# Chapter 1. INTRODUCTION

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## CHAPTER 1. INTRODUCTION

Beginning in 1975 with the passage of the Ground Water Management Act and furthered by the passage in 1984 of the Ground Water Management and Protection Act (GWMPA), the state legislatively recognized ground water as one of its most valuable natural resources requiring sound management practices to insure future sustainability. Initially, ground water legislation provided for examination of ground water quantity problems and established a pattern of local control through delegated authority to the Natural Resource Districts (NRDs). In 1984, the state passed LB 1106 which required the NRDs to prepare ground water management plans specific to their area and submit these plans to the Nebraska Department of Water Resources (DWR). In the past few years, a policy evolved with the emphasis including water quantity and water quality. In 1991, LB 51 was enacted, requiring NRDs to expand their management plans to include ground water quality protection and submit revisions for approval to the DWR.

The basic purpose of these Ground Water Management Plans is to identify the ground water supplies, identify changes of the ground water levels, and identify the sources and levels of ground water contamination within an NRD boundary, to establish ground water quantity and quality goals, as well as a goal for the life of the ground water reservoir, and to develop long-term solutions necessary for the prevention and/or reduction of ground water declines or of high levels of ground water contaminants posing environmental and health hazards. The plans further include recommendations of suitable practices and programs to stabilize, reduce, and prevent the occurrence, increase, or spread of ground water declines or contamination.

The Twin Platte Natural Resources District (TPNRD) has prepared this Ground Water Management Plan to comply with the provisions of the GWMPA (LB 1106) and LB 51. Since the management of both quantity and quality for ground and surface waters has always been a priority of the District, this requirement complements long-standing District policy. This Ground Water Management Plan will be maintained as a growing and dynamic document consistent with the evolving understanding of the ground water resource limitations within the District. It is intended to provide a basis for decisions concerning the need for, and usefulness of, alternative corrective and preventive actions to be implemented within the District.

When evaluating the preparation process and content of these plans, one disadvantage must be recognized. In certain areas there is a lack of good scientific knowledge about ground water systems. The subsurface environment of ground water involves a complex interplay of physical, geochemical and biological forces which vary from place to place dependent on climatic, demographic and hydrogeologic factors. When analyzing quality of these systems, spatial and temporal trends are often further complicated by the effect of both natural phenomena and anthropogenic activities. Research projects and investigations on these systems have recently been increasing with objectives ranging from technological improvements for the assessment of the subsurface and chemical behavior in geologic materials to state-of-the-art remedial techniques.

As such, this Plan should also be viewed as a resource document presenting available technical and research information in a convenient form for utilization by relevant decision makers and other interested persons or organizations. The continual incorporation of new data will ensure that uncertainties do not undermine predictions and actions formulated by the District.

The framework for nonpoint source ground water quality include: 1) evaluate existing and potential sources of ground water contamination's; 2) prepare comprehensive description of the quality and vulnerability of the ground water; 3) develop the programs and identify practices that would be most effective in handling areas of existing and potential ground water contamination; and 4) evaluate the ground water monitoring program to determine the most efficient use of resources which will, in turn, enable the TPNRD to more effectively understand and react to existing or potential ground water contamination.

## 1.1 General Document Format

The Plan is divided into the following sections: Hydrogeologic Characterization; Land Use and Contamination Source Inventory; Water Usage and Demand; Data Collection; Ground Water Goals and Objectives; Endangered and Threatened Species; Ground Water Quantity; Ground Water Quality; and Plan for Action. Appendices include all pertinent supplemental materials.

Technical information on ground water resources is readily available for a statewide region, but detailed information specific to this District is limited at this time. As such, the technical sections of this Plan will provide general information for the entire District and specific information for limited areas. Where technical data is currently undeveloped, it will be so stated.

## 1.2 General Area Description

The TPNRD encompasses approximately 4,157 square miles within four counties: Arthur, and Keith in their entirety, the northern approximately three-fourths of Lincoln and the western two-thirds of McPhersen. The delineation of the TPNRD is shown in Figure 1.

Portions of three major river basins are contained within the TPNRD: the North Platte, the South Platte and the Platte.

Population totals for the 1990 census for the District is 40,816. Approximately 68 % of the District's 1990 census population reside in the cities of North Platte and Ogallala.

Topographically, the District consists of the Nebraska Sandhills, the Central Nebraska Loess Hills, the Rolling Plains and Breaks and the Central High Tableland as defined by the United States Department of Agriculture Natural Resources Conservation Service Major Land Resource Areas in Nebraska. The Major Land Resource Areas are shown in

Figure 8.

The soils vary in types, textures and relief. The soils in the District are shown in Figure 9.

The majority of the valley lands are devoted to pasture and row crops with the uplands consisting primarily of pasture with scattered row crops.

Ground Water or Surface Water for irrigation is required for agriculture production, as there is not sufficient moisture in the form of snow and rainfall to effectively produce crops. The mean annual precipitation is shown in Figure 7.

A complete description of the water supply sources available in the District is necessary so that ground water management decisions can be systematically and logically made. This Plan is based upon available data.

GW1:MPI

# Chapter 2. HYDROGEOLOGIC CHARACTERIZATION

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# CHAPTER 2. HYDROGEOLOGIC CHARACTERIZATION

Hydrogeology can be defined as the study of ground water with particular emphasis given to its chemistry, mode of migration, and relation to the geologic environment. Ground water occurs in many types of geologic formations; aquifers are of most importance. An aquifer is defined as a formation that contains sufficient saturated permeable material to yield significant quantities of water. These ground water bearing formations store and transmit water. Generally, aquifers are areally extensive, and may be overlain or underlain by a confining bed. This confined bed may be defined as a relatively impermeable material stratigraphically adjacent to one or more aquifers. The TPNRD is generally underlain by the Ogallala Aquifer.

## 2.1 Aquifer Description

Beneath the land surface, water occurs in two distinct zones: the zone of aeration and the zone of saturation. The zone of aeration lies immediately beneath the land surface containing both air and water in the pore spaces. The zone of saturation lies beneath the zone of aeration and contains only water in the pore spaces. The boundary between these two zones is commonly referred to as the water table. For the purposes of this section, the term ground water will apply to water occurring in the zone of saturation.

### 2.1.1 Geographic/Areal Description

Nebraska is divided into thirteen ground water regions of which six are represented in the TPNRD. The ground water regions are shown in Figure 2.

**Sand Hills**

Region 1-Sand Hills: Large yields of good-quality water can be obtained from aquifers of Tertiary and Quaternary age. Deposits of the Ogallala Group of Tertiary age underlie the entire region but become thin toward the east. Runoff rarely occurs because precipitation readily infiltrates the sandy soils. Most groundwater either is lost by evapotranspiration from lakes between the dunes and from subirrigated meadows or is discharged by seepage into streams that are known for their uniform flow.

**Platte River Valley**

Region 2-Platte River Valley: High yields of good-quality water can be obtained from sand and gravel of Quaternary age in most parts of the region. The Ogallala Group underlies the alluvium in parts of the North Platte River and South Platte River valleys and the Platte River valley as far east as Grand Island. It is also a source of water supply. Concentrations of dissolved solids in groundwater range from 500 to more than 1,000 milligrams per liter in the alluvium throughout most of the western two-thirds of the re gion. The highest concentrations occur in the South Platte River valley. The water quality there is affected primarily by dissolved minerals carried from soils by

infiltrating precipitation and irrigation water. In some of the Platte River valley, fertilizer applications are affecting ground water quality.

**Southwestern Tablelands**

Region 5-Southwestern Tablelands: Sandstone, sand and gravel deposits of the Ogallala Group have been developed extensively for irrigation. Pumping lifts of 200 feet or more are common. Ground water levels have declined progressively since development, began.

**Panhandle Tablelands**

Regions 6 and 7-Panhandle Tablelands: Although thick sequences of moderately permeable sediments of Tertiary age underlie the tablelands, wells are usually several hundred feet deep, and those of large capacity are restricted generally to areas underlain by the Ogallala or Arikaree Groups. Rocks beside major drainage courses usually are not saturated. In Region 7, wells also derive water from Brule Formation fractures in the valleys of Pumpkin and Lodgepole Creeks and in Sidney Draw.

**East Central Dissected Plains**

Region 8-East Central Dissected Plains: Ogallala Group deposits underlie the western two-thirds of the region, becoming thinner toward the east. In the central and eastern parts of the region, Pliocene and Pleistocene deposits of sand and gravel, mantled by loess, are thickest within buried paleovalleys. Water quality is generally good.

**Republican River Valley and Dissected Plains**

Region 9-Republican River Valley and Dissected Plains: Sand and gravel underlie the flood plains and terraces of the Republican River and its principal tributaries where they have cut into the uplands. Ogallala Group deposits are thickest in the northern and western parts of the region. Sand and gravel of Pliocene and Pleistocene age fill some buried paleovalleys. Cretaceous deposits of shale and chalk underlie the entire region and either are exposed or are thinly mantled by loess on the south side of the Republican River, where good-quality water is difficult to obtain.

### 2.1.2 Physical Characteristics

**Transmissivity**

Transmissivity is a measure of the volume of ground water that will flow through a given width of an aquifer under a specified slope of the water table. In practical terms, it provides a measure of the ability of an aquifer to supply water to wells. Transmissivity is dependent on a combination of the saturated thickness and the permeability of the aquifer. Thick aquifers of highly permeable materials have the highest transmissivity.

The conversion of transmissivity values to potential well yields requires the consideration of more factors than transmissivity alone, such as the type of well construction and development, the amount of drawdown and whether the ground water is confined or unconfined. Usually, where transmissivity values exceed 20,000 gallons per day per foot, wells can be developed with yields adequate for some types of irrigation. Where transmissivity values exceed 100,000 gallons per day per foot, high-capacity wells of more than one thousand gallons per minute can be developed for irrigation or other purposes.

Coarse-grained sediment is generally more permeable than fine-grained sediment. The areas showing the highest transmissivity have coarse-grained deposits of sand, sandstone and/or sandy gravel. Low transmissivity areas are characterized either by fine-grained deposits or by thin deposits of coarse-grained sediments. In such areas, the depth to bedrock generally is shallow or the overlying till is thick, as in the eastern part of the state.

The greatest thickness of saturated, coarse-grained deposits in the state underlies the Sand Hills region. Transmissivity values are high in this region, as they are in the North Platte River and South Platte River valleys, the Platte River valley and in much of the Big Blue River basin.

The transmissivity in the TPNRD is shown in Figure 6.

**Base of the Principal Ground Water Reservoir**

The shape of the bottom surface of the principal ground water reservoir in the TPNRD is shown by the contour lines on Figure 3. Although rocks below that surface may be saturated, they would yield water mostly at slow rates or would yield water of poor quality. Exceptions to this generalization are siltstone and sandstone of Oligocene age and sandstone, chalk, limestone and dolomite of the Cretaceous and Paleozoic ages.

The bottom surface of the principal ground water reservoir does not coincide with the bottom of a single stratigraphic layer in the rock sequence underlying Nebraska. Instead, it coincides with the bottom of different stratigraphic layers from one part of the state to another. For most of Nebraska's panhandle, the base of the principal ground water reservoir is considered to be the base of the Arikaree Group; for much of the central part of the state, it is the base of the Ogallala Group; and for most of the eastern part, it is either the base of the Quatemary deposits or the base of the lowest coarse-textured sediments within those deposits. Rocks directly underlying the principal ground water reservoir are of Pennsylvanian and Permian age in southeastern Nebraska, of Cretaceous age in most of the remainder of the state's eastern half and of the oldest Tertiary rocks (Chadron and Brule Formations of the White River Group) in its western half.

**Water Table**

The regional water table is generally defined as the upper surface of the water that fills

spaces in unconsolidated sediments or in consolidated rocks throughout a given region. Such spaces are mainly between grains, in cavities caused by dissolution or in fractures. They allow water to be transmitted toward some point or area of discharge at the land surface.

As depicted on Figure 4 by the water-table contour lines (lines of equal elevation above mean sea level), the regional water table is a subdued reflection of the land surface. Thus, since the land surface of Nebraska slopes generally eastward, the water table slopes generally in the same direction. The land surface is irregular because streams have carved valleys into it, and the water table reflects those valleys that have been cut deep enough for groundwater to discharge. Even if streams were not shown on the map, their valleys could be located by the upgradient V's in the water-table contour lines.

The points of control used for delineating the water table configuration are water levels in wells not being pumped when those levels were measured in the spring of 1979 and of the topographic elevations anywhere ground water is known to be discharging at the land surface. Admittedly, the water level in many wells does not coincide precisely with the water table since the position of the screen through which water enters a well and local geologic conditions can affect the level at which water stands in the well.

In many places in eastern Nebraska and in some places elsewhere in the state, layers of very fine textured sediments that retard downward movement of water are contained within deposits that are coarser textured and capable of transmitting water more freely. These fine-textured layers so hamper percolation of water that they may create a zone of saturation above them. Such zones are known as perched ground water if they are separated from the regional zone of saturation by intervening unsaturated sediments. The existence of perched ground water cannot be determined readily unless water-level data for both perched and regional zones of saturation are available. The existence of perched ground water further complicates the accurate delineation of the regional water-table configuration.

Natural rates of lateral ground water movement range from a few inches per year to as much as a few feet per day. The movement is downgradient and perpendicular to the water-table contour lines. Pumping from a single well causes a temporary steepening of the water table around the immediate area of the well but has no appreciable effect on the representation of the water-table configuration. On the other hand, long term pumping of large-discharge wells that are concentrated in a single area can cause distortion of the shape of the water table.

**Saturated Thickness of the Principal Ground Water Reservoir**

The saturated thickness map was created by superimposing maps showing the regional water-table configuration in the spring of 1979 (see Figure 4) on same-scale maps showing the configuration of the base of the principal ground water reservoir (see Figure 3) and then computing the differences between those two surfaces. In the TPNRD, saturated thickness ranges from less than 100 feet to more than 500 feet.

The saturated thickness of the principal ground water reservoir in the TPNRD is shown in Figure 5.

Thicknesses on this map indicate water-saturated sediments ranging from fine to coarse texture. A thin saturated thickness of coarse-textured sediments may yield larger amounts of water than fine-textured sediments of a greater saturated thickness. Hence, saturated thickness is only one of several factors serving as guides to the development of water supplies.

In evaluating the volume of the principal ground water reservoir, it is also important to consider that this reservoir is part of a dynamic recharge and discharge system. Nearly all the recharge to a local aquifer results from precipitation falling on overlying land. Additional recharge may come from stream seepage and applied irrigation water. Ground water is discharged from wells that are pumped, wells that flow without being pumped, springs, perennial streams and some lakes and swamps that are hydraulically continuous with saturated earth materials.

Before development of the water supply, a dynamic equilibrium existed that was reflected by relatively stable ground water levels. Because recharge approximately equaled recharge in that condition, ground water in storage remained about the same. Since the rate of intensive development of the state's ground water began to accelerate during the 1940s and 1950s, pumping for irrigation and other uses has increased the amount of discharge. A decline of water levels reflects the removal of ground water from storage. In some areas of the state, storage, transmission and application of surface water for irrigation have in creased the amount of recharge and have raised ground water levels.

The large volume of water stored in ground water reservoirs in Nebraska is of interest because few other regions of a similar size have comparable amounts of readily available, good-quality water occurring at relatively shallow depths. However, the amount of water available for withdrawal is an issue subject to many diverse considerations, including economics, surface water-ground water relationships, adverse environmental impacts and the use of a variety of management techniques, such as artificial recharge or the regulation of ground water withdrawals.

**Depth to Ground Water**

Depth to water is another important consideration in developing ground water supplies. However, factors of more importance are the thickness of the saturated zone and the capacity of that zone to transmit water to wells. Depth-to-water data do indicate the thickness of deposits that must be penetrated to reach an unconfined zone of saturation, but they are only one factor indicating how much pumping lift is required to bring water to the land surface. Other important considerations regarding lift are the transmissivity of the aquifer being developed and the kind of well construction and development. Where ground water is confined under much pressure, as in an artesian aquifer, water would rise in a well beyond the top of the confined saturated zone, and the pumping lift could be less

than the depth to that confined zone. In addition, in the area where perched ground water is common, water may occur in a well at a depth less than is indicated by the depth-to-water patterns.

In a large part of the TPNRD Sand Hills region, the dune topography makes practically impossible any indication of depth-to-water patterns on a map of the size than can be included in this plan. Depth to water beneath the higher dunes may be greater than 300 feet and beneath intervening valleys may be less than 50 feet. In places, such a wide range would require four depth-to-water patterns within distances too small for them to be clearly represented on a map.

## 2.2 Ground Water Recharge Sources

### 2.2.1 Precipitation

The primary source of natural recharge to the ground water reservoir is the precipitation that falls directly on the land. The annual precipitation in the TPNRD varies from slightly less than 18 to slightly more than 20. The mean annual precipitation from 1900 to 1979 is shown in Figure 7.

### 2.2.2 Surface Water

Within the TPNRD are storage facilities and canals for the Nebraska Public Power District (NPPD) which supplies surface water for irrigation in Dawson and Buffalo Counties and storage facilities and canals for the Central Nebraska Public Power and Irrigation District (CNPPID) which supplies surface water for irrigation in Kearney, Phelps and Gosper Counties. CNPPID has an incidental ground water recharge right along the CNPPID supply canal in east central Lincoln County.

Within the TPNRD are seven Irrigation Districts which irrigate lands within the North Platte valley and/or the South Platte valley.

The Keith-Lincoln Irrigation District diverts water from the North Platte River and irrigates lands in the North Platte River valley south of the North Platte River in an area between Sutherland, NE and Paxton, NE and in the South Platte River valley west of Sutherland, NE. The Keith-Lincoln Irrigation District has an incidental ground water recharge right. The application for the incidental ground water recharge right was prepared by the TPNRD. The application is on file in the TPNRD offices.

The Platte Valley Irrigation District diverts water from the North Platte River and irrigates lands in the North Platte River valley and the South Platte River valley south of the North Platte River in an area near Hershey, NE. The Platte Valley Irrigation District has an incidental ground water recharge right. The application for the incidental ground water recharge right was prepared by the TPNRD. The application is on file in the TPNRD offices.

The Paxton-Hershey Irrigation District diverts water from the North Platte River and irrigates lands in the North Platte River valley south of the North Platte River in an area north of Hershey, NE. The Paxton-Hershey Irrigation District has an incidental ground water recharge right. The application for the incidental ground water recharge right was prepared by the TPNRD. The application is on file in the TPNRD offices.

The Surburban Irrigation District diverts water from the North Platte River and irrigates lands in the North Platte River valley and the South Platte River valley south of the North Platte River in an area between Hershey, NE and North Platte, NE. The Surburban Irrigation District has an incidental ground water recharge right. The application for the incidental ground water recharge right was prepared by the TPNRD. The application is on file in the TPNRD offices.

The Cody-Dillon Irrigation District diverts water from the North Platte River and irrigates lands in the North Platte River valley south of the North Platte River in an area west of North Platte, NE.

The Birdwood Irrigation District diverts water from the North Platte River and irrigates lands in the North Platte River valley north of the North Platte River in an area north of Hershey, NE.

The Western Irrigation District diverts water from the South Platte River and irrigates lands in the South Platte River valley south of the South Platte River in an area south of Brule, NE. The Western Irrigation District has an incidental ground water recharge right. The application for the incidental ground water recharge right was prepared by the TPNRD. The application is on file in the TPNRD offices.

There are numerous other individual surface water rights within the TPNRD. The records of the NE Department of Water Resources may be consulted for information for these water rights.

A complete description of the interrelationship of the surface water resources and the ground water resources in the TPNRD is necessary so that management decisions can be systematically and logically made. Studies have not been made by the TPNRD in regard to the interrelationship of the surface water resources and the ground water resources in the TPNRD. This Plan therefore does not provide for the interrelationship of the surface water resources and the ground water resources in the TPNRD.

### 2.2.3 Supplemental Sources

Supplemental water sources are used to augment an existing system or supply to meet current demand or to provide for new uses. Supplemental water sources are additional water supplies that are made available within a specific location by either moving it from one area to another or storing it for later usage. The area's supplemental water sources are physically limited to essentially two alternatives: 1) construction and use of surface water reservoirs; and 2) importing ground and/or surface water from other locations.

Currently, surface water reservoirs in the TPNRD are those of NPPD and CNPPID.

The TPNRD has considered surface water reservoirs for storage of South Platte River water as provided for in the South Platte River Compact with Colorado. The Compact provides for a South Divide canal which could provide for off stream storage at reservoir sites identified by the TPNRD in Keith County. The TPNRD is currently not pursuing this project.

Potential future development of significant surface water reservoirs within the TPNRD is rather limited. Economic justification for such projects and legal/political issues could be insurmountable.

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# Chapter 3. LAND USE AND CONTAMINATION SOURCE INVENTORY

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# CHAPTER 3. LAND USE AND CONTAMINATION SOURCE INVENTORY

An important element to understanding existing and/or potential sources of ground water contamination is recognizing the interrelationship between land use and contamination sources.

## 3.1 Land Use

The TPNRD covers approximately 2,660,480 acres, in which the majority of the land is pastureland. The majority of the urban population resides in the North Platte and Ogallala areas. Irrigated cropland is found in the North Platte River valley, the South Platte River Valley, the Platte River valley and scattered throughout the uplands. The USDA Natural Resources Conservation Service has detailed census information for land use within the TPNRD.

The pattern for land use within the District is not expected to change significantly over the next decade and may show a slight conversion of agricultural lands to other utilities such as residential, industrial and commercial.

### 3.1.1 Major Land Resource Areas

The United States Department of Agriculture Natural Resources Conservation Service (NRCS) has determined that there are ten Major Land Resource Areas within Nebraska. Four of the Major Land Resource Areas are within the TPNRD. The four of the Major Land Resource Areas are within the TPNRD are shown in Figure 8.

### 3.1.2 Soils

The Nebraska Natural Resources Commission (NNRC) has on file in the Data Bank Generalized Soil Maps for Nebraska produced from data from the United States Department of Agriculture Natural Resources Conservation Service (NRCS). The Generalized Soil Map for the TPNRD prepared by the NNRC is shown in Figure 9. A color version of the Generalized Soil Map for the TPNRD is on file in the TPNRD offices and is available from NNRC.

## 3.2 Contamination Source Inventory

Nonpoint and point sources interact with the physical environment and have the ability to contaminate the ground water reservoir. Identifying these sources and developing controls can reduce the threat of ground water contamination.

### 3.2.1 Nonpoint Source Inventory

Nonpoint sources are defined as indiscernible, diffuse and indistinct conveyance from which pollutants are or may be discharged. Nonpoint sources, which are difficult to assess quantitatively and control, include inputs from agrichemicals, storm water runoff,

erosion, ground water, and biological sources such as animal feedlots. Nonpoint source pollution has the potential to significantly impact ground water quality. Nonpoint source problems in Nebraska include agrichemicals, sod erosion and sedimentation, livestock wastes and urban stormwater. No current data is available to quantify the pollutants from these sources.

Residential agrichemicals are applied in urbanized areas. The greatest potential for nonpoint sources lie in the cities of North Platte and Ogallala where the greatest concentration of the populous reside.

Erosion and sedimentation are natural geologic phenomena. Land development activities, however, can initiate severe, highly undesirable, and damaging alterations in the natural process by accelerating the erosion/sedimentation process.

Sedimentation is a rural and urban problem. Existing TPNRD programs assist landowners in the implementation of conservation plans for the construction of soil and water conservation practices. These include terraces, diversions, waterways and erosion control structures to help prevent sod erosion, reduce downstream sedimentation and control nonpoint pollution.

The Nebraska Erosion and Sediment Control Act of 1986 allows landowners to request the TPNRD assistance to control sediment and erosion. This act applies to agricultural lands and commercial, industrial and urban lands.

The Clean Water Act and its amendments have established water quality standards, discharge limitations, and permit goals for point discharge limitations, and permit goals for point discharges.

Nonpoint sources of pollution from agricultural lands are currently unregulated. The Clean Water Act statutorily exempted agricultural storm water and irrigation return flows.

### 3.2.2 Point Source Inventory

In addition to the authority delegated to the NRDs in the GWMPA, statutory authorities in the area of ground water quality have been assigned to the Nebraska Department of Environmental Quality (NDEQ) and the Nebraska Department of Health (NDOH).

In 1971, the Nebraska Environmental Protection Act established NDEQ and entrusted it with the responsibility of protecting and improving environmental quality in the state. NDEQ monitors the land, water, and air for changes in environmental quality. They also issue permits and periodically inspect industries engaged in activities that could affect environmental quality. Long range strategies are also developed, such as the Nebraska Groundwater Quality Protection Strategy (NGQPS).

NDEQ's current monitoring programs involve predominantly point sources (e.g.

industrial and municipal discharge points and solid waste disposal sites) for compliance purposes. They do not systematically sample and/or monitor wells for ground water quality in other areas of the TPNRD which might relate to non-point sources (e.g. pesticides and nitrogen fertilizers). The NGQPS identifies the need to monitor potential contamination sources such as:

1) Spills and leaks of hazardous materials from commercial storage facilities,
2) Agricultural chemical usage, primarily nitrogen fertilizers and pesticides,
3) Waste treatment and disposal areas,
4) Abandoned or poorly constructed wells and test holes,
5) Hazardous material storage, usage, and disposal at industrial facilities, and
6) Spills or leaks of hazardous materials along transportation corridors.

A major focus of the Federal Clear Water Act (CWA) is controlling "point source" pollution. In this Act, a "point source" is defined as "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel . . . from which pollutants are or may be discharged". 33 U.S. C. Section 1362(14). This Act empowered the U.S. Environmental Protection Agency (EPA) or an authorized state agency to conduct programs relevant to the requirements of the CWA. Within the State of Nebraska, the NDEQ administers such programs; their requirements not only overlay the federal regulatory structure, but are often more stringent. Information on the number of regulatory point permits issued by NDEQ and EPA for various communities in the TPNRD may be obtained from NDEQ.

**RCRA**

The Resource Conservation and Recovery Act (RCRA) is a federal statute designed to protect ground water from contamination through releases of hazardous substances. It sets up a "cradle-to-grave" system for tracking wastes from their generation, through transportation, to treatment, storage or disposal. To comply with RCRA, businesses that generate, store or transport hazardous waste are required to register their activities with the EPA. A list of businesses in the TPNRD that have complied under RCRA can be obtained from the NDEQ.

**Title III**

The Emergency Planning and Community Right-to-Know Act, or Title III, lists businesses that use, store, or release hazardous substances as part of the normal business operations. Title III was established to provide necessary information to emergency response teams when preparing for incidents involving hazardous substances and to appraise the public of any hazardous materials being used in their community. A Toxic Chemical Release Inventory for the TPNRD may be obtained from NDEQ.

**Underground Storage Tanks**

NDEQ prepares Underground Storage Tanks (UST) lists and CERCLIS inventory reports that identify known contamination sites. UST identifies all sites with reported underground storage tanks releases. CERCLIS is an acronym for the Comprehensive Environmental Response and Liability Information System. UST lists and CERCLIS inventory reports may be obtained from NDEQ.

**NPDES**

The National Pollution Discharge Elimination System (NPDES) requires all persons discharging pollutants from a point source into any waters of the state to apply and obtain a permit for this activity. State requirements for NPDES permitting are specified under Title 119-NDEQ. Waste water treatment facilities, water treatment facilities, and sanitary improvement districts comprise the majority of the permittes. A list the NPDES permittes may be obtained from NDEQ.

**Hazardous Waste Inventory**

The EPA report for Hazardous Waste Administrative Inventory lists the facilities in the TPNRD. The list may be obtained from the EPA.

**Solid Waste Facilities**

Solid waste facilities are licensed by NDEQ.

The TPNRD is not aware of any active licensed landfills in the TPNRD. Solid waste from within the TPNRD are transported to an active land fill south of Ogallala in Perkins County.

The West Central Nebraska Development with offices in Ogallala, NE has taken an active role in coordinating solid waste management facilities in the TPNRD and may be contacted for information.

**Chemigation**

Chemigation through center pivot irrigation systems are regulated through the Nebraska Chemigation Act of 1986. This Act requires center pivot owners who chemigate to take measures to prevent chemicals from contaminating the groundwater supply. NRDs were assigned the responsibility to inspect these systems, verify safety precautions, and issue permits for chemigation. There are approximately 650 active permits in the TPNRD.

**Private Septic Systems**

A common private septic system consists of a septic tank and soil absorption field. Liquid waste flows from the tank to the soil absorption field where it is purified as it filters through the soil. Soil type is crucial to this process since only certain types of soil can properly purify the effluent. A soil with large pores allows the effluent to move quickly

and does not hold it long enough for complete purification before it encounters the ground water. 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 nitrates, bacteria, viruses, and hazardous chemicals.

There are presently no statistics which summarize the number of septic systems in the TPNRD. However, areas of concern include residential development surrounding lakes. Soils in these areas are coarse, and depth to groundwater is relatively shallow, making the potential for contamination greater than in upland sites.

The location of septic systems relative to drinking water wells is important in determining contamination potential. Where local hydrogeology is suitable, and wells and septic systems are properly constructed, contamination from private septic systems should be minimal.

### 3.2.3 Concentration of Total Dissolved Solids

Concentration of total dissolved solids (TDS) is shown on Figure 11 and includes the major dissolved constituents: calcium, magnesium, sodium, potassium, bicarbonate, sulfate and chloride. Most ground water in the principal reservoir contains low levels of total dissolved solids. In a few areas of the major river valleys in Nebraska, concentrations of TDS exceed 500 milligrams per liter in the principal ground water reservoir. These areas have been affected by seepage from rivers that may have been enriched in total dissolved solids by evapotranspiration and by irrigation return flows. The U.S. Public Health Service in 1962 recommended a limit of 500 milligrams per liter of TDS in drinking water. Regulations implemented in 1977 by the U.S. Environmental Protection Agency (EPA) do not contain a specific limit for TDS, but secondary guidelines that are based generally on aesthetic considerations include a limit of 500 milligrams per liter.

Although the concentration of total dissolved solids serves to indicate the level of mineralization of water in the principal ground water reservoir, this is only one aspect of water quality. TDS is not an indicator of health-related contaminants, such as nitrates, radioactive and nonradioactive metals and organic compounds. In various locations across the state, water occurs in wells with concentrations of nitrates (as nitrogen) exceeding the EPA standard for drinking water of 10 milligrams per liter. Many organic chemicals become injurious to health at concentrations considerably less than one milligram per liter, and TDS levels usually offer no clues to the presence of these chemicals. Considerable variance from average quality can occur at different depths or times at any specific site. Analysis for specific potential contaminants in a well is warranted when there may be a health concern related to water.

### 3.2.4 Ground Water Vulnerability to Contamination

**DRASTIC Method**

Figure 10 is a Generalized Map of the TPNRD showing the potential ground water vulnerability to contamination using the DRASTIC method prepared by NNRC. A color version of the Generalized Map for the TPNRD is on file in the TPNRD offices and is available from NNRC.

The DRASTIC method was developed by the EPA and the National Water Well Association. The method incorporates weighted factors affecting contaminant transport to ground water. The hydrogeologic factors used in the evaluation are:

D - Depth to water
R - Recharge to the aquifer
A - Aquifer media
S - Soil media
T - Topography (slope)
I - Impact to vadose (unsaturated) zone
C - Conductivity (hydraulic) of the aquifer

### 3.2.5 Wellhead Protection Area

NDEQ may delineate Wellhead Protection Areas. These protected areas may be assigned Remedial Action Classes (RAC) by NDEQ. Wellhead Protection Areas have been delineated by NDEQ for seven out of the ten municipalities in the TPNRD (Brady, Brule, Hershey, North Platte, Ogallala, Paxton, and Sutherland).

## 3.3 Needs and Data Deficiencies

The land use data provided by the NNRC data bank primarily focused on agricultural lands. All urban lands were grouped together. In urbanized areas, where sources of containments may need to be further defined, a more detailed map may be necessary.

Improperly abandoned wells provide a mechanism to introduce containments into the ground water. The Nebraska Department of Health, Title 178, Chapter 12 - Regulations Governing Water Well Construction, Pump Installation and Water Well Abandonment Standards - defines the proper procedure to abandon a well. A record of permanently discontinued wells or water wells in which the use has been accomplished is deficient. A method of identifying and locating improperly abandoned wells may be needed to eliminate this passage of containments. The TPNRD provides cost-share assistance for properly sealing abandoned wells.

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# Chapter 4. WATER USAGE AND DEMAND

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## CHAPTER 4. WATER USAGE AND DEMAND

This section discusses the current uses of water from all ground and surface water sources in the TPNRD.

### 4.1 Registered Wells

The registered wells in the TPNRD are shown in Figure 12. Figure 12 was prepared by the Nebraska Natural Resources Commission (NNRC) from data compiled in the Data Bank.

### 4.2 Domestic

Domestic uses of water include human consumption, sanitation and fire protection, as well as seasonal uses for landscaping irrigation and recreation areas. Major ground water concerns in the District focus on individual or community wells that provide potable water for human consumption, business and industry. These concerns are magnified near population centers that rely exclusively upon their relatively inexpensive, abundant ground water resources for future growth and development.

### 4.3 Agricultural

The use of water in agriculture involves two main enterprises: crop production and livestock.

A summary of irrigated acres by year from 1935 to 1993 is shown in Appendix G. Appendix G shows yearly totals by County within the TPNRD and cumulative totals by County within the TPNRD. Appendix G was prepared by NNRC from data compiled in the Data Bank.

A summary of irrigation wells by year from 1935 to 1993 is shown in Appendix E. Appendix E shows yearly totals by County within the TPNRD and cumulative totals by County within the TPNRD. Appendix E was prepared by NNRC from data compiled in the Data Bank.

The center pivot irrigation systems in the TPNRD are shown in Figure 13. Figure 13 was prepared by NNRC from data compiled in the Data Bank.

#### Subirrigation

Subirrigation or subirrigated land is the natural occurrence of a ground water table within the root zone of agricultural vegetation. Nebraska statutes section 46-655(14) define subirrigation as not exceeding ten feet below the surface of the ground.

Studies have not been done for the lands within the TPNRD to determine the extent of subirrigation in the TPNRD.

Subirrigation exists in the valley lands and in scattered areas throughout the uplands within the TPNRD.

## 4.4 Industrial

Water used for industrial purposes in the TPNRD is limited.

A summary of industrial wells by year from 1935 to 1993 is shown in Appendix F. Appendix F shows yearly totals by County within the TPNRD and cumulative totals by County within the TPNRD. Appendix F was prepared by NNRC from data compiled in the Data Bank.

## 4.5 Other Plant and Animal Species

Surface water is the predominant source of water used by fish and wildlife.

Refer to Chapter 7 for information on endangered and threatened species.

## 4.6 Recreation

No information was obtained on water usage and demand for recreation.

## 4.7 Value of Ground Water

There is insufficient data available to estimate the value of ground water use. However, an indication that a value does exist can be shown. In agriculture, irrigation of crops will increase yields. Placing a dollar value on ground water supplies for domestic or municipal usage is extremely difficult. If, however, a public or private water system is threatened either by quality or quantity problems, resolutions may be very costly.

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# Chapter 5. DATA COLLECTION

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## CHAPTER 5. DATA COLLECTION

### 5.1 Ground Water Levels

The ground water table levels in the Twin Platte Natural Resources District have remained relatively stable during the period of monitoring by the District.

The ground water is well understood within the District. The District began a ground water table levels monitoring program in 1976 and continues to monitor 84 sites annually during the early spring and the fall.

Figure 14 shows the locations of the sites monitored. Appendix A is the complete data of record. Appendix B is spring Ground Water Level Changes for Major Land Resource Areas showing the baseline year 1983 compared to the average for 1993, 1994 and 1995.

The District initiated the Ground Water computer model study titled "Hydrogeology of Parts of the Twin Platte and Middle Republican Natural Resources Districts, Southwestern Nebraska" (NE Water Survey Paper 70) in cooperation with the Middle Republican Natural Resources District, the University of NE Conservation and Survey Division, and the U.S. Geological Survey. The study report was published in April, 1992. The study report is on file in the Twin Platte Natural Resources District offices.

The study indicates that the saturated thickness varies in the study area within the Twin Platte Natural Resources District from 200 feet in southeastern Keith County to 550 feet east of the City of North Platte. The model in the study was used to assess the effect of three irrigation development scenarios representing: (1) Minimum development, (2) Continued development at the 1970-1980 rate, and (3) Maximum development. Each scenario was based on a determination of remaining irrigable acres as of 1980 and development of those acres to the year 2020 at a rate of 0 percent (minimum development, no new well after 1980), 2.5 percent per year (continued development), and 10 percent per year (maximum development). Each development rate was in turn coupled with various amounts of water applied by the wells in place by 1980 or by those added to develop the irrigable acres. Rates of water applied assumed no return to the aquifer and included rates of 6, 9, 12, 15, and 18 inches per year. By adding 4 to 5 inches to amounts of water applied, the total inches pumped can be approximated. The study indicated that the application rate of 12 inches per year coupled with 2.5 percent development rate may provide the most realistic assessment of what might be expected across the area up to the year 2020. At that application rate, approximately 16 to 17 inches would be pumped. In the Twin Platte Natural Resources District , at the application rate of 12 inches per year coupled with 2.5 percent development rate, the model shows 0 to 10 feet of declines by the year 2000 and 0 to 40 feet of declines by the year 2020. The application rate of 12 inches per year coupled with a 0 percent development rate is currently the most realistic assessment of what might be expected across the area up to the year 2020. At that application rate, approximately 16 to 17 inches would be pumped. In the Twin Platte Natural Resources District , at the application rate of 12 inches per year coupled with 0 percent development rate, the model

shows no declines by the year 2000 and no declines by the year 2020. It is therefore assumed by the Twin Platte Natural Resources District , that there would be no declines by the year 2020 in the study area.

The District initiated the Ground Water computer model study titled "Simulation of Ground Water Movement in the High Plains Aquifer, Southern Sandhills Area, West Central Nebraska" (U.S.Geological Survey Open File Report 94-XXXX) in cooperation with the Upper Loup Natural Resources District, the University of NE Conservation and Survey Division, and the U.S. Geological Survey. The study is expected to be completed late in calendar year 1995. The District has viewed a draft of the study report. The study report is not available for release.

The draft of the study indicates that the saturated thickness varies in the study area within the Twin Platte Natural Resources District from 100 feet in the western part of the Platte River Valley to 800 feet in the north-central part of the Twin Platte Natural Resources District . The model in the study was used to assess the effect of maximum irrigation development. The maximum irrigation development was based on a determination of remaining irrigable acres as of 1990 and development of those acres for 20 years at a rate of one additional well in each township annually for 10 years and 2 additional wells in each township annually for the next 10 years. The development rate was in turn coupled with an amount of water applied by the wells in place or by those added to develop the irrigable acres. The rate of water applied of 13.2 inches assumed no return to the aquifer. The total pumped was assumed to be 16.5 inches. In the Twin Platte Natural Resources District , at the application rate of 13.2 inches per year coupled with the maximum development rate, the model shows declines up to 2.02 feet in 10 years and declines up to 9.63 feet in 20 years. That maximum development rate coupled with no more than 6 wells in place before new development would cause development of 35% to 40% of a township in the first 10 years and 85% to 100% of a township in the next 10 years. The most realistic assessment of what might be expected across the area in the next 20 years would be a development rate much below the maximum assumed in the model. It is therefore assumed by the Twin Platte Natural Resources District , that there would be no declines in the next 20 years in the study area.

## 5.2 Ground Water Contamination

The ground water nitrate levels in the Twin Platte Natural Resources District have remained relatively stable during the period of monitoring by the District.

The ground water quality in regard to nitrates is fairly well understood within the District. The District began a ground water quality monitoring program for nitrates in 1982 and continues to monitor 78 sites annually during either the early spring or the fall.

Figure 15 shows the locations of the sites monitored. Appendix C is the complete data of record. Appendix D is Ground Water Nitrate Data for Major Land Resource Areas for the years 1988 through 1995 and the average for the last three years, 1993, 1994 and 1995.

The District initiated the Ground Water computer model study titled "Hydrogeology of Parts of the Twin Platte and Middle Republican Natural Resources Districts, Southwestern Nebraska" (NE Water Survey Paper 70) in cooperation with the Middle Republican Natural Resources District, the University of NE Conservation and Survey Division, and the U.S. Geological Survey. The study report was published in April, 1992. The study report is on file in the TPNRD offices.

Within the study area in the Twin Platte Natural Resources District , 5 wells were sampled in Lincoln County, 4 wells were sampled in Arthur County, 3 wells were sampled in McPherson County and 4 wells were sampled in Keith County during 1978. The chemical analysis was for Specific Conductance (MICROMHOS), PH (Units), Temperature (Degree C), Color (PLATINUM-COLBALT UNITS), Hardness (MG/L as CACO3), Hardness Noncarbonate (MG/L CACO3), Calcium Dissolved (MG/L as CA), Magnesium Dissolved (MG/L as MG), Sodium Dissolved (MG/L as NA), Sodium Adsorption Radio, Potassium Dissolved (MG/L as K), Bicarbonate (MG/L as HCO3), Carbonate (MG/L as CO3), Alkalinity (MG/L as CACO3), Sulfate Dissolved (MG/L as SO4), Chloride Dissolved (MG/L as CL), Fluoride Dissolved (MG/L as F), Silica Dissolved (MG/L as SIO2), Solids Residue as 180 Degrees C Dissolved (MG/L), Solids Sum of Constituents Dissolved (MG/L), Solids Dissolved (Tons per AC-FT), Nitrogen NO2+NO3 Dissolved (MG/L as N), Phosphorus Dissolved (MG/L as P), Arsenic Dissolved (UG/L as AS), Boron Dissolved (UG/L as B), Cadmium Dissolved (UG/L as CD), Chromium Dissolved (UG/L as CR), Copper Dissolved (UG/L as CU), Iron Dissolved (UG/L as FE), Lead Dissolved (UG/L as PB), Manganese Dissolved (UG/L as MN), Mercury Dissolved (UG/L as HG), and Zinc Dissolved (UG/L as ZN).

Within the study area in the Twin Platte Natural Resources District, 16 wells were sampled in Lincoln County and outside the study area 3 wells were sampled in McPherson County during 1979. The chemical analysis was for Specific Conductance (MICROMHOS), PH (Units), Temperature (Degree C), Color (PLATINUM-COLBALT UNITS), Hardness (MG/L as CACO3), Hardness Noncarbonate (MG/L CACO3), Calcium Dissolved (MG/L as CA), Magnesium Dissolved (MG/L as MG), Sodium Dissolved (MG/L as NA), Sodium Adsorption Radio, Potassium Dissolved (MG/L as K), Bicarbonate (MG/L as HCO3), Alkalinity (MG/L as CACO3), Sulfate Dissolved (MG/L as SO4), Chloride Dissolved (MG/L as CL), Fluoride Dissolved (MG/L as F), Silica Dissolved (MG/L as SIO2), Solids Sum of Constituents Dissolved (MG/L), Solids Dissolved (Tons per AC-FT), Nitrogen NO2+NO3 Dissolved (MG/L as N), Phosphorus Dissolved (MG/L as P), Boron Dissolved (UG/L as B), Iron Dissolved (UG/L as FE), and Manganese Dissolved (UG/L as MN).

The study indicates that dissolved chemical constituents in water are important because the amounts and combinations of dissolved ions in solution determine the water's suitability for most uses. Generally, water that has low concentrations of dissolved solid is considered to be of good quality, whereas, highly mineralized water is considered to be of poor quality. The study, however, indicates that this is an arbitrary designation that depends on the use of the water.

The study indicates that water is considered suitable if it can be used safely for human and animal consumption or other domestic uses, or if it can be used for crop watering without harm to the crops to which it is applied. Drinking water suitability is based on maximum contaminant levels (MCL) established by the US Environmental Protection Agency (EPA). MCLs for constituents measured on samples from the study area are fluoride, 4 MG/L, and nitrate as nitrogen (N), 10 MG/L. Concentrations of fluoride, a constituent that occurs naturally in water, were well below the MCL in all samples within the Twin Platte Natural Resources District . Concentrations of nitrate as nitrogen was below the MCL in all samples within the Twin Platte Natural Resources District .

The nitrate levels in the ground water within the District are fairly well understood due to the Districts monitoring program which has been in place for 13 years. The data is collected from sites uniformly distributed throughout the District. The sites were selected based on location and availability and the wells are primarily private domestic wells. The drilling information for each well in many cases is not available and therefore the geology of the well in most cases is not known.

Contamination from other non-point sources is not well understood within the District. Snapshots of information is available from the sampling done in 1978 and 1979, but established long term monitoring programs have not been done.

The Board of Directors on March 9, 1995 approved a Ground Water Quality Study to be done by the University of Nebraska Conservation and Survey Division. The study is to begin July 1, 1995 and a final report is to be completed by June 30, 1997. The study will establish base-line water quality conditions of the major ground water bearing units in the District and develop a ground water monitoring program to monitor future conditions as they relate to nonpoint contamination. The approach used in the study will interpret ground water quality data and develop a monitoring strategy in the context of the geologic materials in the subsurface and local hydrologic variables such as precipitation and irrigation. The study will be conducted in two phases.

Phase I (July 1, 1995 to April 30, 1996) Activities.

1. Compile geologic data, construct geologic cross sections and define hydrogeologic units. The anticipated products will be a hydrogeologic data base and maps showing distribution and thickness of hydrostratigraphic units.

2. Compile ground water quality data from all known available sources. The anticipated products will be a ground water quality data base; and maps and tables showing the distribution of ground water quality characteristics.

3. Compile soil and landuse maps. The anticipated products will be soil and land-use maps showing locations of water quality samples.

4. Compile agrichemical application data, types and amounts. The anticipated products will be agrichemical application data and figures showing relations to landuse and crop type and provide the basis for selecting water quality parameters to be analyzed.

5. Compile ground water level data and hydrographs and construct seasonal water table maps. The anticipated products will be water-table maps for the District showing general ground water flow directions.

6. Compile stream discharge data and hydrographic maps. The anticipated products will be graphs showing variations in stream flows along the Platte River and maps showing distributions of surface drainages and canals, which may affect water quality.

7. Compile climatological data. The anticipated products will be graphs showing variations in precipitation data.

8. Evaluate historical ground water quality data in the context of available ancillary data sets and develop ground water monitoring plan. The anticipated products will be a report that focuses the interpretation of ground water quality data in terms of the ground water system and hydrologic variables and present a plan for further sampling to better constrain baseline conditions where data gaps exist.

Phase II (April 30, 1996 to June 30, 1997) Activities.

1. Establish a monitoring well network using available wells based on spatial and vertical hydrogeologic variability across the District.

2. Water sampling. 150 samples for NO3 and immunoassay of selected pesticides and herbicides. If pesticides and/or herbicides are indicated, wells will be resampled and sent to an appropriate lab. 50 of the samples will be analyzed for major ions.

3. Evaluate and interpret the new data using information collected in Phase I.

The anticipated products will be a report entitled "The Twin Platte Natural Resources District Ground Water Quality Study". The report will include recommendations for the design of a monitoring network for long-term analysis of ground water quality. The results of the report will be incorporated in the TPNRD's Ground Water Program.

# Chapter 6. GROUND WATER GOALS AND OBJECTIVES

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# CHAPTER 6. GROUND WATER GOALS AND OBJECTIVES

## 6.1 Objectives

### 6.1.1 Ground Water Quantity

Maintain for 100 years the Twin Platte Natural Resources District's ground water quantity for domestic, agriculture, and commercial purposes.

### 6.1.2 Ground Water Quality

Maintain the Twin Platte Natural Resources District's ground water quality acceptable for domestic purposes.

## 6.2 Reservoir Life Goal

The Reservoir Life Goal for the Twin Platte Natural Resources District's ground water will be infinite for domestic purposes and 100 years for agriculture, and commercial purposes.

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# Chapter 7. ENDANGERED AND THREATENED SPECIES

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## CHAPTER 7. THREATENED AND ENDANGERED SPECIES

The Nebraska Game & Parks Commission notified the Twin Platte Natural Resources District in a letter dated August 10, 1992 that the Commission had identified the existence and/or the potential existence of threatened species that may be affected by ground water levels. The letter is on file in the District's offices.

The Nebraska Game & Parks Commission believes that general protection of ground water quantity and quality has many benefits including protecting the habitats of threatened species listed in this plan.

The Twin Platte Natural Resources District acknowledges that any ground water management activities proposed in this plan may have some impact, positive or negative, on threatened species listed in this plan, but is not advised at this time of any such impact occurring.

The Nebraska Game & Parks Commission has provided information to the District of known locations identified by Nebraska Game & Parks Commission where it is possible that endangered and threatened species could be impacted by ground water withdrawals and descriptions of potential habitats for such species. Letter is on file in the District's offices.

### 7.1 Threatened Fish

Table 7-1, prepared from information provided to the Twin Platte Natural Resources District by the Nebraska Game & Parks Commission, lists the streams in the District occupied by fish which Nebraska Game & Parks Commission has identified as state threatened fish.

**Table 7-1**

| Stream | County | Species |
|---|---|---|
| Sand Creek | Keith | Northern Redbelly Dace |
| Cedar Creek | Keith | Northern Redbelly Dace<br>Finescale Dace |
| Whitehorse Creek Tributary South Fork | Lincoln | Northern Redbelly Dace |

The Twin Platte Natural Resources District has on file slides provided to the District by the Nebraska Game & Parks Commission to aid in the identification of the threatened fish listed in Table 7-1.

The Nebraska Game & Parks Commission reports that the threatened fish found in the Twin Platte Natural Resources District cannot tolerate increased turbidity. The

Commission reports that small reductions in flows in these streams could have a significant impact due to these streams being characterized by low flows and reduction in flows could directly impact these fish through loss of habitat or indirectly impact these fish through increased turbidity resulting from concentrating suspended material.

## 7.2. Threatened Plants

The Nebraska Game & Parks Commission reports that potential habitat for the western prairie-fringed orchid, a federal and state threatened plant, may occur within the Twin Platte Natural Resources District. The Commission reports that potential orchid habitat would require further investigation to determine the presence of the plant.

The Nebraska Game & Parks Commission reports that the western prairie-fringed orchid is an inhabitant of native tallgrass wet meadows and mesic tallgrass prairies. The Commission reports that typical habitats are moderate to high quality meadows and prairies which have not been subjected to large scale disturbance such as plowing, extreme overgrazing, or heavy herbicide use. The Commission reports that potential habitats may have a history of light disturbance such as haying and/or grazing. The Commission reports that the western prairie-fringed orchid initiates growth in late spring with flowering occurring in late June to early July and that in some years, only vegetative growth occurs with no flowering.

The Twin Platte Natural Resources District has on file a booklet provided by the Nebraska Game & Parks Commission titled "NEBRASKA'S Threatened and Endangered Species Western Prairie Fringed Orchid" for assistance in identification of the western prairie-fringed orchid and its habitat.

The Nebraska Game & Parks Commission reports that reduction in ground water levels could significantly impact the hydrology of local habitats occupied by the orchid. The Commission reports that examples of ground water use that could impact the western prairie-fringed orchid and its habitat are the number of wells within an area, the proximity of a well to the habitat, and the timing and quantities of ground water withdrawals. The Commission reports that an example of a direct impact would be a new well installation and examples of indirect impacts may be reduced water availability or increasing the concentration of suspended particles, pesticides, of herbicides.

## 7.3 Management

The Twin Platte Natural Resources District acknowledges that the Nebraska Statutes authorize the District to modify this plan in the future should specific adverse effects on threatened species, listed in this plan, from changing ground water levels, be identified and that such modifications should include actions within control or management areas consistent with the Nebraska Ground Water Management and Protection Act that could be taken by the District to reduce adverse effects on species by maintaining a ground water level that will help sustain these species.

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# CHAPTER 8 GROUND WATER QUANTITY

## 8.1 Historical Review Regarding the Nebraska Ground Water Management and Protection Act (GWMPA)

Since its original enactment in 1975, the Ground Water Management and Protection Act, has been modified several times. The Nebraska State Legislature adopted the Ground Water Management Act (GWMA) in 1975, in response to growing concern over ground water depletion occurring in the state through the mining of aquifers. This Act provided a method to control and regulate ground water depletion (quantity), but did not address ground water quality issues.

The Nebraska Legislature revised the GWMA to incorporate ground water quality concerns in 1982. The title of the Act was changed to the Ground Water Management and Protection Act (GWMPA). The 1982 GWMPA did not provide specific authority to prevent ground water quality degradation. However, it did establish a basis that would ultimately authorize the NRDs to administer non-point source contamination regulations through the implementation of Ground Water Quality Management Areas (GWQMA). Legislation enacted in 1986 provided the NRDs with the authority to choose to establish ground water management areas after preparation of a District Ground Water Management Plan.

Legislative Bill 1106, enacted in 1984, mandated that each of the 23 NRDs develop a ground water management plan to inventory the ground water resources within each District, but contamination concerns were not a required component of the plan. Revisions included in the 1986 update of the Act further defined the role of the Natural Resources Districts and the means by which they could address non-point source ground water contamination.

The concept of Special Protection Area (SPA) was first introduced in the Legislature in 1983 in LB 426, which did not pass. A similar bill, LB 463, was introduced in 1985, which did not pass either. A compromise bill, LB 894, was adopted in 1986. LB 894 allowed the Nebraska Department of Environmental Quality (NDEQ) to administer regulations for ground water non-point source contamination. In addition, this legislation gave NDEQ the ability to engage in a non-point source contamination issue at the request of other entities than just NRDs.

Several pieces of legislation passed in the Nebraska Unicameral have affected the SPA program since its inception in 1986. LB 51, enacted in 1991, imposed that prior to July 1, 1993, each NRD shall amend its ground water management plan to identify to the extent possible: 1) levels and sources of ground water contamination within the area, 2) ground water quality goals, 3) long term solutions necessary to prevent the levels of ground water contaminants from becoming too high and to reduce high levels sufficiently to eliminate health hazards, and 4) practices recommended to stabilize, reduce, and prevent the occurrence, increase, or spread of ground water contamination.

LB 51 also gave the Director of Environmental Quality the authority to require an NRD which has established a Ground Water Quality Management Area to adopt an "action plan" for designated SPAs.

LB 21 was passed in the 1992 Nebraska Legislative Session and became effective July 15, 1993. The primary purpose of LB 21 was to allow a Natural Resources District with a Special Protection Area to increase its general tax levy by up to one-half cent per $100 valuation. In such NRDs, the maximum levy will be five cents per $100 valuation.

The 1993 legislative session resulted in the passage of LB 439 which allows reduction of irrigated acres in Water Management Areas. This bill was requested by the Central Platte NRD and authorizes NRDs with GWQMAs to adopt the type of acreage reduction program (equal percentage of acres reduced for all ground water irrigators) which Central Platte NRD uses for ground water quantity management. This bill also modified the definition of rotation to allow its use on a yearly basis. Previously, rotation could not be based on time periods longer than a month.

In 2004, the Nebraska Legislature passed LB 962, which went into effect July 15, 2004. This bill required the Department of Natural Resources to identify geographic areas where surface water and ground water are hydrologically connected and to designate river basin(s) that are fully appropriated and over appropriated. Once a basin has been designated fully appropriated, the NRD must work in conjunction with DNR to develop an Integrated Management Plan. The development of the IMP may take three to five years.

## 8.2 Methods of Formation for Ground Water Protection

NRDs have the authority to establish Ground Water Management Areas, to address ground water quantity concerns. Prior to designating a management area, an NRD must have prepared a ground water management plan that includes a ground water reservoir life goal and which specifies how proposed controls will impact this goal.

Actions that may be used in a Ground Water Management Area include: 1) Permits required to construct water wells, 2) Adoption of authorized controls that have been identified in the NRDs Ground Water Management Plan, 3) determination of the total amount of ground water to be withdrawn , and 4) After a public hearing, an NRD Board of Directors may dissolve a management area based on ground water returning to acceptable levels and land use practices that no longer pose a contamination threat to ground water.

Before considering a Ground Water Management Area the District will evaluate all available alternatives. When determining whether to designate a Ground Water Management Area, the District will consider its financial and technical capabilities; public input and concerns, and seek to identify the needs for any additional studies to confirm the District's problem(s).

## 8.3 Districtwide Ground Water Management Area

The Twin Platte Natural Resources District will establish the entire district as a Ground Water Quantity Management Area upon approval of revisions for the Ground Water Management Plan to take a proactive approach to protecting the ground water resources.

Upon establishment of a Districtwide Ground Water Quantity Management Area:

- ◊ Permits will be required for all new wells with the capacity to pump greater than 50 gallons per minute.
- ◊ A maximum allowed irrigated acres will be determined for all new well permits issued. The maximum allowed irrigated acres will be determined based on that the total irrigated acres will not exceed 25% of the land area within a one mile radius of a new well which lies within the Twin Platte Natural Resources District. (Example: There are 2010 acres within a one mile radius circle and the total irrigated acres within that circle will not exceed 502.5 acres – 25% of the land area) The new well must be located within the area of the acres irrigated from the new well.

## 8.4 Twin Platte NRD Ground Water Quantity Management Program

The **Goal** of the Twin Platte NRD's Ground Water Quantity Management Program is to maintain or improve the quantity of ground water consistent with the goals and objectives of the District as provided in Chapter 6. The District envisions their goal being accomplished first through voluntary and mandatory educational programs and implementation of agricultural and conservation techniques such as the use of Quantity Best Management Practices (BMPs).

The District's Ground Water Quantity Management Program will establish a Ground Water Quantity Management subarea within a Major Land Resources Area or portion thereof where ground water quantity is or could become a problem.

Currently, the District recognizes that the major threat to depletion of ground water is related to irrigation. The District began a ground water level monitoring program for ground water table levels in 1976 and continues to monitor 116 sites annually. The District initiated a ground water model study titled "Hydrology of Parts of the Twin Platte and Middle Republican Natural Resources Districts, Southeastern Nebraska" which was published in April, 1992 and on file in the Twin Platte Natural Resources District office and initiated a ground water model study titled "Simulation of Ground Water Movement in the High Plains Aquifer, Southern Sandhills Area, West Central Nebraska" which is expected to be completed late in 1995 to establish base-line water quantity conditions in the District and to access future conditions. The District's data collection efforts and ground water modeling studies are described in Chapter 5. Depending on the scope and trends in the ground water, the District will proceed with addressing those problems within a Major Land Resource Area or portion thereof when the spring ground water table levels trends show a three year average decrease of 10.0 feet or greater from

the 1983 baseline year or a 25% or greater density of ground water irrigated acres within the Major Land Resources Area or portion thereof. The year 1983 was selected as a baseline due to the TPNRD implementing additional monitoring sites that year. The triggering mechanism will be based on the average of the data collected in each township and the average of the township data in each Major Land Resource Area or the average of the data collected in the portion of the Major Land Resource Area under consideration for additional management.

### 8.4.1 Major Land Resources Management Areas

The District's Ground Water Quantity Management Program for Ground Water Management Subareas will be implemented within Major Land Resource Areas or within a portion of the Major Land Resources Area in three phases to address ground water quantity problems. The triggering mechanism established below will be used to guide the District when considering a Ground Water Management Subarea to address ground water quantity problems. The triggering mechanism will also be used to move from one management phase to another based on data received from the District's ground water level monitoring system. The triggering mechanism will be based on the previous three year spring average ground water table levels compared to the 1983 baseline year or the density of irrigated acres within the Major Land Resource Area or portion thereof. Implementation of Phase II will be considered two years following the implementation of Phase I and annually thereafter and implementation of Phase III will be considered two years following the implementation of Phase II and annually thereafter. The triggering mechanism for each phase:

Phase I: 10.0 feet or greater decline
Or
25% or greater density of ground water irrigated acres

Phase II: Subsequent declines equal to 30% of the average decline which initiated Phase I
Or
Subsequent 30% increase of irrigated acre density which initiated Phase I

Phase III: Subsequent declines equal to 30% of the total of the average decline which initiated Phase I and Phase II
Or
Subsequent 30% increase of irrigated acre density which initiated Phase II

Prior to the establishment of a Ground Water Quantity Management Subarea, the NRD will develop rules and regulations to implement the controls described below.

**Phase I: Initiation**

A Ground Water Quantity Management Subarea will be established throughout a Major Land Resource Area or within a portion of the Major Land Resource Area when the Phase I triggering mechanism in section 8.4.1 is met.

**Phase I: Controls**

1) The TPNRD will coordinate a mandatory multifaceted educational program for ground water users. The program will emphasize ground water use management through information, education and site demonstrations.

2) The TPNRD may initiate a moratorium on the issuance of additional well construction permits. A moratorium may be in place for no more than 3 years without subsequent renewal by the Board of Director's.

3) The TPNRD may establish a minimum spacing distance between new wells more stringent than statutory requirements.

4) The TPNRD may establish a smaller number of maximum allowed irrigated acres within a one mile radius of a new well and/or increase the radius around a new well.

A list of recommended quantity best management practices are summarized in Table 8-1 (Located at end of Chapter 8). These practices will be incorporated into the general education program.

Table 8-2 (Located at end of Chapter 8) outlines assistance programs that can be developed by the NRD to support landowners in addressing ground water declines in a given area(s).

**Phase II: Initiation**

When the Phase II triggering mechanism in Section 8.4.1 is met for an established Ground Water Management Subarea, Phase II controls will be implemented.

**Phase II: Controls**

1) All requirements in Phase I will be continued.

2) The TPNRD may initiate a moratorium on the issuance of additional well construction permits. A moratorium may be in place for no more than 3 years without subsequent renewal by the Board of Director's.

3) The TPNRD will also adopt **one** or more of the controls listed below:

- ◊ Implementation of an allocation schedule and allocating the total amount of ground water that may be withdrawn. Allocation for purposes of irrigation means the allotment of a specified total number of acre-inches of irrigation water per irrigated acre over any reasonable period of time. Flow meters or other approved water measuring devices will be required to measure the amount of ground water applied to each irrigated field and reports, on forms developed by the District, will be required to be submitted to the District.

- ◊ Require District approval of transfers of ground water off of the land where the water is withdrawn and/or transfers of ground water allocations.

- ◊ Adoption of a rotation system for use of ground water.

- ◊ Adoption of a system for reducing irrigated acres.

- ◊ Establishment of a minimum spacing distance between new wells more stringent than statutory requirements.

- ◊ Establishment of a smaller number of maximum allowed irrigated acres within the area around a new well and/or increases the radius around a new well.

**Phase III. Initiation**

When the Phase III triggering mechanism in Section 8.4.1 is met for an established Ground Water Management Subarea, Phase III controls will be implemented.

**Phase III. Controls**

1) All requirements in Phases I & II will be continued.

2) The TPNRD may initiate a moratorium on the issuance of additional well construction permits. A moratorium may be in place for no more than 3 years without subsequent renewal by the Board of Director's.

3) One or more of the control(s) established in Phase II will be revised to:

   A) Adopt more restrictive requirements for District transfer permits.

   B) Reduce the allocation of the total permissible amount of ground water that may be withdrawn.

   C) Adopt a more restrictive rotation system for use of ground water.

   D) Adopt a system to further reduce irrigated acres.

   E) Establish a greater minimum spacing distance between new wells.

F) Establish a smaller maximum number of allowed irrigated acres within the area around a new well and/or increase the radius around a new well.

and/or

One or more of the following controls will be established to the extent not previously established:

A) Require District approval of transfers of ground water off of the land where the water is withdrawn and/or transfers of ground water allocations.

B) Implementation of an allocation schedule and allocating the total amount of ground water that may be withdrawn. Allocation for purposes of irrigation, means the allotment of a specified total number of acre-inches of irrigation water per irrigated acre per year or an average number of acre-inches of irrigation water per irrigated acre over any reasonable period of time.

C) Adoption of a rotation system for use of ground water.

D) Adoption of a system for reducing irrigated acres.

E) Establishment of a minimum spacing distance between new wells more stringent than statutory requirements.

F) Establishment of a smaller number of maximum allowed irrigated acres within the area around a new well and/or increase the radius around a new well.

## 8.5 Other District Actions to be Considered for Implementation to Protect Water Quantity:

The NRD will work with cities/villages to improve water use efficiency and establish water use conservation guidelines.

## 8.6 Implementation Time Frame for Establishing a Management Area

The main reason for establishing a Management Area is to prevent or reduce declines of water quantity.

Whenever ground water quantity is threatened, meaningful data is necessary to make informed decisions. Studies may be done to define the source, extent, mechanisms and effects to identify the extent of a subarea.

Data collected within an area, consecutively over a three year period, will provide the District with an opportunity to observe the seasonal effects of sampling activities and potential trends. The average levels based on this information will be used to determine the management phase (either I, II, or III) to address declines of ground water within a given area.

The District Board of Directors reserves the option to proceed immediately in implementing Ground Water Quantity Management subareas.

## 8.7 Identifying and Establishing Boundaries

The boundaries of a Ground Water Quantity Management subrea will be the Major Land Resource Area or a portion of a Major Land Resource Area, based on geologic and hydrologic characteristics, within the Twin Platte Natural Resources District as identified by the USDA Natural Resources Conservation Service.

## 8.8 Enhance District's Ground Water Monitoring System

It will be important to maintain a reliable ground water level monitoring system. Future decisions will be based on data from the monitoring system. The District's ground water monitoring program is located in Chapter 5. The data collected through the monitoring program will be accessible to landowners and operators within the monitoring network.

**Table 8-1**
**Recommended Quantity Best Management Practices**

The following are recommended as quantity best management practices and will be incorporated into the general education program and certified training workshops. Detailed descriptions are not given for each practice. Descriptions used by the UN-L Cooperative Extension, Natural Resources Conservation Service and/or other recognized authorities will be used to define the practices.

1. Irrigation Water Management

    a. Flow meters
    b. Irrigation scheduling
    c. Surge valves
    d. Buried pipe lines
    e. Reuse pits, return lines
    f. Measurement of field moisture conditions with moisture blocks, tensiometers, soil probes, etc.
    g. Determine crop water use using modified atmometers
    h. Measurement of uniformity of water application by sprinklers
    i. Development of an irrigation water management plan on each farm

**Table 8-2**
**Potential TPNRD Assistance Programs**

Technology Transfer: As development of agricultural and landscape technology becomes available which will benefit land use decisions, the NRD will communicate information to rural and urban landowners.

The NRD will hold public meetings to provide an open forum to discuss new technologies or programs. Exhibits, rural and urban demonstration projects, newsletters, and reports by agencies/organizations will be used. Local news media will be used to keep the public informed of activities.

Development of Ground Water Advisory Committees: The District will develop advisory committees for the purposes of becoming familiar with NRD regulatory authorities pertaining to ground water management and protection; to promote public understanding of ground water concerns; to advise the Twin Platte NRD Board of Directors on policy making to ensure that all viewpoints are considered, and to communicate on-going District

programs and projects.

Cost-share Assistance: The District maintains the option to develop incentive programs to encourage the use of quantity best management practices. Outlined below are possible items for which cost-share funding could be available through the District. Similar cost share arrangements may be available through state and federal programs.

1) Flow Meters
2) Moisture Meters and Blocks, Tensiometers, and Soil Probes
3) Surge Systems
4) Irrigation Scheduling Services
5) Modified Atmometers
6) LEPA Systems
7) Well Abandonment Program
8) Independent Ag. Consultant

Additional Monitoring Activities: An intensive ground water level monitoring program and network throughout the District is important in order to determine any changes in the condition of the ground water. This program has been explained in greater detail in Chapter 5 of the District's Ground Water Management Plan.

GWLP:CH8

# CHAPTER 9. GROUND WATER QUALITY

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# CHAPTER 9 GROUND WATER QUALITY

## 9.1 Historical Review Regarding the Nebraska Ground Water Management and Protection Act (GWMPA) and NRD Authorities Concerning Nonpoint Source Ground Water Contamination

"Since its original enactment in 1975, the Ground Water Management and Protection Act has been modified several times. The Nebraska State Legislature adopted the Ground Water Management Act (GWMA) in 1975, in response to the growing concern over ground water depletion through mining of the aquifers occurring in the state. This Act provided a method to control and regulate ground water depletion (quantity), but did not address ground water quality issues.

The Nebraska Legislature revised the GWMA to incorporate ground water quality concerns in 1982. The title of the Act was changed to the Ground Water Management and Protection Act (GWMPA). Ground water management area legislation in 1982 did not provide specific authority to prevent ground water quality degradation. However, it did establish a basis that would ultimately authorize the NRDs to administer nonpoint source regulations through the implementation of Ground Water Quality Management Areas (GWQMA). Legislation enacted in 1986 provided the NRDs with the option (authority) to establish ground water management areas after preparation of a District Ground Water Management Plan.

Legislative Bill 1106, enacted in 1984, mandated that each of the 23 NRDs develop a ground water management plan to inventory the ground water resources within each District, but contamination concerns were not a required component of the plan. "Revisions included in the 1986 update of the Act further defined the role of the Natural Resources Districts and the means by which they could address nonpoint source ground water contamination.

In 1983, LB 426 was the first Special Protection Area (SPA) bill introduced but not enacted. SPA legislation, LB 463, was introduced in 1985, and a compromise bill, LB 894, was adopted in 1986. LB 894 allowed the Nebraska Department of Environmental Quality (NDEQ) the ability to administer regulations for ground water nonpoint source contamination activities. In addition, this legislation gave NDEQ the ability to enter into a nonpoint source contamination issue at the request of other entities than just NRDs.

"Several pieces of legislation passed in the Nebraska Unicameral have affected the SPA program since its inception in 1986. LB 51, enacted in 1991, imposed that prior to July 1, 1993, each NRD shall amend its ground water management plan to identify to the extent possible: 1) levels and sources of ground water contamination within the area, 2) ground water quality goals, 3) long term solutions necessary to prevent the levels of ground water contaminants from becoming too high and to reduce high levels sufficiently to eliminate health hazards, and 4) practices recommended to stabilize, reduce, and prevent the occurrence, increase, or spread of ground water contamination.

LB 51 also gave the Director of Environmental Quality the authority to require an NRD which has established a Ground Water Quality Management Area to adopt an "action plan" as required for designated SPAs.

LB 21 was passed in the 1992 Nebraska Legislative Session and became effective July 15, 1993. The primary purpose of LB 21 was to allow a Natural Resources District with a Special Protection Area to increase its general tax levy by up to one-half cent per $100 valuation. In such NRDs, the maximum levy will be five cents per $100 valuation.

"The 1993 legislative session resulted in the passage of LB 439 which allows Reduction of Irrigated Acreage in Water Management Areas. This bill was introduced by the Central Platte NRD and authorizes NRDs with GWQMAs to adopt the type of acreage reduction program (equal percentage of acres reduced for all ground water irrigators) which Central Platte NRD uses for ground water quantity management. This bill also modified the definition of rotation to allow its use on a yearly basis. Previously, rotation could not be based on time periods longer than a month.

## 9.2 Methods of Formation for Ground Water Protection

NRDs have two options available, GWQMAs or SPAs, to address nonpoint source ground water contamination concerns. These statutory authorities are provided to the NRDs through the Ground Water Management and Protection Act. Both the GWQMA and SPA programs allow the NRDs flexibility to confront non-point source contamination problems. Pollution source regulatory authorities in an SPA are substantially similar to GWQMA pollution control authorities already available to NRDs. A District may manage the use of water in a GWQMA for water quantity or quality purposes or both by any of the authorized controls in statutes NRS SS. 46-673.09. Prior to designating a management area, an NRD must have prepared a ground water management plan that includes a ground water reservoir life goal and which specifies how proposed controls will impact this goal. NRD Boards of Directors are provided greater local control in designating or modifying boundaries, and establishing rules and regulations consistent with the law as compared to an SPA.

Other consequences of forming a GWQMA include: 1) Permits required to construct water wells, 2) NRDs are required to adopt one or more of the authorized controls, and adopted controls must be identified in the NRDs' Ground Water Management Plan, 3) NRDs shall determine the total amount of water to be withdrawn consistent with the ground water reservoir life goal and adopt controls to allow the beneficial use of that amount of water, 4) After a public hearing, an NRD Board of Directors may dissolve a management area based on ground water returning to acceptable levels and land use practices that no longer pose a threat to ground water quality and 5) NRDs may levy tax up to 1.8 cents/$100 valuation in a GWQMA.

The second approach to nonpoint source ground water quality problems is the designation and establishment of an SPA. "The SPA process begins at the local level. Any state agency or political subdivision of the state with evidence of nonpoint source ground

water problems may petition the NDEQ for an SPA designation. NRDs may protect ground water quality from nonpoint source contamination by the authorized controls provided in statute NRS SS. 46-674.09.

Other consequences of developing an SPA include: 1) NRDs involved are required to prepare "action plans" designed to stabilize or reduce the increase or spread of ground water contamination, 2) NRDs involved are required to hold hearings regarding the "action plan" and to submit it to NDEQ for approval, 3) NDEQ has authority to adopt protective measures if NRDs do not act, 4) Involved NRDs will need to monitor water quality and provide irrigators with information about fertilizer and chemical usage, 5) An NRD may petition the NDEQ Director to remove an SPA designation if an area has been stabilized or reduced to levels that are not detrimental to beneficial uses of ground water and 6) An NRD may levy tax **in whole District** up to 1/2 cent per $100 actual valuation.

For both types of options, the primary enforcement tool is the issuance of cease and desist orders and suits against alleged violators who fail to abide by cease and desist orders. Violation of SPA statutory provisions for which penalties are not otherwise provided subject the violator to a civil penalty of up to $500 or to prosecution for a Class III misdemeanor.

Before considering a GWQMA or requesting an SPA study designation, the District will evaluate all available alternatives for developing either a GWQMA or SPA. The ultimate decision on how the Board intends to proceed, either with a GWQMA o SPA, can not always be readily defined. The Board believes this decision should be made based upon each specific situation. When determining whether to designate a GWQMA or SPA, the District will consider its financial and technical capabilities; public input and concerns, and seek to identify the needs for any additional studies to confirm the District's contamination
problem(s).

## 9.3 Twin Platte NRD Ground Water Quality Management Program

The **Goal** of the Twin Platte NRD's Water Quality Management Program is to maintain or improve the quality of ground water to within tolerances established by the Federal EPA, and Nebraska Department of Environmental Quality to achieve the District's Ground Water Reservoir Life Goal as provided in Chapter 6. The District envisions their goal being accomplished through voluntary and mandatory educational programs, implementation of agricultural and conservation techniques such as the use of Best Management Practices (BMPs) and land use controls.

The District's Ground Water Quality Management Program will establish a Target Area in those parts of the District where ground water quality could become a problem.

The District's Ground Water Quality Management Program will establish a Ground Water Quality Management Area (GWQMA) or Special Protection Area (SPA) in those parts of the District where ground water quality is a problem.

Currently, the District recognizes that the major threat to ground water contamination in their jurisdiction is nonpoint source nitrate-nitrogen ground water pollution. Other nonpoint source contamination tolerances will be established by the Twin Platte Natural Resources District Board of Directors based on the Maximum Contaminant Levels (MCLs) set by the EPA and DEQ 118 NAC - Ground Water Quality Standards and Use Classification. The District began a ground water monitoring program for nitrates in 1982 and continues to monitor 78 sites annually. Reference may be made to Section 5 in regard to the District's data collection. The District on July 1, 1995 began a two year study to establish base-line water quality conditions in the District and develop a ground water monitoring program to monitor future conditions. Reference may be made to Section 5 in regard to the District's data collection. Depending on the scope and trends of other potential nonpoint source contaminants detected in the ground water, the District will proceed with addressing those problems within an area when ground water sample trends show a three year increase that reaches 50% of the MCL. The triggering mechanism will be based on the average of the data collected in each township and the average of the township data in each Major Land Resource Area. The District will approach all contamination problems utilizing the same procedure provided in this plan for nitrate-nitrogen contamination. Prior to establishing a Target Area or a Management or Special Protection Area for contamination other than nitrate-nitrogen, the District will consult with Local, Nebraska, or Federal agencies or organizations, research institutions and private manufacturers to determine the appropriate Best Management Practices and Controls.

### 9.3.1 Target Areas

The District's Ground Water Quality Management Program for Target Areas will be implemented within Townships to address the nitrate-nitrogen contamination problem. The triggering mechanism established will be 5.0 ppm (50 % of MCL) to guide the District when considering a Target Area to address nitrate-nitrogen problems in the ground water. The triggering mechanism will be based on the average of the last three years of testing.

**Actions:**

Development of Ground Water Advisory Committees: The District will develop an advisory committee within each Township designated a Target Area. Adjoining Townships designated a Target Area in sparsely populated areas within the District may have one advisory committee. The advisory committee will be appointed by the District Board of Directors and will be made up of landowners and/or operators within the Township. The advisory committee will develop recommendations for the District Board of Directors and will promote voluntary actions for the landowners and operators within the Township. The advisory committee will meet a minimum of two times annually in the Spring prior to the beginning irrigation and in the Fall after irrigation has ended for the season. The District will provide a staff person to work with the advisory committee.

Individual Contacts: The District staff will meet annually with each landowner and operators within Target Areas to discuss the advisory committee's recommendations. The District staff will promote voluntary actions for the landowners and operators within the Target Area. The District staff will discuss the hazards associated with using contaminated ground water and options available for using contaminated ground water with the landowners and operators within the Target Area.

Target Information and Education: The District will target information and education for the landowners and operators within Target Areas. The District will attempt to establish and maintain demonstration sites within or near a Target Area.

Target Cost-Share Assistance: The District will target cost-share assistance for land within Target Areas. Outlined below are possible items that cost-share funding could be available through District, State and Federal programs.

1) Flow Meters
2) Moisture Meters and Blocks, Tensiometers, and Soil Probes
3) Surge Systems
4) Irrigation Scheduling Services
5) Modified Atmometers
6) LEPA Systems
7) Well Abandonment Program

Recommend and Promote Voluntary Activities:

Best Management Practices: Information and training for Best Management Practices will be available on a continuing basis. A list of recommended Best Management Practices are summarized in Table 9-1 (Located at end of Chapter 9).

Tests: Test soil (3' deep), irrigation water, and manure; if applied, for nitrate-nitrogen content. The landowner or operator will be asked and encouraged to submit a report on:

a) Water testing results for each irrigation well
b) Soil testing results for each forty (40) acres
c) Manure application rates and analysis for nitrogen
d) Crop to be grown and the realistic yield goal
e) Total nitrogen needed for yield goal
f) Nitrogen available from water
h) Residual nitrogen available in three feet of soil
i) 50% of the pounds of nitrogen per acre available from manure, if applicable
j) Nitrogen available from past crop
k) Recommended use of commercial fertilizer to achieve realistic

Yield Goal

l) Actual commercial fertilizer (nitrogen) applied
m) Beginning and ending flow meter readings, if available
n) Inches of water applied (actual or estimate)
o) Irrigation scheduling method used
i) Actual yield achieved

Water Measuring Devices: Flow meters or other approved water measuring devices (including surface water flow measuring equipment) to measure the amount of water applied to each irrigated field.

Commercial Fertilizer: Commercial Fertilizer not applied on all soils before March lst.

Spring Applications: Spring Applications either split between preplant and sidedress applications or split applications through a pivot chemigation system or applied with an inhibitor if the split application is not administered.

Irrigation Scheduling: Implement irrigation scheduling to increase irrigation efficiency and the conservation of water.

Integrated Pest Management: Development of Integrated Pest Management Programs.

Irrigation Rotation: Adopt a rotation system of use of ground water. Rotation shall mean a recurring series of use and nonuse of irrigation wells on an hourly, daily, weekly, monthly or yearly basis.

Livestock Management: Implementation of livestock waste management practices

Implement Additional Monitoring Activities: An intensive ground water monitoring program and network throughout the District is important in order to determine any changes in the condition of the ground water. This program has been explained in greater detail in Chapter 5. Increase the monitoring sites within and surrounding the Target Area with a maximum of 9 monitoring sites within a Township.

### 9.3.2 Management or Special Protection Areas

The District's Ground Water Quality Management Program for GWQMA of SPA will be implemented within Major Land Resource Areas in three phases to address the nitrate-nitrogen contamination problem. The TPNRD prefers to utilize the statutory provisions authorized for a GWQMA and the plan is written with the intent of using the GWQMA statutory provisions. The TPNRD, however, will consider utilizing the statutory provisions authorized for a SPA prior to initiating management. The triggering

mechanism established below will be used to guide the District when considering a GWQMA or SPA to address nitrate-nitrogen problems in the ground water. The triggering mechanism will also be used to move from one management phase to another based on data received from the District's ground water monitoring system. The triggering mechanism will be based on the average of the last three years of testing.

| | | |
|---|---|---|
| Phase I : | 7.0 ppm | (70 % of MCL) |
| Phase II : | 8.5 ppm | (85 % of MCL) |
| Phase III: | 10.0 ppm | (MCL) |

Prior to implementation of a SPA Action Plan or GWQMA Action Plan/controls, the NRD will develop rules and regulations to address the requirements that would be spelled out in an SPA/GWQMA Action Plan or the District's Ground Water Management Plan.

**Phase I: Initiation**

An Area, either designated as an GWQMA or SPA, will be established when the average nitrate-nitrogen level within a Major Land Resource Area reaches 7.0 parts per million (70% of MCL).

**Phase I: Controls**

In a Phase I Area, the NRD will develop a mandatory and voluntary multifaceted educational program for water users. 'The program, will emphasize crop nutrients, irrigation, and pesticide management through information, education and site demonstrations. In a Phase I area, all landowners/operators of agricultural land (e.g. landowners/operator that apply fertilizer or pesticides to planted dryland and/or irrigated crops) will be required to become certified by attending a class and training session on best management practices. Best management practices training and certification will be mandatory only within a GWQMA or SPA, and would be optional outside an area.

A list of recommended best management practices are summarized in Table 9-1 (Located at end of Chapter 9). The cited practices have been established through federal and state research and demonstration projects, and have shown to be effective in reducing nitrate levels. These practices will be incorporated into the general education program and certified training workshops.

Landowners will be encouraged to voluntarily integrate selected practices into their management system. Table 9-2 (Located at end of Chapter 9) outlines assistance programs that can be developed by the NRD to support landowners in addressing ground water contamination concerns .(nitrate-nitrogen, etc.) in a given area(s).

**Phase II: Initiation**

Phase II, in either a GWQMA or SPA, will be established when the average nitrate-nitrogen level within a Major Land Resource Area reaches 8.5 parts per million (85% of MCL).

**Phase II: Controls**

1) In a Phase II Area, all requirements in Phase I will be continued.

2) In addition, irrigators will be required to test soil (3' deep), irrigation water, and manure; if applied, for nitrate-nitrogen content. The landowner/operator will be required to submit an annual report on:

   a) Water testing results for each irrigation well
   b) Soil testing results for each forty (40) acres
   c) Manure application rates and analysis for nitrogen
   d) Crop to be grown and the realistic yield goal
   e) Total nitrogen needed for yield goal
   f) Nitrogen available from water
   h) Residual nitrogen available in three feet of soil
   i) 50% of the pounds of nitrogen per acre available from manure, if applicable
   j) Nitrogen available from past crop
   k) Recommended use of commercial fertilizer to achieve realistic Yield Goal
   l) Actual commercial fertilizer (nitrogen) applied
   m) Beginning and ending flow meter readings, if available
   n) Inches of water applied (actual or estimate)
   o) Irrigation scheduling method used
   i) Actual yield achieved

**Phase II: Alternative Controls**

"Alternative Controls" are intended to supplement the base controls listed under Phase II. The Twin Platte Board and Advisory Committees will make the decisions whether or not to include the alternative controls when developing an action plan(s). One or more of the alternative controls may be selected for implementation with the listed controls.

1) Flow meters or other approved water measuring devices (including surface water flow measuring equipment) may be required to measure the amount of water applied to each irrigated field.

2) Require irrigation scheduling to increase irrigation efficiency and the conservation of water

**Phase III. Initiation**

Phase III, in either a GWQMA or SPA, will be established when the average nitrate-nitrogen level within a Major Land Resource Area reaches 10.0 parts per million (MCL).

**Phase III. Controls**

1) In a Phase III Area, all requirements in Phases I & 11 will be continued.

2) Flow meters or other approved water measuring devices (including surface water flow measuring equipment) will be required to measure the amount of water applied to each irrigated field.

3) Commercial Fertilizer application on all soils before March lst will be banned for spring planted crops.

4) Spring Applications will either be split (preplant and sidedress) application, split applications through a pivot chemigation system or will be applied with an inhibitor if the split application is not administered.

5) Implementation of an allocation schedule, and allocating the total permissible withdrawal of ground water (NRS SS. 46-673.09(l). Allocation shall mean the allotment of a specified total number of acre-inches of irrigation water per irrigated acre per year or an average number of acre-inches of irrigation water per irrigated acre over any reasonable period of time not to exceed five years (NRS SS. 46-657).

**Phase III: Alternative Controls**

"Alternative Controls" are intended to supplement the base controls listed under Phase 111. The Twin Platte NRD Board and Advisory Committees will make the decisions whether or not to include the alternative controls when developing an action plan(s). One or more of the alternative controls may be selected for implementation with the listed controls.

1) Require irrigation scheduling to increase irrigation efficiency and the conservation of water

2) Development of Integrated Pest Management Programs

3) Adopt a rotation system of use of ground water. Rotation shall mean a recurring series of use and nonuse of irrigation wells on an hourly, daily, weekly, monthly or yearly basis.

4) Adopt a system for reducing irrigated acres (equal percentage of acres reduced for all ground water irrigators).

5) Implementation of livestock waste management practices

### 9.3.3 Strategic Subareas for Management or Special Protection Areas

Strategic subareas may be identified within Major Land Resource Areas for implementation of a Management or Special Protection Area. The TPNRD prefers to utilize the statutory provisions authorized for a GWQMA and the plan is written with the intent of using the GWQMA statutory provisions. The TPNRD, however, will consider utilizing the statutory provisions authorized for a SPA prior to initiating management. Strategic subareas would be considered in target areas previously implemented three years following the implementation of the target area and annually thereafter. Strategic subareas will be identified and implemented if subsequent contamination levels increase in a target area or if subsequent contamination levels in a target area are above 10.0 parts per million (MCL) and have not decreased. The triggering mechanism for a strategic subarea for a management or special protection area will be based on the average of the previous three years of testing compared to the levels which initiated a target area. The triggering mechanism for Phase II and Phase III management will be based on the average of the previous three years of testing compared to the levels which initiated the previous phase of management. Phase II will be considered two years following the implementation of Phase I and annually thereafter and Phase III will be considered two years following the implementation of Phase II and annually thereafter.

Triggering mechanism for a strategic subarea for contamination levels that are less than 10.0 parts per million (MCL) and are increasing.

Phase I: Contamination levels equal to or greater than 150% of the contamination level which initiated the Target Area or 10.0 parts per million (MCL)

Phase II: Contamination levels equal to or greater than 130% of the contamination level which initiated Phase I or 10.0 parts per million (MCL)

Phase III: Contamination levels equal to or greater than 130% of the contamination level which initiated Phase II or 10.0 parts per million (MCL)

Triggering mechanism for a strategic subarea for contamination levels above 10.0 parts per million (MCL) and are not decreasing.

Phase I: Contamination levels decreasing annually less than 10% of the amount of the contamination levels which initiated the Target Area less 10.0 parts per million (MCL) (Example 10% of 12.0 ppm - 10.0 ppm = 0.2 ppm)

Phase II: Contamination levels decreasing annually less than 10% of the amount of the contamination levels which initiated Phase I less

10.0 parts per million (MCL) (Example 10% of 12.0 ppm - 10.0 ppm = 0.2 ppm)

Phase III: Contamination levels decreasing annually less than 10% of the amount of the contamination levels which initiated Phase II less 10.0 parts per million (MCL) (Example 10% of 12.0 ppm - 10.0 ppm = 0.2 ppm)

For a strategic subarea implemented for contamination levels exceeding 10.0 parts per million (MCL), when contamination levels in the strategic subarea fall below 10.0 parts per million (MCL) based on the average of the previous three years of testing, the strategic subarea will be dissolved and a Target Area will be re-implemented if the contamination levels remain above 5.0 parts per million (50% of MCL).

Controls identified in Section 9.3.2 would be utilized for each management phase in a strategic subarea.

Strategic subareas will provide the District flexibility to establish management in an area to address ground water contamination.

The TPNRD recognizes that townships would have different trigger levels and therefore could have the same or similar management procedures for different levels of ground water contamination. The TPNRD believes that the existence of target areas in the effected townships and the advisory committees that would be in place and functioning within the townships and the individual contacts that would have occurred within the townships for a minimum of three years prior to the designation of a strategic subarea will minimize or eliminate any belief by the citizens involved that there is unfair treatment. The TPNRD Board of Directors will annually during the month of November consider any concerns by the citizens involved.

## 9.4 Other District Actions to be considered for Implementation to Protect Water Quality:

1) The NRD will pursue urban soil testing and the use of slow release fertilizer applications and/or split applications of fertilizer for city owned property and city dwellers.

2) The NRD will work with cities/villages to: a) improve lawn and garden water use efficiency and establish voluntary water use conservation guidelines, and b) develop programs to monitor urban surface water runoff quality.

3) The NRD will work with the Nebraska Department of Environmental Quality to reduce point source ground water contamination concerns within an area.

## 9.5 Implementation Time Frame for Establishing a Target Area or GWQMA or SPA

The main reason for establishing a Target Area GWQMA or SPA is to prevent the degradation of water quality.

Whenever ground water quality is threatened based on EPA/DEQ's Safe Drinking Water Standards or pollution is detected, meaningful data is necessary to make informed decisions. Extensive studies must be done to define the source, extent, mechanisms and affects of pollution and to identify the extent of a boundary area(s).

The District will implement Target Areas annually on January 1st.

The District will proceed slowly before implementing GWQMA or SPA - taking up to three years before moving into any of the three (3) management phases. The three year window will allow the District to systematically evaluate the problem area(s). The District's monitoring activities will move towards developing an assessment program. Monitoring requirements for an assessment program are more detailed than those involved in a detection program. In an assessment program the ground water situation must be characterized sufficiently to plan further investigative or remedial activities. Furthermore, the three year time interval will allow the District to plan for an orderly administration, and promote public awareness and input regarding ground water concerns.

Data collected within an area, consecutively over the three year period, will provide the District with an opportunity to observe the seasonal effects of sampling activities and potential nitrate-nitrogen trends. The average levels based on this information will be used to determine the management phase (either 1, II, or 111) to address contamination or potential for contamination of ground water within a given area.

The District Board of Directors reserve the option to proceed immediately for implementing GWQMA or SPA and into a management phase area if information based on contamination levels or contamination potential indicates that action is warranted.

## 9.6 Identifying and Establishing Boundaries

### 9.6.1 Target Areas

The boundaries of a Target Area will be Townships within the Twin Platte Natural Resources District.

### 9.6.2 Ground Water Quality Management Area or Special Protection Area Boundaries

The boundaries of a GWQMA or SPA will be the Major Land Resource Area within the Twin Platte Natural Resources District as identified by the USDA Natural Resources

Conservation Service or townships identified as strategic subareas.

## 9.7 Enhance District's Ground Water Monitoring System

It will be important to maintain a reliable ground water monitoring system. Future decisions and will be based on data from the monitoring system. The District's Ground Water Monitoring Program is located in Chapter 5. The data collected through the monitoring program will be accessible to landowners and operators within the monitoring network.

**Table 9-1**.
**Recommended Best Management Practices**

The following are recommended as best management practices and will be incorporated into the general education program and certified training workshops. Detailed descriptions are not given for each practice. Descriptions used by the UN-L Cooperative Extension, Natural Resources Conservation Service and/or other recognized authorities will be used to define the practices.

1. Fertilizer Management Practices

   a. Deep (3') soil tests and analysis
   b. N credits for residual nitrate
   c. Realistic yield goals
   d. Use of fertilizer inhibitors
   e. Split applications/side dressing
   f. Delay of fall applications
   g. Use integrated management services

2. Irrigation Water Management

   a. Flow meters
   b. Irrigation scheduling
   c. Surge valves
   d. Buried pipe lines
   e. Reuse pits, return lines
   f. Measurement of field moisture conditions with moisture blocks, tensiometers, soil probes, etc.
   g. Determine crop water use using modified atmometers
   h. Measurement of uniformity of water application by sprinklers
   i. Development of an irrigation water management plan on each farm

3. Alternative Crop/Crop Rotation

   a. Select species requiring less fertilizer
   b. Consider scavenger crops that will recover residual fertilizers
   c. Use crop rotation to reduce pesticide and fertilizer applications

**Table 9-1 (Con't).**
**Recommended Best Management Practices**

4. Integrated Pest and/or Fertilizer Management

   a. Select pest and disease resistant varieties
   b. Follow recommended rates and handling for chemicals
   c. Coordinate pest control services with fertilizer program
   d. Use professional consultants

5. Livestock Waste Management

   a. Follow NDEQ Rules and Regulations for proper design, and management of livestock waste storage facilities
   b. Application of livestock waste to cropland at rates that do not exceed the nitrogen requirements of the crops to be grown
   c. Alternative disposal sites

6. Conservation Tillage

   a. To control wind and water erosion

7. Proper Well Abandonment (Required by Nebraska Law)

   a. Follow state standards and statues to plug unused wells
   b. Use bentonite seals as recommended by NRD
   c. Report proper abandonments to NRD or NDWR

**Table 9-2**.
**Potential TPNRD Assistance Programs**

Technology Transfer: As development of agricultural and landscape technology becomes available and which will benefit land use decisions, the NRD will communicate information to rural and urban landowners.

The NRD will hold public meetings to provide an open forum to discuss new technologies or programs. Exhibits, rural and urban demonstration projects, newsletters, and reports by agencies/organizations will be used. Local news media will be used to keep public informed of activities.

Development of Ground Water Advisory Committees: The District will develop advisory committees for the purposes of becoming familiar with NRD regulatory authorities pertaining to ground water management and protection; to promote public understanding of ground water concerns; to advise the Twin Platte NRD Board of Directors on policy making to ensure that all viewpoints are considered, and to communicate on-going District programs and projects.

Cost-share Assistance: The District maintains the option to develop incentive programs to encourage the use of best management practices. Outlined below are possible items that cost-share funding could be available for through the District. Similar cost share arrangements may be available through state and federal programs.

1) Flow Meters
2) Moisture Meters and Blocks, Tensiometers, and Soil Probes
3) Surge Systems
4) Irrigation Scheduling Services
5) Modified Atmometers
6) LEPA Systems
7) Well Abandonment Program
8) Independent Ag. Consultant

Additional Monitoring Activities: An intensive ground water monitoring program and network throughout the District is important in order to determine any changes in the condition of the ground water. This program has been explained in greater detail in Chapter 5 of the District's Ground Water Management Plan.

**Figure 9-2 (Con't).**
**Potential TPNRD Assistance Programs**

The District will augment the above activity with random nitrate water sampling in a GWQMA and/or SPA. Random deep (3') soil samples and core samples will be collected each year in an area to evaluate the effectiveness of management programs. Core samples will be taken to identify movement of nitrates and possibly pesticides in the vadose zone.

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# Chapter 10. PLAN FOR ACTION

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# CHAPTER 10. PLAN FOR ACTION

## 10.1 Ground Water Quantity

The available data does not indicate a ground water quantity problem in the Major Land Resource Areas within the Twin Platte Natural Resources District. The current monitoring program described in Chapter 5 shows that ground water levels have not significantly changed, either increase or decrease, since the monitoring program began in 1976. The available data does indicate ground water quantity could become a problem in some townships within the Major Land Resource Areas.

### 10.1.1 Target Areas

There currently are no designated Target Areas.

The District will initiate Target Areas January 1, 1996 for:

| | | |
|---|---|---|
| Township 11 | Range 34 | Lincoln County |
| Township 12 | Range 36 | Keith County |

The triggering mechanism described in Chapter 8 were met for those Townships. The locations of the Target Areas are shown in Figure 16.

Table 10-1 summarizes the report for the triggering mechanism for 1995. A detailed report for 1995 is contained in Appendix B. The detailed report contains the Spring ground water levels for the baseline year of 1983 and the last three years, 1993, 1994 and 1995 and the average, median and 25%/75% range.

### 10.1.2 Management or Control Areas

There currently are no designated Management or Control Areas.

The District does not propose the establishment of a management area or a control area for quantity at this time. The triggering mechanism described in Chapter 8 are not met for the Major Land Resource Areas within the District.

Table 10-2 summarizes the report for the triggering mechanism for 1995. A detailed report for 1995 is contained in Appendix B. The detailed report contains the Spring ground water levels for the baseline year of 1983 and the last three years, 1993, 1994 and 1995 and the average, median and 25%/75% range.

### 10.1.3 Strategic Subareas for Management or Control Areas

There currently are no designated Strategic Subareas for Management of Control Areas.

The District does not propose the establishment of a strategic subarea for a management

area or a control area for quantity at this time. The triggering mechanism described in Chapter 8 are not met for Target Areas within the District.

**Table 10-1**
**Ground Water Quantity**
**Triggering Mechanism**
**Summary**
**for Target Areas**
**1995**

| Township | Range | County | Triggering Mechanism (Feet) | Change 1983 to 1993/94/95 Average (Feet) |
|---|---|---|---|---|
| 11 | 34 | Lincoln | -5.0 | -12.47 |
| 12 | 36 | Keith | -5.0 | - 8.13 |

**Table 10-2**
**Ground Water Quantity**
**Triggering Mechanism**
**Summary**
**for**
**Management or Control Areas**
**1995**

| Major Land Resources Area | Triggering Mechanism for Phase 1 (Feet) | Change 1983 to 1993/94/95 Average (Feet) |
|---|---|---|
| Central High Tableland | -10.00 | - 0.73 |
| Nebraska Sandhills | -10.00 | + 0.21 |
| Rolling Plains and Breaks | -10.00 | + 3.62 |
| Central Nebraska Loess Hills | -10.00 | + 1.22 |

## 10.2 Ground Water Quality

The available data does not indicate a ground water quality problem in the Major Land Resource Areas within the Twin Platte Natural Resources District. The current monitoring program described in Chapter 5 shows that ground water nitrate levels have not significantly changed, either increase or decrease, since the monitoring program began in 1982. The available data does indicate ground water quality could become a problem in some townships within the Major Land Resource Areas.

### 10.2.1 Target Areas

There currently are no designated Target Areas.

The District will initiate Target Areas January 1, 1996 for:

| | | |
|---|---|---|
| Township 19 | Range 37 | Arthur County |
| Township 20 | Range 38 | Arthur County |
| Township 20 | Range 39 | Arthur County |
| Township 12 | Range 41 | Keith County |
| Township 13 | Range 36 | Keith County |
| Township 13 | Range 39 | Keith County |
| Township 13 | Range 40 | Keith County |
| Township 13 | Range 41 | Keith County |
| Township 11 | Range 26 | Lincoln County |
| Township 13 | Range 26 | Lincoln County |
| Township 20 | Range 34 | McPherson County |

The triggering mechanism described in Chapter 9 were met for those Townships. The locations of the Target Areas are shown in Figure 17.

Table 10-3 summarizes the report for the triggering mechanism for 1995. A detailed report for 1995 is contained in Appendix D. The detailed report contains the nitrate levels for the years of 1988 through 1995 and for the last three years, 1993, 1994 and 1995 and the average, median and 25%/75% range.

### 10.2.2 Management or Special Protection Areas

There currently are no designated Management or Special Protection Areas.

The District does not propose the establishment of a management area or a special protection area for quality at this time. The triggering mechanism described in Chapter 9 are not met for the Major Land Resource Areas within the District.

Table 10-4 summarizes the report for the triggering mechanism for 1995. A detailed report for 1995 is contained in Appendix D. The detailed report contains the nitrate levels for the years of 1988 through 1995 and for the last three years, 1993, 1994 and

1995 and the average, median and 25%/75% range.

### 10.2.3 Strategic Subareas for Management or Special Protection Areas

There currently are no designated Strategic Subareas for Management of Special Protection Areas.

The District does not propose the establishment of a strategic subarea for a management area or a special protection area for quality at this time. The triggering mechanism described in Chapter 9 are not met for Target Areas within the District.

**Table 10-3**
**Ground Water Quality**
**Triggering Mechanism**
**Summary**
**for**
**Target Areas**
**1995**

| Township | Range | County | Triggering Mechanism (ppm) | 1993/94/95 Average (ppm) |
|---|---|---|---|---|
| 19 | 37 | Arthur | 5.0 | 5.6 |
| 20 | 38 | Arthur | 5.0 | 7.0 |
| 20 | 39 | Arthur | 5.0 | 5.1 |
| 12 | 41 | Keith | 5.0 | 9.6 |
| 13 | 36 | Keith | 5.0 | 5.7 |
| 13 | 39 | Keith | 5.0 | 5.2 |
| 13 | 40 | Keith | 5.0 | 12.5 |
| 13 | 41 | Keith | 5.0 | 13.2 |
| 11 | 26 | Lincoln | 5.0 | 6.7 |
| 13 | 26 | Lincoln | 5.0 | 9.7 |
| 20 | 34 | Lincoln | 5.0 | 7.7 |

**Table 10-4**
**Ground Water Quality**
**Triggering Mechanism**
**Summary**
**for**
**Management or Special Protection Areas**
**1995**

| Major Land Resources Area | Triggering Mechanism for Phase 1 (ppm) | 1993/94/95 Average (ppm) |
|---|---|---|
| Central High Tableland | 7.0 | 4.0 |
| Nebraska Sandhills | 7.0 | 1.7 |
| Rolling Plains and Breaks | 7.0 | 5.0 |
| Central Nebraska Loess Hills | 7.0 | 3.5 |

## 10.3 Implementation

### 10.3.1 Schedule

January 1, 1996

The District will initiate Target Areas for ground water quantity for:

| | | |
|---|---|---|
| Township 11 | Range 34 | Lincoln County |
| Township 12 | Range 36 | Keith County |

The triggering mechanism described in Chapter 8 were met for those Townships.

The District will initiate Target Areas for ground water quality for:

| | | |
|---|---|---|
| Township 19 | Range 37 | Arthur County |
| Township 20 | Range 38 | Arthur County |
| Township 20 | Range 39 | Arthur County |
| Township 12 | Range 41 | Keith County |
| Township 13 | Range 36 | Keith County |
| Township 13 | Range 39 | Keith County |
| Township 13 | Range 40 | Keith County |
| Township 13 | Range 41 | Keith County |
| Township 11 | Range 26 | Lincoln County |
| Township 13 | Range 26 | Lincoln County |
| Township 20 | Range 34 | McPherson County |

The triggering mechanism described in Chapter 9 were met for those Townships.

The Board of Directors will annually during the month of November review the triggering mechanism for ground water quantity to determine if target areas or management or control areas should be implemented and for ground water quality to determine if target areas or management or special protection area should be implemented.

### 10.3.2 Personnel

The Board of directors will provide adequate personnel and financial support within available funding sources for implementation of the Ground Water Management Plan.

Effective January 1, 1996, the District will initiate a dedicated Ground Water and Surface Water Program and establish a staff position titled Water Programs Coordinator. The Water Programs Coordinator will initially dedicate 75% of their time for Water Programs including implementation of the Ground Water Management Plan.

There will be no additional personnel costs for the District to implement the Ground

Water Management Plan, as a current employee will be reassigned to the Water Programs Coordinator position and that employee's current job responsibilities will be reduced and/or reassigned to other personnel.

## 10.4 Modification of Controls

The Board of Directors will annually, during the month of November, review the monitoring data and procedure utilized for implementation of controls in a designated Strategic Subarea, Management Area, Special Protection Area or Control Area and modifications of the controls will be accomplished if the average of the previous three years of data has increased to the next triggering mechanism level or decreased to the previous triggering mechanism level.

## 10.5 Dissolution of an Area

The Board of Directors will annually, during the month of November, review the monitoring data and procedure utilized for designation of a Target Area, Strategic Subarea, Management Area, Special Protection Area or Control Area and dissolution of the area may be accomplished if the average of the previous three years of data has decreased below the triggering mechanism level which established the area.

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