loup River supply adequate to fill reservoir every year Implementation: 1-2 years	- Likely limitation on frequency of call on storage water - Significant conveyance losses from release point to Lower Platte River	- Requires cooperation and agreements with existing facility owners - Negotiations will dictate price - Cost estimates based on similar agreements in state
Alluvial Sandpit Pumping	- Minimal infrastructure costs (pumps from existing sandpits) - Utilizes existing sandpits Implementation: 1-2 years	- Limited operation window as pumping this close to the river may cause depletions that amplify impacts during extended drought - Likely limitation on number of calls allowed in a 20-year period	- Requires cooperation/agreements with existing facility owners - Negotiations will dictate price - Cost estimates based on similar agreements in state - Amount of improvement of system
Augmentation Wellfield	- Available every year & year-round - Can be located closer to critical reach to reduce losses compared to alternatives producing similar volumes upstream in the Basin	- Land & infrastructure costs make this one of the more expensive alternatives - Adds to overall depletions Implementation: 5-10 years	- Siting to avoid interference with existing wells - Long-term reliability of aquifer
LWS-MUD Interconnection	- Directly and efficiently addresses drought impact on potable water supplies - Provides access to the drought-resistant Missouri River as a source Implementation: 3-5 years	- Does not directly address low flow conditions on the Platte River during drought - May reduce pumping demands on municipal wells adjacent to the Platte during drought conditions - Infrastructure costs associated with linking finished water supplies	- Feasibility of linking water supplies (water chemistry, system hydraulics, legal framework, etc.) - One of seven options in LWS's Water 2.0 Project

Discussion Questions

- Which projects are you still interested in/no longer interested in?
- What do you like/dislike about each project?
- Do you want to see new calculations for any projects? (\$ or cfs)
- What do you want to get out of a project?
- What other projects would you suggest that meet your needs/goals?
- **What are the next steps? What do you want to accomplish?**
- ***Do you want to pursue any of these projects?***

NEBRASKA

Good Life. Great Water.

DEPT. OF NATURAL RESOURCES

THANK YOU

Caitlin Kingsley, ESIII, Water Planning Division

dnr.nebraska.gov  



United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Water Resources Discipline
Nebraska Water Science Center
5231 South 19th Street
Lincoln, NE 68512-1271

August 30, 2022

Eric Gottschalk
Lower Platte North Natural Resources District
PO Box 126
Wahoo, NE 68066

Dear Mr. Gottschalk:

Enclosed is a copy of Joint Funding Agreement No. 23NRJFA00170 for the operation of two streamgages at Shell Creek near Columbus and Wahoo Creek at Ashland and one real-time groundwater level monitoring site as listed in the enclosed summary of proposed funding. The total amount of the agreement is \$25,120 or \$6,930 for the U.S. Geological Survey and \$18,190 for the Lower Platte North Natural Resources District. Funds in the amount of \$9,750 from the Federal Priority Streamgages Program (FPS), which are not included in the above amounts, have been used as a supplement to or in place of Cooperative Matching Funds. Please sign the agreement and return by email to aflynn@usgs.gov. Work cannot be continued until we receive the signed agreement.

Work performed with funds from this agreement will be conducted on a fixed-price basis under the authority of statute 43 USC 36C. Billings will be rendered annually in July 2023. The results of all work under this agreement will be available for publication by the U.S. Geological Survey.

For more information or any questions concerning this agreement, please contact Jason Lambrecht at 402-328-4124.

Sincerely,

**STEVEN
PETERSON**

Digitally signed by STEVEN PETERSON
Date: 2022.08.30 10:46:55 -05'00'

Steven M. Peterson, Director
USGS Nebraska Water Science Center

2 Enclosures

DUNS No. 949286512

U.S. Department of the Interior
U.S. Geological Survey
Joint Funding Agreement
FOR
Water Resource Investigations

Customer #: 6000000136
Agreement #: 23NRJFA00170
Project #: NR00GS1
TIN #: 47-0542716

Fixed Cost Agreement YES[X] NO[]

THIS AGREEMENT is entered into as of October 1, 2022, by the U.S. GEOLOGICAL SURVEY, Nebraska Water Science Center, UNITED STATES DEPARTMENT OF THE INTERIOR, party of the first part, and the LOWER PLATTE NORTH NATURAL RESOURCES DISTRICT, party of the second part.

1. The parties hereto agree that subject to the availability of appropriations and in accordance with their respective authorities there shall be maintained in cooperation **streamgages at Shell Creek near Columbus and Wahoo Creek at Ashland, and one real-time groundwater level monitoring site**, herein called the program. The USGS legal authority is 43 USC 36C; 43 USC 50, and 43 USC 50b.

2. The following amounts shall be contributed to cover all of the cost of the necessary field and analytical work directly related to this program. 2(b) include In-Kind-Services in the amount of \$0.00

- (a) \$6,930 by the party of the first part during the period
October 1, 2022 to September 30, 2023
- (b) \$18,190 by the party of the second part during the period
October 1, 2022 to September 30, 2023
- (c) Contributions are provided by the party of the first part through other USGS regional or national programs, in the amount of: \$9,750

Description of the USGS regional/national program:
Federal Priority Streamgages Program

- (d) Additional or reduced amounts by each party during the above period or succeeding periods as may be determined by mutual agreement and set forth in an exchange of letters between the parties.
- (e) The performance period may be changed by mutual agreement and set forth in an exchange of letters between the parties.

3. The costs of this program may be paid by either party in conformity with the laws and regulations respectively governing each party.

4. The field and analytical work pertaining to this program shall be under the direction of or subject to periodic review by an authorized representative of the party of the first part.

5. The areas to be included in the program shall be determined by mutual agreement between the parties hereto or their authorized representatives. The methods employed in the field and office shall be those adopted by the party of the first part to insure the required standards of accuracy subject to modification by mutual agreement.

6. During the course of this program, all field and analytical work of either party pertaining to this program shall be open to the inspection of the other party, and if the work is not being carried on in a mutually satisfactory manner, either party may terminate this agreement upon 60 days written notice to the other party.

7. The original records resulting from this program will be deposited in the office of origin of those records. Upon request, copies of the original records will be provided to the office of the other party.

8. The maps, records or reports resulting from this program shall be made available to the public as promptly as possible. The maps, records or reports normally will be published by the party of the first part. However, the party of the second part reserves the right to publish the results of this program, and if already published by the party of the first part shall, upon request, be furnished by the party of the first part, at cost, impressions suitable for purposes of reproduction similar to that for which the original copy was prepared. The maps, records or reports published by either party shall contain a statement of the cooperative relations between the parties. The Parties acknowledge that scientific information and data developed as a result of the Scope of Work (SOW) are subject to applicable USGS review, approval, and release requirements, which are available on the USGS Fundamental Science Practices website <https://www.usgs.gov/about/organization/science-support/science-quality-and-integrity/fundamental-science-practices>

Form 9-1366
(May 2018)

U.S. Department of the Interior
U.S. Geological Survey
Joint Funding Agreement
FOR
Water Resource Investigations

Customer #: 6000000136
Agreement #: 23NRJFA00170
Project #: NR00GS1
TIN #: 47-0542716

9. Billing for this agreement will be rendered **annually**. Invoices not paid within 60 days from the billing date will bear Interest, Penalties, and Administrative cost at the annual rate pursuant the Debt Collection Act of 1982, (codified at 31 U.S.C. § 3717) established by the U.S. Treasury.

USGS Technical Point of Contact

Name: Jason Lambrecht
Hydrologic Data Section Chief
Address: 5231 South 19th
Lincoln, NE 68512
Telephone: (402) 328-4124
Fax: (402) 328-4101
Email: jmlambre@usgs.gov

Customer Technical Point of Contact

Name: Eric Gottschalk
General Manager
Address: PO Box 126
Wahoo, NE 68066
Telephone: (402) 443-4675
Fax:
Email: egottschalk@lpnrd.org

USGS Billing Point of Contact

Name: Amanda Flynn
Budget Analyst
Address: 5231 South 19th
Lincoln, NE 68512
Telephone: (402) 328-4144
Fax: (402) 328-4101
Email: aflynn@usgs.gov

Customer Billing Point of Contact

Name: Eric Gottschalk
General Manager
Address: PO Box 126
Wahoo, NE 68066
Telephone: (402) 443-4675
Fax:
Email: egottschalk@lpnrd.org

U.S. Geological Survey
United States
Department of Interior

Lower Platte North Natural Resources District

STEVEN
By PETERSON
Name: Steven M. Peterson
Title: Director

Signature

Digitally signed by STEVEN
PETERSON
Date: 2022.08.30 10:40:58
-05'00'

Signatures

By _____ Date: _____

Name:

Title:

By _____ Date: _____

Name:

Title:

By _____ Date: _____

Name:

Title:

Table 1. Summary of proposed funding for the period October 1, 2022 -- September 30, 2023 for the operation of two streamgages and one real-time groundwater level monitoring site that are currently supported by the Lower Platte North Natural Resources District.

[CMF, USGS, Cooperative matching funds; LPN NRD, Lower Platte North Natural Resources District; FPS, Federal Priority Streamgages Program; USGS, U.S. Geological Survey]

Station number	Station name	Station funding				Footnote Code
		USGS FPS	USGS CMF	LPN NRD	Total	
Streamflow Stations						
06795500	Shell Creek near Columbus	\$9,750		\$5,990	\$15,740	1
06804700	Wahoo Creek at Ashland		\$6,290	\$9,450	\$15,740	
	Subtotal	\$9,750	\$6,290	\$15,440	\$31,480	
Groundwater Station						
411005096281502	14N 8E 24 ACD2 Mead		\$640	\$2,750	\$3,390	
	Subtotal	\$0	\$640	\$2,750	\$3,390	
	Funding partner totals	\$9,750	\$6,930	\$18,190	\$34,870	

1 USGS FPS funds used in place of CMF funds as match with LPN NRD

Cost Share Assistance 2023 Tree Plantings

<u>Name</u>	<u>County</u>	<u># Trees</u>	<u>Landowner Total Cost w/out Tax</u>	<u>Cost Share CRP 50%</u>	<u>NRD Cost Share Program 75%/25% CRP</u>
Derek Simonds	Saunders	230 trees	\$ 575.00		\$ 431.25
Jordan Larsen	Saunders	200 trees	\$ 500.00		\$ 375.00
Seth McGinn	Dodge	800 trees	\$ 2,000.00		\$ 1,500.00
Totals		1,230 trees	\$3,075.00		\$2,306.25

[illegible]

327 Conservation Cover
327 Conservation Cover
327 Conservation Cover
327 Conservation Cover
327 Conservation Cover
327 Conservation Cover
327 Conservation Cover
327 Conservation Cover
328 Conservation Crop Rotation
328 Conservation Crop Rotation
328 Conservation Crop Rotation
328 Conservation Crop Rotation
328 Conservation Crop Rotation
329 Residue and Tillage Management, No Till
329 Residue and Tillage Management, No Till
329 Residue and Tillage Management, No Till
330 Contour Farming
332 Contour Buffer Strips
332 Contour Buffer Strips
332 Contour Buffer Strips
332 Contour Buffer Strips
338 Prescribed Burning
338 Prescribed Burning
338 Prescribed Burning
338 Prescribed Burning
338 Prescribed Burning
340 Cover Crop
340 Cover Crop
340 Cover Crop
340 Cover Crop
340 Cover Crop
340 Cover Crop
340 Cover Crop
340 Cover Crop
340 Cover Crop
340 Cover Crop
340 Cover Crop
342 Critical Area Planting
342 Critical Area Planting
342 Critical Area Planting
342 Critical Area Planting
342 Critical Area Planting
342 Critical Area Planting
342 Critical Area Planting
348 Dam, Diversion
350 Sediment Basin
350 Sediment Basin

351 Well Decommissioning
351 Well Decommissioning
351 Well Decommissioning
351 Well Decommissioning
351 Well Decommissioning
351 Well Decommissioning
351 Well Decommissioning
351 Well Decommissioning
351 Well Decommissioning
355 Groundwater Testing
355 Groundwater Testing
355 Groundwater Testing
355 Groundwater Testing
355 Groundwater Testing
355 Groundwater Testing
356 Dike and Levee
356 Dike and Levee
356 Dike and Levee
359 Waste Treatment Lagoon
359 Waste Treatment Lagoon
360 Waste Facility Closure
360 Waste Facility Closure
360 Waste Facility Closure
362 Diversion
366 Anaerobic Digester
367 Roofs and Covers
367 Roofs and Covers
367 Roofs and Covers
367 Roofs and Covers
368 Emergency Animal Mortality Management
368 Emergency Animal Mortality Management
368 Emergency Animal Mortality Management
368 Emergency Animal Mortality Management
368 Emergency Animal Mortality Management
368 Emergency Animal Mortality Management
368 Emergency Animal Mortality Management
368 Emergency Animal Mortality Management
368 Emergency Animal Mortality Management
368 Emergency Animal Mortality Management
368 Emergency Animal Mortality Management
368 Emergency Animal Mortality Management
371 Air Filtration and Scrubbing
372 Combustion System Improvement
372 Combustion System Improvement
372 Combustion System Improvement
372 Combustion System Improvement

372 Combustion System Improvement
372 Combustion System Improvement
374 Energy Efficient Agricultural Operation
374 Energy Efficient Agricultural Operation
374 Energy Efficient Agricultural Operation
374 Energy Efficient Agricultural Operation
374 Energy Efficient Agricultural Operation
374 Energy Efficient Agricultural Operation
374 Energy Efficient Agricultural Operation
374 Energy Efficient Agricultural Operation
374 Energy Efficient Agricultural Operation
374 Energy Efficient Agricultural Operation
374 Energy Efficient Agricultural Operation
374 Energy Efficient Agricultural Operation
374 Energy Efficient Agricultural Operation
378 Pond
378 Pond
378 Pond
378 Pond
378 Pond
380 Windbreak/Shelterbelt Establishment and Renovation
380 Windbreak/Shelterbelt Establishment and Renovation
380 Windbreak/Shelterbelt Establishment and Renovation
380 Windbreak/Shelterbelt Establishment and Renovation
380 Windbreak/Shelterbelt Establishment and Renovation
380 Windbreak/Shelterbelt Establishment and Renovation
380 Windbreak/Shelterbelt Establishment and Renovation
382 Fence
382 Fence
382 Fence
382 Fence
382 Fence
382 Fence
382 Fence
382 Fence
382 Fence
382 Fence
382 Fence
382 Fence
382 Fence
382 Fence
382 Fence
382 Fence
383 Fuel Break
383 Fuel Break
383 Fuel Break
384 Woody Residue Treatment
384 Woody Residue Treatment
384 Woody Residue Treatment
384 Woody Residue Treatment
386 Field Border

[illegible]

410 Grade Stabilization Structure
410 Grade Stabilization Structure
412 Grassed Waterway
412 Grassed Waterway
412 Grassed Waterway
412 Grassed Waterway
420 Wildlife Habitat Planting
420 Wildlife Habitat Planting
420 Wildlife Habitat Planting
420 Wildlife Habitat Planting
420 Wildlife Habitat Planting
420 Wildlife Habitat Planting
420 Wildlife Habitat Planting
422 Hedgerow Planting
422 Hedgerow Planting
430 Irrigation Pipeline
430 Irrigation Pipeline
430 Irrigation Pipeline
430 Irrigation Pipeline
430 Irrigation Pipeline
436 Irrigation Reservoir
436 Irrigation Reservoir
436 Irrigation Reservoir
436 Irrigation Reservoir
441 Irrigation System, Microirrigation
441 Irrigation System, Microirrigation
441 Irrigation System, Microirrigation
441 Irrigation System, Microirrigation
441 Irrigation System, Microirrigation
441 Irrigation System, Microirrigation
441 Irrigation System, Microirrigation
441 Irrigation System, Microirrigation
442 Sprinkler System
442 Sprinkler System
442 Sprinkler System
442 Sprinkler System
442 Sprinkler System
442 Sprinkler System
442 Sprinkler System
442 Sprinkler System
442 Sprinkler System
442 Sprinkler System
442 Sprinkler System
442 Sprinkler System
449 Irrigation Water Management
449 Irrigation Water Management
449 Irrigation Water Management
449 Irrigation Water Management
449 Irrigation Water Management

[illegible]

[illegible]

533 Pumping Plant
533 Pumping Plant
550 Range Planting
550 Range Planting
550 Range Planting
550 Range Planting
550 Range Planting
550 Range Planting
550 Range Planting
550 Range Planting
554 Drainage Water Management
558 Roof Runoff Structure
558 Roof Runoff Structure
558 Roof Runoff Structure
560 Access Road
560 Access Road
560 Access Road
560 Access Road
561 Heavy Use Area Protection
561 Heavy Use Area Protection
561 Heavy Use Area Protection
561 Heavy Use Area Protection
570 Stormwater Runoff Control
574 Spring Development
574 Spring Development
575 Trails and Walkways
575 Trails and Walkways
575 Trails and Walkways
576 Livestock Shelter Structure
578 Stream Crossing
578 Stream Crossing
578 Stream Crossing
578 Stream Crossing
578 Stream Crossing
580 Streambank and Shoreline Protection
580 Streambank and Shoreline Protection
580 Streambank and Shoreline Protection
580 Streambank and Shoreline Protection
582 Open Channel
584 Channel Bed Stabilization
584 Channel Bed Stabilization
585 Stripcropping
587 Structure for Water Control
587 Structure for Water Control
587 Structure for Water Control
587 Structure for Water Control

[illegible]

600 Terrace
600 Terrace
600 Terrace
600 Terrace
600 Terrace
600 Terrace
600 Terrace
601 Vegetative Barrier
603 Herbaceous Wind Barriers
604 Saturated Buffer
605 Denitrifying Bioreactor
606 Subsurface Drain
606 Subsurface Drain
606 Subsurface Drain
606 Subsurface Drain
606 Subsurface Drain
612 Tree/Shrub Establishment
612 Tree/Shrub Establishment
612 Tree/Shrub Establishment
612 Tree/Shrub Establishment
612 Tree/Shrub Establishment
612 Tree/Shrub Establishment
614 Watering Facility
614 Watering Facility
614 Watering Facility
614 Watering Facility
614 Watering Facility
614 Watering Facility
614 Watering Facility
614 Watering Facility
614 Watering Facility
620 Underground Outlet
620 Underground Outlet
620 Underground Outlet
620 Underground Outlet
620 Underground Outlet
620 Underground Outlet
620 Underground Outlet
620 Underground Outlet
620 Underground Outlet
620 Underground Outlet
620 Underground Outlet
629 Waste Treatment
629 Waste Treatment
632 Waste Separation Facility
632 Waste Separation Facility
632 Waste Separation Facility
632 Waste Separation Facility
632 Waste Separation Facility

634 Waste Transfer
634 Waste Transfer
634 Waste Transfer
634 Waste Transfer
634 Waste Transfer
634 Waste Transfer
634 Waste Transfer
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
635 Vegetated Treatment Area
636 Water Harvesting Catchment
638 Water and Sediment Control Basin
638 Water and Sediment Control Basin
640 Waterspreading
642 Water Well
642 Water Well
642 Water Well
642 Water Well
642 Water Well
642 Water Well
644 Wetland Wildlife Habitat Management
645 Upland Wildlife Habitat Management
645 Upland Wildlife Habitat Management
645 Upland Wildlife Habitat Management
646 Shallow Water Development and Management
646 Shallow Water Development and Management
647 Early Successional Habitat Development-Mgt
647 Early Successional Habitat Development-Mgt
647 Early Successional Habitat Development-Mgt
649 Structures for Wildlife
649 Structures for Wildlife
649 Structures for Wildlife
649 Structures for Wildlife
650 Windbreak/Shelterbelt Renovation

[illegible]

810 Annual Forages for Grazing Systems

812 Raised Beds

812 Raised Beds

812 Raised Beds

812 Raised Beds

812 Raised Beds

821 Low Tunnel Systems

821 Low Tunnel Systems

821 Low Tunnel Systems

Scenario Number

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 9
- 10
- 11
- 13
- 14
- 3
- 5
- 6
- 7
- 8
- 38
- 78
- 276
- 375
- 1
- 2
- 3
- 4
- 5
- 6
- 85
- 24
- 25
- 26
- 31
- 1
- 97
- 98
- 99
- 100
- 116
- 117
- 45
- 45
- 46
- 46
- 47
- 47
- 48

48
49
49
50
50
54
54
102
64
64
65
65
95
9
9
31
4
56
56
57
57
1
2
3
4
68
17
17
18
18
19
19
44
44
51
85
95
26
26
69
74
74
75
75
1
1
2

1
1
2
2
3
3
4
4
5
5
1
1
2
2
3
3
1
2
3
1
2
1
2
3
1
7
1
2
3
4
64
68
69
70
71
185
201
217
233
249
265
281
3
1
2
3
5

6
7
1
2
3
4
5
7
8
9
10
11
12
13
14
15
1
2
3
4
5
1
5
6
7
12
125
250
1
2
3
4
5
7
8
9
10
11
93
1
5
6
13
14
16
18
31

31
32
32
33
33
81
1
1
2
2
1
1
2
2
3
3
25
25
26
26
1
2
3
4
5
6
2
3
4
5
1
2
3
4
2
3
4
1
2
3
4
5
6
7
8
9
10

11
12
2
2
5
5
172
173
174
175
176
177
178
1
2
3
3
97
98
99
1
2
3
47
2
2
3
15
75
76
88
88
1
1
3
3
4
4
5
5
72
72
4
4
27
27
33

33
83
50
33
1
2
3
4
5
6
7
1
1
2
3
4
5
6
1
2
3
4
6
64
1
2
3
4
5
6
7
8
27
2
3
3
3
4
4
5
5
6
6
7
7
8
8

9
9
12
12
14
14
15
15
78
1
2
4
5
6
7
8
106
107
61
84
2
3
4
1
2
3
5
6
7
8
10
30
31
39
55
1
1
2
2
3
3
4
4
5
7
9
10

12
14
1
1
2
2
3
3
5
5
1
1
37
48
1
2
3
4
1
2
3
19
35
1
2
1
2
52
2
1
2
3
4
5
6
1
2
3
4
1
1
3
4
2
2
4
4

6
6
10
10
11
11
12
12
194
194
454
454
480
480
482
482
484
484
268
268
270
270
271
271
274
274
297
304
304
305
305
22
22
194
195
195
198
198
199
199
200
200
201
201
202
1
2

3
4
5
6
7
8
9
16
10
7
11
1
2
3
4
5
2
3
4
6
7
109
2
3
4
5
6
7
8
12
4
6
7
9
10
11
57
70
71
72
3
21
1
2
3
5
6

1
2
4
5
6
7
9
1
1
2
2
3
3
4
4
5
5
6
6
7
7
8
8
27
1
2
1
1
2
5
6
9
153
3
2
4
308
1
2
1
2
3
5
6
7
8
1

3
4
1
1
2
2
3
3
1
1
2
2
3
3
4
4
5
5
1
2
3
1
1
2
2
3
3
29
1
2
3
8
2
5
1
2
3
5
58
72
73
74
75
76
86
129
130

24
23
24
25
26
27
19
20
21

Scenario

Embankment Storage Pond

Excavated Storage Pond

Buried Concrete Tank, Less than 14,999 c.f. of storage

Buried Concrete Tank, Between 15,000 to 110,000 c.f. of storage

Buried Concrete Tank, Greater than 110,000 c.f. of storage

Steel or Concrete Above Ground Storage Structure

Bedded Pack - Concrete Floor and Concrete Walls

Bedded Pack - Earth Floor and Wood Walls

Bedded Pack - Earth Floor and Concrete Walls

Bedded Pack - Earth Floor with Concrete Walls and Concrete Apron

Dry Stack - Concrete floor and no walls

Dry Stack - Concrete floor and concrete walls

Mechanical and Chemical, Low Infestation

Mechanical and Chemical, Heavy Infestation

Chemical, Uplands

Chemical - Riparian

Chemical, Foliar Spot Treatment

Mechanical and Chemical, Medium Infestation

Mechanical and Chemical, Severe Infestation

Mechanical, Hand tools

Brush Management for 1 Ac. or less

Chemical, Ground or Aerial Treatment

Chemical, Wetland

Mechanical

Mechanical, Tree Establishment

Chemical, Tree Establishment - Banding

Chemical, Tree Establishment - Post-emergent Herbicide

Herbaceous Weed Treatment for One Acre Small Farm

Extra Large Animal - Daily Death Loss

Small Animal - Daily Death Loss

Medium to Large Animal - Daily Death Loss

Small Farm Pad + Bins

Irrigation Canal

High Tunnel, Low Snow and Wind Load

Contiguous US Snow

High Tunnel Gothic with Gutters

Small Gothic HT with Gutter

Small High Tunnel, Snow and Wind

Small High Tunnel, Intensive Sun

Introduced with Forgone Income

Wp_Introduced with Forgone Income

Native Species with Forgone Income

Wp_Native Species with Forgone Income

Pollinator Species with Forgone Income

Wp_Pollinator Species with Forgone Income

Introduced Species

Wp_Introduced Species
Native Species
Wp_Native Species
Pollinator Species
Wp_Pollinator Species
Monarch Species Mix
Wp_Monarch Species Mix
Pollinator Mix-Small Footprint
Wp_Basic Rotation Organic and Non-Organic
Pr_Basic Rotation Organic and Non-Organic
Wp_Irrigated to Dryland Rotation Organic and Non-Organic
Pr_Irrigated to Dryland Rotation Organic and Non-Organic
Pr_Specialty Crop Rotations-Small Scale
No-Till/Strip-Till
Wp_No-Till/Strip-Till
Small Scale No Till
Contour Farming
Introduced Species, Foregone Income (Organic and Non-Organic)
Wp_Introduced Species, Foregone Income (Organic and Non-Organic)
Native Species, Foregone Income (Organic and Non-organic)
Wp_Native Species, Foregone Income (Organic and Non-organic)
Pr_Herbaceous Fuel, Small Acreage
Pr_Herbaceous Fuel - Standard
Pr_Site Preparation
Pr_Level terrain, volatile fuel (wood) <640 acres
Pr_Steep Terrain, Volatile or Woody fuels
Cover Crop - Basic (Organic and Non-organic)
Wp_Cover Crop - Basic (Organic and Non-organic)
Cover Crop - Adaptive Management
Wp_Cover Crop - Adaptive Management
Cover Crop - Multiple Species (Organic and Non-organic)
Wp_Cover Crop - Multiple Species (Organic and Non-organic)
Cover Crop Multiple Species Frost Terminated Organic and Non-Organic
Wp_Cover Crop Multiple Species Frost Terminated Organic and Non-Organic
Cover Crop - 1 acre or less
Multi-species Cover Crop per 1000 square feet
Mechanical Termination of Cover Crop per 1000 square feet
Native or Introduced Vegetation - Normal Tillage (Organic and Non-Organic)
Wp_Native or Introduced Vegetation - Normal Tillage (Organic and Non-Organic)
Permanent Cover
Native Vegetation - Moderate Grading
Wp_Native Vegetation - Moderate Grading
Native Vegetation - Heavy Grading
Wp_Native Vegetation - Heavy Grading
Earthfill
Excavated Basin
Embankment Basin

Shallow, Greater than 15 in. dia.
Wp_Shallow, Greater than 15 in. dia.
Shallow, less than 15 in. dia.
Wp_Shallow, less than 15 in. dia.
Drilled, less than 300 feet
Wp_Drilled, less than 300 feet
Drilled, between 300 and 1,000 feet
Wp_Drilled, between 300 and 1,000 feet
Drilled, greater than 1,000 feet
Wp_Drilled, greater than 1,000 feet
Basic Water Test
Wp_Basic Water Test
Specialty Water Test
Wp_Specialty Water Test
Full Spectrum Test
Wp_Full Spectrum Test
Wetland Dike
Protective dike 6 feet high or less
Protective Dike >6 feet high
Embankment Lagoon
Excavated Lagoon
Decommissioning of Concrete Waste Storage Structure
Earthen Waste Impoundment Closure
Liquid Waste Impoundment Conversion to Fresh Water Storage
Diversion
Covered Lagoon/Holding Pond
Hoop Structure Roof
Timber or Steel Sheet Roof
Flexible Membrane Cover Only
Flex Membrane w/Flare
Burial
Cattle or Horse Disposal Other Than Burial
Swine Disposal Other Than Burial
Disposal of Goats or Sheep Other Than Burial
Forced Air Incineration
National Emergency Shallow Burial of Swine or Cattle
National Emergency Composting ??? purchase carbon material and mobilize equipment
National Emergency Carcass Disposal Other Than Burial, Incineration, Landfill or Render
National Emergency Disposal At Landfill or Render
National Emergency In-House Composting
National Emergency Forced Air Incineration
National Emergency Burial
Biofilter-Traditional Horizontal
IC Engine Repower, < 50 bhp
IC Engine Repower, 50-99 bhp
IC Engine Repower, 100-199 bhp
Electric Motor in-lieu of IC Engine, < 12 HP

Electric Motor in-lieu of IC Engine, 12-74 HP
Electric Motor in-lieu of IC Engine, 75-149 HP
Ventilation - Exhaust
Ventilation - HAF
Plate Cooler-Small
Plate Cooler
Scroll Compressor
Automatic Controller System
Motor Upgrade > 100 HP
Motor Upgrade 10 - 100 HP
Motor Upgrade > 1 and < 10 HP
Motor Upgrade <= 1 HP
Heating - Radiant Systems
Heating (Building)
Heating - Attic Heat Recovery vents
Grain Dryer
Excavated Pond
Excavated Pond with Embankment
Embankment Pond, No Principal Spillway
Embankment Pond with less than 24 inch Pipe
Embankment Pond with greater than or equal to 24 inch Pipe
Hand Planted, Bare Root
Trees, machine planted
Trees, machine planted, wildlife protection
Hand Planted, Bare Root, supplemental water for establishment
Trees, machine planted, wildlife protection, supplemental water for establishment
1 row windbreak - small acreage
Renovation-Supplemental hand planting with container or bare root stock
Barbed Wire, Multi-strand
Barbed Wire, Multi-strand with Fence Markers
Barbed Wire, Multi-strand, difficult terrain
Barbed Wire, Multi-strand with fence markers, difficult terrain
Woven Wire
Electric, high tensile with energizer
Electric, high tensile with energizer and fence markers
Protective Fence
Confinement
Portable Fence
Fence for 1 Acre or less
Fuel Break
Hand Fuel Break
Non Forested Fuel Break
Chipping and hauling off-site
Restoration/conservation treatment following catastrophic events
Forest Slash Treatment - Med/Heavy
Woody residue/silvicultural slash treatment- light
Wp_Field Border, Native Species, Forgone Income

Pr_Field Border, Native Species, Foregone Income
Wp_Field Border, Introduced Species, Foregone Income
Pr_Field Border, Introduced Species, Foregone Income
Wp_Field Border, Pollinator, Foregone Income
Pr_Field Border, Pollinator, Foregone Income
Pr_Small Scale Field Border
Native Species
Wp_Native Species
Native Species with foregone income
Wp_Native Species with foregone income
Wp_Direct Seeding (FI)
Pr_Direct Seeding (FI)
Wp_Bare-root, machine planted (FI)
Pr_Bare-root, machine planted (FI)
Wp_Small container, machine planted (FI)
Pr_Small container, machine planted (FI)
Wp_Filter Strip, Native species, Foregone Income
Pr_Filter Strip, Native species, Foregone Income
Wp_Filter Strip, Introduced species, Foregone Income
Pr_Filter Strip, Introduced species, Foregone Income
Vegetated, permanent, grass
Mowing
Constructed, Tillage
Constructed - Medium equipment, Dozer
Constructed - hand cleared
Constructed, tree clearing
Instream wood placement
Instream rock placement
Rock and wood structures
Fish Barrier
Blockage Removal
Nature-Like Fishway
CMP Culvert
Low Water Crossing
Habitat Structures
Planting Native Vegetation
Depth Management
Embankment, No PS
Embankment, Pipe <24 inch
Embankment, Pipe >=24 inch
Pipe Drop, Plastic - NP Reg 1
Pipe Drop, CMP
Concrete Box Drop
Sheet Pile Weir Drop
Gabion Rock Drop Structures
Concrete Block Chute
Modular Concrete Block Drop

Rock Chute
Tied Concrete Block Mat
Waterway, 25 to 50 ft²
Wp_Waterway, 25 to 50 ft²
Waterway with Side Dikes or Checks
Wp_Waterway with Side Dikes or Checks
Pr_High Species Diversity on Fallow or Non-Cropland, no Foregone Income
Pr_Specialized Habitat Requirements on Non-Cropland, no Foregone Income
Pr_High Species Diversity on Cropland with Foregone Income
Pr_Specialized Habitat Requirements on Cropland with Foregone Income
Pr_Very Small Acreage (<.5 ac) Planting with Seedlings
Pr_Low Species Diversity on Non-Cropland, no Foregone Income
Pr_Low Species Diversity on Cropland with Foregone Income
Bareroot, machine plant (FI)
Container, Machine Plant (FI)
PVC, 10-in by the foot
Wp_PVC, 10-in by the foot
PVC (Iron Pipe Size), less than or equal to 4 inch, Small Scale System
HDPE (Iron Pipe Size and Tubing), less than or equal to 2 inch, Small Scale
Surface HDPE (Iron Pipe Size and Tubing), less than or equal to 2 inch, Small Scale
Embankment Dam
Embankment Reservoir > 30 Acre-Feet
Excavated Tailwater Pit
Plastic tank, less than or equal to 1,000 gallons
Surface PE, with emitters, trees and shrubs
Wp_Surface PE, with emitters, trees and shrubs
Surface PE, with emitters, high tunnel
Surface Tape <5 acres
Small Microirrigation System
Small Surface Tape System
SDI (Subsurface Drip Irrigation)
Wp_SDI (Subsurface Drip Irrigation)
Gravity to Pivot Conversion
Wp_Gravity to Pivot Conversion
System Renovation, Renozzle with Drops
Wp_System Renovation, Renozzle with Drops
Gravity to Pivot Conversion with VRI
Wp_Gravity to Pivot Conversion with VRI
VRI System Retrofit Zone
Wp_VRI System Retrofit Zone
Linear Move System
Wp_Linear Move System
IWM, Advanced Technique
Wp_IWM, Advanced Technique
IWM, Advanced Technique Incorporating Precision Irrigation
Wp_IWM, Advanced Technique Incorporating Precision Irrigation
Consulatant Based IWM No Equipment

Wp_Consulatant Based IWM No Equipment
Intermediate IWM < 1 acre
Heavy Equipment
Terrace Removal
Turf Reinforced Matting, Moderate Stress
Turf Reinforced Matting, High Stress
Rock Lined, 12 in
Rock Lined, 24 in
Concrete - NP Reg 1
Articulated Concrete Block
Splash Pad
Pr_Animal exclusion from sensitive areas (FI)
Natural Material - Straw
Erosion Control Blanket
Tree and Shrub - Squares
Tree and Shrub - Rolls
Hydro-mulching
Natural Materials - Large Area
Mechanical, Heavy
Mechanical, Medium
Windbreak, mechanical only
Windbreak, chemical and mechanical
Windbreak, chemical only
Tree-Shrub Site Prep - small acreage
Removal and Disposal of Fence, Feedlot
Removal and Disposal of Fence, landscape
Removal and Disposal of Power Lines and Poles
Removal and Disposal of Steel and or Concrete Structures
Removal and Disposal of Wood Structures
Removal and disposal of individual landscape structures
Removal and Disposal of Brush and Trees <= 6 inch Diameter
Removal and Disposal of Brush and Trees > 6 inch Diameter
Removal and Disposal of Concrete Slab
Organic Preemptive Harvest
Per-Ann Crops - Delayed Mowing
Native Perennial Grasses, multi species
Wp_Native Perennial Grasses, multi species
Native Perennial Grasses, multi species, forgone income
Wp_Native Perennial Grasses, multi species, forgone income
Introduced Perennial Grasses-Legume
Wp_Introduced Perennial Grasses-Legume
Introduced Perennial Grasses-Legume, foregone income
Wp_Introduced Perennial Grasses-Legume, foregone income
Introduced Perennial & Native Grass Mix
Wp_Introduced Perennial & Native Grass Mix
Introduced Perennial & Native Grass Mix, foregone income
Wp_Introduced Perennial & Native Grass Mix, foregone income

Introduced Perennial Grasses with lime application
Wp_Introduced Perennial Grasses with lime application
Introduced Perennial Grasses-Legumes on irrigated cropland
Wp_Introduced Perennial Grasses-Legumes on irrigated cropland
Organic
Wp_Organic
Organic, forgone income
Wp_Organic, forgone income
Small farm, Pasture and Hay planting for 1 ac.
Shallow or Above Ground Pipeline, any diameter
Standard Installation, 2 inch dia. or less (KS/NE)
Standard Installation, greater than 2 inch dia.
Backhoe, 2 inch dia. or less
Backhoe, greater than 2 inch dia.
Boring, any diameter
Rural Water Connection Equipment
HDPE (Iron Pipe Size and Tubing), Small Scale
Surface HDPE (Iron Pipe Size and Tubing), Small Scale
Soil Dispersant - Covered
Use On-Site Material with Soil Cover
Flexible Membrane - Uncovered with liner drainage or venting
Flexible Membrane - Covered without liner drainage or venting
Flexible Membrane - Covered with liner drainage or venting
Small Ranch Unit
Range, 3-6 Pastures
Range, 7 or More Pastures
Grazing Lands, 30-73% Rest
Grazing Lands, Greater than 73% Rest
Habitat Mgt
Livestock Deferment (FI)
Cover Crop/Aftermath
Range Long Term Monitoring
Habitat Mgt. Long Term Monitoring
Livestock Deferment (FI) High Production Sites
Prescribed Grazing Management for 5 Acres or less
Irrigation, Modify Pump
Wp_Irrigation, Modify Pump
Irrigation, Submersible or Booster
Wp_Irrigation, Submersible or Booster
Irrigation, Variable Frequency Drive
Wp_Irrigation, Variable Frequency Drive
irrigation, Surface Water
Wp_irrigation, Surface Water
Livestock, Manure Transfer
Livestock, w/ Pressure Tank, Low HP
Livestock, without Pressure Tank (HP)
Windmill-Powered Pump - NP Region

Solar-Powered Pump 1hp
Livestock, Variable Frequency Drive
Native, Standard Prep
Wp_Native, Standard Prep
Native, Standard Prep (FI)
Wp_Native, Standard Prep (FI)
Native, Heavy Prep
Wp_Native, Heavy Prep
Native, Wildlife, or Pollinator (FI)
Wp_Native, Wildlife, or Pollinator (FI)
Drainage Water Management (DWM)
Roof Gutter
High Tunnel Roof Runoff Trench Drain and Storage
Roof Gutter, 6 inches wide with runoff Storage Tank
New 6 inch gravel road without Geotextile, Less than 2.5 Ft.
New 6 inch gravel road with Geotextile, less than 2.5 Ft.
New 6 inch gravel road without Geotextile, 2.5 ft. or higher
New 6 inch gravel road with Geotextile, 2.5 ft. or higher
Reinforced Concrete with sand or gravel foundation - cubic yard - NP Region
Rock/Gravel on Geotextile - cubic yard - NP Region
Rock/Gravel
Rock/Gravel-GeoCell-Geotextile
Rain Garden, small scale
Spring, up to 50 ft Collection
Spring, > 50 ft Collection
Earthfill Walkway, 4 Ft high or less
Earthfill Walkway, Higher than 4 Ft.
Wood Chips, Walkway small scale
Permanent Metal Wind Shelter
Bridge
Culvert installation
Low water crossing, rock armor
Low water crossing, concrete slab
Low water crossing, concrete block
Low water crossing, geocell
Shaping
Bioengineered
Rock Riprap
Gabion
Excavate & Fill
Bio-engineering
Wood structures
Stripcropping - wind and water erosion
Inline Flashboard Riser, Metal - Reg 1
Wp_Inline Flashboard Riser, Metal - Reg 1
Culvert <30 inches HDPE - NP Reg 1
Wp_Culvert <30 inches HDPE - NP Reg 1

Slide Gate - Flood Dike
Wp_Slide Gate - Flood Dike
Rock Check
Wp_Rock Check
Earth Check
Wp_Earth Check
Buried Automatic Valve
Wp_Buried Automatic Valve
Commercial Inline Flashboard Riser
Wp_Commercial Inline Flashboard Riser
Inlet Flashboard Riser, Metal
Wp_Inlet Flashboard Riser, Metal
Culvert <30 inches CMP
Wp_Culvert <30 inches CMP
Flow Meter with Mechanical Index
Wp_Flow Meter with Mechanical Index
Flow Meter with Electronic Index & Telemetry
Wp_Flow Meter with Electronic Index & Telemetry
Wp_Basic NM (Non-Organic/Organic)
Pr_Basic NM (Non-Organic/Organic)
Wp_Basic NM (Organic/NonOrganic) greater than or equal to 0.5-10 acres
Pr_Basic NM (Organic/NonOrganic) greater than or equal to 0.5-10 acres
Wp_Basic NM with Manure and/or Compost (Non-Organic/Organic)
Pr_Basic NM with Manure and/or Compost (Non-Organic/Organic)
Wp_Adaptive NM
Pr_Adaptive NM
Pr_Small Scale Basic Nutrient Management
Wp_Prescription Nutrient Efficiency and Precision Application
Pr_Prescription Nutrient Efficiency and Precision Application
Wp_Prescription Nutrient Efficiency
Pr_Prescription Nutrient Efficiency
Wp_Basic IPM Field Crops ??? Herbicide Substitution
Pr_Basic IPM Field Crops ??? Herbicide Substitution
Pr_Plant Health PAMS (acs) Low labor only
Wp_Pest Management Precision Ag
Pr_Pest Management Precision Ag
Wp_Water Quality Pesticide Mitigation > 30 Point AND/OR Beneficial Insect Pesticide Mitigation - Small Farm
Pr_Water Quality Pesticide Mitigation > 30 Point AND/OR Beneficial Insect Pesticide Mitigation - Small Farm
Wp_Water Quality Pesticide Mitigation = 30 Point AND/OR Beneficial Insect Pesticide Mitigation - Small Farm
Pr_Water Quality Pesticide Mitigation = 30 Point AND/OR Beneficial Insect Pesticide Mitigation - Small Farm
Wp_Water Quality Pesticide Mitigation > 30 Point AND/OR Beneficial Insect Pesticide Mitigation
Pr_Water Quality Pesticide Mitigation > 30 Point AND/OR Beneficial Insect Pesticide Mitigation
Wp_Water Quality Pesticide Mitigation = 30 Point AND/OR Beneficial Insect Pesticide Mitigation
Pr_Water Quality Pesticide Mitigation = 30 Point AND/OR Beneficial Insect Pesticide Mitigation
Pr_Plant health PAMS (Small Farm - each) labor only
Storage - Level or Flat Channel
Non-Storage - Broadbase

Storage - Broadbase
Broad Base, Rebuild
Non-Storage - Grass Back
Storage - Grass Back
Non-Storage - Narrow Base
Storage - Narrow Base
Narrow Base, Rebuild
Vegetative Planting
Cool Season Annual/Perennial Species
Saturated Buffer
Denitrifying Bioreactor
Corrugated Plastic Pipe (CPP), Single-Wall, <= 6 inch
Enveloped Corrugated Plastic Pipe (CPP), Single-Wall, <= 6 inch
Corrugated Plastic Pipe (CPP), Single-Wall, >= 8 inch
Corrugated Plastic Pipe (CPP), Twin-Wall, >= 8 inch
Secondary Main Retrofit for DWM
Individual tree - hand planting w/browse protection
Trees, Machine planted with tubes for animal protection
Trees, Machine planted - no tubes
Trees, Machine planted, no tubes, supplemental water for establishment
Hardwood Planting 1 gal pots
Tree-Shrub Establishment - Small Acreage
Steel Tank
Rubber Tire Tank on Earth
Fiberglass Tank on Earth
Rubber Tire Tank on Concrete
Fiberglass Tank on Concrete
Steel Rim Tank - Bottomless
Steel Rim Tank - Concrete Base
Enclosed Storage Tank
4 inch - 6 inch PVC or DW Pipe, Multi-Inlet System
6 inch or smaller Single Wall PE Pipe(non-perf or perf), Multi-Inlet System
8 inch - 10 inch PVC or DW Pipe, Multi-Inlet System
12 inch - 18 inch PVC or DW Pipe, Multi-Inlet System
12 inch - 18 inch PVC or DW Pipe, Single-Inlet System
Over 18 inch PVC or DW Pipe, Single- or Multi-Inlet System
6 inch - 10 inch PVC or DW Pipe, Single-Inlet System
8 inch Single Wall PE Pipe (non-perf or perf), Multi-Inlet System
10 inch Single Wall PE Pipe (non-perf or perf), Multi-Inlet System
>=12 inch Single Wall PE Pipe (non-perf or perf), Multi-Inlet System
Milking Parlor Waste Dosing System and Organic Bed
Aerobic Circulator
Mechanical Separator
Earthen Settling Structure with picket screen outlet
Earthen settling structure with pipe outlet
Concrete Settling Structure with picket screen outlet
Concrete Sand Settling Lane

Concrete Channel
Gravity flow, less than or equal to 18 inch diameter conduit
Pressure flow, less than or equal to 6 inch diameter conduit
Pressure flow, 8 inch diameter conduit
Pressure flow, 10 inch diameter conduit
Pressure flow, 12 inch or greater diameter conduit
Agitator, Slurry Transfer
Concrete Curb, with or without flow spreaders
Wp_Concrete Curb, with or without flow spreaders
Concrete Curb with major shaping
Wp_Concrete Curb with major shaping
Gated Pipe, with or without flow spreaders
Wp_Gated Pipe, with or without flow spreaders
Gated Pipe with major shaping
Wp_Gated Pipe with major shaping
Sprinkler, Solid Set Distribution
Wp_Sprinkler, Solid Set Distribution
Sprinkler, Mobile Pods
Wp_Sprinkler, Mobile Pods
Sprinkler, Center Pivot
Wp_Sprinkler, Center Pivot
Minor Shaping
Wp_Minor Shaping
Plastic tank, less than or equal to 1,000 gallons
WASCOB base
WASCOB topsoil
Dikes
Well Point
Dug (Excavated) Well
Single PVC Casing, greater than 100 ft. deep
Single PVC Casing with pitless unit, greater than 100 ft. deep
Dual Casing PVC
Steel or Copper, 100 ft. or deeper
Management and monitoring only, foregone income (FI)
Greater Prairie Chicken Habitat Development
Wildlife Habitat Enhancement - Former Cropland (FI)
Habitat Monitoring and Management, Medium Intensity and Complexity
Shallow Water Management-Low Level
Shallow Water Management, High Level
Mowing
Disking
Chemical
Escape Ramp
Fence Markers, Vinyl Undersill
Brush Pile - Small
Brush Pile - Large
Sod Release

Removal <8 inches DBH with Skidsteer
Removal > 8 inches DBH with Dozer
Medium, 0.5 ac or less
Wp_Medium, 0.5 ac or less
Large, 0.5 to 1.0 ac.
Wp_Large, 0.5 to 1.0 ac.
Large, more than 1.0 ac.
Wp_Large, more than 1.0 ac.
Wp_Fill in dugout
Pr_Fill in dugout
Wp_Depression Sediment Removal
Pr_Depression Sediment Removal
Wp_Sediment Removal - Saturated Site
Pr_Sediment Removal - Saturated Site
Wp_Ditch plug - Lateral Restoration
Pr_Ditch plug - Lateral Restoration
Wp_Embankment - Fill Height <= 4 feet
Pr_Embankment - Fill Height <= 4 feet
Wetland Creation, Excavation
Excavation at Saturated Site
Excavation and Embankment
Excavation
Wp_Excavation
Excavation on Saturated Site
Wp_Excavation on Saturated Site
Depression Sediment Removal and Ditch Plug
Wp_Depression Sediment Removal and Ditch Plug
Pruning Individual Agroforestry tree - small acreage
Pre-commercial Thinning , Hand tools
Timber Stand Improvement, Single Stem Treatment
Timber Stand Improvement, Chemical, Ground
Thinning for Wildlife and Forest Health
Lighting - LED
Automatic Controller System
Building Envelope - Attic Insulation
Building Envelope - Wall Insulation
Building Envelope - Sealant
Greenhouse - Insulate Unglazed Walls
Building Envelope - Greenhouse Screens
100% Biochar
80% Biochar-20% Compost
60% Biochar-40% Compost
40% Biochar-60% Compost
20% Biochar-80% Compost
Compost - On Site
Compost + Biochar - Small Areas
Other Carbon Amendment

Annual forages mix

Unframed Raised Bed field size < 0.10 acres Contamination or Debris Sites only

Unframed Raised Bed field size < 0.5 acres Contamination or Debris Sites only

Framed Raised Bed Small Lot Contamination or Debris Sites only

Framed Raised Bed < 500 sq ft Contamination or Debris Sites only

Framed Raised Bed greater than or equal to 500 sq ft Contamination or Debris Sites only

Low tunnel < 1000 square feet- Year 1

Low tunnel management- Year 2-3

Low tunnel 1000-5000 square feet, Year 1

Scenario Unit	Total Cost per Unit	EQIP Payment Per Unit	EQIP Share Rate
Cubic Feet	\$0.08	\$0.04	50%
Cubic Feet	\$0.14	\$0.07	50%
Cubic Feet	\$4.26	\$2.13	50%
Cubic Feet	\$2.78	\$1.39	50%
Cubic Feet	\$2.69	\$1.35	50%
Cubic Feet	\$4.13	\$2.06	50%
Square Feet	\$13.53	\$6.77	50%
Square Feet	\$4.06	\$2.03	50%
Square Feet	\$6.14	\$3.07	50%
Square Feet	\$8.47	\$4.24	50%
Square Feet	\$8.41	\$4.20	50%
Square Feet	\$11.48	\$5.74	50%
Acres	\$61.58	\$46.19	75%
Acres	\$411.13	\$308.35	75%
Acres	\$31.99	\$19.19	60%
Acres	\$158.23	\$87.03	55%
Acres	\$42.01	\$25.21	60%
Acres	\$157.24	\$117.93	75%
Acres	\$624.60	\$468.45	75%
Acres	\$69.84	\$10.48	15%
Acres	\$378.29	\$283.71	75%
Acres	\$28.79	\$21.59	75%
Acres	\$28.61	\$21.46	75%
Acres	\$13.17	\$9.88	75%
Acres	\$209.55	\$157.16	75%
Acres	\$47.92	\$35.94	75%
Acres	\$44.10	\$33.08	75%
Acres	\$226.09	\$169.57	75%
Pounds per Day	\$364.24	\$182.12	50%
Pounds per Day	\$214.60	\$107.30	50%
Pounds per Day	\$181.82	\$90.91	50%
Square Feet	\$70.63	\$52.98	75%
Cubic Yards	\$2.46	\$1.23	50%
Square Feet	\$5.44	\$4.08	75%
Square Feet	\$8.12	\$6.09	75%
Square Feet	\$7.44	\$5.58	75%
Square Feet	\$12.92	\$9.69	75%
Square Feet	\$14.10	\$10.58	75%
Square Feet	\$10.14	\$7.60	75%
Acres	\$420.34	\$382.35	91%
Acres	\$420.34	\$382.35	91%
Acres	\$501.94	\$376.46	75%
Acres	\$501.94	\$376.46	75%
Acres	\$817.91	\$680.53	83%
Acres	\$817.91	\$680.53	83%
Acres	\$212.91	\$117.10	55%

Acres	\$212.91	\$117.10	55%
Acres	\$233.56	\$151.81	65%
Acres	\$233.56	\$151.81	65%
Acres	\$717.82	\$287.13	40%
Acres	\$717.82	\$287.13	40%
Acres	\$894.97	\$402.74	45%
Acres	\$894.97	\$402.74	45%
1,000 Square Foot	\$133.94	\$100.46	75%
Acres	\$13.63	\$12.27	90%
Acres	\$13.63	\$12.27	90%
Acres	\$270.96	\$203.22	75%
Acres	\$270.96	\$203.22	75%
1,000 Square Foot	\$35.57	\$32.02	90%
Acres	\$21.98	\$10.99	50%
Acres	\$21.98	\$10.99	50%
1,000 Square Foot	\$40.43	\$30.32	75%
Acres	\$10.19	\$5.10	50%
Acres	\$408.92	\$307.58	75%
Acres	\$408.92	\$307.58	75%
Acres	\$436.02	\$315.71	72%
Acres	\$436.02	\$315.71	72%
Acres	\$25.90	\$23.31	90%
Acres	\$9.53	\$8.57	90%
Acres	\$55.66	\$50.09	90%
Acres	\$9.14	\$8.22	90%
Acres	\$20.64	\$18.58	90%
Acres	\$81.65	\$28.58	35%
Acres	\$81.65	\$28.58	35%
Each	\$2,819.50	\$1,973.65	70%
Each	\$2,819.50	\$1,973.65	70%
Acres	\$102.21	\$40.88	40%
Acres	\$102.21	\$40.88	40%
Acres	\$79.22	\$23.77	30%
Acres	\$79.22	\$23.77	30%
Acres	\$538.82	\$404.11	75%
1,000 Square Foot	\$57.32	\$42.99	75%
1,000 Square Foot	\$27.26	\$20.44	75%
Acres	\$420.33	\$315.24	75%
Acres	\$420.33	\$315.24	75%
1,000 Square Foot	\$20.51	\$15.38	75%
Acres	\$990.89	\$743.17	75%
Acres	\$990.89	\$743.17	75%
Acres	\$1,428.21	\$1,071.15	75%
Acres	\$1,428.21	\$1,071.15	75%
Cubic Yards	\$3.51	\$1.76	50%
Cubic Yards	\$4.26	\$2.13	50%
Cubic Yards	\$3.34	\$1.67	50%

Feet	\$41.34	\$31.00	75%
Feet	\$41.34	\$31.00	75%
Feet	\$9.31	\$4.66	50%
Feet	\$9.31	\$4.66	50%
Feet	\$23.52	\$11.76	50%
Feet	\$23.52	\$11.76	50%
Feet	\$21.53	\$10.77	50%
Feet	\$21.53	\$10.77	50%
Feet	\$12.12	\$6.06	50%
Feet	\$12.12	\$6.06	50%
Each	\$67.27	\$33.63	50%
Each	\$67.27	\$33.63	50%
Each	\$258.72	\$129.36	50%
Each	\$258.72	\$129.36	50%
Each	\$363.69	\$181.84	50%
Each	\$363.69	\$181.84	50%
Cubic Yards	\$4.58	\$3.43	75%
Feet	\$28.39	\$14.19	50%
Feet	\$41.93	\$20.96	50%
Cubic Feet	\$0.09	\$0.05	56%
Cubic Feet	\$0.12	\$0.06	50%
Cubic Feet	\$0.19	\$0.09	47%
Cubic Feet	\$0.10	\$0.05	50%
Cubic Feet	\$0.05	\$0.02	40%
Cubic Yards	\$3.78	\$2.45	65%
Animal Unit	\$474.19	\$118.55	25%
Square Feet	\$11.94	\$5.97	50%
Square Feet	\$16.27	\$8.14	50%
Square Feet	\$1.19	\$0.59	50%
Square Feet	\$10.41	\$5.21	50%
Animal Unit	\$107.05	\$80.28	75%
Each	\$411.21	\$308.41	75%
Each	\$158.54	\$118.91	75%
Each	\$128.26	\$96.20	75%
Animal Unit	\$316.78	\$237.58	75%
Animal Unit	\$184.14	\$138.10	75%
Animal Unit	\$504.44	\$378.33	75%
Animal Unit	\$352.83	\$264.62	75%
Pound	\$0.06	\$0.05	83%
Animal Unit	\$110.13	\$82.60	75%
Animal Unit	\$316.78	\$237.58	75%
Animal Unit	\$107.05	\$80.28	75%
Cubic Yards	\$65.04	\$32.52	50%
Each	\$3,013.16	\$1,506.58	50%
Each	\$14,355.08	\$7,177.54	50%
Each	\$24,144.08	\$12,072.04	50%
Each	\$1,709.07	\$925.79	54%

Each	\$6,404.43	\$3,202.21	50%
Each	\$11,956.86	\$5,978.43	50%
Each	\$2,259.85	\$1,129.93	50%
Each	\$277.24	\$138.62	50%
Each	\$5,196.10	\$2,598.05	50%
Each	\$36,279.86	\$9,069.97	25%
Horsepower	\$757.74	\$378.87	50%
Each	\$2,340.49	\$1,170.24	50%
Horsepower	\$151.76	\$75.88	50%
Horsepower	\$125.24	\$62.62	50%
Horsepower	\$224.11	\$112.05	50%
Horsepower	\$751.73	\$375.87	50%
Each	\$1,834.88	\$917.44	50%
1,000 BTU/Hour	\$25.00	\$12.50	50%
Each	\$230.97	\$173.23	75%
Bushel per Hour	\$223.62	\$111.81	50%
Cubic Yards	\$2.79	\$1.39	50%
Cubic Yards	\$3.45	\$1.72	50%
Cubic Yards	\$5.09	\$2.54	50%
Cubic Yards	\$6.86	\$4.46	65%
Cubic Yards	\$5.51	\$3.58	65%
Each	\$2.66	\$1.99	75%
Feet	\$0.36	\$0.27	75%
Feet	\$1.02	\$0.77	75%
Each	\$9.22	\$5.53	60%
Feet	\$1.58	\$1.19	75%
Feet	\$3.99	\$2.99	75%
Feet	\$3.22	\$0.64	20%
Feet	\$2.81	\$2.11	75%
Feet	\$2.97	\$2.23	75%
Feet	\$3.33	\$2.50	75%
Feet	\$3.44	\$2.58	75%
Feet	\$2.70	\$2.03	75%
Feet	\$1.32	\$0.99	75%
Feet	\$1.50	\$1.12	75%
Feet	\$2.54	\$1.91	75%
Feet	\$6.36	\$4.77	75%
Feet	\$0.28	\$0.21	75%
Feet	\$4.48	\$3.36	75%
Acres	\$1,772.04	\$886.02	50%
Acres	\$2,366.91	\$1,183.46	50%
Acres	\$309.25	\$154.62	50%
Acres	\$288.72	\$216.54	75%
Acres	\$704.11	\$528.08	75%
Acres	\$264.68	\$198.51	75%
Acres	\$208.48	\$156.36	75%
Acres	\$456.91	\$438.06	96%

Acres	\$456.91	\$438.06	96%
Acres	\$390.54	\$378.33	97%
Acres	\$390.54	\$378.33	97%
Acres	\$772.88	\$722.43	93%
Acres	\$772.88	\$722.43	93%
1,000 Square Foot	\$78.98	\$71.08	90%
Acres	\$172.95	\$129.71	75%
Acres	\$172.95	\$129.71	75%
Acres	\$218.45	\$175.21	80%
Acres	\$218.45	\$175.21	80%
Acres	\$1,169.06	\$1,085.27	93%
Acres	\$1,169.06	\$1,085.27	93%
Acres	\$1,867.51	\$1,714.15	92%
Acres	\$1,867.51	\$1,714.15	92%
Acres	\$2,869.05	\$2,615.53	91%
Acres	\$2,869.05	\$2,615.53	91%
Acres	\$540.33	\$513.14	95%
Acres	\$540.33	\$513.14	95%
Acres	\$492.53	\$470.11	95%
Acres	\$492.53	\$470.11	95%
Feet	\$0.14	\$0.07	50%
100 Foot	\$3.36	\$1.68	50%
Feet	\$0.12	\$0.07	58%
Feet	\$0.73	\$0.37	51%
Feet	\$0.72	\$0.36	50%
Feet	\$0.89	\$0.45	51%
Acres	\$20,193.92	\$10,096.96	50%
Acres	\$16,510.97	\$8,255.49	50%
Acres	\$35,190.07	\$17,595.04	50%
Cubic Yards	\$8,306.33	\$4,153.16	50%
Cubic Yards	\$31.17	\$15.59	50%
Acres	\$39,735.16	\$19,867.58	50%
Each	\$9,330.62	\$4,665.31	50%
Cubic Yards	\$203.40	\$101.70	50%
Acres	\$1,069.39	\$534.70	50%
Acres	\$1,007.01	\$503.50	50%
Acres	\$6,966.56	\$3,483.28	50%
Cubic Yards	\$5.08	\$2.54	50%
Cubic Yards	\$6.86	\$4.46	65%
Cubic Yards	\$5.52	\$3.59	65%
Square Feet	\$69.32	\$34.66	50%
Square Feet	\$22.70	\$11.35	50%
Cubic Yards	\$1,083.94	\$541.97	50%
Square Feet	\$64.59	\$41.99	65%
Cubic Yards	\$195.12	\$97.56	50%
Square Feet	\$6.91	\$3.45	50%
Cubic Yards	\$225.34	\$146.47	65%

Cubic Yards	\$137.41	\$89.32	65%
Square Feet	\$11.54	\$5.77	50%
Acres	\$5,036.38	\$2,518.19	50%
Acres	\$5,036.38	\$2,518.19	50%
Acres	\$6,692.02	\$3,346.01	50%
Acres	\$6,692.02	\$3,346.01	50%
Acres	\$531.54	\$478.38	90%
Acres	\$981.82	\$883.63	90%
Acres	\$868.52	\$808.08	93%
Acres	\$1,284.44	\$1,182.41	92%
Square Feet	\$0.58	\$0.53	91%
Acres	\$265.29	\$238.76	90%
Acres	\$585.10	\$553.00	95%
Feet	\$1.02	\$0.58	57%
Feet	\$1.17	\$0.65	56%
Feet	\$16.60	\$5.81	35%
Feet	\$16.60	\$5.81	35%
Linear Feet	\$6.26	\$4.70	75%
Pound	\$40.70	\$30.53	75%
Pound	\$8.79	\$6.60	75%
Cubic Yards	\$5.29	\$2.65	50%
Cubic Yards	\$4.09	\$2.05	50%
Cubic Yards	\$2.40	\$1.20	50%
Gallons	\$4.10	\$3.08	75%
Each	\$3.92	\$1.18	30%
Each	\$3.92	\$1.18	30%
Square Feet	\$0.82	\$0.25	30%
Acres	\$4,224.28	\$3,168.21	75%
Square Feet	\$1.04	\$0.78	75%
Square Feet	\$0.81	\$0.60	74%
Acres	\$2,543.55	\$890.24	35%
Acres	\$2,543.55	\$890.24	35%
Feet	\$77.84	\$23.35	30%
Feet	\$77.84	\$23.35	30%
Each	\$37.25	\$14.90	40%
Each	\$37.25	\$14.90	40%
Feet	\$129.89	\$38.97	30%
Feet	\$129.89	\$38.97	30%
Feet	\$54.81	\$21.92	40%
Feet	\$54.81	\$21.92	40%
Feet	\$124.31	\$37.29	30%
Feet	\$124.31	\$37.29	30%
Each	\$3,048.96	\$1,219.58	40%
Each	\$3,048.96	\$1,219.58	40%
Each	\$5,062.08	\$2,024.83	40%
Each	\$5,062.08	\$2,024.83	40%
Each	\$727.04	\$363.52	50%

Each	\$727.04	\$363.52	50%
Square Feet	\$0.91	\$0.68	75%
Acres	\$1,061.29	\$795.97	75%
Feet	\$0.76	\$0.23	30%
Square Feet	\$2.47	\$1.24	50%
Square Feet	\$2.17	\$1.09	50%
Square Feet	\$6.10	\$3.05	50%
Square Feet	\$13.65	\$6.82	50%
Square Feet	\$7.67	\$3.83	50%
Square Feet	\$13.00	\$6.50	50%
Square Feet	\$9.70	\$4.85	50%
Acres	\$45.94	\$45.67	99%
Acres	\$462.96	\$347.22	75%
Square Feet	\$0.28	\$0.21	75%
Each	\$1.30	\$0.97	75%
Feet	\$0.79	\$0.59	75%
Acres	\$1,144.97	\$572.48	50%
Acres	\$392.16	\$196.08	50%
Acres	\$360.93	\$198.51	55%
Acres	\$336.64	\$168.32	50%
Acres	\$110.40	\$55.20	50%
Acres	\$314.83	\$236.12	75%
Acres	\$79.84	\$39.92	50%
Square Feet	\$3.61	\$2.71	75%
Feet	\$4.02	\$2.01	50%
Feet	\$1.26	\$0.63	50%
Feet	\$3.62	\$1.81	50%
Square Feet	\$13.59	\$6.80	50%
Square Feet	\$7.08	\$3.54	50%
Square Feet	\$6.38	\$3.19	50%
Acres	\$1,141.93	\$570.96	50%
Acres	\$2,184.40	\$1,092.20	50%
Square Feet	\$0.81	\$0.40	49%
Acres	\$4.82	\$2.41	50%
Acres	\$4.82	\$2.41	50%
Acres	\$162.10	\$97.26	60%
Acres	\$162.10	\$97.26	60%
Acres	\$319.19	\$198.87	62%
Acres	\$319.19	\$198.87	62%
Acres	\$80.64	\$60.48	75%
Acres	\$80.64	\$60.48	75%
Acres	\$237.74	\$158.14	67%
Acres	\$237.74	\$158.14	67%
Acres	\$76.85	\$38.42	50%
Acres	\$76.85	\$38.42	50%
Acres	\$275.60	\$177.07	64%
Acres	\$275.60	\$177.07	64%

Acres	\$177.30	\$88.65	50%
Acres	\$177.30	\$88.65	50%
Acres	\$126.10	\$63.05	50%
Acres	\$126.10	\$63.05	50%
Acres	\$131.54	\$65.77	50%
Acres	\$131.54	\$65.77	50%
Acres	\$288.64	\$183.59	64%
Acres	\$288.64	\$183.59	64%
Acres	\$705.80	\$529.35	75%
Feet	\$3.13	\$1.57	50%
Feet	\$3.16	\$1.74	55%
Feet	\$5.90	\$2.95	50%
Feet	\$6.21	\$3.10	50%
Feet	\$8.76	\$4.38	50%
Feet	\$77.52	\$38.76	50%
Each	\$4,395.67	\$3,296.75	75%
Pound	\$40.70	\$30.53	75%
Pound	\$15.26	\$11.44	75%
Cubic Yards	\$6.95	\$3.82	55%
Cubic Yards	\$5.94	\$2.08	35%
Square Yard	\$19.32	\$9.66	50%
Square Yard	\$10.53	\$5.26	50%
Square Yard	\$20.67	\$10.34	50%
Acres	\$31.27	\$15.63	50%
Acres	\$7.09	\$3.54	50%
Acres	\$9.50	\$4.75	50%
Acres	\$10.85	\$5.42	50%
Acres	\$14.91	\$7.46	50%
Acres	\$17.31	\$8.66	50%
Acres	\$45.94	\$31.62	69%
Acres	\$8.07	\$4.04	50%
Acres	\$22.58	\$16.94	75%
Acres	\$32.15	\$24.12	75%
Acres	\$59.59	\$58.91	99%
Acres	\$226.43	\$169.82	75%
Each	\$29,690.76	\$7,422.69	25%
Each	\$29,690.76	\$7,422.69	25%
Each	\$9,110.90	\$4,555.45	50%
Each	\$9,110.90	\$4,555.45	50%
Each	\$6,829.00	\$5,121.75	75%
Each	\$6,829.00	\$5,121.75	75%
Each	\$15,344.81	\$7,672.40	50%
Each	\$15,344.81	\$7,672.40	50%
Each	\$23,926.40	\$11,963.20	50%
Each	\$5,141.03	\$3,084.62	60%
Horsepower	\$2,353.52	\$1,765.14	75%
Each	\$8,404.68	\$4,202.34	50%

Each	\$8,373.79	\$6,280.34	75%
Each	\$6,797.75	\$5,098.32	75%
Acres	\$162.10	\$97.26	60%
Acres	\$162.10	\$97.26	60%
Acres	\$207.60	\$167.08	80%
Acres	\$207.60	\$167.08	80%
Acres	\$181.96	\$109.18	60%
Acres	\$181.96	\$109.18	60%
Acres	\$277.19	\$219.27	79%
Acres	\$277.19	\$219.27	79%
Each	\$118.81	\$59.40	50%
Feet	\$5.61	\$2.81	50%
Linear Feet	\$41.91	\$31.43	75%
Feet	\$20.71	\$15.53	75%
Feet	\$13.02	\$6.51	50%
Feet	\$15.90	\$7.95	50%
Feet	\$19.20	\$9.60	50%
Feet	\$22.47	\$11.23	50%
Cubic Yards	\$464.07	\$232.04	50%
Cubic Yards	\$47.04	\$23.52	50%
Cubic Yards	\$25.70	\$12.85	50%
Square Feet	\$3.61	\$2.71	75%
Square Feet	\$1.69	\$1.27	75%
Each	\$3,686.48	\$1,843.24	50%
Each	\$5,917.89	\$2,958.95	50%
Feet	\$11.30	\$5.65	50%
Feet	\$24.93	\$12.46	50%
Square Feet	\$1.98	\$1.48	75%
Feet	\$127.73	\$95.79	75%
Square Feet	\$68.42	\$34.21	50%
Diameter Inch Foot	\$3.49	\$1.75	50%
Square Feet	\$7.51	\$3.75	50%
Square Feet	\$11.06	\$5.53	50%
Square Feet	\$13.91	\$6.96	50%
Square Feet	\$5.76	\$2.88	50%
Feet	\$8.96	\$4.48	50%
Feet	\$30.30	\$15.15	50%
Cubic Yards	\$141.69	\$70.85	50%
Feet	\$571.73	\$285.86	50%
Cubic Yards	\$2.20	\$1.10	50%
Square Feet	\$4.28	\$2.14	50%
Each	\$4,472.99	\$2,236.49	50%
Acres	\$1.98	\$0.99	50%
Diameter Inch Foot	\$3.99	\$1.99	50%
Diameter Inch Foot	\$3.99	\$1.99	50%
Diameter Inch Foot	\$6.04	\$3.02	50%
Diameter Inch Foot	\$6.04	\$3.02	50%

Feet	\$68.02	\$34.01	50%
Feet	\$68.02	\$34.01	50%
Each	\$1,520.01	\$760.01	50%
Each	\$1,520.01	\$760.01	50%
Each	\$823.78	\$411.89	50%
Each	\$823.78	\$411.89	50%
Each	\$901.57	\$450.78	50%
Each	\$901.57	\$450.78	50%
Diameter Inch Foot	\$5.29	\$2.64	50%
Diameter Inch Foot	\$5.29	\$2.64	50%
Diameter Inch Foot	\$5.89	\$2.94	50%
Diameter Inch Foot	\$5.89	\$2.94	50%
Diameter Inch Foot	\$2.95	\$1.47	50%
Diameter Inch Foot	\$2.95	\$1.47	50%
Inch	\$178.94	\$134.20	75%
Inch	\$178.94	\$134.20	75%
Inch	\$492.52	\$369.39	75%
Inch	\$492.52	\$369.39	75%
Acres	\$9.72	\$8.75	90%
Acres	\$9.72	\$8.75	90%
Each	\$327.95	\$295.16	90%
Each	\$327.95	\$295.16	90%
Acres	\$20.62	\$18.56	90%
Acres	\$20.62	\$18.56	90%
Each	\$2,876.33	\$2,588.70	90%
Each	\$2,876.33	\$2,588.70	90%
1,000 Square Foot	\$73.63	\$66.27	90%
Acres	\$63.34	\$57.01	90%
Acres	\$63.34	\$57.01	90%
Acres	\$47.08	\$42.37	90%
Acres	\$47.08	\$42.37	90%
Acres	\$36.22	\$32.60	90%
Acres	\$36.22	\$32.60	90%
Acres	\$15.51	\$10.85	70%
Acres	\$63.77	\$57.39	90%
Acres	\$63.77	\$57.39	90%
Each	\$1,942.84	\$1,748.56	90%
Each	\$1,942.84	\$1,748.56	90%
Each	\$1,169.86	\$1,052.87	90%
Each	\$1,169.86	\$1,052.87	90%
Acres	\$69.28	\$62.35	90%
Acres	\$69.28	\$62.35	90%
Acres	\$39.79	\$35.81	90%
Acres	\$39.79	\$35.81	90%
Each	\$584.60	\$526.14	90%
Feet	\$2.08	\$1.35	65%
Feet	\$1.89	\$1.04	55%

Feet	\$3.62	\$1.99	55%
Feet	\$1.82	\$0.91	50%
Feet	\$3.23	\$1.45	45%
Feet	\$4.39	\$1.98	45%
Feet	\$3.21	\$1.77	55%
Feet	\$3.46	\$1.73	50%
Feet	\$1.40	\$0.70	50%
Feet	\$1.26	\$0.95	75%
Linear Feet	\$0.10	\$0.07	70%
Feet	\$8.98	\$6.74	75%
Cubic Yards	\$82.99	\$62.24	75%
Feet	\$3.90	\$1.95	50%
Feet	\$4.92	\$2.46	50%
Feet	\$6.76	\$3.38	50%
Feet	\$14.84	\$7.42	50%
Feet	\$8.32	\$4.16	50%
Each	\$7.12	\$5.34	75%
Each	\$11.71	\$8.78	75%
Each	\$3.56	\$2.67	75%
Each	\$8.79	\$6.59	75%
Acres	\$1,464.66	\$1,098.50	75%
Each	\$18.47	\$13.85	75%
Gallons	\$2.35	\$0.71	30%
Gallons	\$1.95	\$1.07	55%
Gallons	\$2.36	\$0.71	30%
Gallons	\$2.44	\$1.22	50%
Gallons	\$2.85	\$1.14	40%
Gallons	\$0.51	\$0.31	61%
Gallons	\$2.08	\$1.15	55%
Gallons	\$1.83	\$0.91	50%
Feet	\$8.64	\$4.32	50%
Feet	\$5.06	\$2.53	50%
Feet	\$20.75	\$8.30	40%
Feet	\$29.44	\$11.78	40%
Feet	\$40.51	\$20.26	50%
Feet	\$50.83	\$25.41	50%
Feet	\$24.78	\$12.39	50%
Linear Feet	\$7.08	\$3.54	50%
Linear Feet	\$10.26	\$5.13	50%
Linear Feet	\$13.58	\$6.79	50%
Gallons per Day	\$67.69	\$33.85	50%
Animal Unit	\$130.08	\$65.04	50%
Each	\$56,300.84	\$28,150.42	50%
Cubic Feet	\$0.36	\$0.18	50%
Cubic Feet	\$0.22	\$0.11	50%
Cubic Feet	\$3.85	\$1.92	50%
Square Feet	\$10.38	\$5.19	50%

Square Feet	\$15.59	\$7.80	50%
Feet	\$33.68	\$16.84	50%
Feet	\$17.82	\$8.91	50%
Feet	\$26.26	\$13.13	50%
Feet	\$37.88	\$18.94	50%
Feet	\$55.30	\$27.65	50%
Each	\$33,633.19	\$16,816.60	50%
Acres	\$4,769.55	\$2,384.78	50%
Acres	\$4,769.55	\$2,384.78	50%
Acres	\$12,298.85	\$6,149.43	50%
Acres	\$12,298.85	\$6,149.43	50%
Acres	\$3,120.98	\$1,560.49	50%
Acres	\$3,120.98	\$1,560.49	50%
Acres	\$12,536.75	\$6,268.38	50%
Acres	\$12,536.75	\$6,268.38	50%
Acres	\$8,411.00	\$4,205.50	50%
Acres	\$8,411.00	\$4,205.50	50%
Acres	\$4,238.75	\$2,119.37	50%
Acres	\$4,238.75	\$2,119.37	50%
Acres	\$4,442.49	\$2,221.24	50%
Acres	\$4,442.49	\$2,221.24	50%
Acres	\$1,376.03	\$688.02	50%
Acres	\$1,376.03	\$688.02	50%
Gallons	\$2.15	\$1.61	75%
Cubic Yards	\$3.90	\$1.95	50%
Cubic Yards	\$4.20	\$2.10	50%
Acres	\$2,017.93	\$1,008.97	50%
Feet	\$136.85	\$68.43	50%
Feet	\$556.07	\$278.03	50%
Feet	\$54.02	\$13.51	25%
Feet	\$56.35	\$22.54	40%
Feet	\$63.24	\$31.62	50%
Linear Feet	\$81.91	\$40.95	50%
Acres	\$244.96	\$239.99	98%
Acres	\$11.17	\$8.38	75%
Acres	\$226.76	\$226.54	100%
Acres	\$13.73	\$10.30	75%
Acres	\$162.57	\$81.28	50%
Acres	\$364.78	\$182.39	50%
Acres	\$11.97	\$5.99	50%
Acres	\$29.80	\$14.90	50%
Acres	\$29.97	\$14.98	50%
Each	\$95.35	\$47.67	50%
Feet	\$0.18	\$0.09	50%
Each	\$44.54	\$22.27	50%
Each	\$177.39	\$88.69	50%
Feet	\$0.15	\$0.11	73%

Feet	\$1.18	\$0.59	50%
Feet	\$2.79	\$1.40	50%
Acres	\$14,829.59	\$7,414.80	50%
Acres	\$14,829.59	\$7,414.80	50%
Acres	\$10,436.80	\$5,218.40	50%
Acres	\$10,436.80	\$5,218.40	50%
Acres	\$7,920.13	\$3,960.06	50%
Acres	\$7,920.13	\$3,960.06	50%
Cubic Yards	\$3.80	\$3.42	90%
Cubic Yards	\$3.80	\$3.42	90%
Cubic Yards	\$3.68	\$3.31	90%
Cubic Yards	\$3.68	\$3.31	90%
Cubic Yards	\$4.67	\$4.21	90%
Cubic Yards	\$4.67	\$4.21	90%
Cubic Yards	\$8.35	\$7.51	90%
Cubic Yards	\$8.35	\$7.51	90%
Cubic Yards	\$6.21	\$5.59	90%
Cubic Yards	\$6.21	\$5.59	90%
Cubic Yards	\$2.65	\$1.98	75%
Cubic Yards	\$4.67	\$3.50	75%
Cubic Yards	\$4.17	\$3.13	75%
Cubic Yards	\$2.46	\$1.84	75%
Cubic Yards	\$2.46	\$1.84	75%
Cubic Yards	\$4.49	\$3.36	75%
Cubic Yards	\$4.49	\$3.36	75%
Cubic Yards	\$2.50	\$1.88	75%
Cubic Yards	\$2.50	\$1.88	75%
Each	\$12.42	\$9.31	75%
Acres	\$346.12	\$173.06	50%
Acres	\$385.84	\$192.92	50%
Acres	\$59.41	\$29.70	50%
Acres	\$1,169.37	\$584.69	50%
Each	\$12.06	\$6.03	50%
Each	\$498.69	\$249.35	50%
Square Feet	\$1.11	\$0.56	50%
Square Feet	\$2.47	\$1.24	50%
Feet	\$2.00	\$1.00	50%
Square Feet	\$0.39	\$0.20	51%
Square Feet	\$3.12	\$1.56	50%
Cubic Yards	\$213.19	\$159.89	75%
Cubic Yards	\$217.85	\$163.39	75%
Cubic Yards	\$158.25	\$118.69	75%
Cubic Yards	\$119.75	\$89.81	75%
Cubic Yards	\$95.67	\$71.76	75%
Cubic Yards	\$357.35	\$71.47	20%
Cubic Feet	\$11.56	\$8.67	75%
Cubic Yards	\$190.53	\$142.90	75%

Acres	\$92.78	\$69.58	75%
Square Feet	\$4.97	\$3.73	75%
Square Feet	\$4.02	\$3.01	75%
Square Feet	\$14.30	\$10.73	75%
Square Feet	\$7.73	\$5.80	75%
Square Feet	\$4.64	\$3.48	75%
Square Feet	\$5.82	\$4.36	75%
Square Feet	\$0.52	\$0.39	75%
Square Feet	\$1.57	\$1.18	75%

**Lower Platte North
Natural Resources District**

**Soil & Water Conservation Program
(SWCP)**

LPNNRD Board Approval 4/11/22

Table of Contents

I. PURPOSE	PG. 3
II. ELIGIBILITY, DISTRIBUTION OF FUNDS	PG. 3
III. APPLICATION REQUIREMENTS	PG. 3
IV. ELIGIBLE HIGH PRIORITY PRACTICES	PG. 3
V. INELIGIBLE PRACTICES	PG. 4
VI. APPLICATION SUBMITTAL, APPROVAL & COMPETITION PERIODS	PG. 5
VII. 2017 PRIORITY AREAS & ELIGIBLE COST SHARE PERCENTAGES	PG. 6
VIII. COST SHARE PERCENTAGE - PRACTICE EXCEPTIONS	PG. 7
IX. MAXIMUM COST SHARE LIMITS	PG. 7
X. AMENDMENTS FOR ADDITIONAL COST SHARE	PG. 8
XI. APPLICATION EXTENSIONS	PG. 8
XII. CONSERVATION PRACTICE DESIGN, STAKING & PERMITS	PG. 8
XIII. SUBMITTING BILLS & PAPERWORK ON COMPLETED WORK	PG. 8
XIV. COST SHARE PAYMENTS	PG. 8
XV. PAYMENT OVERRUNS & REQUESTED REFUNDS	PG. 9
<u>ATTACHMENTS:</u>	
ATTACH A: SEDIMENT & WATER CONTROL BASINS/DIVERSIONS	PG. 10
ATTACH B: PLANNED GRAZING SYSTEMS	PG. 11
ATTACH C: WATER IMPOUNDMENT & GRADE STAB. STRUCTURES	PG. 12-14
ATTACH D: WINDBREAK RENOVATION PRACTICES	PG. 15
ATTACH E: EMERGENCY REPAIR OF CONSERVATION PRACTICES	PG. 16
ATTACH F: LANDS FOR CONSERVATION PROGRAM	PG. 17

LOWER PLATTE NORTH NATURAL RESOURCES DISTRICT POLICY 2021 SOIL & WATER CONSERVATION PROGRAM (SWCP)

I. PURPOSE

The purpose of this program is to provide guidance for administering federal (EPA 319 grants), state (NSWCP, Environmental Trust grants) and local cost-share assistance as an incentive to landowners for the construction and application of soil and water conservation practices.

II. ELIGIBILITY, DISTRIBUTION OF FUNDS

- A. Any landowner within the Lower Platte North NRD (LPNNRD), individual, partnership, corporation or other legal entity is eligible to apply for SWCP funds.
- B. Cost-share program funds will be approved and distributed based on the number of high priority applications received each fiscal year (July 1 - June 30).
- C. Funds may be reserved and targeted toward high priority watersheds and projects as determined and approved by the LPNNRD Projects Committee and Board.
- D. Unobligated or unused SWCP funds in priority watersheds may be redistributed to other areas if not used in a timely manner.
- E. The LPNNRD may supplement the Nebraska Soil and Water Conservation Program (NSWCP) state funds with available federal, other state & local funds. The amount of local funds budgeted and available will be decided each year.
- F. Landowners will be expected to apply for available federal EQIP cost-share funding when applicable and available for eligible high priority practices A, C through M, before state and local cost share funding is approved. It is also generally expected to approve available state funding before local funds are considered.
- G. Lands for Conservation (LFC) program is exempt from the payment cap stipulations of the SWCP policy.

III. APPLICATION REQUIREMENTS

- A. Eligible SWCP applicants are to apply at their local NRCS Service Office (also the LPNNRD office if for tree planting or windbreak renovations). Applications with appropriate NRCS comments/recommendations are to be forwarded to the NRD for consideration.
- B. Applications will contain sufficient information to include:
 - 1. Date construction (summer or fall) is expected to be completed.
 - 2. Type of Project to be installed.
 - 3. Whether the proposed project is located in a priority watershed area or if other special conditions exist.
 - 4. An aerial photograph showing the project location.
 - 5. Total estimated cost-share needed for the project.
 - 6. When applying for a small dam or grade stabilization structure, the estimated percent of land treatment draining to the proposed site (Attachment C).

IV. ELIGIBLE HIGH PRIORITY PRACTICES

- A. **Establishment of warm and cool season grass on crop land**
- B. **Small conservation project (terraces, basins, diversion, grass waterways and/or underground outlets) applications.** This priority practice includes newly established

grass waterways and/or replacement grass waterways.

- i. Small projects are only eligible on fields where a complete no-till cropping management system is currently being applied.
 - ii. Existing grassed waterway applications must be over 10-years old and part of an approved terrace system or on 100% no-tilled fields)
 - iii. Small Projects may involve the construction of a new terrace and/or sediment & water control basins systems or it may include the extension of an existing terrace system with the inclusion of sediment & water control basins (this priority does “NOT” include the replacement of functionally obsolete terrace systems, waterways and sediment & water control basins in excess of 10-years old).
 - iv. Small projects do not include practice of installing tile outlets into existing functional terrace outlet systems (refer to priority G).
 - v. Small projects will not exceed \$5000.00 in cost incentive request.
*For small projects, landowners will not be expected to apply for available federal EQIP cost-share funding for eligible high priority practice B. It will generally be expected to approve available state funding before local funds are considered.
- C. ***Construction of new terrace systems** (includes replacement of functionally obsolete terrace systems in excess of 20-years old).
- D. **Construction of sediment & water control basins when part of a new terrace system where cost share incentives exceeds \$5,000** (Attachment A).
- E. **Construction of Diversions when part of a new terrace system or dam** (Attachments A & C).
- F. **Planned Grazing Management Systems** (Attachment B)
- G. *** Installation of Tiled Outlets into Existing Terraces** (includes the storage portion of the terrace).
- H. **Water Impoundment and Grade Stabilization Structures** (Attachment C)
- I. **Tree/Shrub Planting** (Only when NRD stock is provided and planted by the District) For riparian buffer strips, field, acreage and farmstead windbreaks and for wildlife habitat 200- tree/shrub minimum is required for riparian buffer strips, and for field and farmstead windbreaks. A 300-tree/shrub minimum is required for wildlife habitat.
An eligible high priority practice under our Soil and Water Conservation Program (SWCP), at 50% cost share assistance on handplanting of 600 or more trees, provided that the cooperator uses our tree planning machine. It is further recommended that final approved payments will be subject to LPNNRD inspection. (4/2022)
- J. **Windbreak Renovation** (Attachment D)
- K. **Supplementing EOIP Contracts in Priority Areas**
When federal EQIP funds are approved in LPNNRD priority areas, the District may approve additional local and/or state cost share not to exceed the established maximum cost share percentage approved for a practice or the specific area.
- L. **Emergency Repair of Conservation Practices** (Attachment E)
- M. **Lands for Conservation (LFC) Program :** (Attachment F) Any approved EQIP contract that agrees to the terms of the LFC program; summer construction Jun 1 – September 30 of the calendar year.

***NOTE:** Cost share only applies toward the tile outlet portion of approved terrace systems to establish a stable outlet. A stable outlet is considered to be on land that has a 2% grade or less. A landowner may choose to install a portion of the outlet without cost share

assistance provided that it meets NRCS design standards and specifications.

V. INELIGIBLE PRACTICES

A. Any application that would allow the installation of terraces on land that has established

- grass will not be approved.
- B. The LPNNRD will not approve any conservation practice that will encourage the conversion of grassland, including CRP land, to crop land. This includes CRP land in the last year of the contract.
 - C. Rebuilding grassed waterways or tile outlets if under 10-years old. Note: Cost share for replacing grass waterways will be considered on a case-by-case basis when over ten (10) years old and part of an approved terrace system or on 100% no-till fields (see IV. M.).
 - D. Work that is considered normal maintenance of existing conservation practices.
 - E. Rebuilding terraces on existing terrace lines.
 - F. Terraces systems on Class VI land or greater.
 - G. Sediment removal from small dams or other impoundments and/or from adjacent lands of said structures.
 - H. Work started or constructed prior to approval.
 - I. Livestock Waste Pits.
 - J. The District will not provide cost share for practices on farmland that does not have a certified Nitrogen operator or on irrigated land where the irrigated acres are not certified by LPNNRD.
 - K. Any practice on fields that are determined sod-busted by the NRCS.
 - L. Repair of damage to conservation practices that is determined to be landowner negligence in performing normal maintenance as outlined in NRCS specifications.

VI. APPLICATION SUBMITTAL, APPROVAL & PROJECT COMPLETION PERIODS

A. Summer Construction Applications (For June through September 15):

To insure LPNNRD consideration, **applications for summer construction must be submitted by February 1.** Most generally, the Projects Committee will review, rank and recommend summer application approvals prior to construction season. . However, consideration and approval of summer applications received after **February 1** may occur depending on available funds. All **summer construction projects are to be completed by September 15** and **final paperwork submitted to the LPNNRD office by October 15.** The Projects Committee will review all uncompleted or unpaid applications at the end of each period to determine if application extensions and/or cancellations are warranted. **The field must be available for construction by August 1. The area must be planted to a cover crop or a crop preceding or after construction. The crop or cover may be harvested or pastured during the contract period.** Work not **completed by September 15,** may be canceled or receive reduced cost share as determined by the Projects Committee/Board.

NOTE: Cooperators who are approved for incentive payments within special designated watersheds, must follow these same summer construction requirements (refer to the “Lands for Conservation Program” – Attachment F).

B. Fall Construction Applications (September through December project completion):

To insure LPNNRD consideration, applications for fall construction must be received **by July 1.** Most generally, the Projects Committee will review, rank and recommend fall construction application approvals prior to fall construction season. However, additional approvals for fall work may occur after July/August as funds are available.

Approved fall applications will be given until December 31 to complete the work. The Committee will review all unpaid applications at the end of each year to determine application extensions and cancellations.

C. Grass, Tree Planting, Windbreak Renovation Applications:

Application periods for grass establishment will be approved based on NRCS seed and seeding specifications. Applications for trees are generally considered for approval just before the spring planting season. For approved Windbreak Renovation applications, tree removal will normally be completed in the summer or fall so the site will be ready before spring tree planting.

D. Small Dam Application (Attachment C):

To ensure consideration for approval, the **District will need NRCS/NRD technician recommended applications by December 15.** The Projects Committee will review and prioritize and submit a recommendation for approval at the January Board Meeting.

E. LPNNRD Signatures on Approved Applications & Related Documents:

The Manager, Assistant Manager and Projects Coordinator are authorized to sign Board approved SWCP applications, Completion and Document Certifications and other related documents on behalf of the LPNNRD.

VII. 2022 PRIORITY AREAS & ELIGIBLE COST-SHARE PERCENTAGES

Priority areas for 2022 listed below are given first consideration for District cost share assistance. Each year, high priority practice applications located in priority areas are reviewed and approved by the Projects Committee and Board for the upcoming program year. The cost-share assistance payment may not exceed a total of the eligible percent for an area when combining all sources of federal, state and local assistance. If there is not enough funding for all applications for all listed priority areas, the Projects Committee may rank areas for approval or approve a lower maximum cost share percent.

LPNNRD Cost-Share Amounts	Average (%) and Actual
FALL Work (District Wide) max \$ limit: \$12,500.00	75
FALL Work (Targeted Areas) max \$ limit: \$12,500.00	75
SUMMER Work (District Wide) max \$ limit: \$10,000.00	75
SUMMER Work (Targeted Areas) max \$ limit: \$12,500.00	75

Targeted Areas	Notes
A. LPNNRD Lands North of the Platte River	Platte, Boone, Madison, Colfax & Dodge Counties. Shell Creek is also in ET & EPA 319 grant area - actual percent depends on priority area and practice as defined in approved grant application).
B. Lake Wanhoo (Sand/Duck Creek) Watershed	
C. Czechland Lake Recreation Area Watershed	
D. Homestead Lake Recreation Area Watershed	
E. Wahoo Creek Sub-Basins	Dunlap Creek; North Fork Wahoo Creek; Miller Branch Creek. These Wahoo Creek Sub-Basins are designated EQIP NWQI, EPA 319 and Environmental Trust Priority Areas.
F. Skull Creek Watershed	It is anticipated to alternate this watershed with the Bone Creek Watershed every two years
G. Watersheds Above All Existing and Planned LPNNRD Flood Control Structures	Non-public structures that are or will be LPNNRD Flood Control Structures operated and maintained by the District
H. Watersheds Above Proposed or Completed Landowner SWCP Cost Share Dams	That will or have received LPNNRD assistance
I. Voluntary Compliance of Verified Erosion & Sediment Complaints	District-wide
J. All High Priority Practice Summer Applications	District-wide (June 1 through September 15 completion)
K. Tree/Shrub Planting	District-wide
L. Voluntary Compliance of Verified Erosion & Sediment Complaints	District-wide
M. All High Priority Practice Summer Applications	District-wide (June 1 through September 15 completion)
N. Tree/Shrub Planting	District-wide

VIII. COST SHARE PERCENTAGE - PRACTICE EXCEPTIONS

The maximum cost share percentage for most high priority conservation practices will be 75%; depending on the where the practice is located (**Refer to VII. above**). The exception to this is for the following high priority practices:

- A. **Water Impoundment Dams and Grade Stabilization Structures: 65% - 75%** (Attachment C)
- B. **Windbreak Renovation Practice: 50%** (Attachment D)
- C. **Emergency Repair of Conservation Practices: 50%** (Attachment E)

IX. MAXIMUM COST SHARE LIMITS

A. **General Maximum Limit:**

A cooperator may receive up to \$12,500 SWCP funds within any program year (July 1 - June 30) for most high priority practices unless otherwise specified below.

B. **Priority Areas with Federal or State Grant Funding:**

Within priority areas (**Wahoo Creek and Shell Creek e.g.**) that are receiving reimbursable federal or state grant funding, the maximum limits may be exceeded to expedite use of those special funds within the specified grant period time line.

C. **Planned Grazing Systems – Livestock Well Pumping Plants:**

The maximum limit for planned grazing systems is \$12,500, however a maximum cost share limit of \$5,000 will also apply toward the livestock well and well pumping plant components (combined) when part of the approved system (Attachment B).

D. **Water Impoundment & Grade Stabilization Structures:**

The maximum limit for water impoundment dams and grade stabilization structures is \$15,000 upon NRCS recommendation and Projects Committee/Board approval on a case-by-case basis (Attachment C).

E. **Windbreak Renovation:**

The maximum limit for windbreak renovation is \$1,000 per landowner per year (Attachment D).

F. **Emergency Repair of Conservation Practices:**

The maximum limit for emergency repair of conservation practices is \$1,000 per landowner per year (Attachment E).

G. **2022 Summer Conservation Practices in Non-Priority Areas:**

For 2022, the maximum limit for approved conservation practices in non-priority areas will be \$10,000 per landowner per year.

X. AMENDMENTS FOR ADDITIONAL COST SHARE

When applications are approved under the maximum limit, additional funds, up to the limit, may be approved if notified by the landowner or technician before construction. LPNNRD staff is authorized to approve an additional \$1,000 above the original approval (up to the maximum limit) if the request is received from the landowner and/or technician prior to construction. Staff will notify the Projects Committee of any staff authorized changes.

XI. APPLICATION EXTENSIONS

Extensions may be granted for inclement weather or for other conditions beyond the landowner's control. All extension requests will be considered by the Projects Committee and Board on a case-by-case basis. No more than one 6-month extension can be approved for the same application.

XII. CONSERVATION PRACTICE DESIGN, STAKING & PERMITS

- A. All conservation measures must be designed and staked by Natural Resources Conservation Service personnel (NRCS), NRD technicians or other NRCS approved technical service providers. All completed conservation work must be according to the NRCS design standards and specifications as outlined in the NRCS Procedures Handbook for LPNNRD.
- B. The landowner is responsible for contacting the NRCS office to secure funds and schedule the layout (design and staking) of the approved work
- C. The landowner is responsible for obtaining all required local, state and federal permits.

XIII. SUBMITTING BILLS & PAPERWORK ON COMPLETED WORK

- A. The landowner is responsible for submitting all bills to the NRCS office. The NRCS will calculate the eligible cost share payment (on NSWCP form # 3) and submit completed and properly signed paperwork to the LPNNRD.
- B. Drawings of the completed practices at to be provided by the NRCS/NRD technician on an aerial photo and submitted with the payment request.

XIV. COST SHARE PAYMENTS

- A. LPNNRD has approved use of NeDNR's 2022 conservation practice payment rates for calculating SWCP contract cost-share payments. Payments will be based on NeDNR's conservation practice payment rates that were in force at the time the application was approved. The cost-share percent may be lowered if summer work is extended into fall.
- B. The LPNNRD calculates and pays cost-share on terraces only by the linear foot, not by the cubic yard.
- C. The cost-share percentages are calculated by multiplying the eligible cost share percentage by the approved cost share practice payment schedule rate or actual cost whichever is less. The cost-share assistance payment may not exceed a total of the eligible percent for an area when combining all sources of federal, state and local assistance.
- D. **Splitting Cost-Share Percentages:** When a field splits two cost-share priority areas, the corresponding eligible cost share percentage will be applied to each portion of the field being treated. When a field splits into a non-priority area, that area will be allowed up to 50% cost share assistance, if the non-priority area is 50% or less of the entire field being treated.
- E. When grant funds are available special conditions aligned with terms of grants will be implemented; in some cases a higher payment percentage rate, or payment cap may be allowed.

XV. PAYMENT OVERRUNS AND LANDOWNER REQUESTED REFUNDS

A. Payment Overruns:

Overruns of up to 10 % above the approved project amount may be approved by staff. Overruns above 10% will need Board approval. Payments are not to exceed the maximum cost share limits set for the various practices. Exception to this is when payments are combined with grant funds in priority areas.

B. Landowner Refunds:

If an SWCP practice is purposely damaged, removed or destroyed within ten years after completion (25 years for a small dam), the cooperator who received cost share, will be requested to reimburse the District, all or a portion of the SWCP cost share funds, as determined by the Projects Completion (25 years for a small dam), the cooperator who received cost share will be required to reimburse the District all or a prorated portion of the funding assistance, as determined by the Projects Committee and Board.

SWCP ATTACHMENT A
SEDIMENT & WATER CONTROL BASINS AND DIVERSIONS

This attachment is to help clarify the use of sediment & water control basins and diversions as an eligible cost-share practice. Basins and diversions are to be used as a part of an approved conservation system according to the NRCS technical guides and field manual.

- A. Sediment & water control basins and diversions may be approved as a high priority practice when in conjunction with terraces or dams.
- B. Basins and diversions will be considered a high priority practice when a part of a terrace system or in conjunction with a 100% no-till system. A 100% no-till system must have the goal of controlling soil erosion to soil replacement levels ("T"). A 100% no-till system is accepted land treatment when ephemeral and gully erosion is controlled, or "T" is met. Basins and/or diversions built separately on a terraced field are not considered a part of the terrace system.
- C. Basins and diversions not part of a terrace system may be considered as a high priority practice on fields where the NRCS or NRD technician determines terraces are not feasible and/or they offer the most practical solution to a problem. This will be determined by the Projects Committee on a case-by-case basis.

LOWER PLATTE NORTH NRDSWCP ATTACHMENT B PLANNED GRAZING SYSTEM PRACTICE

I. GENERAL REQUIREMENTS

- A. An applicant must have at least 40 acres of connecting grassland to be developed into at least two grazing cells with planned rest periods in accordance with Natural Resources Conservation Service (NRCS) recommendations.
- B. Applicants must complete a minimum 10-year planned grazing system developed by the NRCS prior to submitting an application.
- C. Applicants are required to sign a 10-year cost-share agreement with the LPNNRD. (Form NSWCP-10)
- D. All approved cost-share items must meet NRCS Standards and Specifications.
- E. Funds for approved practices may be used on CRP lands if such lands are in the last year of the CRP contract.
- F. The amount and type of eligible practices approved for each application will be determined by the overall grazing system plan and the most cost effective alternative available.
- G. Cost-share on eligible practices will be based on the approved cost-share percentage times the approved practice payment schedule cost share rate or 75 percent of the actual cost, whichever is less.

II. ELIGIBLE PRACTICES

- A. **Cross Fencing:** Only fencing designed to facilitate cell division is eligible for cost-share (Standard 382 specifications). Boundary fences are not eligible for cost-share.
- B. **Livestock Water Dugouts:** Dugouts will be sized by daily animal needs and Nebraska Engineering Handbook Standards.
- C. **Livestock Well Installation:** Livestock wells will be sized to provide a maximum of 15 gallons of water per animal-unit per day within each cell. No cost-share will be available for domestic or irrigation wells. Well test holes are not eligible for cost-share.
- D. **Pumping Plants for Livestock Wells** (As outlined by State NSWCP Guidelines): While a cooperator may receive up to \$12,500 SWCP funds toward completing a Planned Grazing System, a maximum cost share limit of \$5,000 will apply toward the livestock well and well pumping plant component (combined) if part of the approved system.
- E. **Livestock Water Tanks:** Tanks sized according to standard storage requirements in the NRCS Technical Guide, Standard 614, are eligible.
- F. **Livestock Water Pipeline Installation**

**LOWER PLATTE NORTH NRD
SWCP ATTACHMENT C
GUIDELINES FOR WATER IMPOUNDMENT (SMALL DAMS) &
GRADE STABILIZATION STRUCTURES**

I. PURPOSE

The purpose of this program is to assist landowners with the construction of water impoundment and grade stabilization structures on their property.

II. ELIGIBLE PROJECT ITEMS

A. Eligible Project Costs Include:

1. Construction (Not to include site preparation)
2. Seeding (Structure and emergency spillway)
3. Fencing when required by the NRCS

III. LAND TREATMENT REQUIREMENT

To be eligible for cost-share assistance, a minimum of 75% land treatment is required within the watershed above each proposed structure site. To calculate this percentage, non-highly erodible land is considered treated.

Land Treatment Definition:

Land treatment is defined as any practice or combination of practices (i.e. terraces, no-till etc.), that control soil erosion rates on highly erodible soils to soil replacement levels or less (Soil replacement level or "T" = 5 tons/acre in the LPNNRD). Any approved NRCS farm plan that treats land to "T" qualifies under this definition (8/2/00 Projects Committee).

IV. COST-SHARE PERCENTAGE AND MAXIMUM ASSISTANCE

The cost-share percent for approved applications outside selected priority areas is up to a maximum of 65%. For small dams approved within selected LPNNRD priority areas, the cost-share rate is up to a maximum of 75%. Eligible assistance will be based on the eligible cost-share percent times the county average costs or 75% of actual costs whichever is less. The maximum cost-share limit will be \$15,000 upon NRCS recommendation and Projects Committee approval on a case-by-case basis (see Special conditions below).

Special conditions: The Board may approve a higher cost-share percentage and increase the maximum assistance if an application site is above an LPNNRD recreation area, within a targeted watershed or when other special conditions exist. The Board may also approve a lower cost-share percent and decrease the maximum assistance for structure sites of lower priority. **Special** conditions will be evaluated by the Board on a case-by-case basis.

V. PRIORITY AREAS

Priority-areas for small dams and grade stabilization structures include the following watersheds:

- A. Sand & Duck Creek
- B. Wahoo Creek*

- C. Skull Creek
- D. Shell Creek* (Additional grant funding available)
- E. Bone Creek
- F. Watersheds above Pubic Recreation Structures (e.g. Czechland Lake, Homestead Lake, Lake Wanahoo)
- G. Above all existing LPNNRD Operated and Maintained Watershed Structures.

VI. APPLICATION ELIGIBILITY AND SIGN-UP

- A. Any landowner within the Lower Platte North NRD who is an individual, a partnership, a corporation or other legal entity.
- B. Applications may be submitted any time during the year; however, only NRCS inspected and recommended applications received by December 15, will ensure consideration for the following construction year. Unapproved applications will expire on May 1 of each year, requiring a new landowner application for future consideration. The Projects Committee will review, prioritize and submit a recommendation for approval at the January Board Meeting.
- C. The applicant shall apply at the county NRCS office on forms provided by the LPNNRD. An aerial photo showing the proposed project location must accompany the application. The application must be signed by the applicant and sent to the LPNNRD before December 15 of each year to insure consideration for the immediate year's construction.
- D. At the time of application, the NRCS will be requested to provide an estimate of drainage acres, percentage of land treatment present, quantities and costs for the project.

VII. APPLICATION EVALUATION AND TENTATIVE APPROVAL

- A. Application sites will be inspected by LPNNRD and NRCS representatives to evaluate feasibility, benefits and cost. Benefits to be evaluated will include but not be limited to: flood control, grade control, erosion and sediment control, wildlife habitat enhancement, livestock water, and protection to public roads and property.
- B. The Projects Committee will most generally review, prioritize, and make recommendations on applications at their January meeting.
- C. The NRD Board of Directors will generally approve, reject, or table each request at the January Board Meeting.
- D. After receiving LPNNRD approval, the applicant will be required to submit a \$500 deposit to the NRD before a survey or design is started. The deposit will be returned to the applicant after project completion. If the deposit is not received by February 1, the application will be canceled. If the applicant withdraws from the project after the design has been complete, the deposit will be retained by the LPNNRD unless conditions in XII. B. apply.
- E. In February of each year, the Natural Resources Conservation Service will be requested to proceed with survey and design of approved projects.
- F. After receiving LPNNRD approval, the applicant will be given two years to obtain necessary permits, complete the structure and submit all required paperwork. If the project is delayed due to adverse weather conditions, or other conditions beyond the

applicant's control, an extension may be granted by the LPNNRD Board of Directors. Extensions will be considered by the LPNNRD Board on a case-by-case basis.

VIII. LAND RIGHTS, AGREEMENTS AND PERMITS

- A. The applicant is responsible for obtaining any required easements and any required federal, state and local (i.e. NDNR, Army COE, and County Zoning) permits.
- B. The applicant is responsible for the relocation or modification of water lines, power lines and telephone lines and pay the costs involved.
- C. The applicant will be required to enter into a 25-year cost-share agreement with the LPNNRD. This agreement states that the applicant will refund cost-share funds if the project is removed, altered, or modified without the consent of the LPNNRD.

IX. STRUCTURE DESIGN AND CONSTRUCTION

- A. The NRCS will be requested to survey, design, and supervise all structures approved by the LPNNRD Board.
- B. Construction will not commence until formal notice to proceed is given by the LPNNRD. This notice will be given after NRD Board approval, and after receiving the applicant's deposit and signed cost-share agreement.

X. FINAL APPROVAL AND PAYMENT

- A. Final Approval and Payment will occur when:
 - 1. The project is completed and certified by the NRCS/NRD technician to meet all NRCS standards and specifications.
 - 2. The completed application form NSWCP-3 is signed and returned to the LPNNRD with a copy of all project bills.

XI. OPERATION AND MAINTENANCE

The landowner is responsible for all operation and maintenance after project construction.

XII. SMALL DAM DEPOSIT REQUIREMENT & REIMBURSEMENT

- A. The applicant will be required to submit a \$500 deposit to the NRD before a survey or design is started. The deposit will be returned to the applicant after NRCS approves the completed project and all paperwork is submitted and approved by the District. If the deposit is not received by February 1, the application will be canceled. If the applicant withdraws from the project after the design has been complete, the deposit will be retained by the LPNNRD unless conditions in B. apply.
- B. If a landowner does not proceed with the small dam project because the final cost estimate is 40% or more over the original project estimate, the LPNNRD will return the \$500 deposit based on financial hardship. All other conditions will be reviewed by the Projects Committee on a case-by-case basis.

**LOWER PLATTE NORTH NRD
SWCP ATTACHMENT D
WINDBREAK RENOVATION PRACTICE**

I. PURPOSE

To provide for the restoration of farmstead, acreage or field windbreaks that have been rendered substantially ineffective due to the death of trees or other windbreak plantings as a result of weather, disease, or other natural causes.

II. PLAN REQUIREMENT

A windbreak renovation plan is to be based on a plan reviewed and approved by a forester of the Nebraska Forest Service. The forester is to certify that the windbreak has lost its effectiveness, should be renovated and that they approve the plan of renovation.

III. SITE PREPARATION

Tree removal off the site is required to be accomplished in late fall/early winter at least before the planting occurs the following spring. The only area that is replanted with a new windbreak receives cost share for removal costs. Tree removal work should not be initiated until the application is approved by the Lower Platte North NRD and the landowner agrees to replant the windbreak in the same area.

IV. COST SHARE RATE AND MAXIMUM ASSISTANCE

The windbreak renovation cost-share payment will not be based on a cost greater than the county average unit cost adopted by the USDA-FSA. The renovation practice is not to include the replanting of the windbreak because of different cost-share percentage rates. The windbreak planting cost-share will be separate. The Lower Platte North NRD will cost share at a 50% rate, up to \$1,000.

Tree planting cost-share is eligible for riparian buffers, farmsteads, acreages, field and livestock protection windbreaks. Windbreaks must contain 200 or more trees and shrubs which are purchased through and planted by the NRD. When the planting is strictly for wildlife habitat, a minimum of 300 trees/shrubs purchased and planted by the NRD is required.

LOWER PLATTE NORTH NRD
SWCP ATTACHMENT E
FOR EMERGENCY REPAIR OF CONSERVATION PRACTICES

I. PURPOSE

On occasion, the LPNNRD Board of Directors may approve local SWCP funds for the Repair of conservation practices damaged from intense rainstorms. The decision for approving emergency repair funds will be considered annually, with the location and total amount of available funds dependent on the severity of storm damage to conservation practices in designated areas in the District. When approved by the Board, Emergency repair funds will be allocated in the following manner:

- A. The LPNNRD Board will consider approval of the amount and eligible area for emergency repair funds, with a recommendation from the Projects Committee. Typically, this will occur on or prior to the LPNNRD September Board Meeting.
- B. Only eligible Conservation Practices, two years old and newer that were originally built to NRCS design specifications, will be eligible for cost-share assistance.
- C. The committee will consider approval of emergency repair assistance only when it is determined by an NRCS technician that the damage was not due to landowner negligence in performing normal maintenance as outlined in NRCS O&M specifications.
- D. To be eligible for emergency repair funds, the landowner must be following an approved NRCS farm plan.
- E. Prior to LPNNRD approval, applications will receive recommendation s from LPNNRD and NRCS staff. The LPNNRD Projects Committee will prioritize application practices and areas.
- F. Eligible assistance will be 50% of the approved amount up to a maximum of \$1,000 per landowner per program period.

**LOWER PLATTE NORTH NRD
SWCP ATTACHMENT F
2022 LANDS FOR CONSERVATION PROGRAM
)**

Purpose: The Lands for Conservation program provides landowners with an incentive to get conservation structures constructed on the land during the growing season.

1. The Lands for Conservation program will be on contractual basis between the landowner (cooperator) and the Lower Platte North Natural Resources District for one year while conservation practices are being established. Applications deadline for each calendar year will be February 1.
2. Sediment and Water Control Basins with tile outlets and/or terraces with grassed waterways and terraces with tile outlets qualify for this program. Sediment and Water Control Basins/Terraces and/or waterways must be seeded during the contract period.
3. NRCS and/or NRD personnel will design terraces with waterways or tile drains or Sediment and Water Control Basins with tile outlets. These practices must protect the entire field on which they are established. However, the area under contract will be the smallest practical area to encompass the practices, as agreed upon with the cooperator.
4. Land enrolled in another program (ex: CRP) may not be eligible for Lands for Conservation contracts.
5. Sediment and Water Control Basins with tile outlets and terraces with waterways or tile outlets may be cost-shared through the EQIP program administered by Natural Resources Conservation Service (NRCS). If federal funds are not available, cost-sharing assistance may be available through LPNNRD's Soil & Water Conservation Cost-Share Program.
6. **Construction must be done between June 1 and September 15.** The field must be available for construction by August 1. The area enrolled in the LPNNRD Lands for Conservation will be planted to cover crop or a non-grain forage crop (forage sorghum, etc.) preceding and/or after construction. The crop or cover may be harvested or pastured during the contract period.
7. **For 2022: Payment is \$195 per acre*.**
 *Payment Rate will be reviewed annually. Payment rate is based on 2021 Nebraska Non-Irrigated Cropland Cash Rent Paid per Acre, Source: USDA National Agricultural Statistics Service.
 Payment will not be processed and forward to the NRD applicant until the project (including the planting of the cover crop) has been certified as completed by the NRCS.
8. If used for permanent pasture before or after the contract period, these areas are not eligible for the Lands for Conservation Program. Money received through this program resulting in permanent pasture after the contract period, must be returned. Land can be used for hayland as a normal part of the crop rotation.
9. If ownership of land changes during the contract period, the contract becomes void. The new owner may continue the contract, if agreed to with the Lower Platte North NRD.
10. Approval of contracts will be on a rotating basis.
11. The landowner will contract for the construction of Sediment and Water Control Basins, terraces, waterways, tile outlets and any other necessary construction.
12. Terraces, Sediment and Water Control Basins, waterways and tile outlets must be maintained for 10 years or as long as the current owner has control of the land, whichever is less.
13. **Eligible Watersheds for the Lands for Conservation Program: Within the Wahoo Watershed, three of the HUC 12 sub watersheds were identified as highest priority areas for this program: North Fork-Wahoo Creek, Dunlop Creek and Miller Branch-Wahoo Creek. The Shell Creek Watershed. Applications OUTSIDE of priority watersheds will be evaluated after high priority applications.**
14. **Separate fund pool allotted in 2022 for the remainder of the LPNNRD outside of 319/NWQI watersheds.**

Article

Application of Neural Networks for Hydrologic Process Understanding at a Midwestern Watershed

Annushka Aliev ^{1,2} , Sinan Rasiya Koya ², Incheol Kim ², Jongwan Eun ², Elbert Traylor ³ and Tirthankar Roy ^{2,*} 

¹ Department of Civil and Environmental Engineering, University of Maryland, College Park, MD 20742, USA

² Department of Civil and Environmental Engineering, University of Nebraska, Lincoln, NE 68588, USA

³ Nebraska Department of Environment and Energy, Lincoln, NE 68521, USA

* Correspondence: roy@unl.edu

Abstract: The Shell Creek Watershed (SCW) is a rural watershed in Nebraska with a history of chronic flooding. Beginning in 2005, a variety of conservation practices have been employed in the watershed. Those practices have since been credited with attenuating flood severity and improving water quality in SCW. This study investigated the impacts of 13 different controlling factors on flooding at SCW by using an artificial neural network (ANN)-based rainfall-runoff model. Additionally, flood frequency analysis and drought severity analysis were conducted. Special emphasis was placed on understanding how flood trends change in light of conservation practices to determine whether any relation exists between the conservation practices and flood peak attenuation, as the strategic conservation plan implemented in the watershed provides a unique opportunity to examine the potential impacts of conservation practices on the watershed. The ANN model developed in this study showed satisfactory discharge–prediction performance, with a Kling–Gupta Efficiency (KGE) value of 0.57. It was found that no individual controlling variable used in this study was a significantly better predictor of flooding in SCW, and therefore all 13 variables were used as inputs, which resulted in the satisfactory ANN model discharge–prediction performance. Furthermore, it was observed that after conservation planning was implemented in SCW, the magnitude of anomalous peak flows increased, while the magnitude of annual peak flows decreased. However, more comprehensive assessment is necessary to identify the relative impacts of conservation practices on flooding in the basin.



Citation: Aliev, A.; Koya, S.R.; Kim, I.; Eun, J.; Traylor, E.; Roy, T.

Application of Neural Networks for Hydrologic Process Understanding at a Midwestern Watershed. *Hydrology*

2023, 10, 27. <https://doi.org/10.3390/hydrology10020027>

Received: 10 November 2022

Revised: 7 January 2023

Accepted: 8 January 2023

Published: 18 January 2023



Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Keywords: rainfall-runoff modeling; watershed hydrology; artificial neural network; conservation practices; flood frequency analysis; drought analysis

1. Introduction

Flooding is a significant and recurring issue in Nebraska. In the past 100 years alone, five historic floods have been recorded [1]. The most recent of those historic floods was the March 2019 flood, during which several new records were set for river crests, snowfall prior to the event, and precipitable water values [2]. The flood caused extensive damage to infrastructure and personal property, including the destruction of bridges and roads, the breaching of 50 levees, and more. Five lives were lost, and thousands more were forced to evacuate their homes and businesses [1]. By August of 2019, flood damage cost estimates had reached \$3 billion [2].

In addition to the widespread infrastructure damage inflicted, Nebraska's agriculture industry also suffered heavy repercussions from the March 2019 flood. Cows and calves died or were stranded, crop fields were flooded or left covered in chunks of river ice, and grain stores were contaminated, resulting in approximately \$400 million in cattle losses and \$440 million in crop losses [3]. Destruction of roads due to the floods posed further challenges for farmers beyond immediate losses, as many farms suddenly became inaccessible or required detours of extra tens of miles to reach in order to tend to livestock. According

to an estimate made by the President of the Nebraska Farm Bureau, the additional transportation costs of these detours, as well as related costs of fuel and feed, were costing the Nebraska cattle industry roughly \$1 million a day at the time [4]. The flooding of March 2019 was a devastating example of the serious damage to crops and livestock that floods can inflict on farmers and rural areas.

The March 2019 flood occurred as a result of the culmination of several meteorological and hydrological events. The warm and wet start to winter resulted in unfrozen ground that was heavily saturated with moisture, which then froze following a shift to colder temperatures in late January; early winter conditions were approximately 1–2 °C warmer than average, while late January conditions ranged from 3–5 °C colder than average and resulted in frost depths of 60–90 cm. Record-breaking snowfall followed, developing a significant snowpack with a snow-water equivalent of 3–10 cm, and rivers froze, creating the potential for ice jams. When warmer temperatures returned coincident with a cyclone that brought 25–50 mm and 40–75 mm of rain across northeastern and central Nebraska, respectively, the excessive runoff generated from the combination of snowmelt, precipitation, and rain-on-snow events could not percolate into the frozen, saturated ground, thus overwhelming rivers and creating significant flooding [2].

The mechanism by which the March 2019 flood was produced, along with its repercussions, highlights the importance of understanding the interactions of antecedent hydrological and meteorological factors in creating flooding. Increased understanding of conditions that contribute to flooding can help with forecasting and decision-making [5]. As seen during the March 2019 flood, monitoring and modeling of several hydrological and meteorological inputs allowed for forecasts and warnings to be put out in advance of the flood event, which likely saved many lives and personal property [2]. Further improvements to flood models and additions to the understanding of flood development can aid in yielding more accurate and timely predictions for flooding.

This study aimed to contribute to the improvement of flood forecasting and hydrologic process understanding in a specific rural watershed in Nebraska, Shell Creek Watershed (SCW). Furthermore, preliminary insights were drawn from the results of this study regarding the effects of conservation practices on attenuating flooding in the watershed. SCW provides a unique example of a watershed that has had a comprehensive and strategic conservation plan aimed at addressing flooding and water quality issues, and this plan has been in place for a long enough span of time that observations can reasonably be drawn regarding the relationship between conservation practices and flood attenuation. This study opens the door to such discussion, laying groundwork and preliminary observations for future researchers to build upon when analyzing the impact of SCW's conservation plan on flooding.

SCW is a major tributary of the Platte River located in east-central Nebraska. The watershed is largely agrarian, with 93% of its area designated as agricultural land, and has a history of chronic flooding [6]. In the past 80 years, SCW experienced 17 river crests above flood stage, with an additional seven above action stage [7]. As previously exemplified, flooding can cause devastating damage and setbacks to Nebraskan farms through crop and cattle losses, making the frequent flooding of SCW an important matter of concern. In the early 1990s, some farmers began implementing conservation practices on their land in efforts to reduce flood risk on a small scale. Later, in 1999, the Shell Creek Watershed Improvement Group (SCWIG) organized to address flooding in SCW, then shifted their focus towards water quality impairments in the watershed and drove the development and implementation of the 2005 Shell Creek Watershed Management Plan. The plan was fully implemented in 2015; however, certain water quality impairments and other issues remained unresolved, warranting the development of the 2016 Shell Creek Watershed Environmental Enhancement Plan to improve soil health, reduce runoff, improve water quality, and address stream conditions impacted by watershed degradation. The 2016 plan is to be implemented in several phases extending to 2032 and beyond, and efforts will require a more detailed understanding of the hydrology of SCW [6]. The existing restoration

efforts and conservation practices implemented over the course of these management plans have been credited anecdotally with somewhat reducing flooding, an observation that warrants exploration and discussion and, as yet, lacks validation. This paper's research on flood modeling of SCW will aid in addressing the demand for further understanding of SCW hydrological processes, investigate potential changes in streamflow patterns, and support the improvement of forecasting for the watershed's frequent floods. Furthermore, analysis of the impact conservation practices have had on flood attenuation in the watershed will aid managers in making decisions regarding future conservation implementations.

To model flooding in SCW, a feedforward artificial neural network (ANN) was developed, trained, and tested in MATLAB. ANNs are useful for their ability to determine relationships between given inputs and recorded outputs of a process without explicit physical process information [8–10] and have been successfully employed in several hydrological applications [11–15].

This study designed and trained a single-hidden-layer feedforward ANN to model the rainfall-runoff process in SCW using varying combinations of potential flooding factors. Building a rainfall-runoff model allows for a deeper understanding of the hydrological processes, specifically flooding, in SCW, and aid in the accomplishment of the four main objectives of this study: (1) characterizing the efficacy of the selected controlling factors in SCW flood prediction, (2) building a rainfall-runoff model for the watershed using ANN, (3) assessing drought intensity and flood frequency in the watershed, and (4) drawing preliminary insights on the effects of conservation practices on flooding in the watershed.

2. Materials and Methods

2.1. Study Area

Shell Creek Watershed is a rural Nebraskan watershed that serves as a major tributary of the Lower Platte River, which eventually feeds into the Missouri River. Approximately 193 km long and spanning 123,391 hectares of land, the watershed runs through Antelope County, Boone County, Madison County, Platte County, and Colfax County. The cropland map of SCW is shown in Figure 1. Land use in SCW is predominantly agricultural, with 93% of the watershed area dedicated to farmland. The main agricultural crops of the watershed by land-use area are corn (48%) and soy (28%), and other agricultural products include swine, cattle, and alfalfa. Developed land only takes up about 4% of SCW. Land-use immediately adjacent to the channel (305 m to either side) is 73% crop cultivation and 11% grassland and grazing, with the rest populated by forest, wetlands, or development. In the upper half of SCW, cropland is often farmed up to the edge of the channel. In the lower half, the edges of the channel are typically lined with a narrow forest buffer [6].

The meteorological patterns of SCW are seasonal, and thus average temperature, precipitation, and streamflow in the region vary by season. Summers are warm, with an average temperature of 23.9 °C. Precipitation falls as rain in the form of showers and storms during summer, reaching a cumulative 50.8 cm from April to September out of the total annual 66 cm. The average summer surface water flow is 2.04 m³/s. During winter, temperatures average −4.4 °C, and precipitation is mainly in the form of snow. Average snowfall is about 63.5 cm, and average surface water flow is 0.71 m³/s. The average mid-afternoon relative humidity in SCW is 60% [6].

Like most of eastern Nebraska, SCW is characterized by rolling hills of easily erodible soils [6]. The majority of soils found in SCW are classified in the B Hydrologic Soil Group: moderately deep to deep soils that are between 10% and 20% clay and 50% to 90% sand in composition. These soils have a moderate infiltration rate when thoroughly wet [16]. SCW also contains a sizeable amount of loess [17], silt blankets of which eastern Nebraska has some of the thickest in the Midwest. Loess is highly erodible when wet and thus contributes significantly to the channel stability problems observed in SCW. There are three main types of bedrock in SCW, which divide the watershed into thirds; the western third is composed of mudstone and sandstone, the middle third of limestone, and the lower third of shale. Bedrock rarely impacts stream processes in SCW.

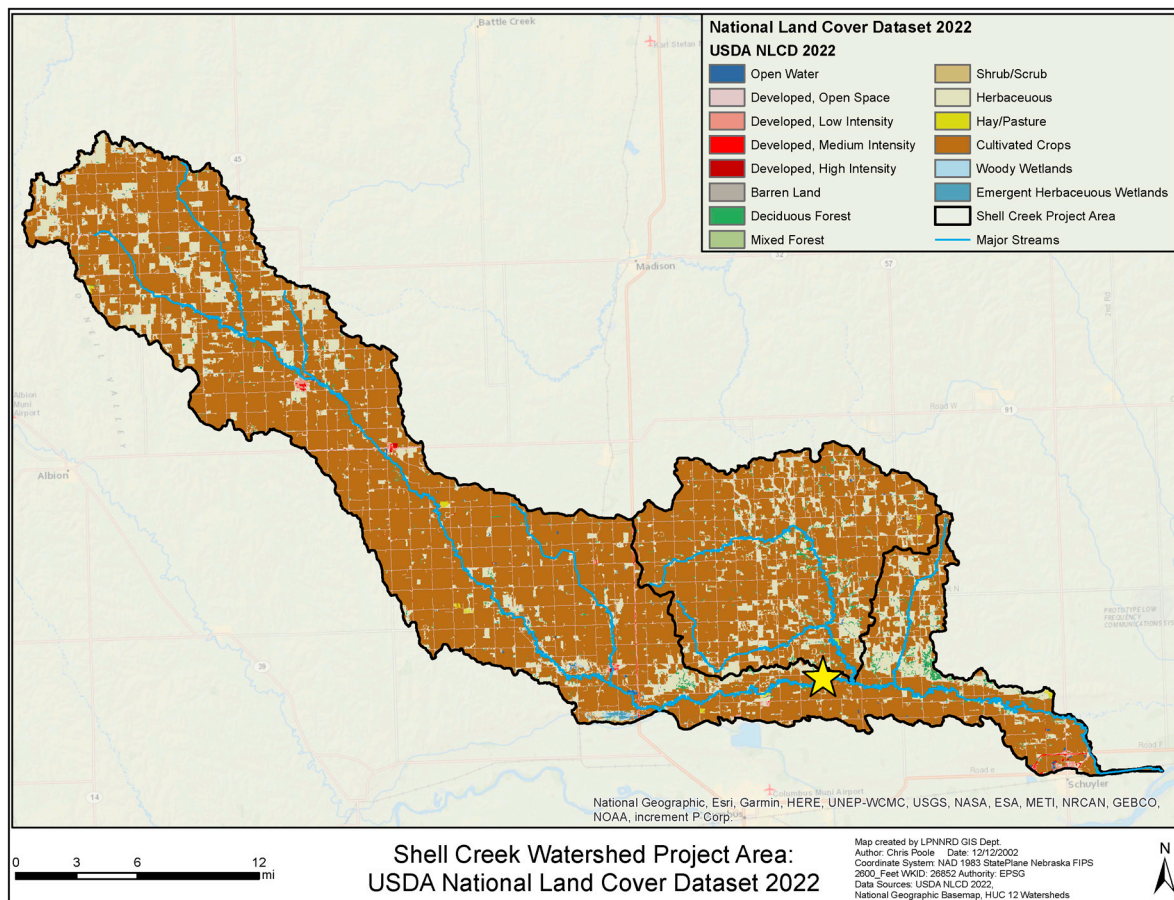


Figure 1. Shell Creek Watershed with USDA 2022 land cover data. The location of the streamflow gauge used for this study is indicated by a yellow star.

The designated beneficial uses of Shell Creek are recreation, aquatic life, agricultural water supply, and aesthetics. However, a history of agricultural use and anti-conservationist attitudes and practices left Shell creek impaired in the areas of recreation and aquatic life by Atrazine, selenium, and *Escherichia coli* (*E. coli*) [18]. Furthermore, historic anthropogenic hydrological and environmental modification in the way of clearing large tracts of land for cultivation has resulted in an increased rate and volume of storm flow in SCW, increasing the risk and frequency of flooding and accelerating erosion. Since 1999, SCWIG has been working to address these issues systematically on a watershed scale. The result of their efforts was the development of the 2005 Shell Creek Watershed Management Plan, which focused on both the quantity and quality of runoff to resolve flooding and water quality issues in Shell Creek. The 2016 Shell Creek Watershed Environmental Enhancement Plan was subsequently developed to address persisting water quality impairments not resolved by the 2005 plan. Through these plans and the work of SCWIG and SCW landowners, more than 340 conservation practices have been implemented on the land. These practices include no-till farming, cover crops, and filter and buffer strips and have resulted in the successful delisting of Shell Creek for aquatic life impairment due to Atrazine in 2018 [19]. Outside of improvements to water quality, these conservation practices have additionally been credited with alleviating flooding somewhat in SCW [20].

2.2. Data

The majority of hydrological and meteorological data for this study were obtained from Phase 2 of the North American Land Data Assimilation System [21,22]. The available dataset includes precipitation totals (PCP), above-ground convective available potential energy (CAPE), the fraction of total precipitation that is convective (CNFRAC), longwave

radiation flux downwards (DLRWF), shortwave radiation flux downwards (DSWRF), potential evaporation (PEVAP), surface pressure (S.P.), specific humidity (S.H.), temperature, zonal wind speed (UGRD), and meridional wind speed (VGRD), and starts from January 1979. Hourly data for these variables were masked to the study region, then aggregated to daily averages. Daily snow water equivalent (SWE) data were pulled from the National Snow and Ice Data Center [23], and daily groundwater level (GWL) data were obtained from the National Water Information System (NWIS). A large number of initial variables was selected intentionally, as it allows for the narrowing down of variables to determine what factors are relevant for flooding in SCW—one of the main objectives of this study.

Discharge data were obtained from the U.S. Geological Survey (USGS) from a stream-flow gauge near Columbus, NE. The Columbus gauge is the only gauge for Shell Creek that provides daily discharge data to date, and as discharge is the target variable in our rainfall-runoff model, the study region and time period for this research are restricted by the location and available data of this gauge. The Columbus gauge is located upstream from the point where SCW flows into the Lower Platte River and just slightly upstream from where Loseke Creek feeds into Shell Creek, so this study will focus on the portion of the watershed above the gauge and exclude the downstream area beyond Columbus. Approved daily discharge data from the Columbus gauge only extend as far back as 1990, and thus the total time interval used for variable selection and model training in this work is from 1990 to 2020.

While daily discharge data from the Columbus gauge are only available from 1990, annual peak flow data from the same gauge are documented and available all the way back to 1947, with the exception of 1976 and 1977. These annual peak flow data from the USGS are used for flood frequency analysis of the watershed. Drought analysis was conducted using NLDAS precipitation data from 1982 to 2020.

2.3. Model: Artificial Neural Network

Artificial neural networks are machine learning models loosely based on the structure of biological networks in the brain. These networks are composed of artificial neurons organized into distinct layers—the input layer, hidden layers, and output layer—each of which contains at least one neuron. Data inputs are run from the input layer through the hidden layers to the output layer, where a prediction is output. Neurons in the hidden layers and output layer take the outputs of other neurons as inputs, then compute nonlinear transformations of those inputs to generate their own outputs. In recurrent neural networks, a neuron may take the outputs of other neurons from the previous layer and from within the same layer. In feedforward neural networks (FFNNs), neurons only receive outputs as inputs from the previous layer.

In an ANN, a connection between two neurons has a weight associated with it that represents the connection strength. Changing these weights of an ANN changes the final output of the model, and thus it is necessary for such weights to be adjusted to optimize the performance of the model. This is done through training. Two widely used categories of ANN training are supervised and unsupervised training (note that there are other types of training as well, such as semi-supervised or self-supervised training, which are not discussed here). Supervised training is a method in which an established pair of inputs and outputs is compared against the model's outputs for the same established data inputs, and then feedback is given in order to minimize the deviation of the model outputs from the expected outputs. Unsupervised learning is a method in which unlabeled training data (data without a target variable) is given to an algorithm, from which the algorithm then identifies patterns and categories on its own. This study employed supervised learning to train the ANN model.

A common method used for adjusting network weights in supervised training is error backpropagation. Backpropagation compares the network output for a set of inputs with the observed target, then evaluates the error with a loss function. This error is then propagated backward to adjust connection weights and improve the accuracy of the model.

This study used a FFNN with a single hidden layer to model rainfall-runoff processes in SCW. A single-layer model was chosen for this research as preliminary testing of a single dataset on both a single-layer and double-layer model yielded nearly identical results, making the added complexity of the double-layer ANN redundant.

ANN codes were written in MATLAB, and all datasets were normalized using z-score normalization prior to input to the ANN according to the following expression:

$$z = \frac{x - x_{\text{mean}}}{\sigma}$$

where x is the data point, x_{mean} is the mean value of the data, and σ is the standard deviation of the data. Once data had been normalized, they were used in the training of an ANN whose number of neurons in the hidden layer was varied from 1 to 50. The model was trained on 70% of the dataset, then validated on the remaining 30% of the data. Mean squared error (MSE) from validation for the output of each model was compared, and a number of neurons between 10 and 50 were then selected for the prediction ANN model by determining which ANN had the lowest MSE after training and validation. These bounding values of 10 and 50 neurons were chosen in order to ensure the selection of a model that was neither oversimplified nor overly complex.

Following training, the selected ANN model was made to predict discharge, and the performance of the model was measured using the Kling–Gupta efficiency (KGE) [24]. KGE is a statistic that compares the bias, variability, and timing of a model's output to that of the observed data, and is calculated as follows:

$$\text{KGE} = 1 - \sqrt{(r - 1)^2 + (\alpha - 1)^2 + (\beta - 1)^2}$$

where r is the linear correlation coefficient, α is a measure of relative variability in the simulated and observed values, and β represents bias. KGE values range from negative infinity to 1, with 1 indicating that a model's outputs perfectly match with the observed target data. The closer a KGE value is to 1, the better the model is performing.

The ANN was trained and run numerous times, and on data for three different time periods: the full period, 1990–2020; the pre-planning period, 1990–2004; and the post-planning period, 2005–2020. In this paper, the pre-planning period is sometimes noted as the non-conservation period, and the post-planning period is sometimes noted as the conservation period. Discharge was the target variable for all trials. The first trial for each period included all predictive variables, and its KGE was recorded as a reference KGE for future trials. Leave-one-out analysis was then conducted where the model for each period was run multiple times, each with a different variable left out, and the resulting KGE of each trial was compared to the reference KGE for that time period in order to determine the respective influence of each variable on the model's output accuracy and performance. The least influential variables were eliminated, and the process was repeated until the most effective model had been obtained.

2.4. Flood Frequency Analysis

Flood frequency analysis is a method employed in hydrology to estimate the exceedance probabilities corresponding to specific streamflow values for a given river. Annual peak flow or peak-over-threshold data existing over a sizeable number of consecutive years (typically more than 30) were collected and used to fit probability distribution functions from which the exceedance probabilities can be calculated. In this study, flood frequency analysis was conducted using the U.S. Army Corps of Engineers Hydrologic Engineering Center's (HEC) Statistical Software Package (HEC-SSP 2.2). Flood frequency analysis for SCW was also broken into three different time periods to allow for the examination and identification of flood frequency differences before and after the implementation of conservation practices. These periods are the full period, 1947–2020, the pre-planning period, 1947–2004, and the post-planning period, 2005–2020. However, only results from

the full period and pre-planning period were analyzed in this paper, as the post-planning period extends only 15 years back, so it would not be a reliable source to draw conclusions from regarding flood frequencies. Conclusions about flood frequency changes during the post-planning period were instead drawn from the comparison of the full period and the pre-planning period. It is to be noted that there always has been some level of conservation in the watershed, but the key to success in the Shell Creek watershed was the development and implementation of the comprehensive and strategic plan to address the flooding and water quality issues as opposed to random acts of conservation.

2.5. Drought Analysis

Droughts are often measured using drought indexes, which analyze data for selected drought indicators over various time intervals in order to output a drought index value. This drought index value is a single number interpreted on a range from abnormally wet to abnormally dry. In order to conduct a drought analysis for SCW, this study employed the Standard Precipitation Index (SPI) [25], which compares actual precipitation accumulation over a region for a certain time period to the probability of precipitation according to historical records for that same time period. SPI values indicate the number of standard deviations from mean moisture conditions, with positive SPI values representing wet conditions and negative SPI values representing dry conditions. SPI values ranging in magnitude from 0 to 0.99 indicate mild conditions, from 1 to 1.49 indicate moderate conditions, from 1.5 to 1.99 indicate severe conditions, and 2 or above indicate extreme conditions [25]. In this study, SPI was run for 1-month, 3-month, 6-month, and 12-month time intervals. Inferences about soil moisture levels in an area can be drawn from the 3-month SPI, while SPI values corresponding to longer timescales (e.g., 6- to 12-month) relate information about wet and dry periods.

2.6. Analysis Framework

Figure 2 shows the analysis framework followed in this study. In order to determine variables relevant to flooding, both model-free and model-based elimination were employed. Once data were masked to study area and aggregated to daily data, pair plots and cross-correlation plots were created that plotted each variable individually against the target variable discharge, as well as all variables against each other. These plots were generated for the three time intervals previously mentioned: the full time period, 1990–2020; the pre-planning period, 1990–2004; and the post-planning period, 2005–2020. This step allowed for the examination of relationships between each variable and the target variable and the identification of multicollinearity between independent variables. The variables were then run through the ANN, which first underwent training and validation with the data, then generated predictions for the target variable discharge. These predictions were evaluated using KGE, and using those evaluations, the variables most relevant to flooding were determined. This identification of factors and conditions conducive to flooding allowed for an improved understanding of SCW hydrological processes.

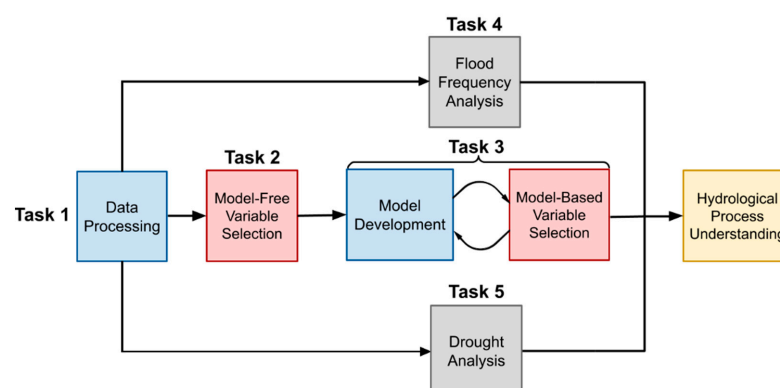


Figure 2. Flowchart depicting the analysis framework for this study.

Additional pathways towards improved hydrologic understanding taken on in this research are flood frequency analysis and drought analysis. Using USGS annual peak flow data, flood frequency analysis was carried out to identify the exceedance probabilities of streamflow in SCW. Using long-term precipitation data, drought analysis was conducted with the SPI in order to better understand patterns of dryness and wetness in SCW.

3. Results

3.1. Model-Free Variable Selection

Figure 3 shows a pair plot of the cross-correlation between the selected predictive variables for the full time period of study, 1990–2020. From the figure, it can be seen that temperature shows a relatively high correlation with specific humidity, potential evaporation, and longwave radiation flux downwards. Specific humidity additionally showed a good correlation with above-ground convective available potential energy and longwave radiation flux downwards. Shortwave radiation flux downwards displayed a fairly good correlation with potential evaporation. These correlation patterns between variables held true not only for the full time period but for the pre-planning and post-planning periods as well (see Appendix A for cross-correlation pair plots for each period). Similar patterns of occurrence between variables can indicate similar potential efficiency in flood prediction, making some of these variables candidates for removal in order to reduce redundancies before inputting data into the ANN. However, none of the predictive variables showed a good correlation with the target variable, discharge, as evidenced in Figure 4. The correlation coefficient (r) is a measure of the relationship between two variables and exists on a scale from -1 to 1 ; 1 represents perfect positive correlation, -1 represents perfect negative correlation, and 0 indicates no correlation. All correlation coefficients found for the SCW data between the predictive variables and target variable were within ± 0.2 of zero, indicating a very poor correlation. For both the full period and the post-planning period, precipitation was the most closely correlated variable to discharge, with r values of only 0.16 and 0.18 , respectively. The most highly correlated variable in the pre-planning period was the fraction of total precipitation that is convective, with an r value of 0.14 . Due to the low across-the-board low correlations, it was decided that all variables would be carried over to the ANN phase of variable selection instead of eliminating variables with low target correlations or selected variables with close cross-correlations.

3.2. Model-Based Variable Selection

The ANN was initially trained, validated, and run for all three time periods with all variables included as inputs in order to determine reference KGE values for model performance. The resulting reference KGEs for the total time period, pre-planning period, and post-planning period were 0.3624 , 0.1740 , and 0.5666 , respectively. The components of the KGE score—correlation (r), bias ratio (β), and variability ratio (α)—for the total time period were 0.5103 , 0.9037 , and 0.6033 , respectively. For the pre-planning period, r was 0.4397 , β was 0.8876 , and α was 0.4036 . For the post-planning period, r , β , and α were 0.6891 , 0.7573 , and 0.8204 , respectively.

Following the determination of the reference KGEs, the leave-one-out process was then conducted with the model for each time period, and the percent change in model performance from the reference KGE was recorded for each trial. Figure 5 displays these percentage changes. In both the full period and the post-planning period, there were no instances of variable removal improving model performance. However, the pre-planning period showed four instances of model performance improving with the removal of certain variables. For the full period, the three greatest performance drops resulted from the removal of snow water equivalent (-104.64%), shortwave radiation flux downwards (-102.98%), and specific humidity (-97.05%). The post-planning period saw its three greatest model performance drops from the removal of shortwave radiation flux downwards (-102.54%), precipitation (-97.49%), and specific humidity (-91.86%). The pre-planning period saw model performance improvement with the removal of temperature, poten-

tial evaporation, convective available potential energy, and meridional wind speed, the highest of which was potential evaporation (34.14%). The largest performance drop in the pre-planning period was due to the removal of groundwater level (−96.72%).

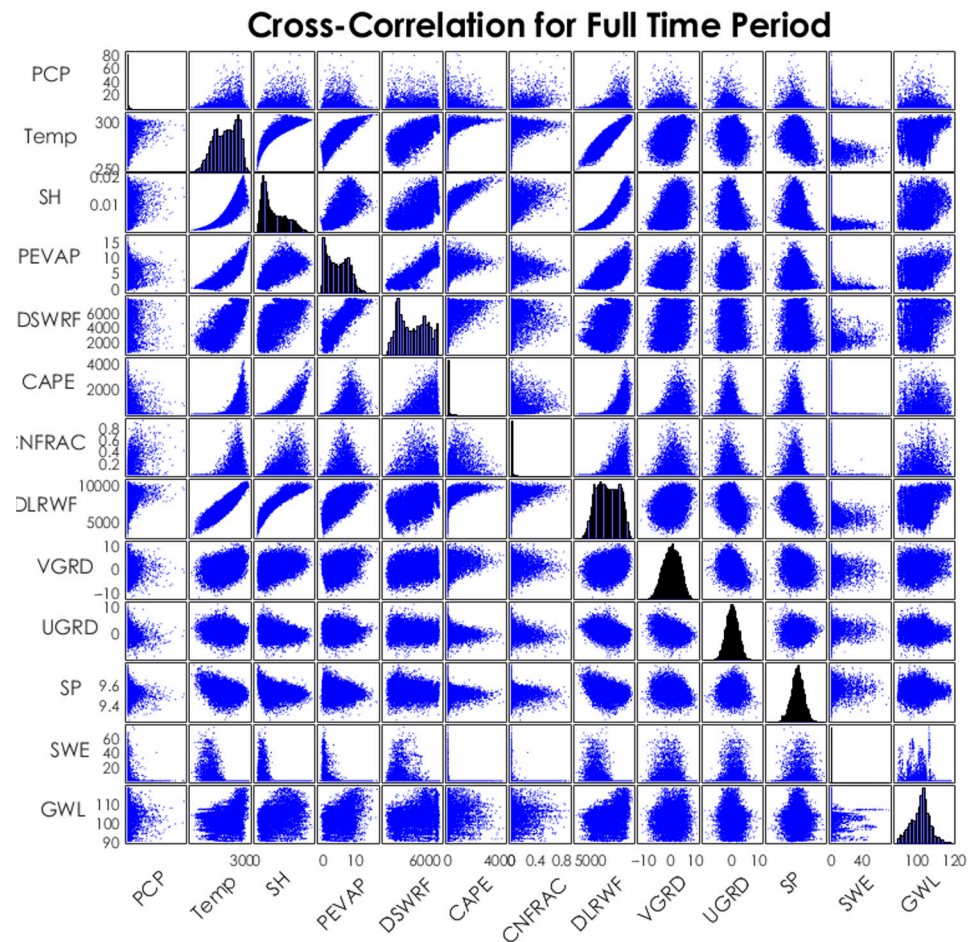


Figure 3. Cross-correlation pair plot for all 13 predictive variables over the full time period.

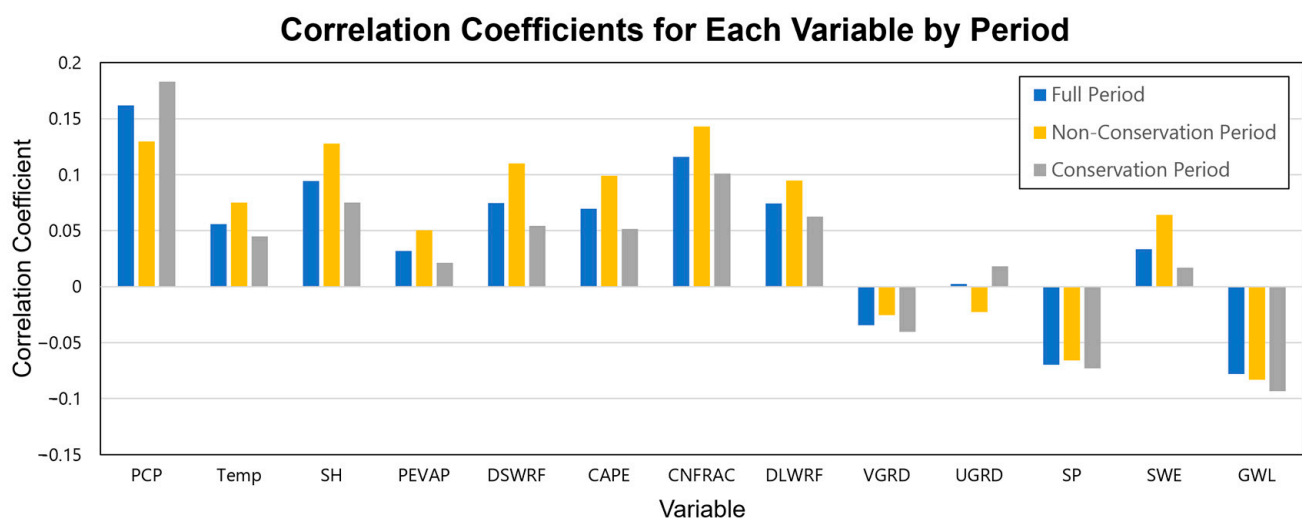


Figure 4. Correlation coefficients between each variable and the target variable by time period.

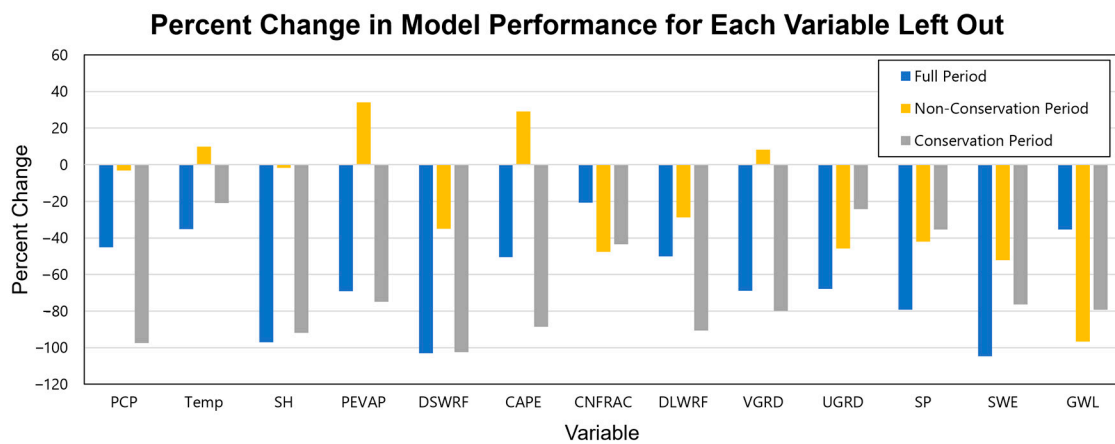


Figure 5. Percent change in model performance by time period due to each variable left out.

3.3. Flood Frequency Analysis

Computed streamflow and their corresponding return periods for both the full period and pre-planning period are shown in Figure 6. For each return period, computed curve flow is consistently higher for the full period flood frequency analysis than the pre-planning period flood frequency analysis, with the exception of the 2-year return period.

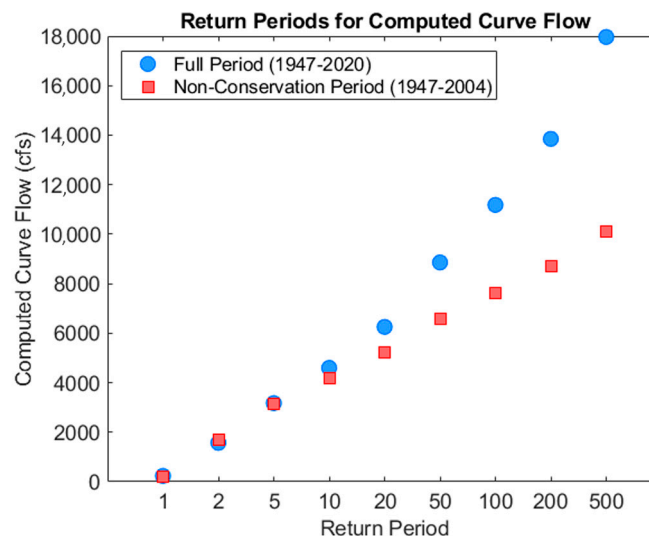


Figure 6. Return periods for the computed curve flows of the full period and the non-conservation period.

Flood frequency analysis for the post-planning period was not included in this analysis as the post-planning period only extends 15 years, which is too short of a time span to produce reliable flood frequency results. To see flood frequency analysis results for the post-planning period and two halves of the pre-planning period, as well as tabulated results for the flood frequency analysis, see Appendix B.

3.4. Drought Analysis

Figure 7 shows the 1-month, 3-month, 6-month, and 12-month SPI values for SCW plotted over time from 1982–2020 (See Appendix C for each SPI timescale plotted individually). From the 12-month SPI, moderate wet periods can be seen during 1984, 1987, 1994, 1995, 2010, 2011, 2016, and 2019. Severe wet periods were observed in 1983, 1993, 1999, 2007, and 2008 (which reached extreme levels mid-year). Moderate dry periods can be seen during 1991, 1997, 2002, and 2014, severe dry periods occurred during 1988, 2000, and 2020, and extremely dry periods took place in 1989, 1990, and from the end of 2012 to the beginning

of 2013. From the 3-month SPI, one can speculate some patterns of dryer soil moisture conditions in winter, and wetter conditions in spring, summer, and fall. However, summer soil moisture occasionally drops, so spring and fall appear to show more consistently moist conditions. Wet and dry periods indicated by the drought analysis were used for deeper understanding and discussion of individual variable prediction efficacy in Section 4.1.

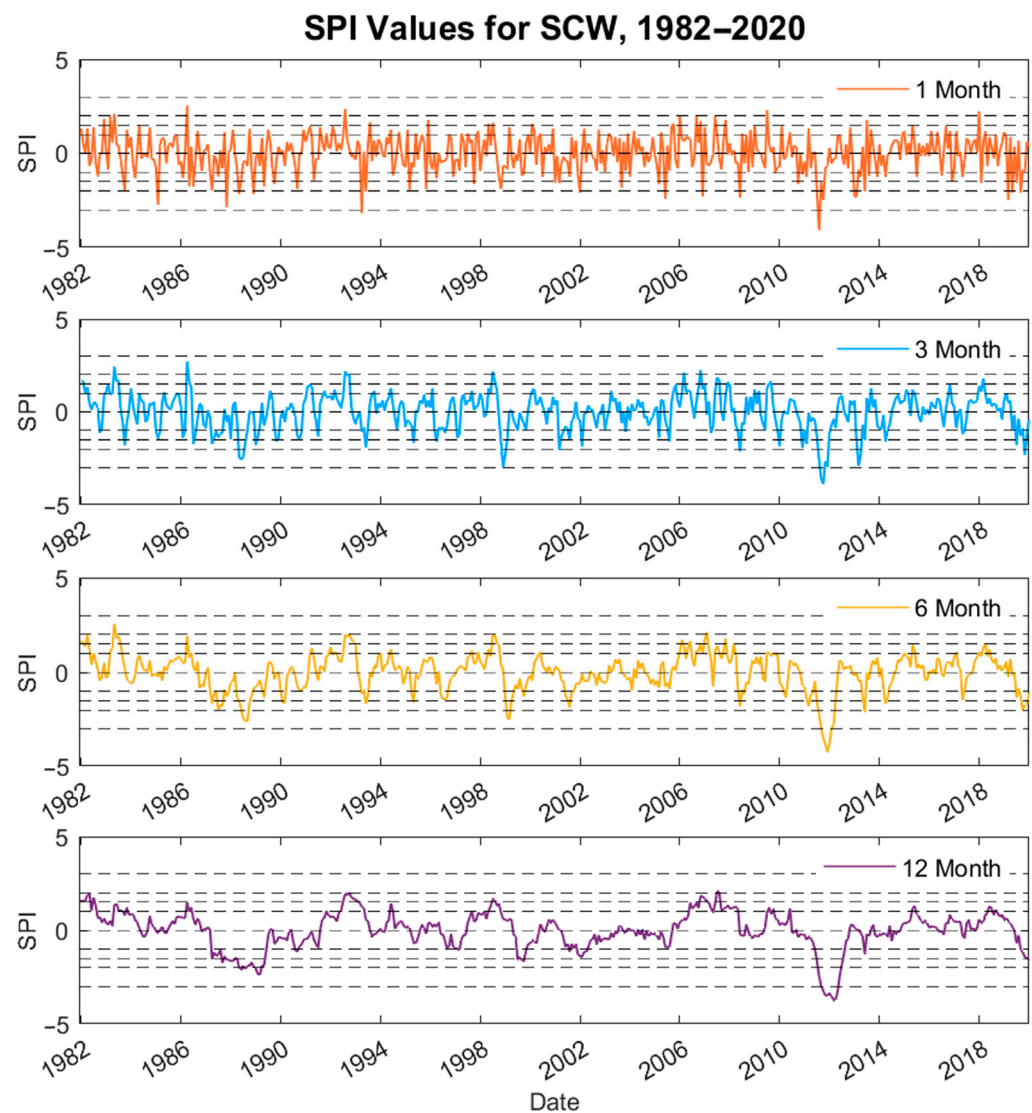


Figure 7. 1-month, 3-month, 6-month, and 12-month SPI values for SCW plotted over time from 1982–2020.

4. Discussion

4.1. Individual Variable Prediction Efficacy

Individual variable prediction efficacy was primarily determined through analysis of the correlation coefficients for each variable found in Section 3.2 of Results. The low across-the-board correlation between predictive variables and the target variable, discharge, suggests that no one factor (of those included in this study) is a good indicator of flooding. However, if one were to select for the highest individual variable prediction efficacy, precipitation is the variable most tied to discharge in SCW. Precipitation saw the highest correlation with discharge for the full period and post-planning period and was the second most correlated variable for the pre-planning period after the fraction of precipitation that is convective, another precipitation-related statistic.

The precipitation-to-discharge relationship is also supported by the SPI results found in the drought analysis. For example, from the 12-month SPI, one can see multiple instances of marked wet periods coinciding with past floods. Major examples include 1982, 1993, and 2008: 1982 had peak SPI values above 1.5 (well within the wet range) and 2 large floods; 1993 had major flooding and showed a sharp increase in SPI (and therefore precipitation) mid-year that reached into the moderately wet range ($SPI > 2$); 2008 had an SPI value that reached the moderately wet range, and had an annual peak flow that is the highest of those on record. However, there were also some cases where flooding coincided with dry or average moisture periods, so the SPI results were fairly consistent with the low precipitation–discharge relationship observed in the model-free variable selection.

One variable not considered in this study was soil moisture, however results of the drought analysis suggest that this variable be taken into account for flood prediction in future studies. The majority of flooding in SCW takes place during spring and summer [7], and according to results from the 3-month SPI, spring and summer in SCW typically have higher soil moisture levels than winter. This suggests a potential correlation between discharge and soil moisture, though that relationship should be validated with data and cannot be confirmed from the results of this research.

4.2. Model Prediction

The across-the-board low variable-target correlations found in this study could have the implication that a combination of factors is the more reliable route for discharge prediction. Indeed, from the ANN leave-one-out analysis results detailed in Section 3.2, it can be seen that model prediction performance is better when all 13 predictive variables are included as inputs (with the exception of the pre-planning period), as shown in Figure 6. Since the full-period and post-planning period models showed performance drops solely with the removal of variables, their final and most successful versions included all input variables. For the full period, the best model included 32 hidden neurons and had a KGE value of 0.36. The best model for the post-planning period had 45 neurons in the hidden layer and a KGE of 0.57. For the pre-planning period, performance increased slightly with the individual removal of certain variables; however, the removal of combinations of multiple variables again resulted in decreased performance. Thus, the pre-planning period model with the highest performance was simply the one that excluded potential evaporation—the variable that caused the greatest performance increase when left out—and included all other input variables. This pre-planning model had 11 hidden neurons and a KGE of 0.23.

The KGE values for these models indicate functional prediction performance of varying degrees of acceptability, as all final model KGEs were positive. Of these final proposed models, the post-planning period model showed the best relative performance as its KGE value of 0.57 was closest to 1. The low variable-target correlations of the input variables used in the models justify acceptance of this 0.57 KGE value for the post-planning period as satisfactory performance. To increase the robustness of the model, more data would be needed for both before and after the initiation of conservation practices in the watershed.

4.3. Changes in Flood Intensity

Comparison between the results of the flood frequency analysis of the full period and the pre-planning period (from Section 3.3) allows for insight into patterns of flood frequency and magnitude during the post-planning period. From the examination of higher-probability flows (those with lower return periods) for both periods, it can be seen that the full period has lower corresponding streamflow values than the pre-planning period, indicating that more common flows have decreased in magnitude during the post-planning period. However, for lower-probability flows (those with higher return periods), differences between corresponding flow values for the full period and the pre-planning period become increasingly pronounced, with the full period having higher flow values for return periods greater than 2 years. This indicates a marked increase in the

magnitude of extreme flows during the post-planning period. These anomalous, high-magnitude flows could potentially be attributed in part to climate intensification, as was the case with the 2019 flood. In the Midwest, climate change has been linked to increased annual precipitation and higher intensity rainstorms [26], which in turn could contribute to increased flooding. In fact, increased precipitation in the region is projected to drive 10–30% increases in 100-year peak daily streamflows by the 2080s [27]. Historical data further support the possibility that climate change may be linked to increased peak flow magnitudes, as analysis of 100 years of US watershed data has brought to light increases in flooding in the northern eastern prairies and parts of the Midwest, particularly over recent decades [28].

The findings of the flood frequency analyses comparison are supported by Figure 8; Figure 8a shows annual peak flows and their 15-year moving average for SCW. Figure 8b shows the same SCW peak flow data, but with outliers above 4000 cfs, or 113.27 m³/s, reduced to 4000 cfs in order to more closely examine the typical behavior of streamflow by minimizing added variability from very high extremes. From Figure 8a, instances of abnormally high magnitude flows during the post-planning period can be observed, consistent with the notably increasing difference between computed flows for the full period and pre-planning period in the flood frequency analysis. Conversely, the 15-day average for the modified dataset in Figure 8b shows an overall downward trend in annual peak flow during the post-planning period, consistent with the implications of the lower streamflow values corresponding to lower return periods in the full period flood frequency analysis. In the early post-planning period, this downward trend is very mild, but it becomes more pronounced starting roughly 10 years after the advent of the post-planning period in 2005. During the 10 years immediately prior to the post-planning period, peak flows appeared to have stabilized at just above 2000 cfs, or 56.63 m³/s, before which could be observed an increasing trend in peak flows. The period of stabilization beginning in the 1990s could be explained by the preliminary conservation practices that began in the early 1990s, prior to the 2005 Shell Creek Watershed Management Plan. This trend of flood peak stabilization and subsequent decrease, with the exception of some high outliers later in the record, suggests that the conservation practices implemented beginning in the early 1990s and adopted more widely in 2005 through the SCW Management Plan may have had an impact on attenuating flood peaks, while climate change may be playing a role in intensifying flood peaks. Further research is necessary to disentangle the impacts of conservation practices and climate change on the watershed.

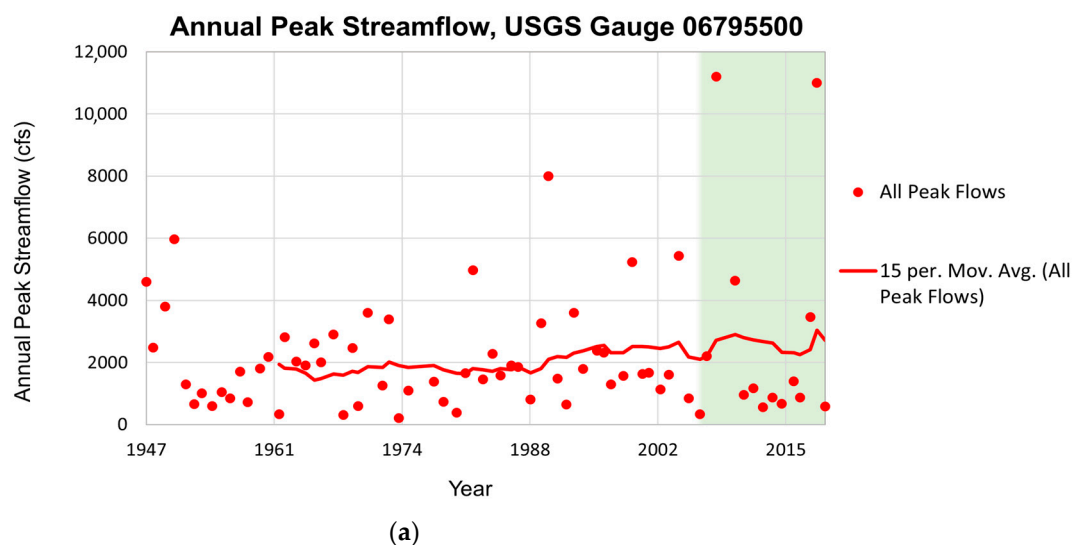


Figure 8. Cont.

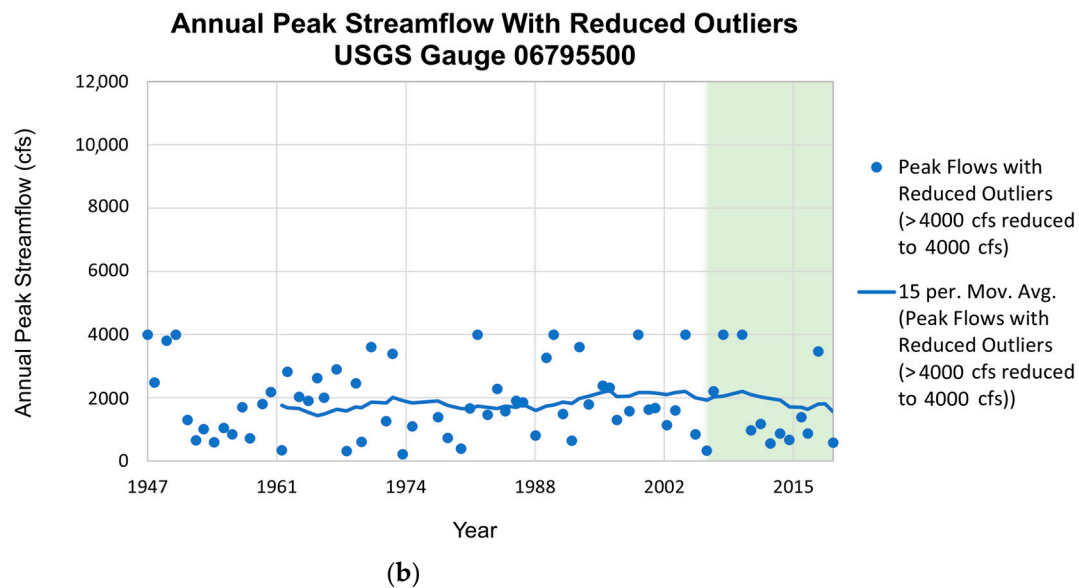


Figure 8. Unmodified and modified peak flow data for SCW, with the green section of each graph indicating the years of the post-planning period. (a) Annual peak flow data for SCW are plotted in red points. The 15-year moving average for the data is indicated by a red line. (b) Annual peak flow data for SCW with outliers above 4000 cfs reduced to 4000 cfs is plotted above in blue points. The blue line indicates the 15-year moving average for the modified peak streamflow data.

5. Conclusions

In this study, Shell Creek Watershed was examined in order to identify the respective influence of selected controlling factors on the hydrology of the catchment, improve understanding of hydrological processes there, and develop an effective rainfall-runoff model for the watershed using ANN. An additional intention of the work was to identify any possible relationship between changes in flood severity and the implementation of conservation practices. Variable selection was broken into three time periods determined by the start of widespread conservation practice implementation in SCW: the full time period (1990–2020), the pre-planning period (1990–2004), and the post-planning period (2005–2020). Model-free and model-based variable selection were used to identify variable influence on flooding, following which ANN rainfall-runoff models were developed using the optimal combination of input variables for each period. Additionally, drought and flood frequency analyses were conducted to improve hydrological understanding of the watershed. Their results contributed to analyses of the efficacy of certain variables in discharge prediction and the identification of changes in peak flow trends.

From the results and analysis of this work, several conclusions can be drawn, as well as some suggestions for future study. In terms of individual variable predictability, our results suggest that of the variables considered, precipitation is most tied to flooding in SCW. However, the correlation between precipitation and discharge for SCW is still quite low, so dependence solely on this factor for discharge prediction is discouraged. Instead, a combination of all variables is encouraged for this purpose. Out of all of the models developed in this study, the model for the post-planning period more closely reflects the current conditions of the watershed and has overall good prediction performance, making it the strongest candidate for discharge prediction in SCW. This model included all variables used in this study as inputs; however, future work may benefit from the investigation and inclusions of soil moisture, as the 3-month SPI results implied cases of high soil moisture coinciding with flooding. With regard to the relationship between flood-change and conservation implementation, flooding has seen an overall decrease in intensity during the post-planning period (with the exception of a few outliers); however, more intensive investigation is warranted to determine a cause for this trend. Furthermore, the

incorporation of climate change effects on SCW in such future studies may aid in shedding light on flood trend shifts and the appearance of anomalous flows. Understanding the potentially countering effects of climate change and conservation practices on flooding is crucial to advancing our fundamental understanding of the hydrological processes in the basin. This will require a more in-depth investigation with high-resolution remote sensing datasets and advanced hydrologic modeling.

Author Contributions: Conceptualization, A.A. and T.R.; methodology, A.A. and T.R.; software, A.A. and T.R.; formal analysis, A.A.; investigation, A.A.; resources, A.A. and T.R.; data curation, S.R.K. and I.K.; writing—original draft preparation, A.A.; writing—review and editing, A.A., S.R.K., I.K., J.E., E.T. and T.R.; visualization, A.A.; supervision, T.R.; funding acquisition, A.A. and T.R. All authors have read and agreed to the published version of the manuscript.

Funding: Funding for Annushka Aliev was provided in part by the National Science Foundation (Award EEC-1950597; Title: REU Site: Sustainability of Horizontal Civil Networks in Rural Areas). Tirthankar Roy acknowledges funding from the Nebraska Department of Environment and Energy (EPA Grant 9007403-29, Title: Impacts of conservation practices on the water quality and quantity in the Shell Creek Watershed, Nebraska).

Data Availability Statement: Publicly available datasets were analyzed in this study. The NLDAS-2 data presented in this study is openly available in NLDAS Primary Forcing Data L4 Hourly 0.125×0.125 degree V002 at 10.5067/6J5LHHOHZHN4. The NWIS data can be found here: <https://maps.waterdata.usgs.gov/mapper>, accessed on 1 November 2022. The USGS data can be found here: https://waterdata.usgs.gov/ne/nwis/uv/?site_no=06795500. The NSIDC can be found here: <https://nsidc.org/data/NSIDC-0719/versions/1>, accessed on 1 November 2022.

Acknowledgments: Special thanks to Mark Seier, Gene Wissenburg, and Matt Bailey for their help and enthusiasm in connecting us with background information about SCW and touring us around the watershed. We thank Chris Poole from the Lower Platte North Natural Resources District for his help in creating Figure 1.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

This appendix includes cross-correlation plots with all input variables included for all three time periods of study.

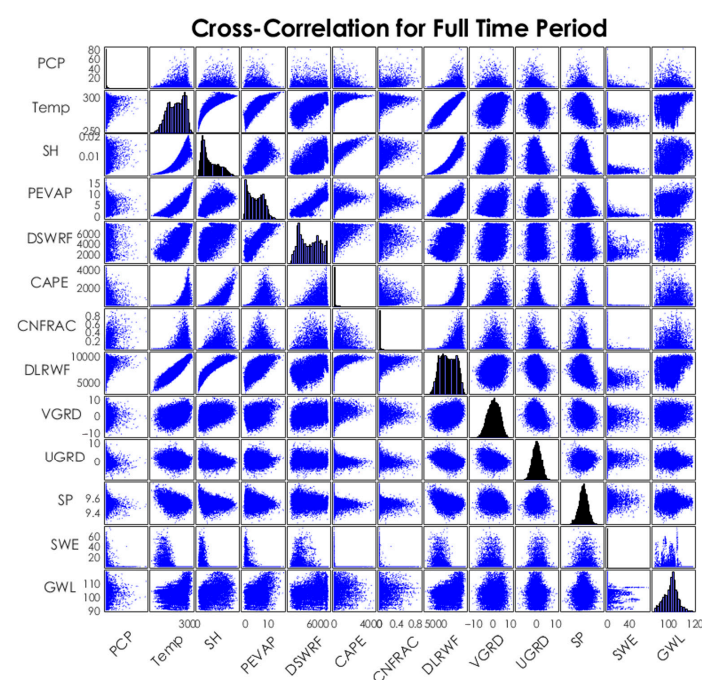


Figure A1. Cross-correlation pair plot for all 13 predictive variables over the full time period (1990–2020).

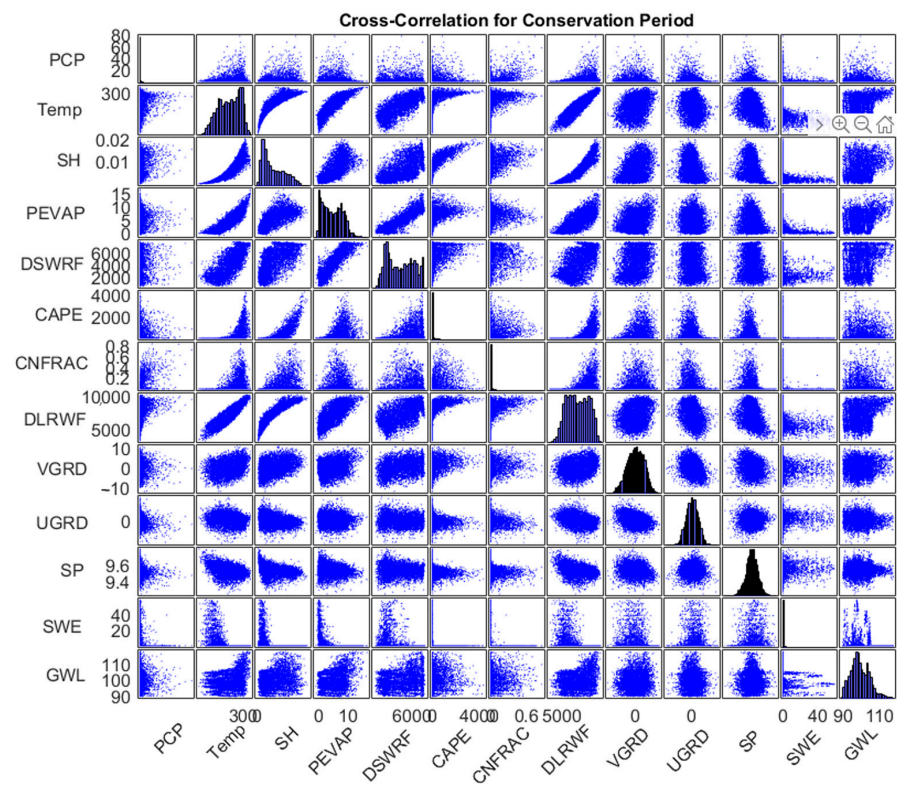


Figure A2. Cross-correlation pair plot for all 13 predictive variables over the conservation period (2005–2020).

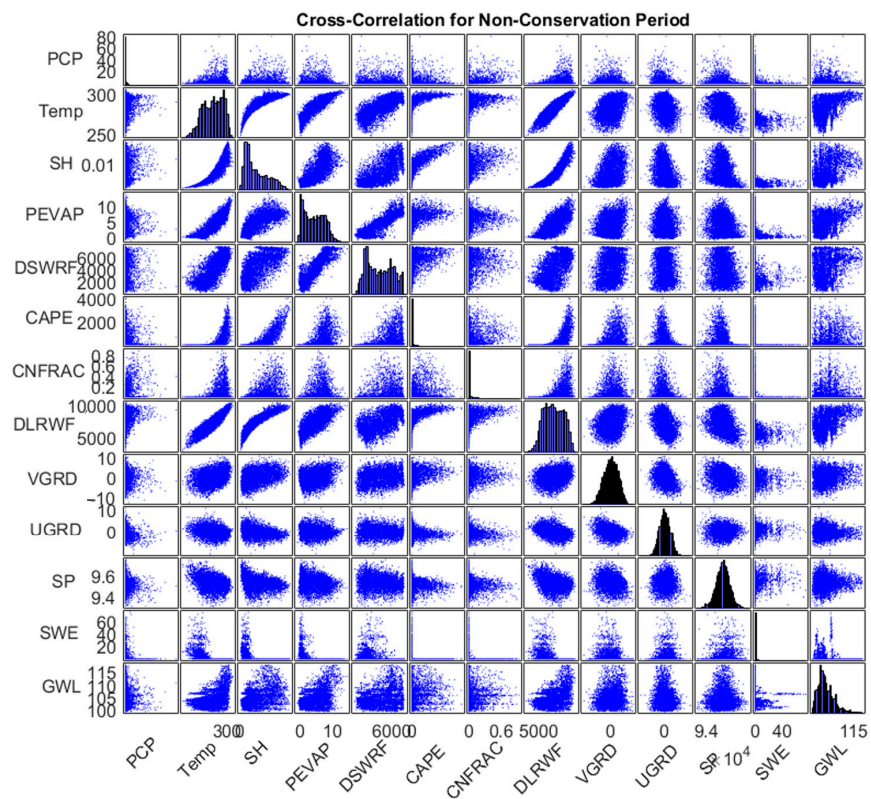


Figure A3. Cross-correlation pair plot for all 13 predictive variables over the non-conservation period (1990–2004).

Appendix B

This appendix includes flood frequency analysis results for the post-planning period and two halves of the pre-planning period, as well as tabulated results for flood frequency analysis.

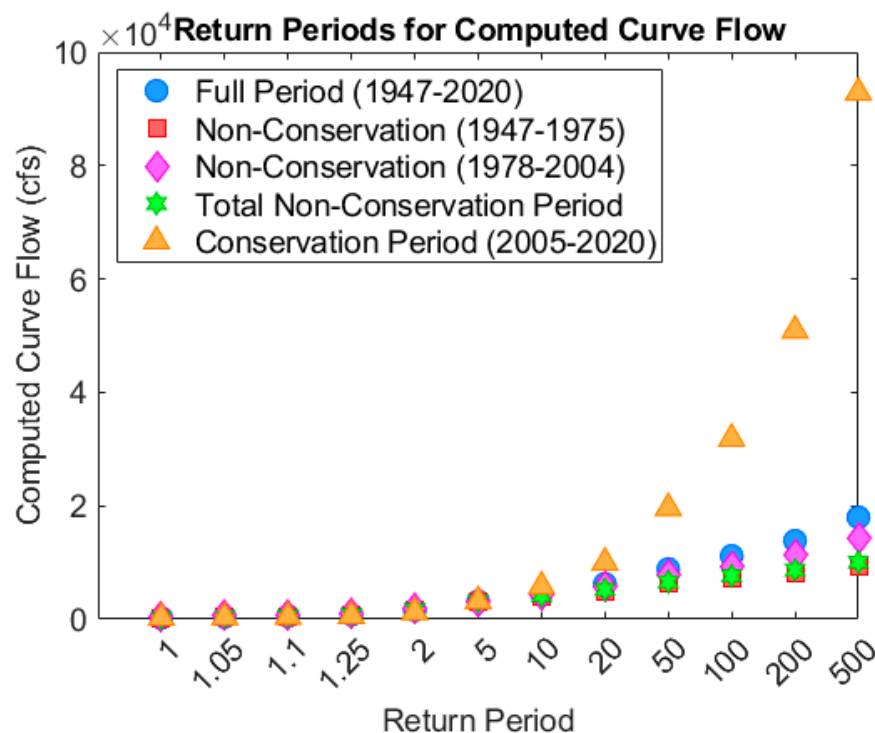


Figure A4. Flood frequency analysis results for 5 different time periods: The full period (1947–2020), the total non-conservation period (1947–1975), the first half of the non-conservation period (1947–1975), the second half of the non-conservation period (1978–2004), and the conservation period (2005–2020). Peak flow data was missing for the years 1976 and 1977, accounting for the break between the two non-conservation time periods.

Table A1. Return periods and their corresponding computed curve flows for the full time period, total pre-planning period, and the post-planning period.

Full Time Period		Total Pre-Planning Period		Post-Planning Period	
Return Period	Computed Curve Flow (cfs)	Return Period	Computed Curve Flow (cfs)	Return Period	Computed Curve Flow (cfs)
1	259.9	1	214.2	1	259.9
1.05	354	1.05	420.2	1.05	354
1.1	436.4	1.1	588.5	1.1	436.4
1.25	588.9	1.25	867.2	1.25	588.9
2	1222.1	2	1713.5	2	1222.1
5	3181.5	5	3136.1	5	3181.5
10	5783.7	10	4177.3	10	5783.7
20	9990	20	5216.1	20	9990
50	19,604.1	50	6594.8	50	19,604.1
100	31,838.9	100	7643.1	100	31,838.9
200	50,899.6	200	8695.1	200	50,899.6
500	92,883.2	500	10,088.9	500	92,883.2

Table A2. Return periods and their corresponding computed curve flows for the two halves of the pre-planning period.

Pre-Planning Period (1947–1975)		Pre-Planning Period (1978–2004)	
Return Period	Computed Curve Flow (cfs)	Return Period	Computed Curve Flow (cfs)
1	146.2	1	396.5
1.05	322.7	1.05	610.1
1.1	476	1.1	771.2
1.25	739.5	1.25	1028.5
2	1571.1	2	1807.7
5	2985	5	3232.6
10	4002.8	10	4410.9
20	4995.7	20	5722.3
50	6274	50	7700.4
100	7214.6	100	9407.8
200	8131.1	200	11,318.9
500	9303.8	500	14,192.1

Appendix C

This appendix contains the 1-month, 3-month, 6-month, 12-month, and combined SPI results expanded and plotted in individual figures.

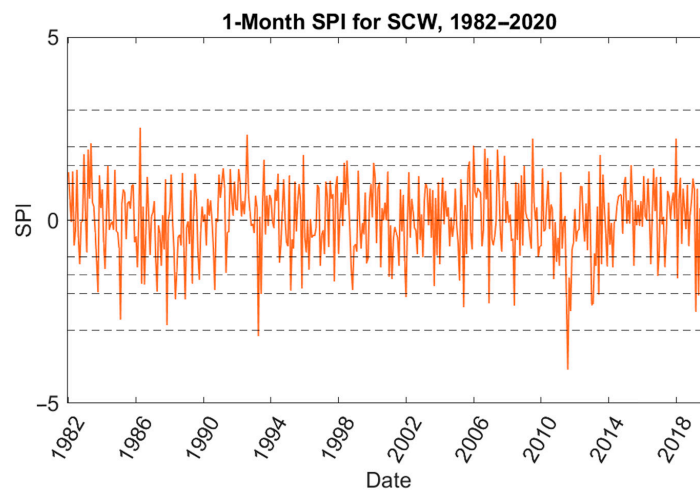


Figure A5. 1-Month SPI from 1982 to 2020.

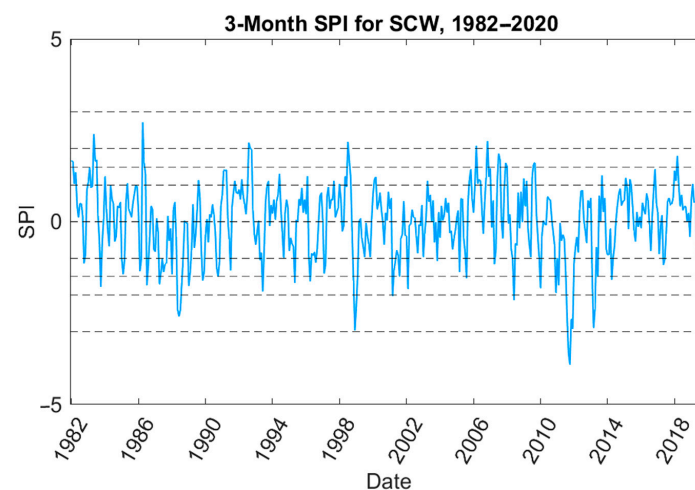


Figure A6. 3-Month SPI from 1982 to 2020.

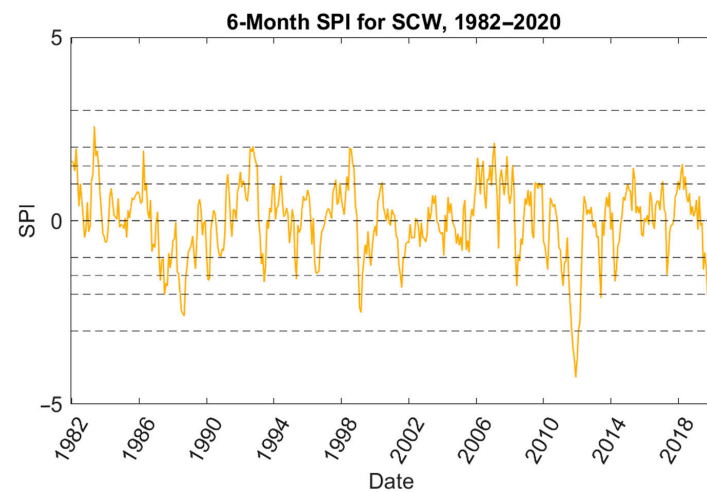


Figure A7. 6-Month SPI from 1982 to 2020.

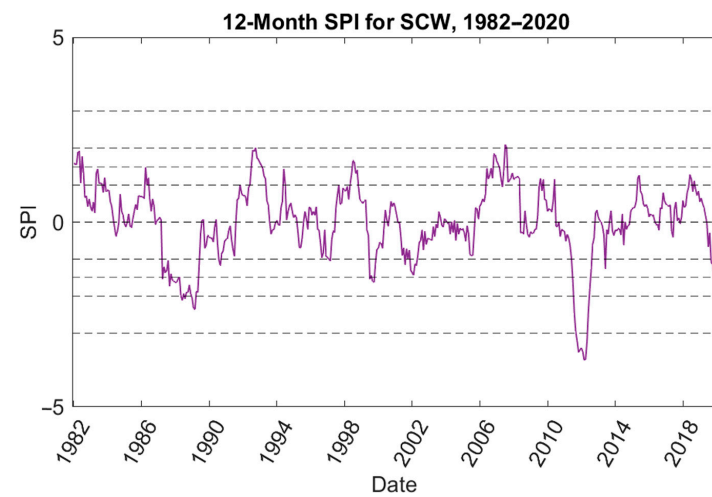


Figure A8. 12-Month SPI from 1982 to 2020.

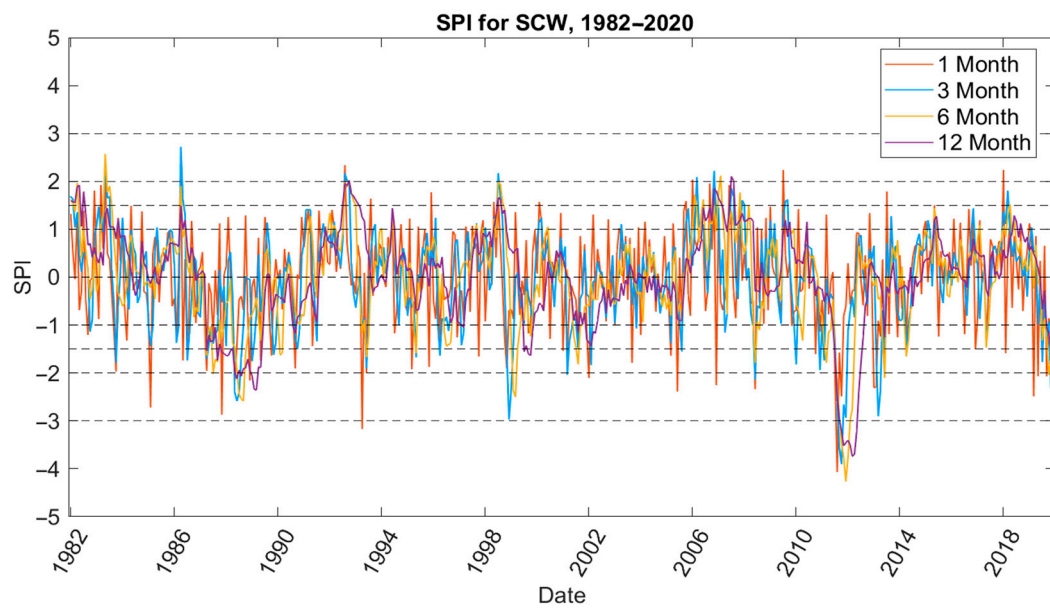


Figure A9. 1-, 3-, 6-, and 12-Month SPI from 1982 to 2020 plotted on the same axes.

Appendix D

This appendix includes some information about the current state of flood forecasting in the basin.

SCW's floodplains have been recorded and made publicly available on the Nebraska Department of Natural Resources (NeDNR) Floodplain Management Interactive Map, which can be found at the following link: <https://gis.ne.gov/portal/apps/webappviewer/index.html?id=7bc8738d3d8f4e87823cc604543b7ddf>, accessed on 1 November 2022.

Forecasting takes place primarily at Shell Creek near Columbus, NE, as that is the only gauge that provides daily streamflow data to date. River forecasts in this location rely on past precipitation and predicted precipitation amounts for the 48 h following the time of issuance for the forecast. Forecasts are only issued as needed during times of high water, and thus are not routinely available [7].

Information about data and measurements taken at the USGS 06795500 Shell Creek near Columbus, Nebraska stream site can be found at the following link: https://waterdata.usgs.gov/nwis/inventory?agency_code=USGS&site_no=06795500 (accessed on 9 November 2022).

References

1. NWS. Flooding in Nebraska. National Weather Service. 13 October 2020. Available online: <https://www.weather.gov/safety/flood-states-ne> (accessed on 28 June 2021).
2. Flanagan, P.X.; Mahmood, R.; Umphlett, N.A.; Haacker, E.; Ray, C.; Sorensen, W.; Shulski, M.; Stiles, C.J.; Pearson, D.; Fajman, P. A Hydrometeorological Assessment of the Historic 2019 Flood of Nebraska, Iowa, and South Dakota. *Bull. Am. Meteorol. Soc.* **2020**, *101*, E817–E829. [\[CrossRef\]](#)
3. Salter, P. 'Just a Terrible Mess'—Ranchers, Farmers Left with Dead Animals, Flooded Fields, Work to Be Done; Journal Star: Lincoln, NE, USA, 2019.
4. Ducey, M. 'An Utter Disaster': Ag Losses from Nebraska Flooding Could Top \$1 Billion; Omaha World-Herald: Omaha, NE, USA, 2019.
5. Holman, K.D. Characterizing Antecedent Conditions Prior to Annual Maximum Flood Events in a High-Elevation Watershed Using Self-Organizing Maps. *J. Hydrometeorol.* **2018**, *19*, 1721–1730. [\[CrossRef\]](#)
6. NDEE. *Shell Creek Watershed Environmental Enhancement Plan*; Nebraska Department of Environment and Energy: Lincoln, NE, USA, 2016.
7. NWS. National Weather Service Advanced Hydrologic Prediction Service. Advanced Hydrologic Prediction Service. Available online: <https://water.weather.gov/ahps2/hydrograph.php?gage=clbn1&wfo=oax> (accessed on 22 June 2021).
8. Govindaraju, R.S. Artificial Neural Networks in Hydrology. II: Hydrologic Applications. *J. Hydrol. Eng.* **2000**, *5*, 124–137.
9. Dawson, C.; Wilby, R.L. Hydrological modelling using artificial neural networks. *Prog. Phys. Geogr. Earth Environ.* **2001**, *25*, 80–108. [\[CrossRef\]](#)
10. Sahoo, S.; Jha, M.K. Groundwater-level prediction using multiple linear regression and artificial neural network techniques: A comparative assessment. *Hydrogeol. J.* **2013**, *21*, 1865–1887. [\[CrossRef\]](#)
11. Hsu, K.-L.; Gupta, H.V.; Sorooshian, S. Artificial Neural Network Modeling of the Rainfall-Runoff Process. *Water Resour. Res.* **1995**, *31*, 2517–2530. [\[CrossRef\]](#)
12. French, M.N.; Krajewski, W.F.; Cuykendall, R.R. Rainfall forecasting in space and time using a neural network. *J. Hydrol.* **1992**, *137*, 1–31. [\[CrossRef\]](#)
13. Jain, A.; Roy, T. Evaporation modelling using neural networks for assessing the self-sustainability of a water body. *Lakes Reserv. Res. Manag.* **2017**, *22*, 123–133. [\[CrossRef\]](#)
14. Roy, T.; Schütze, N.; Grundmann, J.; Brettschneider, M.; Jain, A. Optimal groundwater management using state-space surrogate models: A case study for an arid coastal region. *J. Hydroinform.* **2016**, *18*, 666–686. [\[CrossRef\]](#)
15. Rajurkar, M.; Kothiyari, U.; Chaube, U. Modeling of the daily rainfall-runoff relationship with artificial neural network. *J. Hydrol.* **2004**, *285*, 96–113. [\[CrossRef\]](#)
16. Mockus, V.; Werner, J.; Woodward, D.E.; Nielson, R.; Dobos, R.; Hjelmfelt, A.; Hoeff, C.C. Chapter 7: Hydrologic Soil Groups. In *National Engineering Handbook Part 630 Hydrology* (pp. 7–2–7–2). *Essay*; United States Department of Agriculture, Natural Resources Conservation Service: Washington, DC, USA, 2009.
17. LPNNRD. 2009 Lower Platte North Natural Resources District Hydrogeologic Evaluation and Subarea Delineation Study. Olsson Associates: 2009. Available online: https://www.enwra.org/media/LPN_Subarea%20Delineation%20Report%20Final.pdf (accessed on 1 November 2022).
18. NDEE. *Total Maximum Daily Loads for Shell Creek: LP1-20700, Atrazine*; Water Quality Planning Unit, Water Quality Division, Nebraska Department of Environmental Quality: Lincoln, NE, USA, 2007.
19. Hill, E.; TePoel, D. Nebraska's Shell Creek Watershed Makes History for Successful Water Clean-Up Efforts. LPNNRD. Available online: https://lpnnrd.org/wp-content/uploads/2018/08/Shell_Creek_Press_Release.pdf (accessed on 1 November 2022).

20. Traylor, E.; McCullough, C. Shell Creek Watershed: A Tough Nut to Crack. NDEE. 2018. Available online: <http://neiwpc.org/wp-content/uploads/2018/11/McCullough-Shell-Creek-A-Tough-Nut-to-Crack-NPS-Workshop-Final-10-26.pdf> (accessed on 1 July 2021).
21. Xia, Y.; Al, E. NCEP/EMC (2009), NLDAS Primary Forcing Data L4 Hourly 0.125×0.125 degree V002, Edited by David Mocko, NASA/GSFC/HSL, Greenbelt, Maryland, USA, Goddard Earth Sciences Data and Information Services Center (GES DISC). Available online: <https://doi.org/10.5067/6j5lhohzhn4> (accessed on 1 November 2022).
22. Xia, Y.; Mitchell, K.; Ek, M.; Sheffield, J.; Cosgrove, B.; Wood, E.; Luo, L.; Alonge, C.; Wei, H.; Meng, J.; et al. Continental-scale water and energy flux analysis and validation for the North American Land Data Assimilation System project phase 2 (NLDAS-2): 1. Intercomparison and application of model products. *J. Geophys. Res. Atmos.* **2012**, *117*, 25. [CrossRef]
23. Broxton, P.; Zeng, X.; Dawson, N. Daily 4 km Gridded SWE and Snow Depth from Assimilated In-Situ and Modeled Data Over the Conterminous US, Version 1. January 1982 to December 2020, 42°N, 99°W; 41°N, 96°W. Boulder, Colorado, USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. 2019. Available online: <https://doi.org/10.5067/0GGPB220EX6A> (accessed on 1 July 2021).
24. Gupta, H.V.; Kling, H.; Yilmaz, K.K.; Martinez, G.F. Decomposition of the mean squared error and NSE performance criteria: Implications for improving hydrological modelling. *J. Hydrol.* **2009**, *377*, 80–91. [CrossRef]
25. McKee, T.B.; Doesken, N.J.; Kleist, J. 1993: The relationship of drought frequency and duration of time scales. In Proceedings of the Eighth Conference on Applied Climatology, Anaheim, CA, USA, 17–23 January 1993; American Meteorological Society: Boston, MA, USA; pp. 179–186.
26. Harrington, S. Did Climate Change Cause Midwest Flooding? Yale Climate Connections. 2019. Available online: <https://yaleclimateconnections.org/2019/04/did-climate-change-cause-midwest-flooding/> (accessed on 1 November 2022).
27. Byun, K.; Chiu, C.-M.; Hamlet, A.F. Effects of 21st century climate change on seasonal flow regimes and hydrologic extremes over the Midwest and Great Lakes region of the US. *Sci. Total. Environ.* **2018**, *650*, 1261–1277. [CrossRef] [PubMed]
28. Peterson, T.C.; Heim, R.R., Jr.; Hirsch, R.; Kaiser, D.P.; Brooks, H.; Diffenbaugh, N.S.; Dole, R.M.; Giovannettone, J.P.; Guirguis, K.; Karl, T.R.; et al. Monitoring and Understanding Changes in Heat Waves, Cold Waves, Floods, and Droughts in the United States: State of Knowledge. *Bull. Am. Meteorol. Soc.* **2013**, *94*, 821–834. [CrossRef]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

Shell Creek Research Group

2023 Order Request

Newman Grove High School

Forestry Suppliers 205 West Rankin St Jackson, MS 39201 800-647-5368					
	Description	Item Number	Price	Quantity	Total
	Nitrate Test Kit	94834	\$66.95	4	\$267.80
	Phosphate Test Kit	94837	\$56.25	1	\$56.25
	pH Test Kit	94836	\$74.95	1	\$74.95
	Chest Waders	94507	\$122.25	1	\$122.25
	Chest Waders	94510	\$122.25	1	\$122.25
	1 ml pipettes	53891	\$7.25	5	\$36.25
Vernier 13979 SW Millikan Way Beaverton, OR 97005 1-888-837-6437 www.vernier.com					
	LabQuest 3	LABQ3	\$399.00	1	\$399.00
	Go Direct Optical Dissolved	GDX-ODO	\$359.00	1	\$359.00
	ODO Clamp	GDX-Clamp	\$14.00	1	\$14.00
	ODO Cap	GDX-ODO-CAP	\$79.00	2	\$158.00
				TOTAL	#####

Progress Report for Wahoo Creek Watershed Dams Sites



Lower Platte North NRD

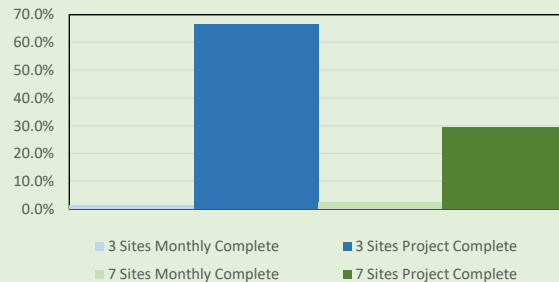
For Work Completed During The Month Of : **December, 2022**
(through 12/31/22)

Project # 018-3423 Dam Site 26A, 26B, &27 Project Phase	Phase Budget	Billings for Month		Project Total Billings to Date	
		Current Earned/Billings	% Completed This Month	JTD Earned/Billings	% Completed Overall
010 - Project Management/Meetings	\$ 23,213		0.0%	\$ 12,109.75	52.2%
020 - Geotechnical Engineering	\$ 224,493		0.0%	\$ 224,785.21	100.1%
030 - Dam Design	\$ 184,885	\$ 9,431.75	5.1%	\$ 168,732.62	91.3%
040 - Permitting	\$ 86,634		0.0%	\$ 35,774.94	41.3%
050 - Survey and Legal Descriptions	\$ 11,142		0.0%	\$ 23,636.47	212.1%
060 - Community/Public Participation	\$ -			\$ -	
070 - Construction Services	\$ 171,962			\$ 1,590.75	
				\$ -	
3 Sites Totals	\$ 702,329	\$ 9,431.75	1.3%	\$ 466,629.74	66.4%

Project # A18-3423 (separate invoice) Sites 55, 66, 77, 82, 84, 85, &86 Project Phase	Phase Totals	Billings for Month		Project Total Billings to Date	
		Current Earned/Billings	% Completed This Month	JTD Earned/Billings	% Completed Overall
100 - Project Management/Meetings	\$ 60,813	\$ 1,205.80	2.0%	\$ 25,704.88	42.3%
110 - Geotechnical Engineering	\$ 592,047	\$ 14,327.40	2.4%	\$ 352,680.66	59.6%
120 - Dam Design	\$ 425,202	\$ 21,535.21	5.1%	\$ 114,489.39	26.9%
130 - Permitting	\$ 244,810	\$ 4,407.20	1.8%	\$ 69,119.27	28.2%
140 - Survey and Legal Descriptions	\$ 28,165	\$ 1,341.94	4.8%	\$ 13,327.70	47.3%
150 - Community/Public Participation	\$ 30,000		0.0%	\$ 5,899.20	19.7%
160 - Other	\$ -			\$ -	
170- Construction Services	\$ 603,992			\$ -	
7 Sites Totals	\$ 1,985,029	\$ 42,817.55	2.2%	\$ 581,221.10	29.3%

Billings For Month	\$ 52,249.30
Total Billings To Date	\$ 1,047,850.84
Project Budget	\$ 2,687,358
Budget Remaining	\$ 1,639,507.16

% Budget Spent Per Site



Summary Of Work Completed This Month	
<u>Sites 26A, 26B, & 27</u>	<u>Sites 55,66,77,82,84,85, & 86</u>
-Principal spillway update -Speciations updates -NRCS comments updates for principal spillway and plunge pool -NEScap environmental report updates -Finalize geotechnical reports -Riser structural design	- H&H design and centerline layout -Geotechnical analysis for sites 55, 66, & 77 -Processing of collected survey information -Topo for Site 77 -Project Management -Triaxial testing for all sites -SITES reviews for auxiliary spillways -NeSCAP Scoring and Maps

Planned Work For Next Month	
<u>Site 26A, 26B, & 27</u>	<u>Sites 55, 66, 77, 82, 84, 85, & 86</u>
-Finishing up 90% submittal	-H&H design, centerline layout, and auxiliary spillway design -Geotechnical laboratory testing -Mitigation discussions and design -Topographic survey and picking up section corners

For questions regarding billings, please contact Andrew Phillips at (402) 440-8807 or aphillips@olsson.com

Invoice

olsson

601 P St Suite 200
PO Box 84608
Lincoln, NE 68501-4608
Tel 402.474.6311, Fax 402.474.5063

January 12, 2023
Invoice No: 445545

Ryan Chapman
Lower Platte North NRD
PO Box 126
Wahoo, NE 68066-0126

Invoice Total	\$42,817.55
----------------------	--------------------

Olsson Project # A18-34230 Lower Platte North NRD Wahoo Creek Watershed & 7 Dam Sites
Phase II

Professional services rendered December 4, 2022 through December 31, 2022 for work completed in accordance with agreement.

Phase 100 Sites 55 66 77 82 83 84 85 86 Project Management

Labor

	Hours	Amount
Principal	5.00	1,205.80
Totals	5.00	1,205.80
Total Labor		1,205.80

Billing Limits

	Current	Prior	To-Date
Total Billings	1,205.80	24,499.08	25,704.88
Limit			62,400.00
Balance Remaining			36,695.12

Total this Phase \$1,205.80

Phase 110 Geotechnical Engineering

Labor

	Hours	Amount
Assistant Engineer	.75	67.85
Technician	8.75	620.90
Principal	5.00	1,097.25
Project Professional	53.25	7,147.75
Assistant Professional	5.00	223.65
Totals	72.75	9,157.40
Total Labor		9,157.40

Unit Billing**Atterberg Limit**

1 Test @ \$95/Test	95.00
1 Tests @ \$95/Test	95.00
2 Tests @ \$95/Test	190.00

Dispersion - Pinhole

2 Test @ \$130/Test	260.00
---------------------	--------

INVOICE PAYMENT IS REQUESTED WITHIN 30 DAYS

Project	A18-34230	Lower Platte North NRD Wahoo Creek Water	Invoice	445545
---------	-----------	--	---------	--------

Dry Density Test				
1 Tests @ \$30/Test			30.00	
Moisture Content				
1 Tests @ \$20/Test			20.00	
One-Dimensional Consolidation Test				
1 Tests @ \$165/Test			165.00	
1 Tests @ \$165/Test			165.00	
1 Tests @ \$165/Test			165.00	
P-200 Sieve Test				
1 Tests @ \$45/Test			45.00	
Triaxial Comp Cons Drained-Intact				
1 Test @ \$1,925/Test			1,925.00	
Triaxial Comp Cons Undrained-Intact				
1 Test @ \$1,925/Test			1,925.00	
Unconfined Compress Strgth - Soils				
2 Tests @ \$45/Test			90.00	
Total Units			5,170.00	5,170.00

Billing Limits	Current	Prior	To-Date	
Total Billings	14,327.40	338,353.26	352,680.66	
Limit			607,460.00	
Balance Remaining			254,779.34	
		Total this Phase		\$14,327.40

Phase	120	Dam Design
-------	-----	------------

Labor				
		Hours	Amount	
Assistant Professional		165.50	15,804.45	
Designer		48.50	5,730.76	
Totals		214.00	21,535.21	
Total Labor				21,535.21

Billing Limits	Current	Prior	To-Date	
Total Billings	21,535.21	92,954.18	114,489.39	
Limit			436,278.00	
Balance Remaining			321,788.61	
		Total this Phase		\$21,535.21

Phase	130	Permitting
-------	-----	------------

Labor				
		Hours	Amount	
Assistant Professional		45.50	4,407.20	
Totals		45.50	4,407.20	
Total Labor				4,407.20

INVOICE PAYMENT IS REQUESTED WITHIN 30 DAYS

Project	A18-34230	Lower Platte North NRD Wahoo Creek Water	Invoice	445545
---------	-----------	--	---------	--------

Billing Limits	Current	Prior	To-Date	
Total Billings	4,407.20	64,712.07	69,119.27	
Limit			251,140.00	
Balance Remaining			182,020.73	
Total this Phase				\$4,407.20

Phase 140 Survey & Legal Descriptions

Labor	Hours	Amount	
Survey 2-Man Crew	8.50	786.68	
Survey Crew Support	8.50	472.01	
Totals	17.00	1,258.69	
Total Labor			1,258.69

Unit Billing			
Field Vehicle 1457	111.0 Miles @ 0.75	83.25	
Total Units		83.25	83.25

Billing Limits	Current	Prior	To-Date	
Total Billings	1,341.94	11,985.76	13,327.70	
Limit			28,875.00	
Balance Remaining			15,547.30	
Total this Phase				\$1,341.94

AMOUNT DUE THIS INVOICE \$42,817.55

Outstanding Invoices	Number	Date	Balance
	443248	12/19/2022	40,128.20
	Total		40,128.20

Authorized By: Andrew Phillips

INVOICE PAYMENT IS REQUESTED WITHIN 30 DAYS

Invoice**olsson**

601 P St Suite 200
PO Box 84608
Lincoln, NE 68501-4608
Tel 402.474.6311, Fax 402.474.5063

January 12, 2023
Invoice No: 445542

Ryan Chapman
Lower Platte North NRD
PO Box 126
Wahoo, NE 68066-0126

Invoice Total	\$9,431.75
----------------------	-------------------

Olsson Project # 018-34230 Lower Platte North NRD Wahoo Creek Watershed & 3 Dam Sites
Professional services rendered December 4, 2022 through December 31, 2022 for work completed in accordance with agreement.

Phase 030 Dam Design 26a, 26b, 27

Labor

	Hours	Amount	
Principal	4.50	734.18	
Assistant Professional	7.00	674.87	
Designer	23.50	2,776.76	
CAD Operator	68.25	5,245.94	
Totals	103.25	9,431.75	
Total Labor			9,431.75
Total this Phase			\$9,431.75

Billing Limits	Current	Prior	To-Date
Total Billings	9,431.75	457,197.99	466,629.74
Limit			702,329.00
Balance Remaining			235,699.26

AMOUNT DUE THIS INVOICE \$9,431.75

Outstanding Invoices

Number	Date	Balance
443247	12/19/2022	9,835.44
Total		9,835.44

Email invoice to: rchapman@lpnnrd.org

Authorized By: Andrew Phillips

INVOICE PAYMENT IS REQUESTED WITHIN 30 DAYS

Progress Report for Wahoo Creek Watershed Dams Sites



Lower Platte North NRD

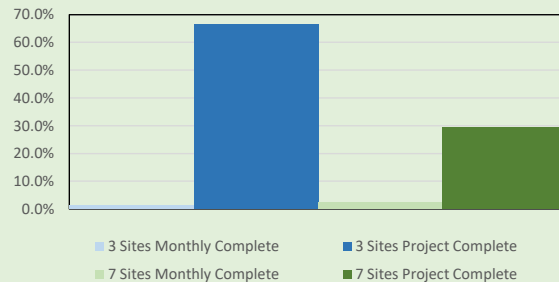
For Work Completed During The Month Of : **December, 2022**
(through 12/31/22)

Project # 018-3423 Dam Site 26A, 26B, &27 Project Phase	Phase Budget	Billings for Month		Project Total Billings to Date	
		Current Earned/Billings	% Completed This Month	JTD Earned/Billings	% Completed Overall
010 - Project Management/Meetings	\$ 23,213		0.0%	\$ 12,109.75	52.2%
020 - Geotechnical Engineering	\$ 224,493		0.0%	\$ 224,785.21	100.1%
030 - Dam Design	\$ 184,885	\$ 9,431.75	5.1%	\$ 168,732.62	91.3%
040 - Permitting	\$ 86,634		0.0%	\$ 35,774.94	41.3%
050 - Survey and Legal Descriptions	\$ 11,142		0.0%	\$ 23,636.47	212.1%
060 - Community/Public Participation	\$ -			\$ -	
070 - Construction Services	\$ 171,962			\$ 1,590.75	
				\$ -	
3 Sites Totals	\$ 702,329	\$ 9,431.75	1.3%	\$ 466,629.74	66.4%

Project # A18-3423 (separate invoice) Sites 55, 66, 77, 82, 84, 85, &86 Project Phase	Phase Totals	Billings for Month		Project Total Billings to Date	
		Current Earned/Billings	% Completed This Month	JTD Earned/Billings	% Completed Overall
100 - Project Management/Meetings	\$ 60,813	\$ 1,205.80	2.0%	\$ 25,704.88	42.3%
110 - Geotechnical Engineering	\$ 592,047	\$ 14,327.40	2.4%	\$ 352,680.66	59.6%
120 - Dam Design	\$ 425,202	\$ 21,535.21	5.1%	\$ 114,489.39	26.9%
130 - Permitting	\$ 244,810	\$ 4,407.20	1.8%	\$ 69,119.27	28.2%
140 - Survey and Legal Descriptions	\$ 28,165	\$ 1,341.94	4.8%	\$ 13,327.70	47.3%
150 - Community/Public Participation	\$ 30,000		0.0%	\$ 5,899.20	19.7%
160 - Other	\$ -			\$ -	
170- Construction Services	\$ 603,992			\$ -	
7 Sites Totals	\$ 1,985,029	\$ 42,817.55	2.2%	\$ 581,221.10	29.3%

Billings For Month	\$ 52,249.30
Total Billings To Date	\$ 1,047,850.84
Project Budget	\$ 2,687,358
Budget Remaining	\$ 1,639,507.16

% Budget Spent Per Site



Summary Of Work Completed This Month	
<u>Sites 26A, 26B, & 27</u>	<u>Sites 55,66,77,82,84,85, & 86</u>
-Principal spillway update -Speciations updates -NRCS comments updates for principal spillway and plunge pool -NEScap environmental report updates -Finalize geotechnical reports -Riser structural design	- H&H design and centerline layout -Geotechnical analysis for sites 55, 66, & 77 -Processing of collected survey information -Topo for Site 77 -Project Management -Triaxial testing for all sites -SITES reviews for auxiliary spillways -NeSCAP Scoring and Maps

Planned Work For Next Month	
<u>Site 26A, 26B, & 27</u>	<u>Sites 55, 66, 77, 82, 84, 85, & 86</u>
-Finishing up 90% submittal	-H&H design, centerline layout, and auxiliary spillway design -Geotechnical laboratory testing -Mitigation discussions and design -Topographic survey and picking up section corners

For questions regarding billings, please contact Andrew Phillips at (402) 440-8807 or aphillips@olsson.com

Invoice**olsson**

601 P St Suite 200
PO Box 84608
Lincoln, NE 68501-4608
Tel 402.474.6311, Fax 402.474.5063

January 12, 2023
Invoice No: 445542

Ryan Chapman
Lower Platte North NRD
PO Box 126
Wahoo, NE 68066-0126

Invoice Total	\$9,431.75
----------------------	-------------------

Olsson Project # 018-34230 Lower Platte North NRD Wahoo Creek Watershed & 3 Dam Sites
Professional services rendered December 4, 2022 through December 31, 2022 for work completed in accordance with agreement.

Phase 030 Dam Design 26a, 26b, 27

Labor

	Hours	Amount	
Principal	4.50	734.18	
Assistant Professional	7.00	674.87	
Designer	23.50	2,776.76	
CAD Operator	68.25	5,245.94	
Totals	103.25	9,431.75	
Total Labor			9,431.75
Total this Phase			\$9,431.75

Billing Limits	Current	Prior	To-Date
Total Billings	9,431.75	457,197.99	466,629.74
Limit			702,329.00
Balance Remaining			235,699.26

AMOUNT DUE THIS INVOICE \$9,431.75

Outstanding Invoices

Number	Date	Balance
443247	12/19/2022	9,835.44
Total		9,835.44

Email invoice to: rchapman@lpnnrd.org

Authorized By: Andrew Phillips

INVOICE PAYMENT IS REQUESTED WITHIN 30 DAYS

Invoice

olsson

601 P St Suite 200
PO Box 84608
Lincoln, NE 68501-4608
Tel 402.474.6311, Fax 402.474.5063

January 12, 2023
Invoice No: 445545

Ryan Chapman
Lower Platte North NRD
PO Box 126
Wahoo, NE 68066-0126

Invoice Total	\$42,817.55
----------------------	--------------------

Olsson Project # A18-34230 Lower Platte North NRD Wahoo Creek Watershed & 7 Dam Sites
Phase II

Professional services rendered December 4, 2022 through December 31, 2022 for work completed in accordance with agreement.

Phase 100 Sites 55 66 77 82 83 84 85 86 Project Management

Labor

	Hours	Amount
Principal	5.00	1,205.80
Totals	5.00	1,205.80
Total Labor		1,205.80

Billing Limits

	Current	Prior	To-Date
Total Billings	1,205.80	24,499.08	25,704.88
Limit			62,400.00
Balance Remaining			36,695.12

Total this Phase \$1,205.80

Phase 110 Geotechnical Engineering

Labor

	Hours	Amount
Assistant Engineer	.75	67.85
Technician	8.75	620.90
Principal	5.00	1,097.25
Project Professional	53.25	7,147.75
Assistant Professional	5.00	223.65
Totals	72.75	9,157.40
Total Labor		9,157.40

Unit Billing**Atterberg Limit**

1 Test @ \$95/Test	95.00
1 Tests @ \$95/Test	95.00
2 Tests @ \$95/Test	190.00

Dispersion - Pinhole

2 Test @ \$130/Test	260.00
---------------------	--------

INVOICE PAYMENT IS REQUESTED WITHIN 30 DAYS

Project	A18-34230	Lower Platte North NRD Wahoo Creek Water	Invoice	445545
---------	-----------	--	---------	--------

Dry Density Test				
1 Tests @ \$30/Test			30.00	
Moisture Content				
1 Tests @ \$20/Test			20.00	
One-Dimensional Consolidation Test				
1 Tests @ \$165/Test			165.00	
1 Tests @ \$165/Test			165.00	
1 Tests @ \$165/Test			165.00	
P-200 Sieve Test				
1 Tests @ \$45/Test			45.00	
Triaxial Comp Cons Drained-Intact				
1 Test @ \$1,925/Test			1,925.00	
Triaxial Comp Cons Undrained-Intact				
1 Test @ \$1,925/Test			1,925.00	
Unconfined Compress Strgth - Soils				
2 Tests @ \$45/Test			90.00	
Total Units			5,170.00	5,170.00

Billing Limits	Current	Prior	To-Date	
Total Billings	14,327.40	338,353.26	352,680.66	
Limit			607,460.00	
Balance Remaining			254,779.34	
		Total this Phase		\$14,327.40

Phase	120	Dam Design
-------	-----	------------

Labor				
		Hours	Amount	
Assistant Professional		165.50	15,804.45	
Designer		48.50	5,730.76	
Totals		214.00	21,535.21	
Total Labor				21,535.21

Billing Limits	Current	Prior	To-Date	
Total Billings	21,535.21	92,954.18	114,489.39	
Limit			436,278.00	
Balance Remaining			321,788.61	
		Total this Phase		\$21,535.21

Phase	130	Permitting
-------	-----	------------

Labor				
		Hours	Amount	
Assistant Professional		45.50	4,407.20	
Totals		45.50	4,407.20	
Total Labor				4,407.20

INVOICE PAYMENT IS REQUESTED WITHIN 30 DAYS

Project	A18-34230	Lower Platte North NRD Wahoo Creek Water	Invoice	445545
---------	-----------	--	---------	--------

Billing Limits	Current	Prior	To-Date	
Total Billings	4,407.20	64,712.07	69,119.27	
Limit			251,140.00	
Balance Remaining			182,020.73	
Total this Phase				\$4,407.20

Phase 140 Survey & Legal Descriptions

Labor	Hours	Amount	
Survey 2-Man Crew	8.50	786.68	
Survey Crew Support	8.50	472.01	
Totals	17.00	1,258.69	
Total Labor			1,258.69

Unit Billing			
Field Vehicle 1457	111.0 Miles @ 0.75	83.25	
Total Units		83.25	83.25

Billing Limits	Current	Prior	To-Date	
Total Billings	1,341.94	11,985.76	13,327.70	
Limit			28,875.00	
Balance Remaining			15,547.30	
Total this Phase				\$1,341.94

AMOUNT DUE THIS INVOICE \$42,817.55

Outstanding Invoices	Number	Date	Balance
	443248	12/19/2022	40,128.20
Total			40,128.20

Authorized By: Andrew Phillips

INVOICE PAYMENT IS REQUESTED WITHIN 30 DAYS

Summary of Conceptual Project Costs

Project Costs	Rawhide WFPO - NW Fremont		
	Total	NRCS Share	Local Share
DC1-21, Airport Detention	\$13,713,240	\$10,642,940	\$3,070,300
DC1-13, Merlyn England Detention	\$19,182,600	\$14,823,700	\$4,358,900
L1-11, Rawhide Creek Berms	\$7,849,340	\$6,956,340	\$893,000
L1-1, Fremont Cutoff Rd Raise and Brush Creek Berm	\$1,601,050	\$1,457,850	\$143,200
C1-2, County Road S Ditch	\$9,890,880	\$7,532,200	\$2,358,680
TOTAL	\$48,236,830	\$39,233,030	\$9,003,800

\$ 42,346,230 \$ 33,880,830 \$ 8,465,400

Summary of Conceptual Project Costs

	Rawhide WFPD	DCI-21	DCI-13	L1-11	L1-1	C1-2
Sponsor Costs						
Item	TOTAL	Airport Det.	Merlyn England Det.	Rawhide Creek berms	Fremont Cutoff and Brush Creek	County Road 5 Ditch
Property Rights	\$6,201,000	\$2,310,000	\$3,300,000	\$396,000	\$39,000	\$156,000
Project Administration*	\$1,557,100	\$422,400	\$588,300	\$276,100	\$57,900	\$212,400
Permitting	\$1,245,700	\$337,900	\$470,600	\$220,900	\$46,300	\$170,000
SUBTOTAL	\$9,003,800	\$3,070,300	\$4,358,900	\$893,000	\$143,200	\$538,400
	<i>Local/WSF</i>	<i>\$3,601,520</i>	<i>\$1,228,120</i>	<i>\$1,743,560</i>	<i>\$57,280</i>	<i>\$215,360</i>
WFPD Costs						
Engineering	\$8,096,000	\$2,196,200	\$3,058,900	\$1,435,500	\$300,900	\$1,104,500
Construction	\$31,137,030	\$8,446,740	\$11,764,800	\$5,520,840	\$1,156,950	\$4,747,700
SUBTOTAL	\$39,233,030	\$10,642,940	\$14,823,700	\$6,956,340	\$1,457,850	\$5,852,200
Total Installation Cost	\$48,236,830	\$13,713,240	\$19,182,600	\$7,849,340	\$1,601,050	\$5,890,600
Annual O&M**	\$233,528	\$63,351	\$68,236	\$41,406	\$8,677	\$31,858

* Estimated at 5% of Construction

** Estimated at 0.75% of Construction

For a Flood Control purpose WFPD project:
NRCS Pays 100% of Design (Engineering) and Construction
Sponsor Pays 100% of Land Rights and Permitting

Rawhide WFPO

JEO Project Number: 200881

Dodge County

January 2023

Conceptual Cost Opinion

Alternative - DC1-21 - Airport Detention

Item	Unit	Quantity	Unit Price	Total
Mobilization	LS	1	\$ 474,000.00	\$ 474,000.00
Bonding and Insurance	LS	1	\$ 158,000.00	\$ 158,000.00
Clearing and Grubbing	LS	1	\$ 90,000.00	\$ 90,000.00
Temporary Traffic Control Measures	LS	1	\$ -	\$ -
Excavation, Established Quantity	CY	1,027,250	\$ 5.00	\$ 5,136,250.00
Earthwork Measured in Embankment (Established Quantity)	CY	7,800	\$ 20.00	\$ 156,000.00
Bridge Removal and Replacement	SF	600	\$ 500.00	\$ 300,000.00
18" RCP, Class III	LF	40	\$ 250.00	\$ 10,000.00
18" RCP Flared End Section	EA	1	\$ 1,700.00	\$ 1,700.00
Concrete Headwall	EA	1	\$ 7,500.00	\$ 7,500.00
Automatic Flap Gate	EA	0	\$ 10,000.00	\$ -
Crushed Rock Base Course	TONS	0	\$ 75.00	\$ -
Gravel Surface Course	TONS	0	\$ 90.00	\$ -
Rock Riprap	TONS	50	\$ 110.00	\$ 5,500.00
Remove Pavement	SY	0	\$ 25.00	\$ -
7" Concrete Pavement	SY	0	\$ 100.00	\$ -
Silt Fence, Low Porosity	LF	0	\$ 4.00	\$ -
Seeding, Fertilizer and Mulch	ACRE	140	\$ 5,000.00	\$ 700,000.00
CONSTRUCTION SUBTOTAL				\$7,038,950.00
CONSTRUCTION with 20% CONT				\$8,446,740.00
Mitigation Costs				
Recreation Facilities				\$0.00
Land Acquisition				
Land	ACRE	140	\$ 15,000.00	\$ 2,100,000.00
Home Buyout	EA	0	\$ 250,000.00	\$ -
Hold	LS	0	\$ -	\$ -
Hold	LS	0	\$ -	\$ -
Land Acquisition Subtotal				\$2,100,000.00
Legal Fees, Appraisals, Etc				\$210,000.00
LAND ACQUISITION TOTAL				\$2,310,000.00
Engineering				
Design, Geotech, & Bidding	LS	1	\$ 1,351,500.00	\$ 1,351,500.00
Permitting	LS	1	\$ 337,900.00	\$ 337,900.00
Construction Engineering & Material Testing	LS	1	\$ 844,700.00	\$ 844,700.00
ENGINEERING SUBTOTAL				\$2,534,100.00
SUBTOTAL PROJECT COST				\$13,290,840.00
Sponsor Admin and Other Fees				\$422,400.00
TOTAL PROJECT COST				\$13,713,240.00

Rawhide WFPO JEO Project Number: 200881 Dodge County January 2023 Conceptual Cost Opinion				
			Alternative - DC1-13 - Merlyn England Detention	
Item	Unit	Quantity	Unit Price	Total
Mobilization	LS	1	\$ 655,000.00	\$ 655,000.00
Bonding and Insurance	LS	1	\$ 219,000.00	\$ 219,000.00
Clearing and Grubbing	LS	1	\$ 200,000.00	\$ 200,000.00
Temporary Traffic Control Measures	LS	1	\$ -	\$ -
Excavation, Established Quantity	CY	1,520,000	\$ 5.00	\$ 7,600,000.00
Earthwork Measured in Embankment (Established Quantity)	CY	3,100	\$ 20.00	\$ 62,000.00
Bridge Removal and Replacement	SF	0	\$ 500.00	\$ -
24" RCP, Class III	LF	80	\$ 300.00	\$ 24,000.00
24" RCP Flared End Section	EA	2	\$ 2,000.00	\$ 6,000.00
48" RCP Class III	LF	0	\$ 500.00	\$ -
48" RCP Flared End Section	EA	0	\$ 3,000.00	\$ -
Concrete Headwall	EA	2	\$ 7,500.00	\$ 15,000.00
Automatic Flap Gate	EA	0	\$ 10,000.00	\$ -
Crushed Rock Base Course	TONS	0	\$ 75.00	\$ -
Gravel Surface Course	TONS	0	\$ 90.00	\$ -
Rock Riprap	TONS	100	\$ 110.00	\$ 11,000.00
Remove Pavement	SY	0	\$ 25.00	\$ -
7" Concrete Pavement	SY	0	\$ 100.00	\$ -
Silt Fence, Low Porosity	LF	3,000	\$ 4.00	\$ 12,000.00
Seeding, Fertilizer and Mulch	ACRE	200	\$ 5,000.00	\$ 1,000,000.00
CONSTRUCTION SUBTOTAL				\$9,804,000.00
CONSTRUCTION with 20% CONT				\$11,764,800.00
Mitigation Costs				
Recreation Facilities				\$0.00
Land Acquisition				
Land	ACRE	200	\$ 15,000.00	\$ 3,000,000.00
Home Buyout	EA	0	\$ 100,000.00	\$ -
Hold	LS	0	\$ -	\$ -
Hold	LS	0	\$ -	\$ -
Land Acquisition Subtotal				\$3,000,000.00
Legal Fees, Appraisals, Etc			10%	\$300,000.00
LAND ACQUISITION TOTAL				\$3,300,000.00
Engineering				
Design, Geotech, & Bidding	LS	1	\$ 1,882,400.00	\$ 1,882,400.00
Permitting	LS	1	\$ 470,600.00	\$ 470,600.00
Construction Engineering & Material Testing	LS	1	\$ 1,176,500.00	\$ 1,176,500.00
ENGINEERING SUBTOTAL				\$3,529,500.00
SUBTOTAL PROJECT COST				\$18,594,300.00
Sponsor Admin and Other Fees				\$588,300.00
TOTAL PROJECT COST				\$19,182,600.00

Rawhide WFPO

JEO Project Number: 200881

Dodge County

January 2023

Conceptual Cost Opinion

Alternative - L1-11 Rawhide Creek Berms

Item	Unit	Quantity	Unit Price	Total
Mobilization	LS	1	303,000.00	303,000.00
Bonding and Insurance	LS	1	101,000.00	101,000.00
Clearing and Grubbing	LS	1	165,000.00	165,000.00
Temporary Traffic Control Measures	LS	1	0.00	0.00
Excavation, Established Quantity	CY	4,600	10.00	46,000.00
Earthwork Measured in Embankment (Established Quantity)	CY	20,500	20.00	410,000.00
Bridge Removal and Replacement	SF	4,500	500.00	2,250,000.00
36" RCP, Class III	LF	240	400.00	96,000.00
36" RCP Flared End Section	EA	6	2,500.00	15,000.00
Concrete Headwall	EA	6	7,500.00	45,000.00
Automatic Flap Gate	EA	6	10,000.00	60,000.00
Double 4'x4' Box Culvert	LF	100	3,000.00	300,000.00
Crushed Rock Base Course	TONS	2,560	75.00	192,000.00
Gravel Surface Course	TONS	1,280	90.00	115,200.00
Rock Riprap	TONS	125	100.00	12,500.00
Remove Pavement	SY	0	25.00	0.00
7" Concrete Pavement	SY	0	100.00	0.00
Silt Fence, Low Porosity	LF	40,000	4.00	160,000.00
Seeding, Fertilizer and Mulch	ACRE	33	10,000.00	330,000.00
CONSTRUCTION SUBTOTAL				\$4,600,700.00
CONSTRUCTION with 20% CONT				\$5,520,840.00
Mitigation Costs				
Recreation Facilities				\$0.00
Land Acquisition				
Land	ACRE	24.0	15,000.00	360,000.00
Home Buyout	EA	0.0	100,000.00	0.00
Hold	LS	0.0	0.00	0.00
Hold	LS	0.0	0.00	0.00
Land Acquisition Subtotal				\$360,000.00
Legal Fees, Appraisals, Etc			10%	\$36,000.00
LAND ACQUISITION TOTAL				\$396,000.00
Engineering				
Design, Geotech, & Bidding	LS	1	\$ 883,400.00	\$ 883,400.00
Permitting	LS	1	\$ 220,900.00	\$ 220,900.00
Construction Engineering & Material Testing	LS	1	\$ 552,100.00	\$ 552,100.00
ENGINEERING SUBTOTAL				\$1,656,400.00
SUBTOTAL PROJECT COST				\$7,573,240.00
Sponsor Admin and Other Fees				\$276,100.00
TOTAL PROJECT COST				\$7,849,340.00

Rawhide WFPO

JEO Project Number: 200881

Dodge County

January 2023

Conceptual Cost Opinion

**Alternative - L1-1 Cutoff Rd + Brush
Berm**

Item	Unit	Quantity	Unit Price	Total
Mobilization	LS	1	\$ 64,000.00	\$ 64,000.00
Bonding and Insurance	LS	1	\$ 22,000.00	\$ 22,000.00
Clearing and Grubbing	LS	1	\$ 30,000.00	\$ 30,000.00
Temporary Traffic Control Measures	LS	1	\$ 30,000.00	\$ 30,000.00
Excavation, Established Quantity	CY	0	\$ 10.00	\$ -
Earthwork Measured in Embankment (Established Quantity)	CY	7,950	\$ 20.00	\$ 159,000.00
Bridge Removal and Replacement	SF	0	\$ 500.00	\$ -
48" RCP Class III	LF	160	\$ 500.00	\$ 80,000.00
48" RCP Flared End Section	EA	4	\$ 3,000.00	\$ 12,000.00
Concrete Headwall	EA	4	\$ 7,500.00	\$ 30,000.00
Automatic Flap Gate	EA	4	\$ 10,000.00	\$ 40,000.00
Crushed Rock Base Course	TONS	3,000	\$ 75.00	\$ 225,000.00
Gravel Surface Course	TONS	1,500	\$ 90.00	\$ 135,000.00
Rock Riprap	TONS	192	\$ 110.00	\$ 21,120.00
Remove Pavement	SY	0	\$ 25.00	\$ -
7" Concrete Pavement	SY	0	\$ 100.00	\$ -
Silt Fence, Low Porosity	LF	14,000	\$ 4.00	\$ 56,000.00
Seeding, Fertilizer and Mulch	ACRE	6	\$ 10,000.00	\$ 60,000.00
CONSTRUCTION SUBTOTAL				\$964,120.00
CONSTRUCTION with 20% CONT				\$1,156,950.00
Mitigation Costs				
Recreation Facilities				\$0.00
Land Acquisition				
Land	ACRE	2	\$ 15,000.00	\$ 30,000.00
Home Buyout	EA	0	\$ 100,000.00	\$ -
Hold	LS	0	\$ -	\$ -
Hold	LS	0	\$ -	\$ -
Land Acquisition Subtotal				\$30,000.00
Legal Fees, Appraisals, Etc			30%	\$9,000.00
LAND ACQUISITION TOTAL				\$39,000.00
Engineering				
Design, Geotech, & Bidding	LS	1	\$ 185,200.00	\$ 185,200.00
Permitting	LS	1	\$ 46,300.00	\$ 46,300.00
Construction Engineering & Material Testing	LS	1	\$ 115,700.00	\$ 115,700.00
ENGINEERING SUBTOTAL				\$347,200.00
SUBTOTAL PROJECT COST				\$1,543,150.00
Sponsor Admin and Other Fees				\$57,900.00
TOTAL PROJECT COST				\$1,601,050.00

Rawhide WFPO

JEO Project Number: 200881

Dodge County

January 2023

Conceptual Cost Opinion

Alternative - C1-2 County Road S Ditch

Item	Unit	Quantity	Unit Price	Total
Mobilization	LS	1	\$ 238,000.00	\$ 238,000.00
Bonding and Insurance	LS	1	\$ 80,000.00	\$ 80,000.00
Clearing and Grubbing	LS	1	\$ 60,000.00	\$ 60,000.00
Temporary Traffic Control Measures	LS	1	\$ 30,000.00	\$ 30,000.00
Excavation, Established Quantity	CY	15,000	\$ 10.00	\$ 150,000.00
Earthwork Measured in Embankment (Established Quantity)	CY	0	\$ 20.00	\$ -
Bridge Removal and Replacement	SF	4,500	\$ 500.00	\$ 2,250,000.00
48" RCP Class III	LF	0	\$ 500.00	\$ -
48" RCP Flared End Section	EA	0	\$ 3,000.00	\$ -
Concrete Headwall	EA	0	\$ 7,500.00	\$ -
Automatic Flap Gate	EA	0	\$ 10,000.00	\$ -
Double 8'x4' Box Culvert	LF	128	\$ 3,000.00	\$ 384,000.00
Crushed Rock Base Course	TONS	200	\$ 75.00	\$ 15,000.00
Gravel Surface Course	TONS	100	\$ 90.00	\$ 9,000.00
Rock Riprap	TONS	325	\$ 110.00	\$ 35,750.00
Remove Pavement	SY	0	\$ 25.00	\$ -
7" Concrete Pavement	SY	0	\$ 100.00	\$ -
Silt Fence, Low Porosity	LF	42,000	\$ 4.00	\$ 168,000.00
Seeding, Fertilizer and Mulch	ACRE	12	\$ 10,000.00	\$ 120,000.00
CONSTRUCTION SUBTOTAL				\$3,539,750.00
CONSTRUCTION with 20% CONT				\$4,247,700.00
Mitigation Costs				
Recreation Facilities				\$0.00
Land Acquisition				
Land	ACRE	8	15,000.00	120,000.00
Home Buyout	EA	0	100,000.00	0.00
Hold	LS	0	0.00	0.00
Hold	LS	0	0.00	0.00
Land Acquisition Subtotal				\$120,000.00
Legal Fees, Appraisals, Etc			30%	\$36,000.00
LAND ACQUISITION TOTAL				\$156,000.00
Engineering				
Design, Geotech, & Bidding	LS	1	\$ 679,700.00	\$ 679,700.00
Permitting	LS	1	\$ 170,000.00	\$ 170,000.00
Construction Engineering & Material Testing	LS	1	\$ 424,800.00	\$ 424,800.00
ENGINEERING SUBTOTAL				\$1,274,500.00
SUBTOTAL PROJECT COST				\$5,678,200.00
Sponsor Admin and Other Fees				\$212,400.00
TOTAL PROJECT COST				\$5,890,600.00

Drainage Improvement Project - Phase 1 Payments				
Date	Amount Paid	Grant	Leshara	NRD
Nov-22	10,547.85	8,765.51	891.17	891.17
Dec-22	5,067.85	4,211.51	428.17	428.17
Jan-23	0.00			
Feb-23	0.00			
Mar-23	0.00			
Apr-23	0.00			
May-23	0.00			
Jun-23	0.00			
Jul-23	0.00			
Aug-23	0.00			
Sep-23	0.00			
Total	15,615.70	12,977.02	1,319.34	1,319.34



1/11/2023

Village of Leshara, NE
Attn: Paula Wagner
210 Summit Street
Leshara, NE 68064

RE: Village of Leshara #21-PW-013 Drawdown #2

Dear Mrs. Wagner:

Enclosed is Drawdown #2 for your Public Works, street and drainage improvement project. After you have reviewed the material, please have Board Chairperson, Melvina Ruhe-Langfeldt and yourself sign the Drawdown (DD) as noted and mail the original DD form back to SENDD for processing. Please sign all documents in **"BLUE INK"** and place in File IV.

After the drawdown documents are submitted, the Village can expect an automatic transfer from the Nebraska Department of Economic Development (NDED) within 10-30 business days that will be deposited into the designated Community Development Block Grant (CDBG) account. Once received, please write the following check(s):

	TOTAL	CDBG	Match
Drawdown #2: The following #03K Street Improvements bills have not yet been paid.			
SENDD Invoice(s): Activity Code #21A General Administration	\$0.00	\$0.00	\$0.00
Street Improvements: Activity Code #03K Street Improvements	\$5,067.85	\$4,211.51	\$856.34
SENDD Invoice(s): Activity Code #03K Construction Management	\$0.00	\$0.00	\$0.00
Totals:	\$5,067.85	\$4,211.51	\$856.34

LINCOLN OFFICE
7407 O Street
Lincoln, NE 68510
Office: 402-475-2560

www.sendd.org



AUBURN OFFICE
919 Central Ave
Auburn, NE 68305
Office: 402-862-2201

SENDD is an Equal Opportunity Provider and Employer



According to the above figures, the Village should make the following payments:

Activity Code: #03K

Amount: \$5,067.85

To: Southeast Nebraska Development District

Address: 7407 O St, Lincoln, NE 68510

NOTES:

1. Upon completed processing at NDED/State, the CDBG funds will be electronically deposited in the identified City's account. **Please disburse NDED funds within five days;** otherwise, it may result in a finding during monitoring.
2. If you make a payment with local funds before the CDBG funds are electronically deposited in your City account, that will be "reimbursement" and those funds are no longer considered "federal" and may be transferred to local accounts as you wish.
3. Please remember to keep copies of the checks made as payment for CDBG activities and keep copies of the bank statements showing deposits of CDBG funds and clearance of checks distributed.

Please feel free to give me a call at (402) 475-2560 if you have any questions.

Sincerely,

A handwritten signature in blue ink that reads "Ceylon J. Herath". The signature is fluid and cursive, with the first name "Ceylon" being more prominent than the last name "Herath".

Ceylon J. Herath
Community Development Specialist

LINCOLN OFFICE
7407 O Street
Lincoln, NE 68510
Office: 402-475-2560

www.sendd.org



AUBURN OFFICE
919 Central Ave
Auburn, NE 68305
Office: 402-862-2201

SENDD is an Equal Opportunity Provider and Employer



Request for Funds (Drawdown/Payment Request)
Community Development Block Grant Program
Nebraska Department of Economic Development

Name of Subrecipient (Local Unit of Government) Village of Leshara			Mailing Address 210 Summit Street		City Leshara	State NE	ZIP 68064
CDBG Agreement Number #21-PW-013	Federal Identification Number 470663927	DUNS Number 118125358	UEI Number ZAF7F9TRL5K2	SAM Expiration Date 10/07/2023	Number sequence order of funds 2	Final Drawdown	DED Program Representative Aaron Boucher

Part I – STATUS OF FUNDS

1. CDBG Funds Received to Date	\$8,765.52
2. Add: Program Income Received to Date (exclude RLF)	\$0.00
3. Subtotal	\$8,765.52
4. Less: Federal Funds Disbursed To Date (Must Agree To Total Of Part II, Line 3)	\$8,765.52
5. Total: Federal Funds On Hand (Must Agree To Part II, Line 6)	

Part II – CASH REQUIREMENTS (Identify all activities listed in the CDBG Agreement, even if funds are not being requested.)

Activity/Budget Category	21A GA	03K CM	03K SI				TOTAL
1. Total Cash Requirements To Date	\$0.00	\$0.00	\$15,615.70				\$15,615.70
2. Less: Local Funds Disbursed (includes RLF) (exclude Program Income)	\$0.00	\$0.00	\$2,638.68				\$2,638.68
3. Less: Federal Funds Disbursed (include Program Income) Total Must Agree To Part I, Line 4 (exclude RLF)			\$8,765.52				\$8,765.52
4. Total Current Cash Requirements			\$4,211.50				\$4,211.50
5. Less: Unpaid Previous Request.							
6. Less: Federal Funds On Hand (Must Agree To Part I, Line 5)							
7. Net Amount of Federal Funds Requested							\$4,211.50

By signing this report, I certify to the best of my knowledge and belief that the report is true, complete, and accurate, and the expenditures, disbursements and cash receipts are for the purposes and objectives set forth in the terms and conditions of the Federal award, I am aware that any false, fictitious, or fraudulent information, or the omission of any material fact, may subject me to criminal, civil or administrative penalties for fraud, false statements, false claims or otherwise. (U.S. Code Title 18, Section 1001 and Title 31, Sections 3729-3730 and 3801-3812). I also certify that the amount of the request for federal funds is not in excess of current needs.

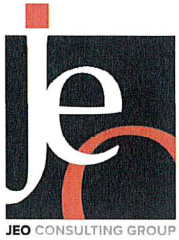
Signature of Authorized Official (Mayor/Board Chairman)	Typed Name of Authorized Official Melvina Ruhe-Langfeldt, Board Chairperson	Date
Signature of Authorized Official (Clerk/Treasurer)	Typed Name of Authorized Official Paula Wagner, Village Clerk	Date
Person Preparing Request for CDBG Funds Form Name: Ceylon Herath	Organization: SEND	Telephone Number: 402-475-2560
		Email: cherath@sendd.org

PLEASE REFER TO INSTRUCTIONS FOR ADDITIONAL GUIDANCE. INCOMPLETE OR INCORRECT FORMS WILL NOT BE PROCESSED

**To update calculations, either tab two (2) fields or click on a different field with your mouse.

Village of Leshara Street and Drainage Improvements (#21-PW-013) Contract Obligation Spreadsheet

Recipient Village of Leshara		Elected Official	Melvina Ruhe-Langfel	Clerk/City Admin. Paula Wagner	SEND Admin	Ceylon J. Herath	Approval		
CDBG Grant # 21-PW-013		DED Program Rep.	Aaron Boucher	Clerk/Admin Email thevillageofleshara@gmail.com	SEND Admin Email	cherath@sendd.org			
Mailing Address	210 Summit Street	SOURCES	21A General Admin.	03K Construction Management	03K Streets/Bridges	TOTAL			
Fed. ID #	470663927	CDBG	\$ 25,000.00	\$ 10,000.00	\$ 300,000.00	\$ 335,000.00			
DUNS #	118125358	OTHER City Match	\$ -	\$ -	\$ 61,000.00	\$ 61,000.00			
UEI	ZAF7F9TRL5K2	TOTAL	\$ 25,000.00	\$ 10,000.00	\$ 361,000.00	\$ 396,000.00			
Release of Funds	6/18/2022	% CDBG	100.00%	100.0000%	83.10%				
Program Income	No	% Other Business			16.90%				
Sam.gov Expiry	10/7/2023	1.Total Cash Requirements to Date	\$ -	\$ -	\$ 15,615.70	\$ 15,615.70	Current Fund Request 2		
Amendment #		2.Local Funds Disbursed	\$ -	\$ -	\$ 2,638.68	\$ 2,638.68	7. Net Fund Request \$ 4,211.51		
Contract End Date	4/17/2024	3.Federal Funds Disbursed	\$ -	\$ -	\$ 8,765.52	\$ 8,765.52	Fed Funds Disbursed \$ 8,765.52		
USDA/Other Reporting	No	4.Total Cash Required to Date	\$ -	\$ -	\$ 4,211.51	\$ 4,211.51	Local Funds Disbursed \$ 2,638.68		
		5. Total Funds Remaining	\$ 25,000.00	\$ 10,000.00	\$ 345,384.29	\$ 380,384.29	Funds Remaining \$ 380,384.29		
Previous Fund Requests	Submit Date	Net Amount of Fed. Fund Request	21A General Admin.	03K Const. Mgmt	03K Streets/Bridges	INVOICE TOTAL	LOCAL	Disbursement Date	
1	12/7/2022	\$ 10,547.85	CDBG	CDBG	CDBG	\$ 10,547.85	\$ 8,765.52	1,782.34	
2	1/11/2023	\$ 4,211.51	CDBG	CDBG	CDBG	\$ 5,067.85	\$ 4,211.51	856.34	
			\$ -	\$ -					
Fund Request Details									
Drawdown 2									
Contractor	Description	Invoice Date	Invoice #	CDBG 21A Gen. Admin	CDBG 03K Const Mgmt.	Invoice Total	CDBG 03K	Match 03K	Check #
JEO Consulting Group		12/16/2022	137909			\$ 5,067.85	\$ 4,211.51	\$ 856.34	



Engineering | Architecture | Surveying | Planning

Invoice

December 16, 2022
Project No: R210551.00
Invoice No: 137909
Invoice Amount: 5,067.85

Village of Leshara
210 Summit Street
Leshara, NE 68064

Project Manager Nathan Boone

Project R210551.00 Leshara CDBG Phase I Drainage Improvements

Professional Services through December 9, 2022

- Phase 2, the study phase, is ongoing and nearing completion. The project will soon move into preliminary design with an anticipated bid period late Winter 2022/2023.

	Contract Amount	Percent Complete	Billed-to-Date	Previous Billing	Current Billing
Lump Sum Phase(s)					
Funding Assistance	\$2,955.00	18 %	\$531.90	\$502.35	\$29.55
Topographic Survey	\$7,400.00	28 %	\$2,072.00	\$2,072.00	0.00
Urban Drainage Study	\$23,255.00	39 %	\$9,069.45	\$4,883.55	\$4,185.90
Design	\$10,655.00	37 %	\$3,942.35	\$3,089.95	\$852.40
Permitting	\$3,270.00	0 %	0.00	0.00	0.00
Bidding and Negotiation	\$2,925.00	0 %	0.00	0.00	0.00
Construction Administration	\$7,620.00	0 %	0.00	0.00	0.00
Construction Observation	\$25,920.00	0 %	0.00	0.00	0.00
Total	\$84,000.00		\$15,615.70	\$10,547.85	\$5,067.85
Total Amount Due Upon Receipt :					\$5,067.85

Email Invoice to: thevillageofleshara@gmail.com

Village of Lindsay

121 Pine St. - P.O. Box 66

Lindsay, NE 68644

(402) 428-4010

Village of Lindsay

PO Box 66

121 Pine Street

Lindsay, NE 68644

402-428-4010; clerk@villageoflindsay.com

January 19, 2023

Mr. Eric Gottschalk
General Manager
Lower Platte North NRD
511 Commercial Park Road
Wahoo, NE 68066

RE: Cost-share, Financial Assistance for Pond Rehabilitation Project

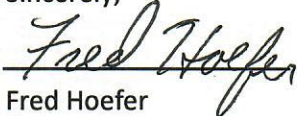
Dear Mr. Gottschalk:

The Village of Lindsay would like to formally request cost-share assistance from the Lower Platte North NRD for a pond rehabilitation project that arose after the spring 2019 flooding. The flooding overtopped the banks of the pond in town depositing a considerable amount of sediment. The project consists of removal of approximately 5,700 cubic yards of sediment, installation of shoreline protection using an articulated concrete block matting system, installation of a crushed rock trail and access points, and installation of an ADA accessible parking pad. The Village submitted a successful NET grant application that will be awarded during the funding cycle beginning in 2023, they are to receive 60% of the total project costs from NET. The NRD provided a letter of support that was included with the NET grant application.

The Village would also like to formally request the NRD provide cost-share assistance for the pond rehabilitation project described above, up to \$50,000. The cost share could be provided over the course of multiple years, starting in 2023.

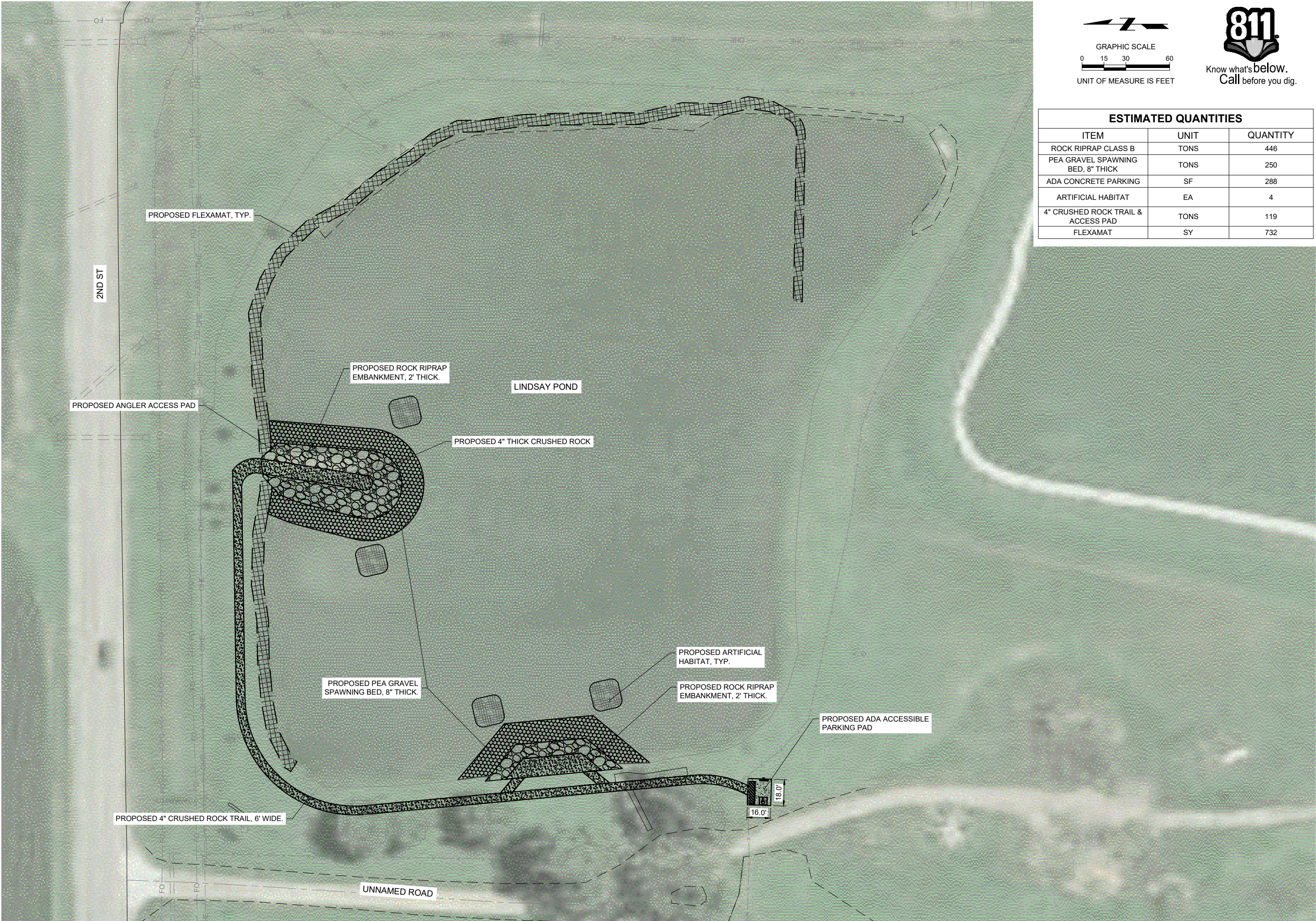
We appreciate the NRD's support and assistance with this important project. Feel free to call me at (402) 428-4010 or email me at clerk@villageoflindsay.com if you have any questions. We look forward to hearing your feedback to this request for assistance.

Sincerely,



Fred Hofer
Board Chairman

Enclosure: Conceptual Design Plan, Conceptual Cost Estimate



P:\Engineering\191217_00 - Lindsay Pond Restoration\Drawings\SheetS-191217.00.dwg, on 8/4/2022 9:52 AM.



Know what's below.
Call before you dig.



JEO CONSULTING GROUP
1-800-728-0867

**LINDSAY POND RESTORATION
VILLAGE OF LINDSAY, NEBRASKA**

PROPOSED SITE PLAN

PRELIMINARY

NOT FOR CONSTRUCTION

0%

DATE:
8/4/2022

PRELIMINARY

PROJECT NO.	PROJECT NO.
DATE	8/4/2022
DRAWN BY	DRAWN BY
FILE NAME	S-191217.00.dwg
FIELD BOOK	FIELD BOOK
FIELD CREW	FIELD CREW
SURVEY FILE NO.	SURVEY FILE #
PLAN IN HAND	PIH INI
DATE	PIH DATE
70 PERCENT REVIEW	70% INI
DATE	70% DATE
95 PERCENT REVIEW	95% INI
DATE	95% DATE
REVISIONS	

C2.1



EARTHWORK QUANTITIES		
	CUT (CU. YD)	FILL (CU. YD.)
POND	7,474 CY	1,828 CY
CONCRETE TRAIL (SLAB ON GRADE)	-	37

GRAPHIC SCALE

0 15 30 60

UNIT OF MEASURE IS FEET

Know what's below.
Call before you dig.



LINDSAY POND RESTORATION
VILLAGE OF LINDSAY, NEBRASKA

PROPOSED GRADING PLAN

PRELIMINARY
NOT FOR
CONSTRUCTION
0%
DATE:
8/4/2022
PRELIMINARY

PROJECT NO.	PROJECT NO.
DATE	8/4/2022
DRAWN BY	DRAWN BY
FILE NAME	S-191217.00.dwg
FIELD BOOK	FIELD BOOK
FIELD CREW	FIELD CREW
SURVEY FILE NO.	SURVEY FILE #
PLAN IN HAND	PIH INI
DATE	PIH DATE
70 PERCENT REVIEW	70% INI
DATE	70% DATE
95 PERCENT REVIEW	95% INI
DATE	95% DATE
REVISIONS	

ENGINEER'S BUDGETARY OPINION OF PROBABLE COST

Pond Restoration

Lindsay, NE

JEO Project No. 191217.00

Date Prepared:

August 5, 2022

**ESTIMATE OF QUANTITIES**

Item #	Description	Unit	Quantity	Unit Price	Total
BASE BID - MINIMALIST OPTION					
1.	Mobilization	LS	1	\$20,000.00	\$20,000
2.	Bonding and Insurance	LS	1	\$7,000.00	\$7,000
3.	Excavation, Spoiled Off-Site (Established Quantity)	CY	5,646	\$15.00	\$84,690
4.	Earthwork Measured in Embankment, On-Site Borrow (Established Quantity)	CY	1,828	\$10.00	\$18,280
5.	Earthwork Measured in Embankment, Off-Site Borrow (Established Quantity)	CY	1,050	\$20.00	\$21,000
6.	Dewatering	LS	1	\$25,000.00	\$25,000
7.	ADA Compliant Concrete Parking Pad	SF	288	\$12.00	\$3,456
8.	Rock Riprap Type B	TON	446	\$100.00	\$44,600
9.	Flexamat	SY	732	\$50.00	\$36,600
10.	Crushed Rock Surface Course	TONS	119	\$60.00	\$7,140
11.	Pea Gravel Spawning Bed, 8" Thick	TON	250	\$60.00	\$15,000
12.	Artificial Habitat	EA	4	\$750.00	\$3,000
13.	Seeding, Fertilizer and Mulch	ACRE	0.8	\$7,500.00	\$6,000
				Construction Subtotal	Base Bid
					\$291,770
				Contingency	20%
					\$58,360
				Total Opinion of Construction Cost	\$350,130
PROFESSIONAL SERVICES					
1.	Design Services (Engineering, Survey, Architecture)				\$50,600
				Subtotal Professional Services	\$50,600
				Total Opinion of Project Cost	\$400,730

JEO Consulting Group Inc.'s (JEO) Opinions of Probable Cost provided for herein are to be made on the basis of JEO's experience and qualifications and represent JEO's best judgment. However, since JEO has no control over the cost of labor, materials, equipment, or services furnished by others, or over the Contractor's methods of determining prices, or over competitive bidding or market conditions, JEO cannot and does not guarantee that proposals, bids, or actual construction cost will not vary from Opinions of Probable Cost prepared by JEO.

VARIANCE REQUEST FOR EXPANDED WATER USE FROM EXISTING WELL IN A STAY MANAGEMENT AREA OF THE LOWER PLATTE NORTH NRD (LPNNRD)



Updated Form: August 2012

NRD USE ONLY

Date Received _____ Paid: Cash or Check _____
Initial Review by NRD Representative _____
Certified Acres _____ by NRD Representative _____
Date of Water Committee Recommendation to the NRD Board _____
Date NRD Board issues Conditional Approval or Denial of Variance Request _____
Date of Approved Variance _____ by NRD Representative _____

ALL APPLICANTS SEEKING A VARIANCE MUST COMPLETE PAGES 1 AND 2. (CLASS 1-4 VARIANCE)
VARIANCE REQUESTS FOR IRRIGATED ACRES GREATER THAN 160 ACRES IN SIZE OR TOTAL
ANNUAL WATER USE BETWEEN 150 AND 300 ACRE FEET PER YEAR MUST COMPLETE PAGES 1, 2,
AND 3. (CLASS 3 VARIANCE)
VARIANCE REQUESTS FOR TOTAL ANNUAL WATER USE EQUAL TO OR GREATER THAN 300 ACRE
FEET PER YEAR, REGARDLESS OF NUMBER OF IRRIGATION ACRES, MUST COMPLETE PAGES 1,
2, AND 4. (CLASS 4 VARIANCE)

1. NAME AND ADDRESS OF APPLICANT:

Todd Maurer
39290 190th Ave
Columbus NE 68601

Home Phone: (402) - 276 - 0391
Cell Phone: (402) - 276 - 0391
Landowner Name: Keith & Todd Maurer
(if other than applicant)

2. PURPOSE OF EXPANDED WATER USE (indicate one or more):

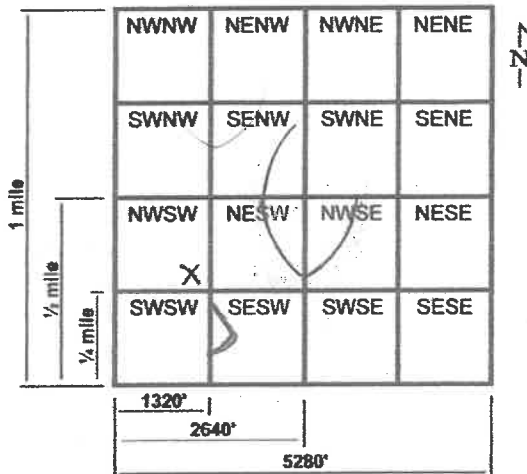
☒ Irrigation _____ Dewatering (Over 30 days) _____
☐ Livestock _____ Domestic Irrigation on one acre or larger) _____
☐ Industrial _____ Public Water Supply _____
☐ Recovery or Remediation _____ Other (specify) _____

3. LOCATION OF PROPOSED EXPANDED WATER USE:

A. Platte County, SW 1/4 of the _____ 1/4 of
Section 18, Township 19 North, Range 1
East West. (circle one)

B. The box at the right represents one square mile, (section).
Indicate with an "X", the proposed location of the water
source. Outline the proposed water use area. If the water is
to be used outside the above written legal description, give
legal description of water use area,
_____ 1/4 of the _____ 1/4 of Section _____,
Township _____ North, Range _____ East/West.

C. List the number of new irrigated acres 42
D. List the number of previously irrigated acres 125



4. WATER SOURCE (fill out one or more water source categories as needed, continued on page 2) :

A. Surface Water:
Legal Description of water source _____ County, _____ 1/4 of the _____ 1/4 of Section _____,
Township _____ North, Range _____ East/West. (circle one)
Name of river, stream, lake, or other water body _____

Dept. of National Resources Surface Water Permit # _____
Total annual amount of consumptive water use to be delivered to proposed location in
Acre Inches / Year _____ or Total Gallons / Year _____

4. **WATER SOURCE, CONTINUED:**

B. Ground Water:

Legal Description of well Platte County, SW 1/4 of the _____ 1/4 of Section 18,
Township 19 North, Range 1 East/West. (circle one) Well Registration Number G-053124
Will the well be used in a system with other wells? ____ Yes, X No. If Yes, How many _____
Attach list of well registration number and legal description for each well.
Total annual amount of consumptive water use to be delivered to proposed location in
Acre Inches / Year _____ or Total Gallons / Year _____

C. Reuse Water:

Legal Description of water source: _____ County, _____ 1/4 of the _____ 1/4 of Section _____,
Township _____ North, Range _____ East/West. (circle one)
Landowner and Address of person(s) providing reuse water _____

Original water source of this reuse water: ____ Ground Water, ____ Surface Water, mark all that apply.

Total annual amount of consumptive water use to be delivered to proposed location in
Acre Inches / Year _____ or Total Gallons / Year _____

- Attach information from the operation you will be using as a source of reuse water. List amount of intake water used by this operation, description of water use within the operation, and the amount discharged.

5. **OFFSET WATER USE:**

- A. Will proposed new water use be offset by retiring water use in this same aquifer system? ____ Yes, X No
- B. If Yes, give legal description of that offsetting water use: _____ County, _____ 1/4 of the _____ 1/4 of Section _____, Township _____ North, Range _____ East/West. (circle one)
- C. Landowner and Address of person(s) providing offset water _____
- D. If using offset from irrigation, list number of acres at this 'offset' location _____
- E. Original water source of this offset water: ____ Ground Water, ____ Surface Water, ____ Reuse Water, mark all that apply.
- F. Total annual amount of consumptive water use to be retired at this 'offset' location in
Acre Inches / Year _____ or Total Gallons / Year _____
- Please provide flow records for the last five years from this 'offset' location.

6. **Addition information and requirements for Lower Platte North NRD review.**

- Attach current tax assessor records including map, parcel number, and current land use such as irrigated acres.
- Attach aerial photo showing location of water source(s) and area water or reuse water is to be used.
- All expanded water uses must install a District approved flow meter and report water pumped annually to the LPNNRD by January 31st of the following year.
- Additional variance conditions maybe required for approval by the Lower Platte North NRD.
- Variances will be reviewed annually.

7. **I certify that I am familiar with the information contained in this application, and it's restrictions, rules and regulations and that to the best of my knowledge and belief such information is true, complete and accurate.**

Date 1/5/23 Signature of Applicant Jed M. Maurer
Signature of Well System Operator, if different than Applicant _____
NRD Certification Number of Landowner or Operator 5704 (Required for irrigation, livestock, domestic (with irrigation on one acre or more of land), industrial, and public water supply wells.)

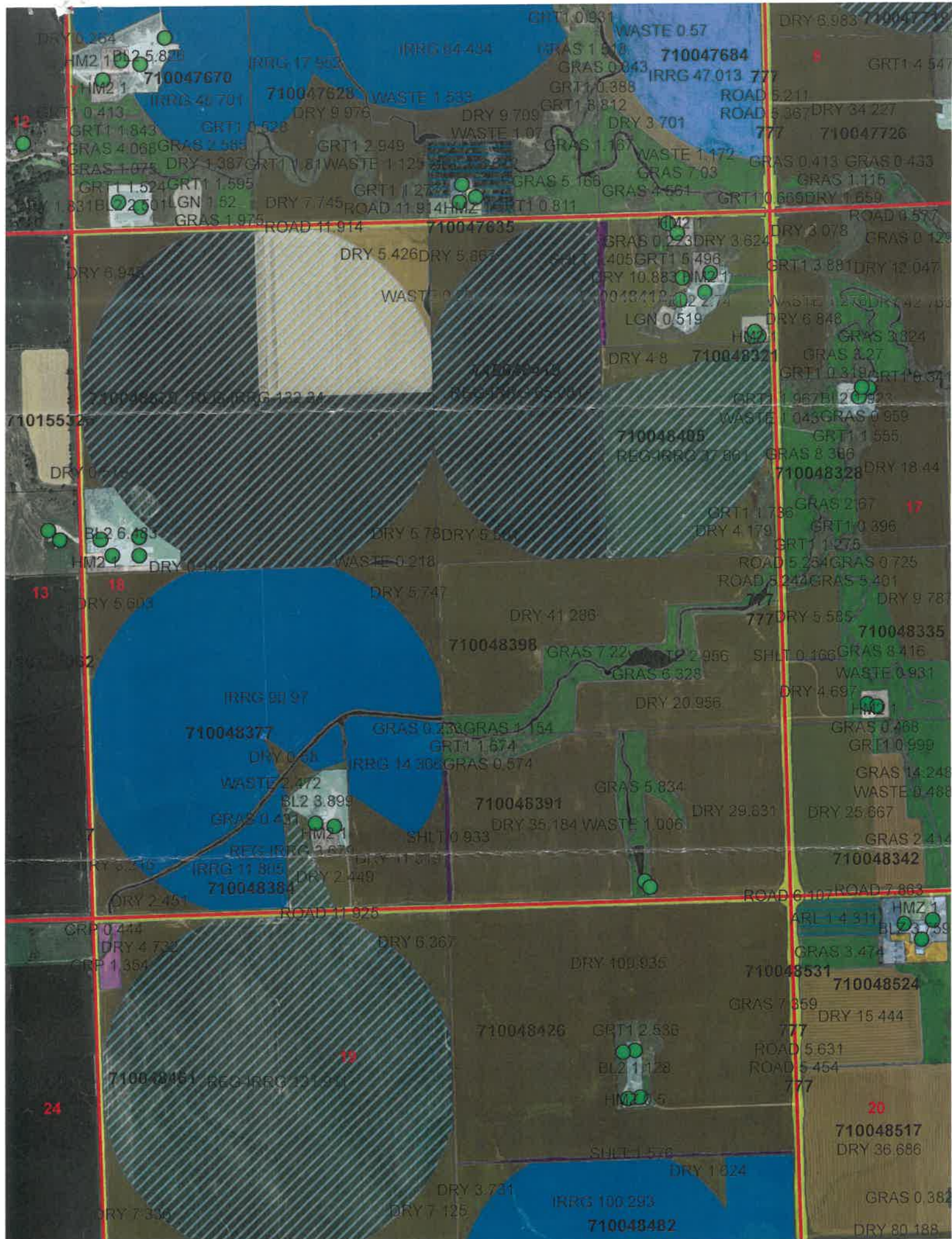
8.

If needed, Signature of Landowner providing Reuse Water _____
Date _____

If needed, Signature of Landowner providing Offset Water _____
Date _____

9. **Lower Platte North NRD Use Only.**

Comments by District Representative.





PLATTE COUNTY

2022 Real Estate Breakdown Report

Parcel ID 710048377 Owner MAURER/KEITH A (ETAL % TODD M MAURER 39290 190 AVE COLUMBUS, NE 68601-9683 Card File 019-1E0-18-0000-04380				Legal SW EXC IRR 11.91 AC TR IN SE SW S-T-R: 18-19-01 E Acres: 153.000 Situs					
County Area 6 AREA SIX Neighborhood 12 FARM Location / Group 15 PLATTE CNTY FARM Valuation / Group 0 N/A District 162 5SH-2-P School 71-0005 0 0 Class Code 02-05-00-03-00-09 State GEO 2117-18-3-00006-000-4380 Cadastral 1E-15-14 Book / Page 211 / 486 Sale Date 11/07/2003 Sale Amount 331,000				Value Buildings 0 0 Improvement 0 0 Land / Lots 933,570 933,570 Total 933,570 933,570					
Soil	Use	LCG/LVG	LCG/LVG Description	Spot	Code	Acres	Value/Acre	Assessed	Sub
3561	IRRG	2A1	2A1	N		15.540	8,000	124,320	0
6603	IRRG	2A	2A	N		36.700	7,500	275,250	0
6754	IRRG	2A	2A	N		0.360	7,500	2,700	0
6774	IRRG	4A	4A	N		6.000	5,400	32,400	0
6778	IRRG	4A1	4A1	N		59.190	6,000	355,140	0
						117.790		789,810	
3561	DRY	2D1	2D1	N		3.920	5,800	22,735	0
6603	DRY	1D	1D	N		5.760	6,100	35,135	0
6754	DRY	1D	1D	N		0.370	6,100	2,255	0
6774	DRY	4D	4D	N		5.830	2,900	16,905	0
6778	DRY	3D	3D	N		13.040	4,600	59,985	0
6812	DRY	1D	1D	N		1.080	6,100	6,590	0
						30.000		143,605	
RO	ROAD	RO	RO	N		3.660	0	0	0
VVV	WASTE	VVV	VVV	N		1.550	100	155	0
Land Total						153.000		933,570	

PLATTE COUNTY

2022 Real Estate Breakdown Report

Parcel ID 710048398 Owner MAURER/KEITH A (& TODD M MAURER %TODD MAURER 39290 190 AVE COLUMBUS, NE 68601 Card File 019-1E0-18-0000-04410				Legal N1/2 SE EXC HWY ROW S-T-R: 18-19-01 E Acres: 78.770 Situs																		
County Area 6 AREA SIX Neighborhood 12 FARM Location / Group 15 PLATTE CNTY FARM Valuation / Group 0 N/A District 162 5SH-2-P School 71-0005 0 0 Class Code 02-05-00-03-00-09 State GEO 2117-18-4-00006-000-4410 Cadastral 1E-15--16 Book / Page 202 / 400 Sale Date 10/10/1998 Sale Amount 266,463				<table><tr><td>Value</td><td>Previous</td><td>Current</td></tr><tr><td>Buildings</td><td>0</td><td>0</td></tr><tr><td>Improvement</td><td>0</td><td>0</td></tr><tr><td>Land / Lots</td><td>326,585</td><td>330,535</td></tr><tr><td>Total</td><td>326,585</td><td>330,535</td></tr></table>				Value	Previous	Current	Buildings	0	0	Improvement	0	0	Land / Lots	326,585	330,535	Total	326,585	330,535
Value	Previous	Current																				
Buildings	0	0																				
Improvement	0	0																				
Land / Lots	326,585	330,535																				
Total	326,585	330,535																				
Soil	Use	LCG/LVG	LCG/LVG Description	Spot Code	Acres	Value/Acre	Assessed	Sub														
3545	DRY	4D	4D	N	1.140	2,900	3,305	0														
3561	DRY	2D1	2D1	N	2.470	5,800	14,325	0														
3775	DRY	1D1	1D1	N	2.180	6,500	14,170	0														
6603	DRY	1D	1D	N	15.810	6,100	96,440	0														
6681	DRY	4D	4D	N	1.500	2,900	4,350	0														
6754	DRY	1D	1D	N	0.050	6,100	305	0														
6774	DRY	4D	4D	N	4.100	2,900	11,890	0														
6778	DRY	3D	3D	N	34.710	4,600	159,665	0														
					61.960		304,450															
3545	GRAS	1G	1G	N	1.330	1,900	2,525	0														
3561	GRAS	1G	1G	N	7.480	1,900	14,210	0														
6603	GRAS	1G	1G	N	0.740	1,900	1,405	0														
6681	GRAS	2G	2G	N	1.180	1,725	2,035	0														
6774	GRAS	2G1	2G1	N	0.360	1,725	620	0														
6778	GRAS	1G	1G	N	2.620	1,900	4,980	0														
					13.710		25,775															
WW	WASTE	WW	WW	N	3.100	100	310	0														
Land Total					78.770		330,535															

PLATTE COUNTY

2022 Real Estate Breakdown Report

Parcel ID 710048370 Owner MAURER/OLIVER L (FAMILY TRUST ETAL % CRYSTAL A MAURER 3061 39 AVE COLUMBUS, NE 68601 Card File 019-1E0-18-0000-04370				Legal NW S-T-R: 18-19-01 E Acres: 165.210 Situs 39290 190 AVE COLUMBUS, NE 68601				
County Area 6 AREA SIX Neighborhood 12 FARM Location / Group 15 PLATTE CNTY FARM Valuation / Group 0 N/A District 162 5SH-2-P School 71-0005 0 0 Class Code 01-05-00-03-00-10 State GEO 2117-18-2-00006-000-4370 Cadastral 1E-15--13 Book / Page 215 / 1155 Sale Date 05/04/2006 Sale Amount 0				Value Buildings 94,120 98,215 Improvement 28,155 18,195 Land / Lots 963,210 968,920 Total 1,085,485 1,085,330				
Soil	Use	LCG/LVG	LCG/LVG Description	Spot Code	Acres	Value/Acre	Assessed	Sub
HM2	HM2	HM2	HM2	N	1.000	27,000	27,000	0
3840	REG-IRRG	4A1	4A1	N	3.520	6,000	21,120	0
6603	REG-IRRG	2A	2A	N	3.850	7,500	28,875	0
6681	REG-IRRG	4A	4A	N	4.780	5,400	25,810	0
6754	REG-IRRG	2A	2A	N	36.100	7,500	270,750	0
6774	REG-IRRG	4A	4A	N	27.910	5,400	150,715	0
6778	REG-IRRG	4A1	4A1	N	49.730	6,000	298,380	0
						125.890	795,650	
3545	DRY	4D	4D	N	0.010	2,900	30	0
6603	DRY	1D	1D	N	5.270	6,100	32,145	0
6681	DRY	4D	4D	N	0.060	2,900	175	0
6754	DRY	1D	1D	N	2.980	6,100	18,180	0
6774	DRY	4D	4D	N	6.920	2,900	20,070	0
6778	DRY	3D	3D	N	9.730	4,600	44,760	0
						24.970	115,360	
6754	GRT1	3G1T1	3G1T1	N	0.640	1,650	1,055	0
6774	GRT1	4G1T1	4G1T1	N	0.330	1,525	505	0
6778	GRT1	3GT1	3GT1	N	2.680	1,650	4,420	0
						3.650	5,980	
BL2	BL2	BL2	BL2	N	4.710	5,000	23,550	0
RO	ROAD	RO	RO	N	4.070	0	0	0
FL1	FL1	FL1	FL1	N	0.920	1,500	1,380	0
Land Total					165.210		968,920	

2022 A

A

Lower Platte North NRD**Bills Pending****2/10/23**

<u>Vendor</u>	<u>Description</u>	<u>Balance</u>
Aflac	Employee Benefits	\$ 369.72
All Copy Products	Lease Payment/Maintenance	\$ 458.87
Bill Bos	Mileage Expense	\$ 50.63
Bomgaars	Wanahoo Rec/Bldg/O&M	\$ 356.91
Boone County Election Commissioner	Election Fees	\$ 420.30
Bret C. Schomer	Cell Phone Reimbursement	\$ 35.00
Butler County Clerk	Election Fees	\$ 3,845.58
Butler County Events Center	Rent - Nirtrogen Certificaton Class	\$ 900.00
Butler Public Power	Utlities Expense	\$ 721.38
Christopher L. Poole	Cell Phone Reimbursement	\$ 30.00
Cuda's Auto, Inc.	Vehicle Tire Repair	\$ 25.00
Daryl Andersen	Cell Phone Reimbursement	\$ 45.00
Daryl Andersen	GMDA Expense	\$ 279.50
DAS State Acctg - Central Finance OCIO	Cell Phone Expense	\$ 430.34
David A Moore	Cell Phone Reimbursement	\$ 40.00
David City Utilities	Bruno Water Purchase	\$ 1,502.84
Diode Communications	Ed. Bldg/Office Open Path	\$ 54.58
Embassy Suites	Director Meeting Expense	\$ 688.00
Eric Gottschalk	Cell Phone Reimbursement	\$ 45.00
Eric Gottschalk	Airline & Microwave Reimbursement	\$ 361.35
Eric Gottschalk	NACD Expense	\$ 281.00
FNIC	Treasurers Bond	\$ 1,388.00
Fremont Sanitation	NRD/Wanahoo Rec Garbage	\$ 334.49
Google	Email	\$ 152.44
HBE LLP	Professional Service Accounting	\$ 6,750.00
Intermedia	Long Distance Fee	\$ 156.62
JEO Consulting Group, Inc.	New Office Building	\$ 9,700.00
Jill Breunig	Mileage Expense	\$ 42.50
Jill Breunig	Cell Phone Reimbursement	\$ 35.00
Joe Birkel	GMDA Expense	\$ 200.50
Karen Rezac	Cell Phone Reimbursement	\$ 35.00
Kim Homes	Wanahoo Ed. Building Cleaning	\$ 150.00
KTIC 840 Rural Radio	Radio Ads	\$ 217.00
Lacey Sabatka	Mileage Expense	\$ 36.68
Lacey Sabatka	Cell Phone Reimbursement	\$ 40.00
Lisa Russ - Cleaning Service	NRD Office Cleaning	\$ 517.50
M.E. Collins Contracting Co., Inc.	Wanahoo Stilling Basin	\$ 292,798.07
Madison County Clerk	Election Fees	\$ 200.00
Mark McGill	Education Outreach	\$ 350.00
Mid-American Benefits, Inc	Employee Benefits	\$ 578.00
Nationwide	Retirement	\$ 6,405.08
Ne Department of Revenue	Wanahoo Lodging Tax	\$ 249.50
Ne Department of Revenue	Czechland Lodging Tax	\$ 499.49
Nebraska Public Health Environmental Lab	Colon RW	\$ 30.00
Nebraska Public Health Environmental Lab	Bruno RW	\$ 30.00
Nebraska Public Health Environmental Lab	GWMP Cost-Share	\$ 48.00

Lower Platte North NRD

Bills Pending

2/10/23

Nebraska's Natural Resource District	Personnel Meeting	\$ 805.00
News Channel Nebraska	TV Promotion	\$ 475.00
Noah Franzen	Cell Phone Reimbursement	\$ 40.00
Olsson Associates	Wahoo Creek	\$ 42,817.55
Olsson Associates	Wahoo Creek Design 26a, 26b, 27	\$ 9,431.75
One Call Concepts, Inc	One Call	\$ 3.20
Papio-Missouri River NRD	Water Strategies Reimbursement	\$ 2,100.00
Platte County Agricultural Society	Rent - Nirtrogen Certificaton Class	\$ 1,000.00
Quill.com	Lamination Pouches	\$ 68.97
Quill.com	Office Supplies	\$ 87.46
Robert Meduna	GMDA Expense	\$ 200.50
Ryan Chapman	Cell Phone Reimbursement	\$ 45.00
Ryan Chapman	GMDA Expense	\$ 279.50
Sean Elliott	Cell Phone Reimbursement	\$ 45.00
Sparq Data Solutions Inc.	Yearly Subscription Emeetings	\$ 3,500.00
St. Benedict Center	Rent - Nirtrogen Certificaton Class	\$ 50.00
Sydney Abbott	Cell Phone Reimbursement	\$ 40.00
Sydney Abbott	NACD Expense	\$ 281.00
Thomas B. Preister	Decommissioned Well Reimbursement	\$ 1,565.72
Tyler Benal	Cell Phone Reimbursement	\$ 40.00
Tyler Benal	GMDA Expense	\$ 200.50
UBT	Bi-Weekly Payroll - 1/20/23	\$ 45,382.13
UBT	Director Per Diem - 1/20/23	\$ 7,417.08
UBT	Bi-Weekly Payroll - 2/3/23	\$ 43,452.88
UBT - Visa	Per. Mtg/Bldg Maint./Promo Item	\$ 6,952.56
Union Bank & Trust	Bank Fees	\$ 44.44
Village of Leshara	Drainage Improvcment Project	\$ 428.17
Village of Lindsay	Rent - Nirtrogen Certificaton Class	\$ 75.00
Wahoo Chamber of Commerce	Dues and Membership	\$ 85.00
Wahoo Newspaper	Yearly Subscription	\$ 160.99
Wahoo Utilities	Utlities Expense/Colon RW	\$ 2,220.00
Wahoo-Waverly-Ashland Newspapers	Eads- Public Notice	\$ 212.57
William Brueggemann	Cell Phone Reimbursement	\$ 35.00
Windstream	Internet Expense	\$ 551.80
Grand Total		\$ 501,978.64

Consent Agenda

February 10, 2023

- 5. Approval of Minutes
- 6.A.2.a.2. NARD Washington DC Trip
- 6.A.3.a. Directors Absence
- 6.A.6.a. Approval of Financial Reports
- 6.A.6.b. Approval Manager Time and Expense Sheets
- 6.B.4.d. NRD Owned Thomas Lake Lots
- 6.B.4.e. Sand/Duck Dam 15 Land Locked Issue
- 6.B.7.b.3. New Projector for Clint Johannes Ed. Building
- 6.C.4.a.2. Plugged Wells
- 6.C.5.a. USGS Stream Flow Gauging Sites
- 6.D.2.a. SWCP Tree Planting Applications
- 6.D.3.a.1. Shell Creek Implementation – 319/NET
- 6.D.3.a.2. Shell Creek Student Testing Supplies
- 8. Authorize General Manager to approve and then treasurer to pay monthly recurring expenses pursuant to April 11, 2011 board policy.