JEO CONSULTING GROUP INC

DRAFT PLAN
FOR ADOPTION

July 2016

York Wellhead Protection Plan

York, NE

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City of York, Nebraska

Wellhead Protection Plan

DRAFT PLAN FOR ADOPTION

Prepared: July 2016
Adopted: [date to be inserted]
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Prepared for: *City of York, Nebraska*

Prepared by: *JEO Consulting Group, Inc.*

JEO Project Number: *140304.00*

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This wellhead protection plan has been prepared to assist the City of York to proactively protect and manage the aquifer that is the source of community drinking water. It has been written with guidance published by the Nebraska Department of Environmental Quality (NDEQ).

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LIST OF ABBREVIATIONS AND ACRONYMS

AO	Administrative Order
BMP	Best Management Practice
CDL	Cropland Data Layer
CWS	Community water system
DHHS	Department of Health and Human Services
DNR	Nebraska Department of Natural Resources
E. coli	*Escherichia coli*
EPA	United States Environmental Protection Agency
ETJ	Extraterritorial Jurisdiction
GIS	Geospatial Information Systems
GWMA	Groundwater Management Area
GWMP	Groundwater Management Plan
IMP	Integrated Management Plan
JEO	JEO Consulting Group, Inc.
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
NDEQ	Nebraska Department of Environmental Quality
NPS	Non-Point Source Pollution
NRCS	Natural Resources Conservation Service
NRD	Natural Resources District
PER	Preliminary Engineering Report
ppm	Parts Per Million
PWSS	Public Water System Supervision
PWSSs	Public Water Supply Systems
SDWA	Safe Drinking Water Act
the City	City of York
UBBNRD	Upper Big Blue Natural Resources District
USDA	United States Department of Agriculture
WHPA	Wellhead Protection Area
WHPP	Wellhead Protection Plan

NEBRASKA'S WELLHEAD PROTECTION PROGRAM SUMMARY

A WELLHEAD PROTECTION AREA IS THE SURFACE AND SUBSURFACE AREA SURROUNDING A COMMUNITY DRINKING WATER WELL OR WELL FIELD, THROUGH WHICH CONTAMINANTS ARE REASONABLY LIKELY TO MOVE TOWARD AND REACH SUCH WATER WELL OR WELL FIELD (§46-1502).

NEBRASKA'S WELLHEAD PROTECTION PROGRAM

The Nebraska Department of Environmental Quality (NDEQ) administers the Wellhead Protection Program (WHPP), which began after the Nebraska Legislature passed LB 1161 in 1998 (Neb. Rev. Stat. §46-1501 – 46-1509), authorizing the Wellhead Protection Area Act. **The Act sets up a process for public water supply systems to use, if they choose, to implement a local WHPP**. The intent of this process was to establish guidelines for communities and other public water suppliers to develop local WHPPs. A WHPP does not provide any new powers to a community; it serves as a guide to local decision makers tasked with protecting the community drinking water supply.

All community public water supplies in Nebraska have a Wellhead Protection Area map as of October 1, 2004.

Nebraska Department of Environmental Quality

WELLHEAD PROTECTION PROGRAM ACTIVITIES

1. **Delineate the Wellhead Protection Area (WHPA)** - The NDEQ, and some Natural Resources Districts (NRDs), may provide a public water system with a WHPA map that shows the area which is critical to recharging a community's groundwater and drinking water supply.
2. **Perform a Contaminant Source Inventory (CSI)** - Conducting a CSI involves locating and documenting activities, structures, and locations which could affect the quality of the source of drinking water.
3. **Manage potential contaminants** - After identifying potential contaminant sources within the WHPA, the community can use management such as county and municipal zoning, local ordinances, working with landowners to implement best management practices (BMPs), or other options, such as education and information, to ensure a safe drinking water supply, which complies with The Safe Drinking Water Act.
4. **Develop emergency and contingency plans** - These plans assist a community in responding to events such as natural disasters, contamination, and drought. These and other issues, such as population growth, may be addressed through emergency/contingency plans, as well as by planning for new wells.
5. **Educate and involve the public** - Community awareness will help to provide citizens with the information they need to protect drinking water, reduce pollution, and increase their participation in the development of a wellhead protection plan.

SECTION 1. INTRODUCTION

1.01 ABOUT THIS PLAN

The planning document herein is prepared for the City of York (the City) as a general guide to accommodate anticipated future growth and water quality management. The intent of the document is not founded as regulatory framework nor does adoption provide additional authority to the City or other federal, state, or local entities. Adoption of the document is indicative to water system users, the community, and outside agencies that the City values its water system and desires systematic protection of its sources of water.

A strength and often over looked value of developing a WHPP is the planning process that communities are required to undertake. The planning process convenes community leaders, agency representatives, land owners, and technical specialists along with the general public – of which, may have competing interests, differences in viewpoints, conflicting terminologies, or general absence of knowledge pertaining to water protection. The process challenges stakeholders to re-evaluate their own ideas and continue education of the issues. The planning process is an aide in forming a relationship between all stakeholders and facilitates future community efforts.

1.02 FUTURE UPDATES TO THE PLAN

Periodic reviews and revisions should be completed to ensure the best science and inclusion of up-to-date information. Regular monitoring and evaluation of the implementation progress of the plan is recommended. At a minimum, the WHPP should be updated or reviewed when new information changes the WHPA boundaries or there is a change in groundwater quality. Other reasons for updates may include when a new drinking water well is added to the drinking water system, NDEQ issues an updated WHPA map, or there has been a significant change to the land use within the WHPA.

The specific timeframe for updates is at the discretion of the community and may be based on the complexity of the area or pace the community is changing. It is recommended the plan be reviewed annually by the Wellhead Protection Stakeholder Committee. Groundwater and wellhead protection related actions should be documented, reported, evaluated, and revised during this time. A more comprehensive update should be addressed at a minimum of every five years. At this interval, updates should include any changes in the potential contaminant source inventory and land use within the WHPA. Long-term water quality and use trends should be evaluated and extrapolated into future projections to ensure sustainability of the source water is maintained.

NDEQ and Department of Health and Human Services (DHHS) should be consulted during each update to determine if additional information has been developed or if any related regulations or other requirements require a review of the plan.

1.03 COMMUNITY BACKGROUND

York is located in eastern Nebraska, in York County (Figure 1). The town was platted in 1869 and currently has a population of 7,766. The population peaked in 2000 (Table 1) but has generally shown a growing trend throughout its history. The City is surrounded by agricultural production/landuse, which is a dominant factor in the local economy.

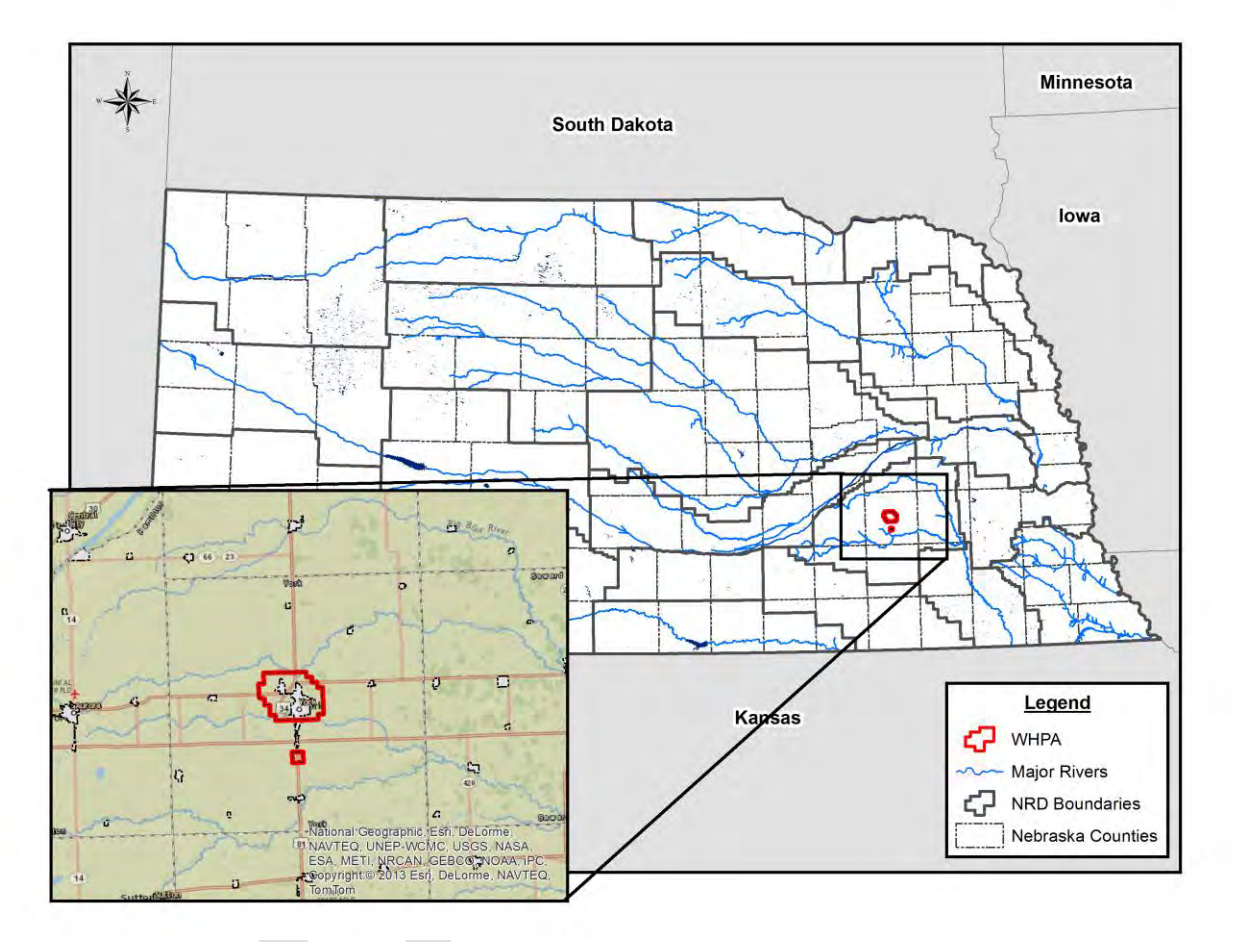
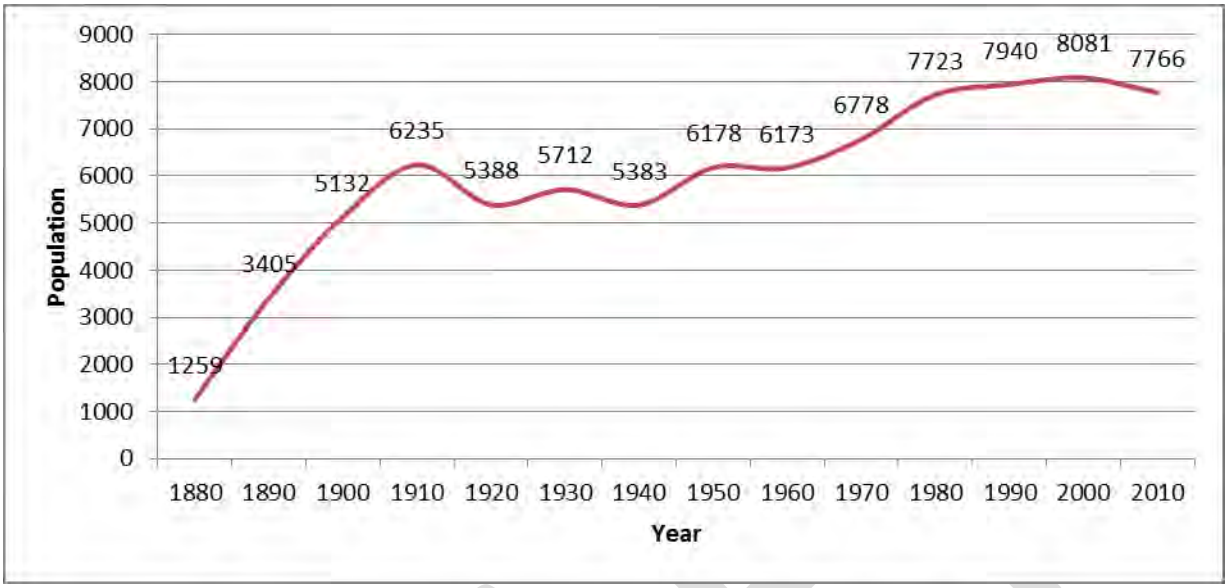


Figure 1: York, Nebraska Location

Table 1: Historical Population for York



Source: U.S. Bureau of the Census

Compiled by: Nebraska State Data Center, Center for Public Affairs Research, University of Nebraska Omaha

1.04 UPPER BIG BLUE NATURAL RESOURCES DISTRICT

Natural Resource Districts (NRDs) are local government entities with broad responsibilities to protect natural resources. Major Nebraska river basins form the boundaries, enabling districts to respond best to local needs. Nebraska's NRDs are involved in a variety of projects and programs to conserve and protect the state's natural resources. Elected boards of directors govern district and much of their funding comes from local property taxes. York is located in the Upper Big Blue NRD (UBBNRD), as shown in Figure 2.

The UBBNRD is charged under state law with twelve areas of responsibility, including: erosion prevention & control, prevention of damages from flood water & sediment, flood prevention & control, soil conservation, water supply for any beneficial uses, development, management, utilization, & conservation of groundwater & surface water, pollution control, solid waste disposal & drainage, drainage improvement & channel rectification, development & management of fish & wildlife habitat, development & management of recreational & park facilities, and forestry and range management.

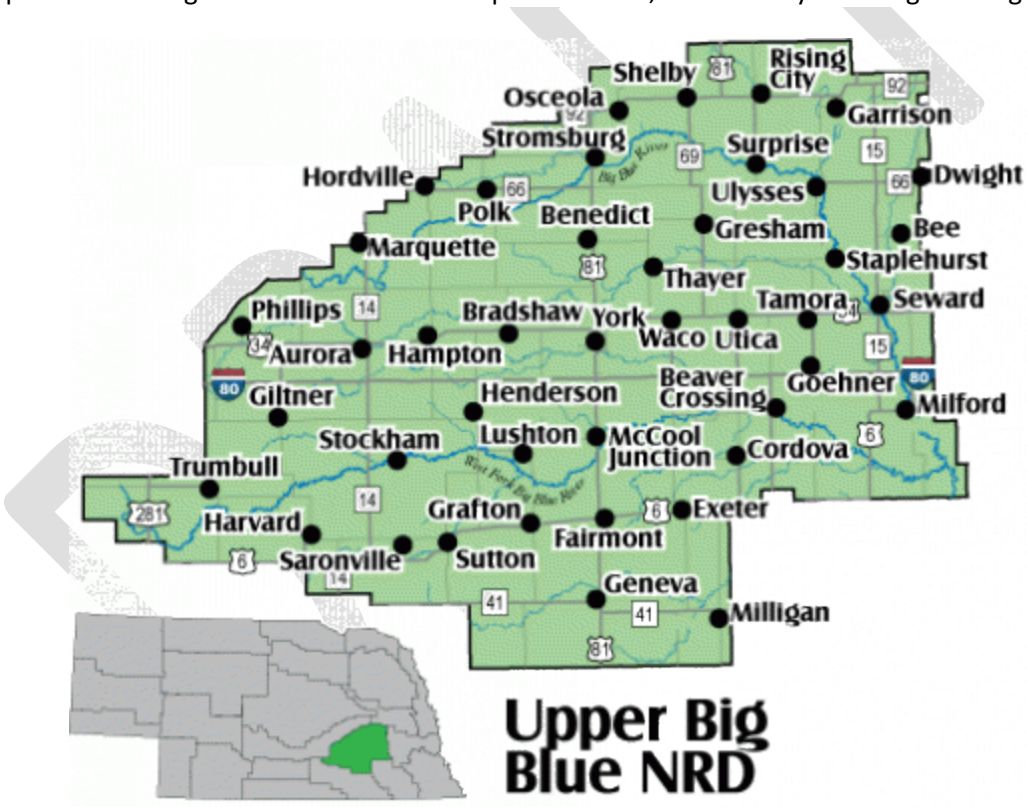


Figure 2: Upper Big Blue Natural Resources District

1.05 NEBRASKA GROUNDWATER

The State of Nebraska has a significant source of groundwater throughout its territorial jurisdiction, making it a vital natural resource of the state. Groundwater uses include irrigation, water supply for humans and animals, and uses for commercial and industrial activities. Nebraska receives nearly 88% percent of its public drinking water and nearly 100% of its private water supply from groundwater sources (NDEQ, 2015). Agriculture (the state's largest industry) is also dependent on this resource as well. As of November 2015, the Nebraska Department of Natural Resources (DNR) listed over 96,000 active irrigation wells and over 28,000 domestic wells registered in the state (NDEQ, 2015). Figure 3, displays the density of registered irrigation wells in the vicinity of York. Domestic wells were not required to be registered with the state prior to September 1993, therefor thousands of domestic wells exist that are unregistered and their locations unknown.

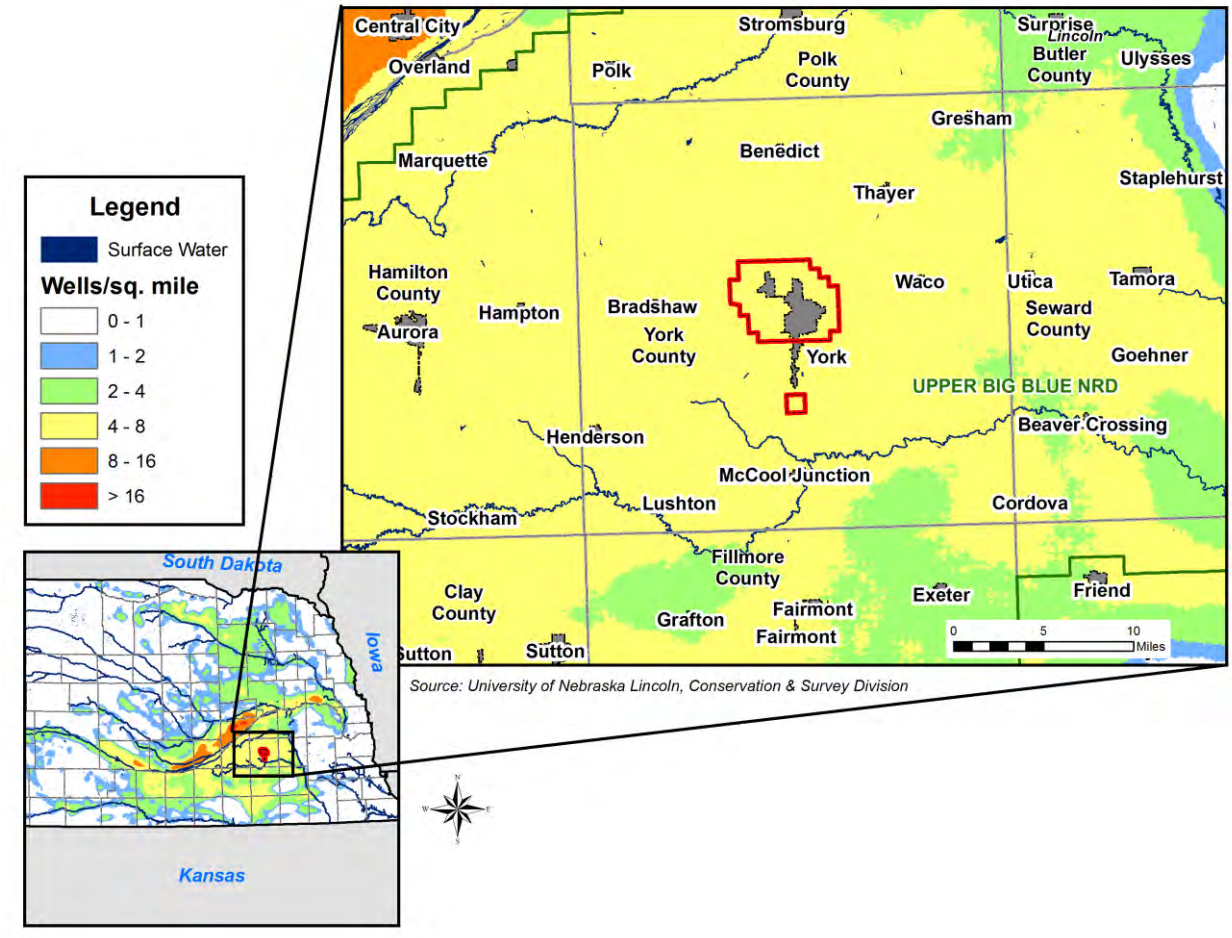


Figure 3: Density of Active Registered Irrigation Wells – December 2015

In regard to the importance of groundwater across the state, extensive monitoring and evaluation of the quantity and quality of the resource is ongoing. Multiple entities are involved:

- Natural Resource Districts (23)Nebraska Department of Agriculture
- Nebraska Department of Natural Resources
- Nebraska Department of Environmental Quality
- Nebraska Department of Health and Human Services
- Public Water Suppliers
- University of Nebraska-Lincoln
- United State Geological Survey

The results from monitoring are compiled in the Quality-Assessed Agrichemical Contaminant Database for Nebraska Groundwater (Database). The Database compiles groundwater monitoring data from different sources and provides public access to the results. Available water quality data ranges from 1974 to the present. The monitoring data is collected from irrigation and domestic supply wells in addition to dedicated groundwater monitoring sites. The number of designated groundwater monitoring wells has increased through the past several years across the state. The database is available online at http://dnrdata.dnr.ne.gov/Clearinghouse/Clearinghouse.aspx.

The network of monitoring wells provides data for a range of environmental conditions and is analyzed for a variety of compounds. In respect to withdrawal of groundwater, elevation of the aquifer is measured to establish trends in groundwater levels and availability. Figure 4, characterizes the change in groundwater levels from pre-development to the spring of 2015.

Most of Nebraska, which is underlain by the High Plains Aquifer, has groundwater available in adequate amounts. However, other areas, primarily those in the east, and northwest regions of the state have difficulty providing adequate yields. Groundwater in the east can be more limited because of glaciation and erosion have deposited many geologic formations with variable properties. In the northwest, the Chadron aquifer is composed of bedrock and has limited capacity. Groundwater quality is generally considered excellent for the majority of the state; however, some areas experience non-point source pollution (NPS) of contamination from pollutants such as nitrates and agricultural contaminants, or from naturally occurring pollutants such as arsenic, uranium, or selenium. In addition, point sources of contamination have had additional impacts in localized areas. These sources may include underground injection wells, leaking underground tanks, livestock lagoons, landfills, improperly constructed wells, hazardous waste, grain fumigants, munitions sites, and/or septic systems.

Contamination of groundwater is a public health issue and has a potential to cause significant costs to communities as they may be forced to abandon wells or construct expensive water treatment systems. The result of contamination leads to long-term financial impacts for communities in treatment, drilling new wells, or development of management strategies and programs.

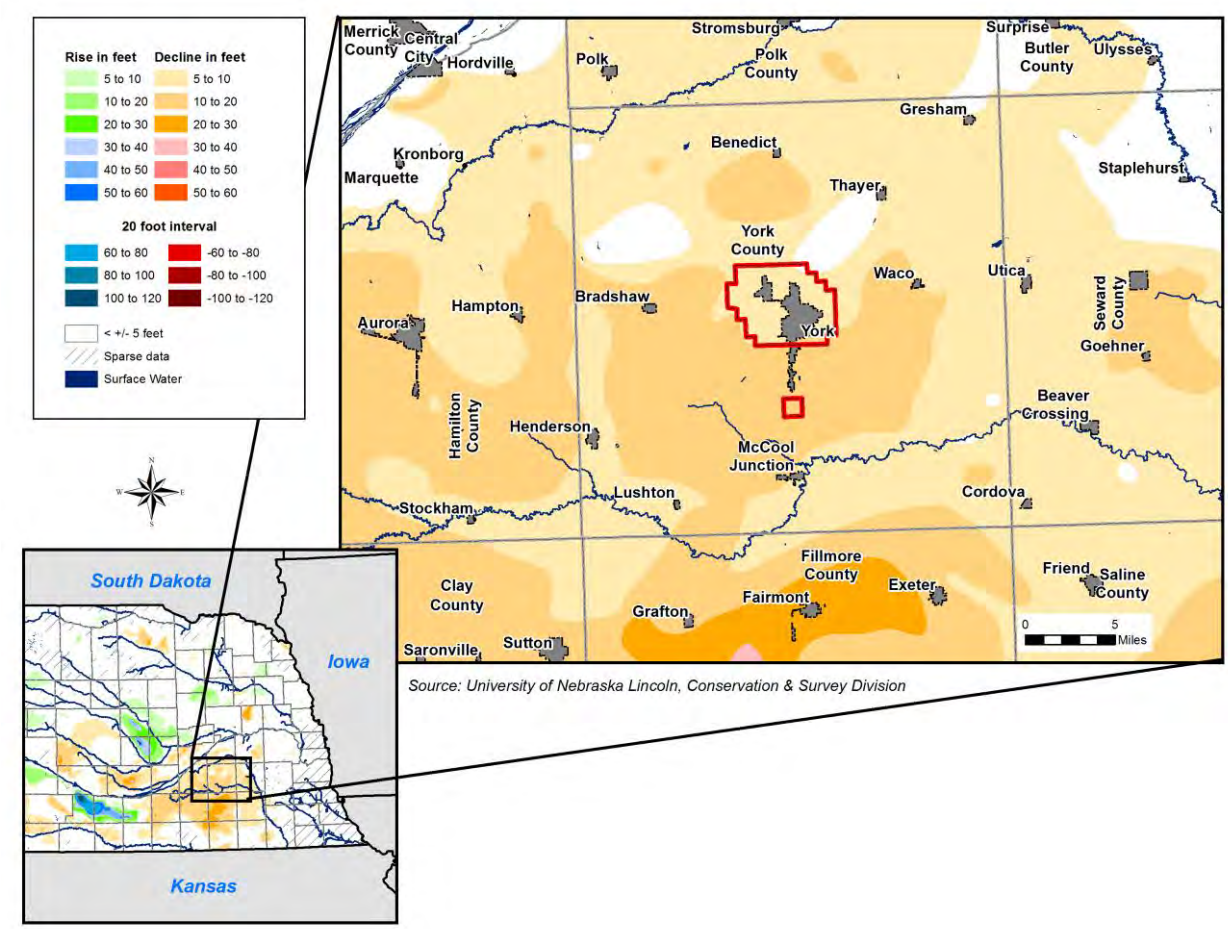


Figure 4: Groundwater-level Changes in Nebraska - Predevelopment to Spring 2015

1.06 GROUNDWATER POLLUTION IN NEBRASKA

Groundwater pollution throughout Nebraska is variable by the type of pollutant and scale of the contamination. Typically, three types of pollutants are of concern to impairments of water quality in Nebraska: nitrates, pesticides, and bacteria (coliforms, *E. coli*, etc). The presence of pesticides in water supplies is an increasing concern. Atrazine is one of the commonly detected pesticides found in drinking water wells of Nebraska which is consistent with usage, as well as its relatively high mobility and persistence. Coliform group bacteria are microscopic, generally harmless organisms living in the digestive system of warm blooded animals. Although coliform bacteria do not directly cause diseases, they are often indicators of other, more dangerous bacteria. Sources of fecal coliform are septic systems, barnyards, and animal waste lagoons (Gosselin, 1997).

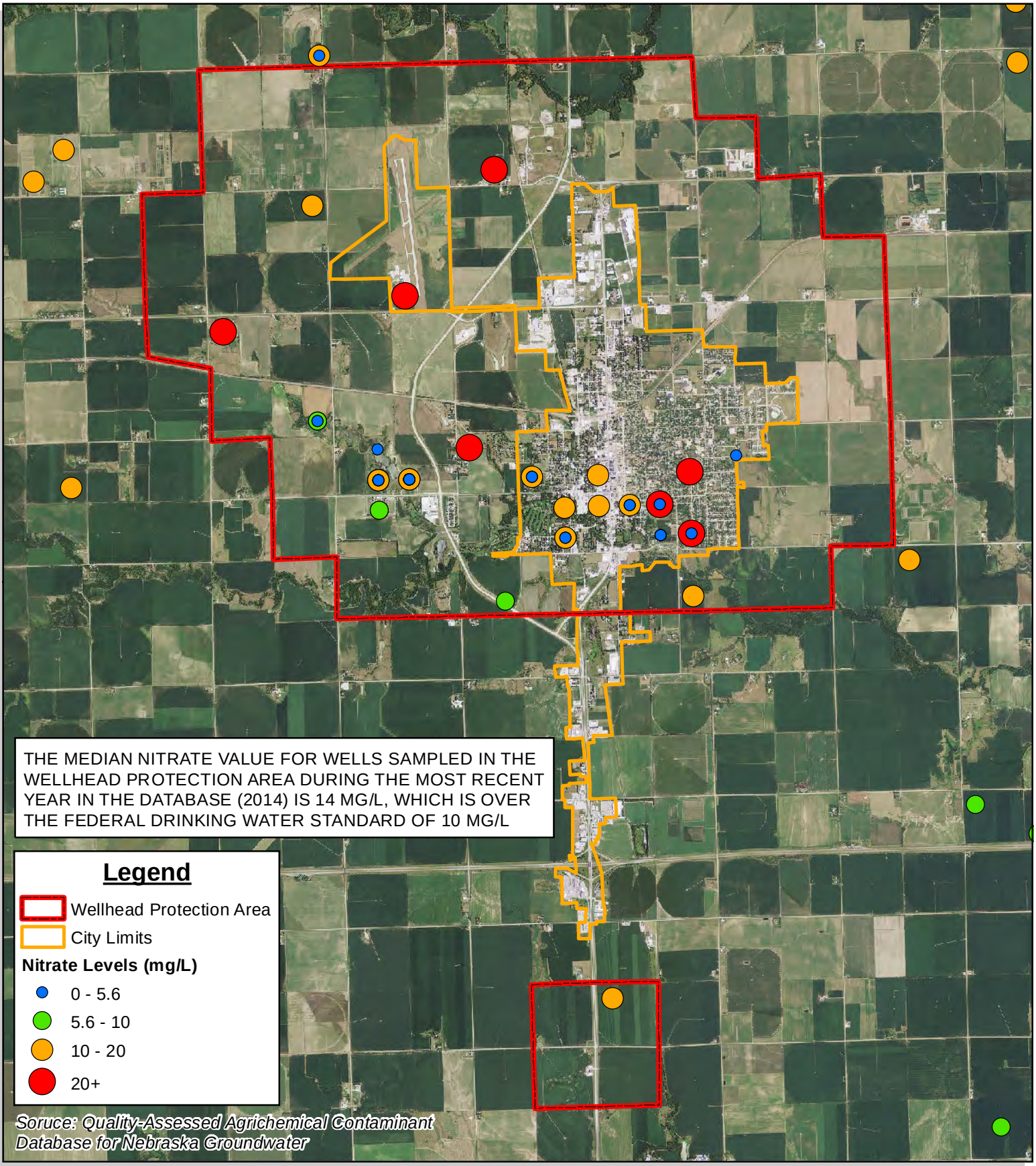
NITRATE POLLUTION

Of the three pollutants, the most pervasive is nitrate-nitrogen (nitrate). Nitrates are known to cause a disease called methaemoglobinaemia (or "blue baby syndrome") with infants. The major symptom of this disease causes inhibition of the blood's ability to carry oxygen resulting in blue skin coloring around the mouth, hands, and feet. Carcinogenic compounds have also been known to become more prevalent when there are high levels of nitrates in drinking water. When nitrates in the body are broken down and converted into the chemical compound nitrite, they can react with other compounds (amines) in the body and form nitrosamines; a cancer causing compound (NHDES, 2006). Due to the risk of "blue baby syndrome," the US Environmental Protection Agency (EPA) has set a maximum contaminant level (MCL) of 10 milligrams per liter (mg/L) or parts per million (ppm) for nitrate-nitrogen in drinking water.

Available records show that beginning in the 1960s and extending through 1998, 37% of Nebraska's small city and village water systems have exceeded the MCL for nitrates. Additionally, another 28% have had readings between 5 and 10 mg/L, which requires quarterly sampling (USDOI 1999). More recently, the number of systems that have received violations for exceeding the MCL has decreased significantly, with only six systems in violation in 2015 (DHHS, 2015). However, of the nearly 550 groundwater based community public water supply systems in Nebraska, 158 of those must perform quarterly sampling for nitrate (NDEQ, 2015).

Due to this history, groundwater concerns of Nebraska have focused heavily on nitrates, and for this reason WHPPs are typically written in that context. Figure 5 illustrates the most recent nitrate sampling data for wells in the Database, from 1994-2014 (approximately the last 20 years). This is an attempt to show the "current" groundwater quality from the most recent time the well has been sampled. Unfortunately, there are numerous wells throughout the state that haven't been sampled and analyzed for nitrates for 10 or more years, but still represent the most recent sample collected. Judgment must be used in analyzing data from the Database as most wells sampled are irrigation or domestic supply wells which are not normally constructed to provide discreet samples from the aquifer (specific screens at specific depths). Nevertheless, insights can be realized from the data.

THE MEDIAN NITRATE VALUE FOR WELLS SAMPLED IN THE WELLHEAD PROTECTION AREA DURING THE MOST RECENT YEAR IN THE DATABASE (2014) IS 14 MG/L, WHICH IS OVER THE FEDERAL DRINKING WATER STANDARD OF 10 MG/L



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This map was prepared using information from record drawings supplied by JEO and/or other applicable city, county, federal, or public or private entities. JEO does not guarantee the accuracy of this map or the information used to prepare this map. This is not a scaled plat.

York Wellhead Protection Plan

Figure 5: Most Recent Nitrate Concentrations, from wells sampled 1994 - 2014

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EMERGING CONTAMINANTS

The UBBNRD has become concerned that the overall groundwater chemistry is changing and naturally occurring elements in the aquifer material are being released into the groundwater. Several recent studies (Weber, 2015) have considered the relationship of elevated groundwater nitrate levels and uranium concentrations in groundwater. Elevated uranium concentrations are found in many regions, including those without anthropogenic uranium activity (mining, nuclear testing, etc.), indicating a source of natural uranium contamination. Research indicates that natural uranium in the subsurface may be oxidized and mobilized as the nitrate (in many forms) moves through the root zone and eventually to groundwater. Shallow groundwater was determined to be the most susceptible to co-contamination. Weber (2015) indicated that nitrate concentrations near the MCL are correlated to elevated groundwater uranium concentrations; thus, nitrate, a primary groundwater contaminant, can be a factor leading to secondary uranium concentration.

This is significant because consumption of uranium contaminated drinking water has been linked to nephrotoxicity and osteotoxicity and, thus, poses a health risk (Weber, 2015). In fact, some public water supply systems treat not only nitrate, but are also treating uranium (NDEQ, 2015). In addition to drinking water concerns, food crops irrigated with contaminated water have been demonstrated to accumulate uranium, thus leading to an additional uranium exposure through food crops (Weber, 2015).

Starting in 2014, the UBBNRD began a three-year review of uranium, arsenic, and selenium in the District's groundwater. The NRD began collecting samples for those constituents; however, complete interpretation of the data will not occur until after the third year. According to the City, one well has experienced issues with uranium levels in the water.

1.07 GROUNDWATER VULNERABILITY TO CONTAMINATION

Regions that are within an aquifer zone, or rely on the groundwater produced by a well are vulnerable to contamination from human activities. In order to quantify or illustrate that vulnerability, there are various computer models available that serve as a practical visualization tool for decision making. Alone, they do not fill a direct role, but cumulatively contribute to the understanding of the issues. According to the National Research Council (1993):

> ***GROUNDWATER VULNERABILITY TO CONTAMINATION IS THE TENDENCY OR LIKELIHOOD FOR CONTAMINANTS TO REACH A SPECIFIED POSITION IN THE GROUNDWATER SYSTEM AFTER INTRODUCTION AT SOME LOCATION ABOVE THE UPPERMOST AQUIFER.***

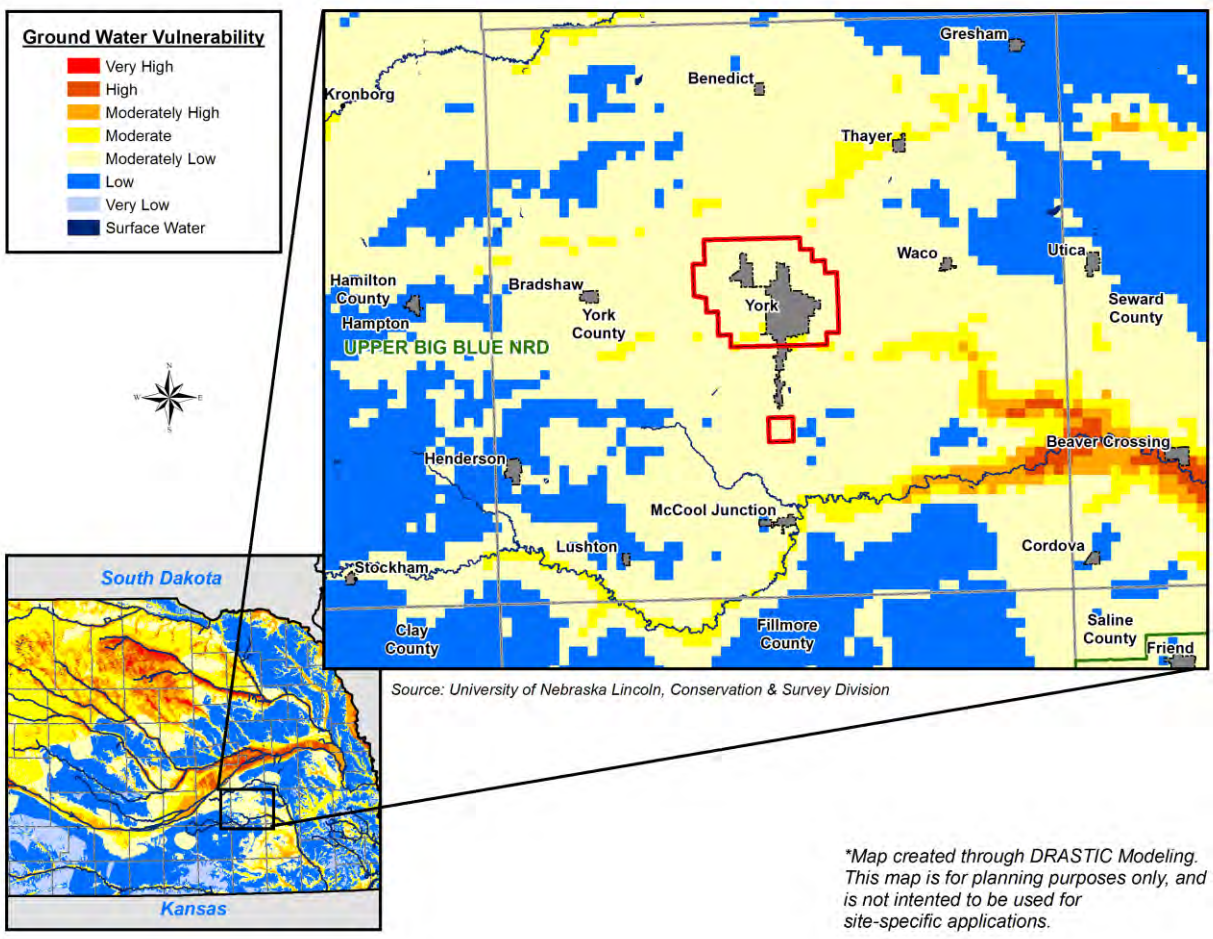


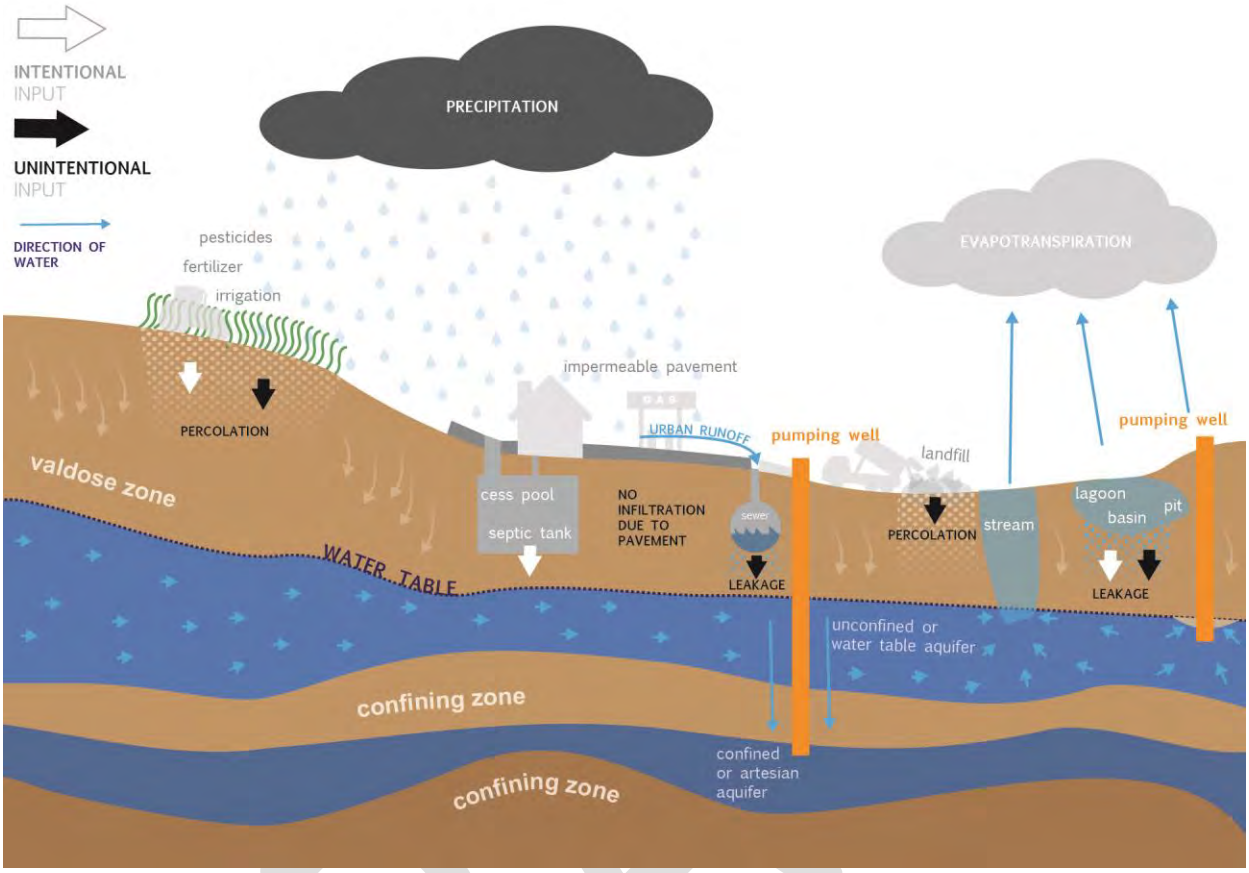
Figure 6: Groundwater Vulnerability to Contamination in Nebraska Using the DRASTIC Method

Vulnerability of groundwater contamination may be attributed to a combination of factors. Figure 6 is a generalized map of Nebraska groundwater vulnerability to contamination based on EPA's DRASTIC model.

DRASTIC is an acronym for the factors used to estimate vulnerability: **D**epth to the water table, **R**echarge (amount of water that percolates down into the aquifer), **A**quifer media, **S**oil media, **T**opography (slope), **I**mpact of the vadose zone (time required for water to percolate through the unsaturated zone between the surface and the water table), and **C**onductivity (hydraulic conductivity of the soil). The model results displayed in Figure 6 were developed on the statewide scale; as a result, site (field) specific applications of the contamination potential may have limitations, and could require refinements including additional data and interpretation.

Every pollutant and chemical has unique properties that influence how they move downward (leach) through the soil column (vadose zone) and into groundwater. The leaching rate and contaminant diffusion is dependent on the soil composition and water infiltration due to water bodies, precipitation, and irrigation. The highest potential for groundwater contamination occurs in sandy, permeable soils low in organic matter, particularly in locations with shallow depth to groundwater. Clay soils tend to have poor drainage and typically hold moisture and contaminants longer in the upper layers of the stratum.

The DRASTIC model provides a relative evaluation of vulnerability of groundwater to contamination and is not designed to provide definitive vulnerability. Generally, it is relatively easy to delineate areas of high vulnerability, difficult to determine that an area has very low vulnerability, and not possible to define fine gradations in between the two. Areas identified with high risk may require a detailed hydrogeologic evaluation performed (Nebraska Natural Resources Commission). Solely utilizing any to address management decisions should be done conservatively and with additional information. Groundwater management requires cooperative efforts of regulatory agencies, policy makers, natural resource managers, educators, the public, and technical experts. Actions based solely on a vulnerability assessment should be tempered by the uncertainty of the assessment and the confidence of the technical experts in the assessment they have produced (National Research Council, 1993).



Source: Adapted from University of Texas at Austin – Center for Research in Water Resources

Figure 7: Typical Routes of Groundwater Contamination

Groundwater vulnerability is a function of the properties in the natural system where groundwater is found; however, the risk of contamination may be relativity low or high regardless of the vulnerability. Contamination risk is assessed by the proximity or siting of a source where potential introduction of a pollutant into a vulnerable area may exist. Additional groundwater monitoring of vulnerable areas may aid in reducing the risk of contamination. It is important that decisions and management of resources distinguish between vulnerability and risk (Rahman 2008). Figure 7 illustrates the many ways in which contamination may be introduced to a groundwater system (risk factors). With increased potential contaminate sources present, the higher the risk of contamination (regardless of vulnerability).

BECAUSE THE WELLHEAD PROTECTION AREA IS THE MOST CRITICAL AREA FOR RECHARGE OF THE CITY OF YORK'S SOURCE OF DRINKING WATER, IT SHOULD BE CONSIDERED HIGHLY VULNERABLE AND EVERY RISK FACTOR SHOULD BE EVALUATED CAREFULLY.

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SECTION 2. YORK WATER SYSTEM

2.01 NEBRASKA'S PUBLIC WATER SYSTEM PROGRAM

The EPA established the Public Water System Supervision (PWSS) Program under the authority of the 1974 Safe Drinking Water Act (SDWA). With the SDWA and subsequent 1986 Amendments, EPA regulates nationally the limits of contaminant levels in drinking water for ensuring that public water supplies are safe for human consumption. These limits are known as MCLs. Additionally, EPA sets rules for sampling, treatment, and public notification. Within the State of Nebraska, the Division of Public Health of the DHHS administers the PWSS Program, under EPA guidance. The mission of the Public Water System Program of DHHS is to protect the health and welfare of Nebraskans by assuring safe, adequate, and reliable drinking water

PEOPLE EXPECT THEIR DRINKING WATER WILL BE SAFE WHEN THEY TURN ON THE FAUCET.

As part of administering the PWSS program, DHHS's Department of Regulation and Licensure visits all Public Water Supply Systems (PWSSs) to conduct a sanitary survey. The routine sanitary survey is conducted once every three years for community water systems (CWS). A sanitary survey is an on-site review of the water source, facilities, equipment, operations, and maintenance of a public water system for the purpose of evaluating the system's adequacy and ability to reliably produce and distribute safe drinking water within the confines of the regulatory requirements.

The sanitary survey also includes a vulnerability assessment done within 1,000 feet of community supply wells. Ranking of vulnerability is based on the locations of potential contaminant sources within established setbacks up to a 1,000-foot radius.

York's most recently completed (2015) Sanitary Survey and Annual Water Quality Report (2014) is summarized in the following sections. The documents are included in Appendix A and are also available at the York City Hall.

2.02 YORK WATER SYSTEM INFORMATION

The source of water supply for York is groundwater, located in aquifers underlying the immediate area. The City's municipal water system consists of sixteen (16) active supply wells, three (3) emergency supply wells, and three (3) storage facilities. Table 3, displays the general system summary for York's water system. Figure 8 and Table 3 display additional location and information about each supply well.

Table 2: York General Water System Information

General System Information	
System ID	NE31-18706
Meters Connected	100%
Maximum Daily (24-hour) Production Capability	15.819 million gallons/day
Total Production for past year	496.347 million gallons

Source: Public Water Supply Routine Sanitary Survey (2015)

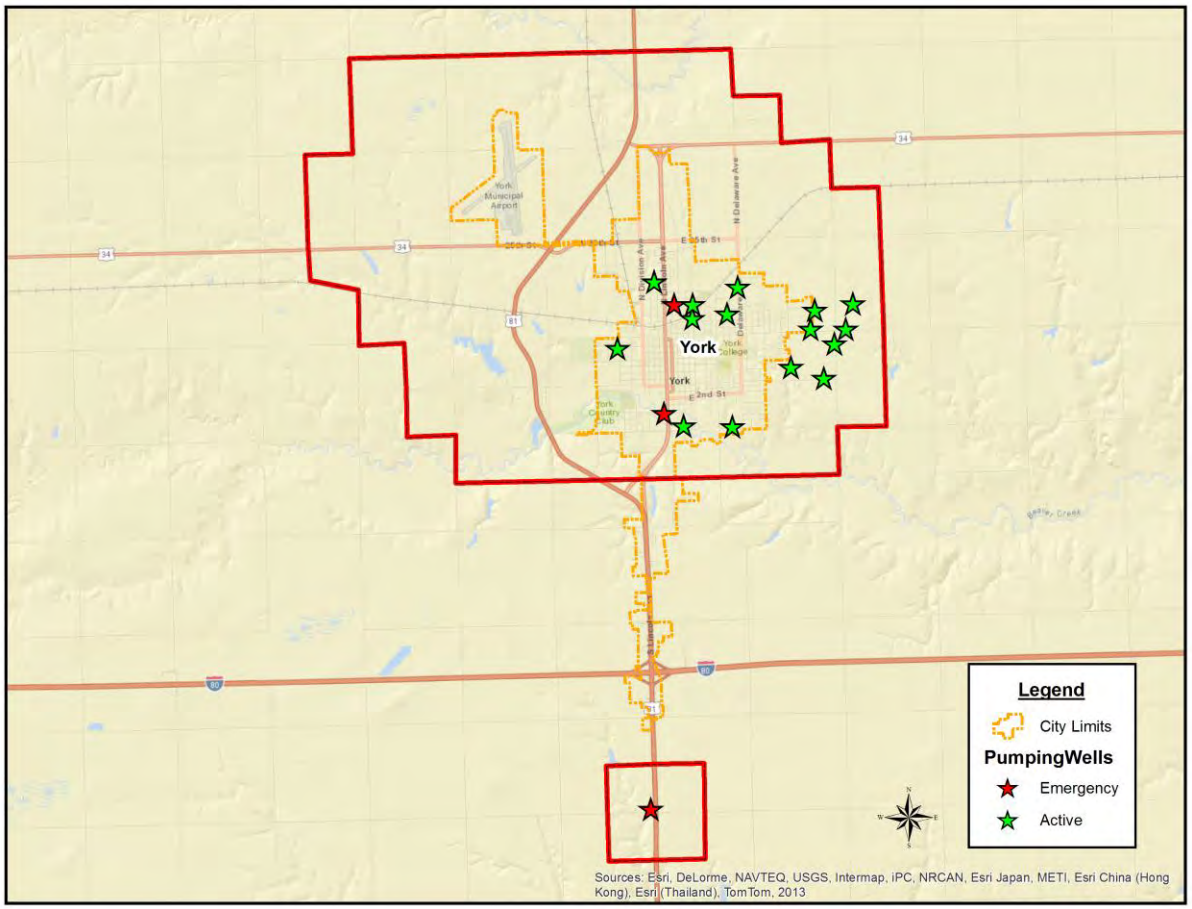


Figure 8: York Municipal Well Locations

Table 3: York Municipal Water Supply Well Information

DHHS Well ID #	DNR Registration #	Status	Total Well Depth (feet)	Static Water Level (feet)	Draw Down (feet)
621	G-03563	Emergency	183	30	42
681	G-030559	Active	356	77	54
761	G-063042	Active	194	34	48
771	G-060709	Active	380	138	56
773	G-060708	Active	292	44	34
774	G-060707	Active	249	48	54
821	G-030560A	Emergency	368		
822	G-030560B	Active	340	87	53
881	G-071287	Emergency	174		
971	G-094218	Active	367	79	66
971A	G-094220	Active	233	74	51
972	G-094219	Active	384	87	65
2004-1	G-130246	Active	384	104	16
2009-1	G-157272	Active	326	102	37
2009-2	G-157274	Active	347	105	33
2009-3	G-157275	Active	376	108	31
2009-4	G-157276	Active	392	113	28
2009-5	G-157277	Active	375	98	40
2009-6	G-157273	Active	375	101	44

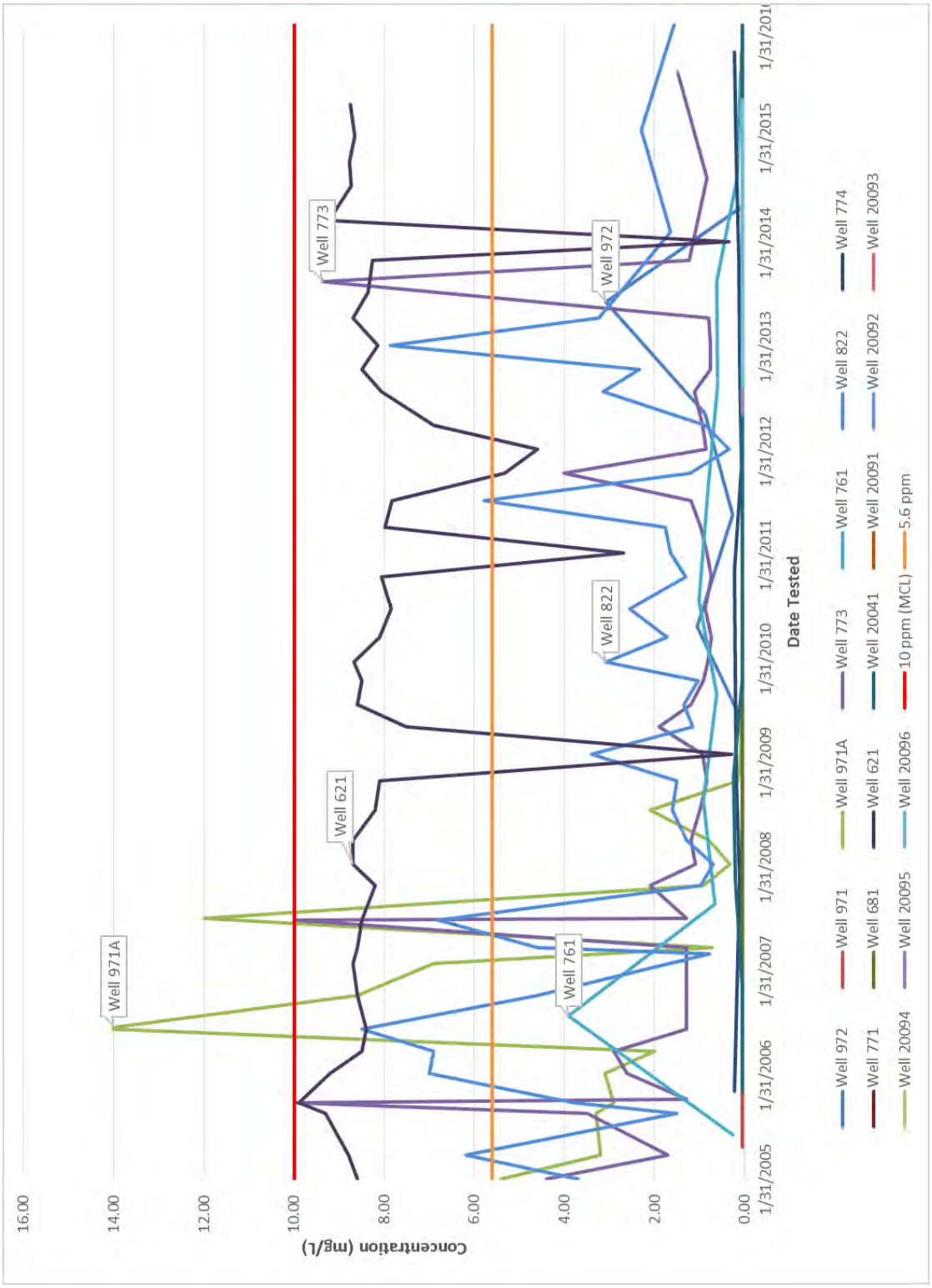
Source: Public Water Supply Routine Sanitary Survey (2015)

2.03 HISTORICAL NITRATE SAMPLING INFORMATION

The DHHS maintains historical drinking water well data. This is accessible through the "Drinking Water Watch" located on their website: http://dhhs.ne.gov/publichealth/Pages/enh_pwsindex.aspx. The "Drinking Water Watch" database was searched for nitrate-nitrite (code 1038) sampling results for the past 15 years (2000 thru 2015). The available results are displayed in Table 4. The chart also displays the EPA regulated MCL at 10 ppm (or mg/L) as a red line and 5.6 ppm as an orange line, which is a level that triggers additional monitoring by the system operator.

Nitrates are known to be naturally occurring in groundwater, with a typical background concentration of 3 ppm. Concentrations above 3 ppm may indicate an extent of human impact. Concentrations above 5 ppm are likely a result of human activity (Gosselin, 1997). Currently, the York drinking water system is in compliance, although there have been a few occasions that nitrates have exceeded the MCL. The last occurrence was in 2007. No other trends were observed in the data.

Table 4: Historical Nitrate-Nitrite Sampling Data



2.04 EXISTING GROUNDWATER CONTAMINATION

In recent years, York city officials have been working with the EPA and NDEQ to investigate and clean up various known soil and groundwater contamination sites in and around York. While these types of activities are not the focus of York's Wellhead Protection Plan, they should be mentioned as they play a big role in the public's perception of the groundwater quality in York. Figure 9, which shows a pollution plume from the southeast area of York (PCE Southeast Site), and near Wells 76-1 and 77-4, is an example of some of the information available. Sources of the information presented here include the NDEQ, EPA, and various newspaper sources. Copies of these sources are located in Appendix B. Additional information may be obtained from city officials.

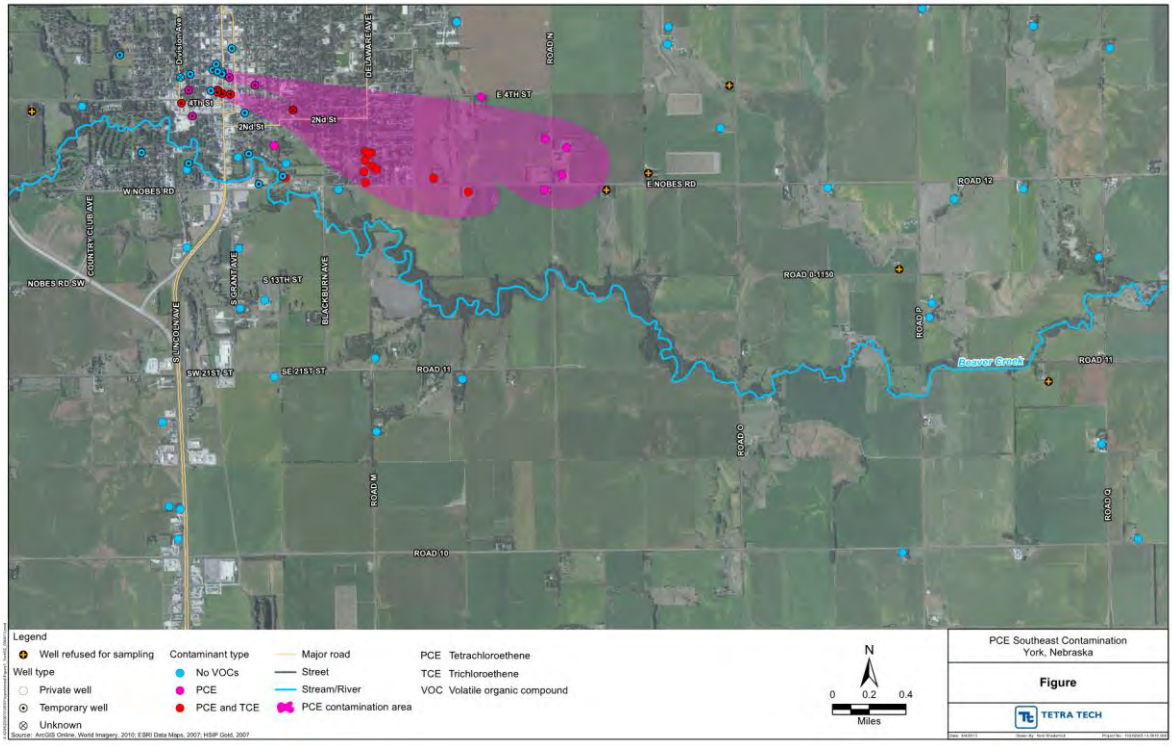


Figure 9: Example of Existing Groundwater Pollution Plume (PCE Southeast Site)

ACTIVE SITES

The following is a summary of the location, background, contaminants, and the current status of active contamination sites in and around York. Additional information on these (and nonactive sites) can be found in Appendix B.

Lincoln Former Air Force Base Atlas "F" Missile Site 10 (IIS 72118 SF) (NESFN073245)

- The Atlas missile site is located five miles west of York and was decommissioned in 1964, but left behind groundwater contamination
- Additional testing began in 2006 and found that contaminant plume had expanded 4.5 miles towards the City
- The U.S. Army Corps of Engineers is implementing soil and groundwater cleanup, and has installed multiple testing and extracting systems
- Cleanup started in 2008
- Not on the Superfund National Priority List

York City-County Sanitary Landfill (IIS 47897 IWM) (NE0054372)

- The closed York City-County Sanitary Landfill (York Landfill) is adjacent to the municipal solid waste disposal area operated by York Area Solid Waste Agency (YASWA). Previous operations at the York Landfill resulted in groundwater contamination, which impacted several domestic wells. Cleanup is being conducted under Nebraska Title 118 as the York Landfill closed prior to the implementation of Subtitle D standards.
- The currently implemented remedy for the site is groundwater monitoring, including monitoring of the off-site domestic wells, and landfill gas control. Recent groundwater sampling results indicate that none of the contaminants of concern (volatile organic compounds) have been detected either at the landfill or in the off-site domestic wells exceed drinking water standards or risk-based screening levels for at least two years. If all concentrations remain below cleanup standards for a period of three consecutive years, groundwater monitoring will cease.

USDA York Grain Bin

- The site is located in the northeast part of York, originating at the former USDA Grain Storage Facility. The site is located near several industrial facilities/businesses, and the associated groundwater contaminant plume extends to the east/southeast through residential areas.
- The US Department of Agriculture is participating in the state Voluntary Cleanup Program (VCP) for several former grain storage bin sites
- Pollutants at the site include chlorinated solvents, including tetrachloreothene (PCE), trichloroethene (TCE), trichloroethylene (TCA), dichloroethylene (DCE), and a second compound of trichloroethane (TCA).
- This site was discovered when municipal supply well 81-1 was found to have significant TCE and other contaminants. The well was immediately shut down. It is not known if the CT found in 81-1 and in private wells southeast of the well was from the grain bin or had an industrial source.

This plume appears to be exclusively carbon tetrachloride and degradation products, suggesting it is separate from the PCE/TCE Northeast plume (discussed below) that impacted municipal well 88-1.

- The York Former Grain Bin site is currently being investigated by the USDA's contractor Argonne National Lab. The plume is migrating southeast with groundwater flow, but is degrading with time.
- Argonne conducted groundwater sampling in 2015 and 2016 and has installed multiple monitoring wells at several locations
- The site was proposed for the National Priority List (NPL) in December 2013 and became final on the NPL in May 2014.

PCE/TCE Northeast Site (IIS 999632 SF) (NEN000706105)

- This site was recently added to the Superfund National Priority List
- Groundwater contamination in the north York area was first observed in 1990 when municipal well 88-1 was found to be significantly impacted by TCE, tetrachloroethylene (PCE), 1,1,1-trichlorethane (1,1,1-TCA), and carbon tetrachloride (CT). An investigation conducted by NDEQ and EPA in the early 1990's found multiple private wells from the East and Edison Avenues area to Delaware Street that were also impacted. The EPA provided alternate drinking water for all impacted homes and the city shut down well 88-1.
- The EPA is working with the potentially responsible party(s) to conduct an on-site investigation in the vicinity of North Division Ave. and 25th Street and continue the off-site groundwater investigation. Contamination appears to be primarily limited to the shallow unconfined aquifer, but additional testing is needed.

PCE Southeast Site (IIS 999632 SF) (NEN000706200)

- The site is in the southeast part of York, originating in the downtown area. There appear to be at least three source areas in downtown York, all apparently former dry cleaners, resulting in two or more plumes.
- Investigation is being led by the EPA because there are no viable potentially responsible parties
- The plume extends approximately two miles and is comprised of chlorinated solvents, including PCE, TCE, and degradation products.
- Although low concentrations of PCE and TCE have been found in the confined aquifers, the contamination is primarily restricted to the shallow, unconfined aquifer.
- The site was proposed for the National Priority List (NPL) in December 2013 and became final on the NPL in May 2014.

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SECTION 3. YORK WELLHEAD PROTECTION AREA

3.01 WELLHEAD PROTECTION AREA DELINEATION

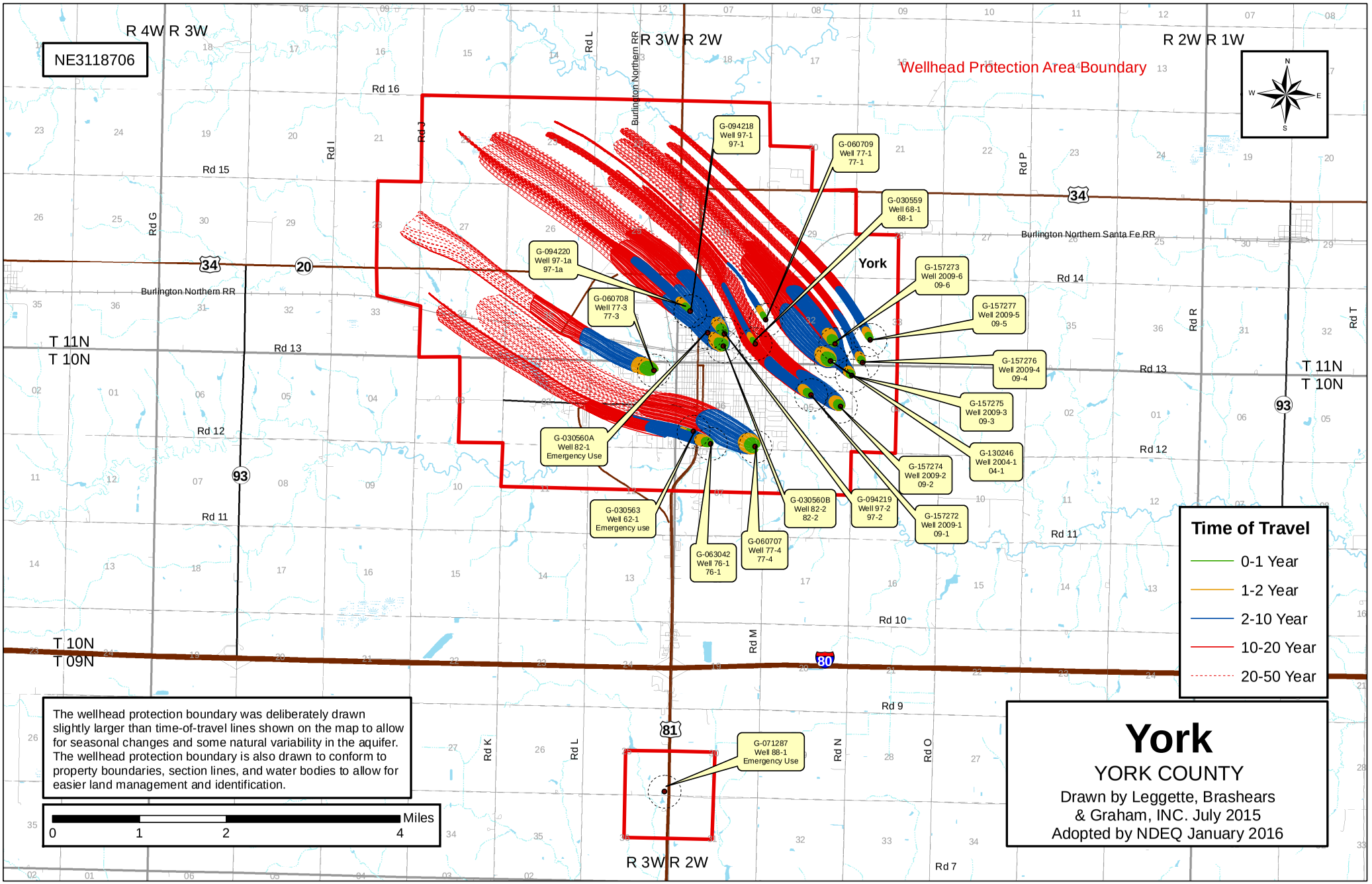
York's previous WHPA was provided by NDEQ in 2010. In February 2016, the NDEQ updated York's WHPA (Figure 10 and Figure 11). Figure 12 displays the hydrogeology of the vicinity around York. The WHPA was created by NDEQ based on modeling conducted by Leggette, Brashears, & Graham, Inc. (LBG) and accepted by NDEQ. Time-of-travel lines were created using MODFLOW (an USGS numerical groundwater flow model) and particle-tracking module MODPATH. Additional documentation is provided by a report from LBG in Appendix C, dated July 28, 2015.

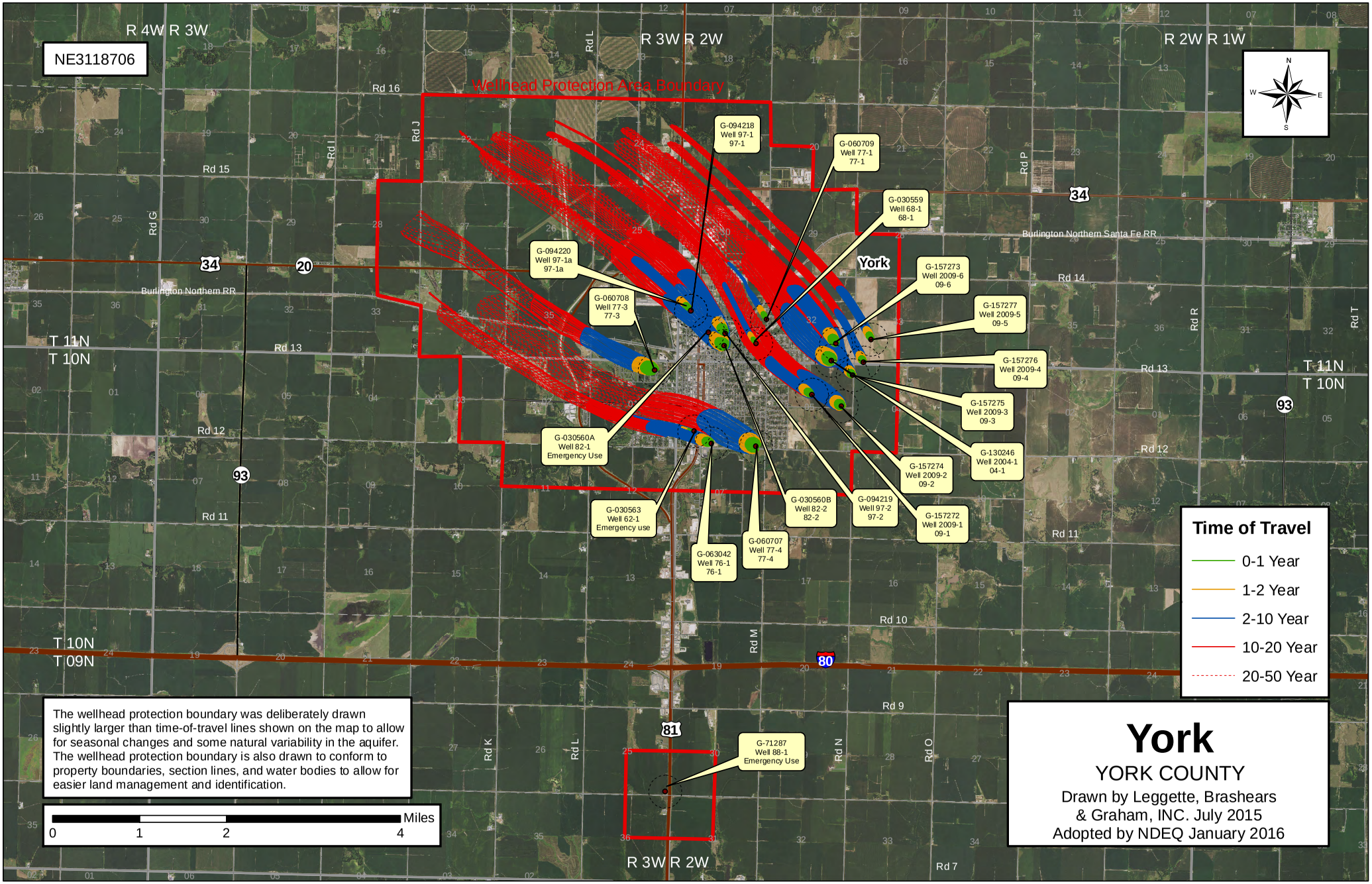
The groundwater model utilizes hydrogeology variables for steady-state pumping wells, including the influence of hydrological parameters, estimated annual recharge rates, and model no-flow boundary conditions, such as streams, recharge areas, historical well pumping data, and no-flow geological formations of bedrock. Additionally, groundwater flow direction and velocity, pumping volumes, and test holes and well construction data is used in the model. The model determines flow lines, which depict the approximate flow path of the groundwater, and contaminant movement in groundwater, and the estimated time it will take to reach a well. These groundwater flow lines are associated with an estimated time-of-travel (TOT). One set of TOT path lines are delineated for each active well: 1, 2, 10, 20, and 50-year. The 20-year time-of-travel is what generally determines the water system's wellhead protection area. However, due to the advanced modeling provided by LBG, the City and NDEQ delineated the WHPA on the 50-year TOT lines. This will enable increased long-term protection and planning.

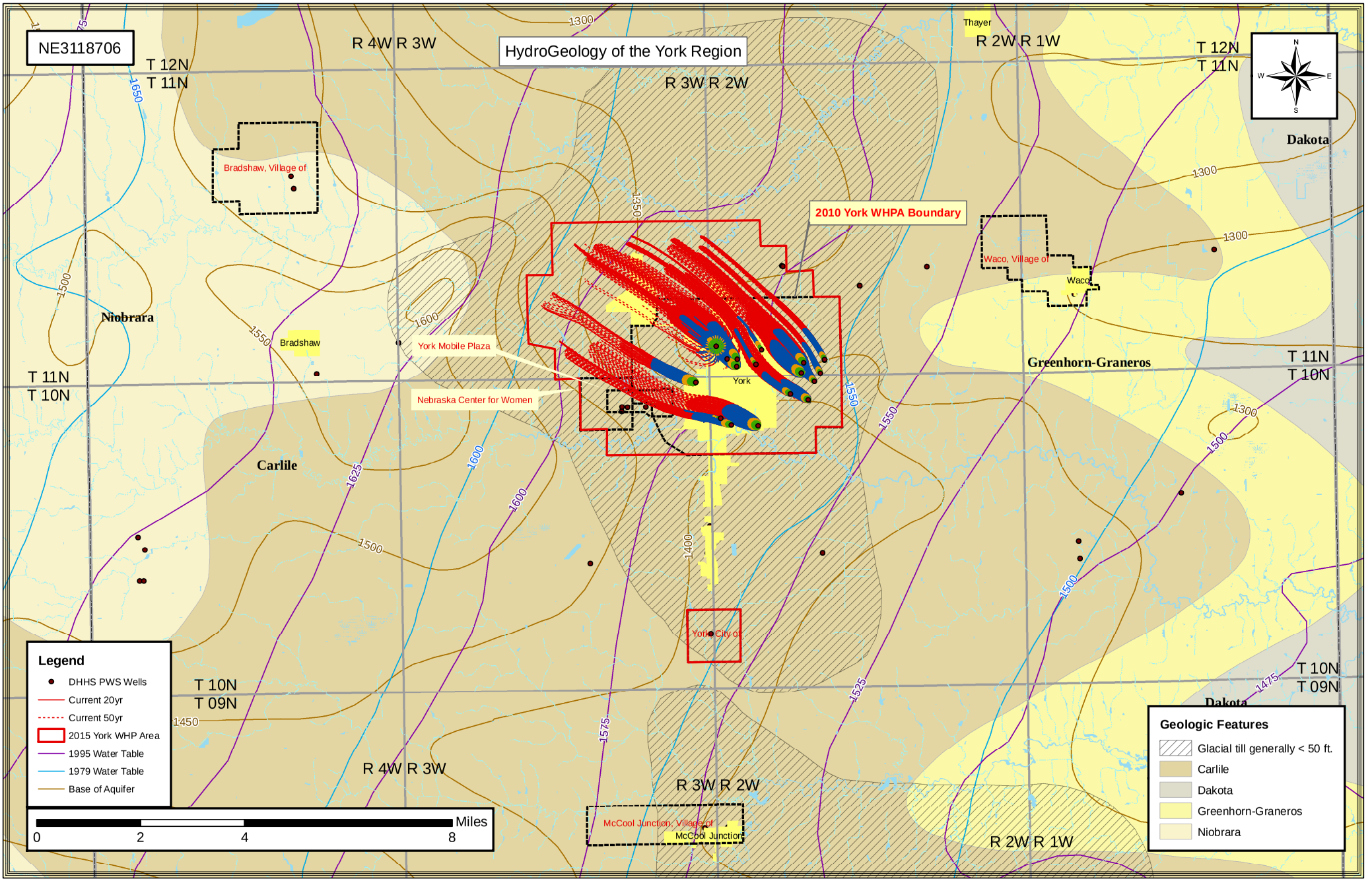
The wellhead protection boundary is drawn slightly larger than the50-year time-of-travel lines shown on the map to accommodate seasonal changes and natural variability of the aquifer. The WHPA is statutorily recognized as a boundary in which a community manages potential contaminant sources though the wellhead protection program. The WHPA is drawn around the 50-year time-of-travel along visible or easily identifiable boundaries such as roads, rivers, creeks, section, quarter-section, and quarter-quarter sections lines. This allows for easier land management and identification. Maps are periodically updated as when additional data is available, modeling technology advances, the science behind aquifers advances, as wells are added/removed from use, or as well pumping volumes change.

York's WHPA is made up of two areas, which together covers approximately 15,200 acres. The City officially recognized the updated WHPA on June 16, 2016. The ordinance can be found in Appendix D. The main wellfield is located in and near the main city, and small WHPA is located just south of the interstate around an emergency well.

THE WELLHEAD PROTECTION AREA MAP BY ITSELF DOES NOT GIVE A COMMUNITY ANY ADDITIONAL AUTHORITY OR PROTECTION OF THE PUBLIC WATER SUPPLY. IT IS JUST A PIECE OF "SCRAP PAPER" UNLESS A COMMUNITY ENACTS ORDINANCES, ZONING, OR VOLUNTARY ACTIVITIES WITHIN THE WHPA.


NE3118706
R 4W R 3W
R 3W R 2W
R 2W R 1W
Wellhead Protection Area Boundary
N
W
E
S
Rd 16
Rd 15
Rd 14
Rd 13
Rd 12
Rd 11
Rd 10
Rd 9
Rd 7
Rd G
Rd I
Rd J
Rd L
Rd M
Rd N
Rd O
Rd P
Rd R
Rd T
Burlington Northern RR
Burlington Northern Santa Fe RR
34
20
93
80
81
York
T 11N
T 10N
T 10N
T 09N
G-094218
Well 97-1
97-1
G-060709
Well 77-1
77-1
G-030559
Well 68-1
68-1
G-094220
Well 97-1a
97-1a
G-060708
Well 77-3
77-3
G-157273
Well 2009-6
09-6
G-157277
Well 2009-5
09-5
G-157276
Well 2009-4
09-4
G-157275
Well 2009-3
09-3
G-130246
Well 2004-1
04-1
G-157274
Well 2009-2
09-2
G-157272
Well 2009-1
09-1
G-030560A
Well 82-1
Emergency Use
G-030563
Well 62-1
Emergency use
G-063042
Well 76-1
76-1
G-060707
Well 77-4
77-4
G-030560B
Well 82-2
82-2
G-094219
Well 97-2
97-2
G-071287
Well 88-1
Emergency Use
Time of Travel
0-1 Year
1-2 Year
2-10 Year
10-20 Year
20-50 Year
The wellhead protection boundary was deliberately drawn slightly larger than time-of-travel lines shown on the map to allow for seasonal changes and some natural variability in the aquifer. The wellhead protection boundary is also drawn to conform to property boundaries, section lines, and water bodies to allow for easier land management and identification.
Miles
0
1
2
4
York
YORK COUNTY
Drawn by Leggette, Brashears & Graham, INC. July 2015
Adopted by NDEQ January 2016

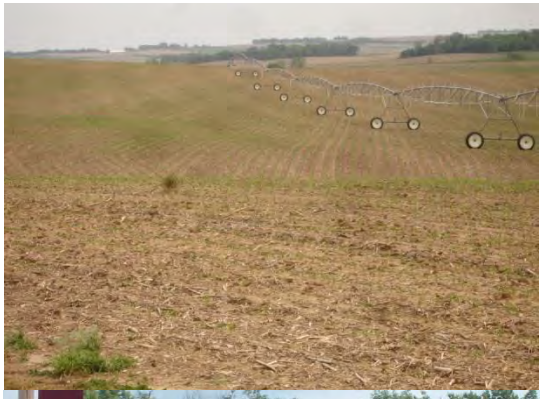

NE3118706
R 4W R 3W
R 3W R 2W
R 2W R 1W
Wellhead Protection Area Boundary
Rd 16
Rd 15
Rd 14
Rd 13
Rd 12
Rd 11
Rd 10
Rd 9
Rd 7
Rd G
Rd I
Rd J
Rd L
Rd M
Rd N
Rd O
Rd P
Rd R
Rd T
34
20
93
80
81
York
Burlington Northern RR
Burlington Northern Santa Fe RR
T 11N
T 10N
T 10N
T 09N
G-094218 Well 97-1 97-1
G-060709 Well 77-1 77-1
G-030559 Well 68-1 68-1
G-094220 Well 97-1a 97-1a
G-060708 Well 77-3 77-3
G-157273 Well 2009-6 09-6
G-157277 Well 2009-5 09-5
G-157276 Well 2009-4 09-4
G-157275 Well 2009-3 09-3
G-130246 Well 2004-1 04-1
G-157274 Well 2009-2 09-2
G-157272 Well 2009-1 09-1
G-094219 Well 97-2 97-2
G-030560A Well 82-1 Emergency Use
G-030563 Well 62-1 Emergency use
G-030560B Well 82-2 82-2
G-060707 Well 77-4 77-4
G-063042 Well 76-1 76-1
G-71287 Well 88-1 Emergency Use
N
S
E
W
Time of Travel
0-1 Year
1-2 Year
2-10 Year
10-20 Year
20-50 Year
The wellhead protection boundary was deliberately drawn slightly larger than time-of-travel lines shown on the map to allow for seasonal changes and some natural variability in the aquifer. The wellhead protection boundary is also drawn to conform to property boundaries, section lines, and water bodies to allow for easier land management and identification.
Miles
0
1
2
4
York
YORK COUNTY
Drawn by Leggette, Brashears & Graham, INC. July 2015
Adopted by NDEQ January 2016


NE3118706
HydroGeology of the York Region
2010 York WHPA Boundary
R 4W R 3W
R 3W R 2W
R 2W R 1W
T 12N
T 11N
T 10N
T 09N
Bradshaw, Village of
Bradshaw
York Mobile Plaza
Nebraska Center for Women
York
York, City of
Waco, Village of
Waco
McCool Junction, Village of
McCool Junction
Thayer
Niobrara
Carlile
Greenhorn-Graneros
Dakota
Legend
DHHS PWS Wells
Current 20yr
Current 50yr
2015 York WHP Area
1995 Water Table
1979 Water Table
Base of Aquifer
Miles
0
2
4
8
Geologic Features
Glacial till generally < 50 ft.
Carlile
Dakota
Greenhorn-Graneros
Niobrara
N
S
E
W

3.02 LAND COVER

Difference in land cover type has the potential to effect sources of pollution. Nonpoint Source Pollution (NPS) occurs over a wide area and does not have a single source of outfall, as opposed to point source pollution. NPS pollution may be related to runoff from rainfall or snowmelt moving over and through the ground. As the runoff travels across a surface or through the ground, it carries away pollutants that may eventually be deposited into lakes, rivers, wetlands, coastal waters and groundwater. Certain types of land cover are commonly associated with varying potential for different types of contaminates, as shown in Figure 13. Additionally, land cover types affect the rate of runoff and infiltration into the ground. An inventory of land cover will assist York in developing specific and appropriate management strategies to reduce potential contamination.

A



B

C

Figure 13: Varying Types of Land Use. (A) Row crops; (B) Urban setting; (C) Natural vegetation

Agriculture areas, particularly row-crops may contribute to NPS through agricultural runoff, which can potentially contribute to nitrates, herbicides, and other contaminants flowing into surface water, and infiltrating through the soil into groundwater. Irrigated cropland is particularly vulnerable to increased nitrogen leaching.

Urban land areas, particularly areas of impervious surfaces, may contribute to NPS, by increased run off of impervious surfaces, over application of lawn fertilizers, oils and grease, solvents, or other industrial land. Urban areas can contribute to water pollution at a high right due to the high concentration of facilities or land uses which can contribute to water pollution.

Natural vegetation, such as trees, grasses, and shrubbery are generally considered to have the capability of improving or protecting water quality. Natural vegetation may serve as a buffer and filter between pollutant sources and water bodies. The vegetation often removes some or all of contaminants and nutrients before they enter the water supply.

Land cover in the York WHPA was determined by GIS analysis of the 2015 USDA-NRCS's Cropland Data Layer (CDL). The CDL is a complete, geographically referenced classification of all satellite ortho-imagery data within a state by crop or land cover. By using imagery from multiple times of the year, the CDL is able to classify pastures, trees, and other permanent vegetation separately from annual crops. The CDL has an accuracy of 85%-95% for the major crop types, according to the USDA metadata. The CDL is spot-checked for accuracy during the potential contaminant source inventory (discussed in Section4). Table 5 displays the land cover in the York WHPA. The percentages of land cover are approximate. The York WHPA's land cover is primarily agricultural land, but a large portion (approximately 22%) is also developed (urban) land.

Strategies to limit NPS water pollution may vary greatly throughout the WHPA because of the varying land uses. See Figure 14 for a map of the land cover. Several management strategies are discussed to limit NPS in Section 6: Management Strategies.

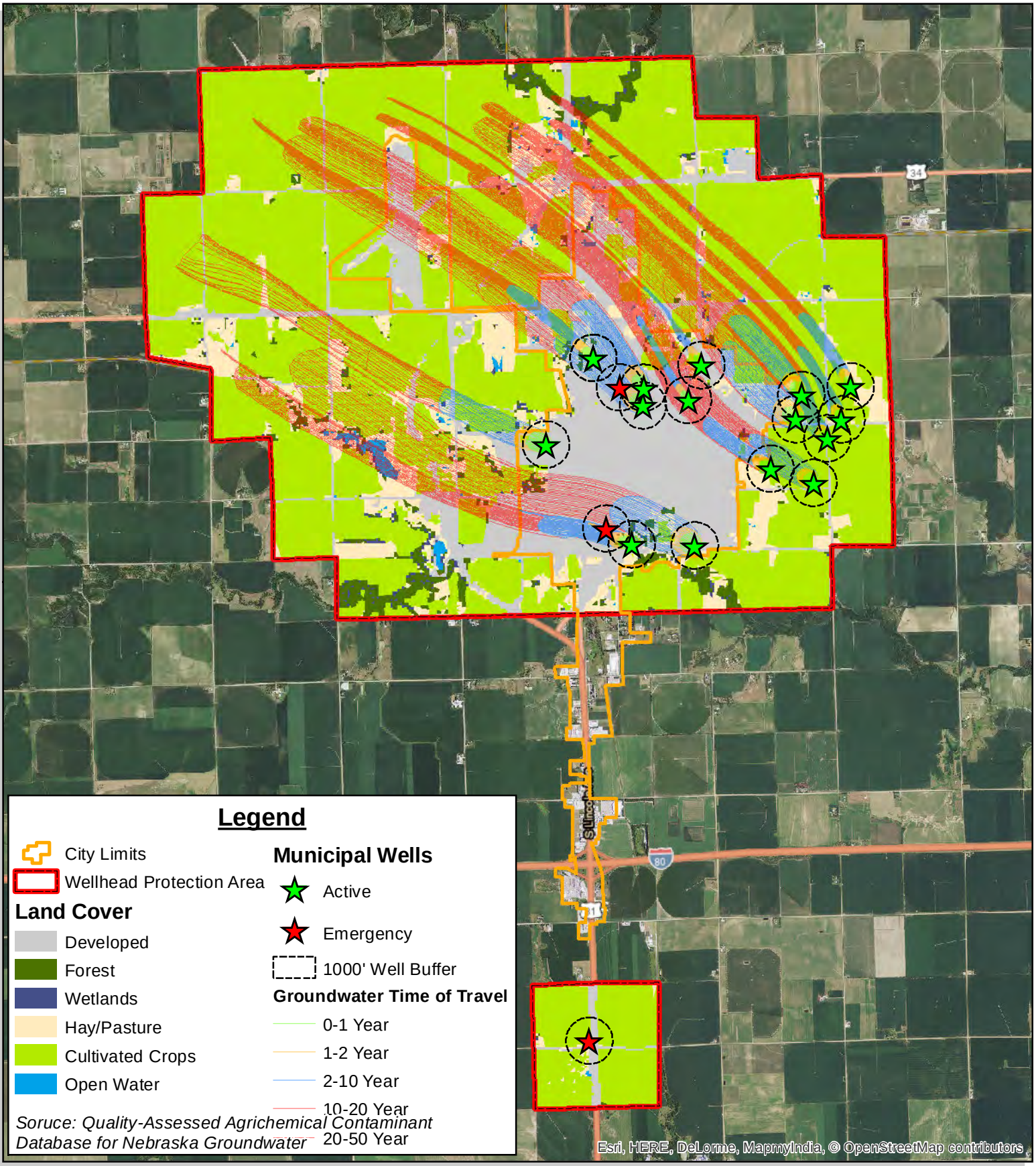
Land cover types included in the summary are as follows:

- **Developed (Urban)** - Includes areas with a mixture of constructed materials and vegetation.
- **Forest** - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Less than 1% of the tree species shed foliage simultaneously in response to seasonal change.
- **Grassland/Pasture/Hay** - Areas dominated by herbaceous vegetation, generally greater than 80% of total vegetation. This includes areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.
- **Cultivated (Row) Crops** – Areas that are used for the production of annual crops, which may include corn, soybeans, vegetables, wheat, and also perennial woody crops such as orchards and vineyards. This class also includes all land being actively tilled and alfalfa.
- **Wetlands** - Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover or where forest or shrub-land vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
- **Open Water** – All areas of open water, generally with less than 25% of vegetation or soil. Open water accounts for less than 1% of the total cover.

Table 5: York WHPA Land Cover Breakdown

Land Cover Type (2015)	Total Acres in WHPA	Percent of Total in WHPA
Cultivated Crops	9,654	64%
Forest	448	3%
Grassland/Pasture/Hay	1,563	10%
Open Water	81	<1%
Wetlands	86	<1%
Developed	3,362	22%
Total	15,195	100%
Summary		
Cultivated Crops	9,654	64%
Developed (Roads, Urban, etc.)	3,362	22%
Grassland/Forested/Water	2,179	14%

Source: 2015 Cropland Data Layer, provided by USDA-NRCS GeoSpatialDataGateway



0 0.5 1 Miles

Created By: ADR
Date: 5/3/106
Software: ArcGIS 10.2
File: 140304

This map was prepared using information from record drawings supplied by JEO and/or other applicable city, county, federal, or public or private entities. JEO does not guarantee the accuracy of this map or the information used to prepare this map. This is not a scaled plat.

York Wellhead Protection Plan

Figure 14: York WHPA Land Cover

JEO CONSULTING GROUP INC

SECTION 4. POTENTIAL CONTAMINANT SOURCE INVENTORY

BACKGROUND

The purpose of a potential contaminant source inventory (CSI) is to identify potential drinking water contaminants or sources that the contaminants may originate from. The CSI is a major step in establishing a wellhead protection plan and includes recording locations and information on potential contaminant sources such as fuel storage, onsite wastewater systems, illegal wells, and many others (Figure 15).

A CSI allows a community to plan for and manage potential contaminant sources and decide where to focus educational and management efforts to minimize the likelihood of source water contamination. Strategies to limit pollution may vary greatly within the WHPA because of the varying types of potential contaminant sources. See Figure 14 for a map of the land cover. Several management strategies are discussed to limit NPS in Section 6: Management Strategies. Identifying potential sources of contamination provides an outline to a community to plan for potential accidental releases of pollutants and to gain an understanding of possible sources of nonpoint source pollution. The inventory is compiled from existing databases and on-the-ground observations. Even if identified in the CSI, a feature may not be contributing to contamination presently but may still present a risk.

> ***UNDERSTANDING WHAT POTENTIAL CONTAMINANT SOURCES EXISTS WITHIN THE WHPA, ALLOWS A COMMUNITY TO MAKE INFORMED DECISIONS TO SAFELY MANAGE THREATS TO THEIR DRINKING WATER SUPPLY.***

It is important to note that this inventory only represents a snapshot to the history of the area. There can be features which have already contributed to groundwater contamination, but there is no record of occurrence. Just as likely, features recorded may not be actively operating, but have in the past. Due to the long period of time it requires for an aquifer to respond to changes in the land surface or for contaminants to migrate through the aquifer or be detected, historical land use and activities are important to record.

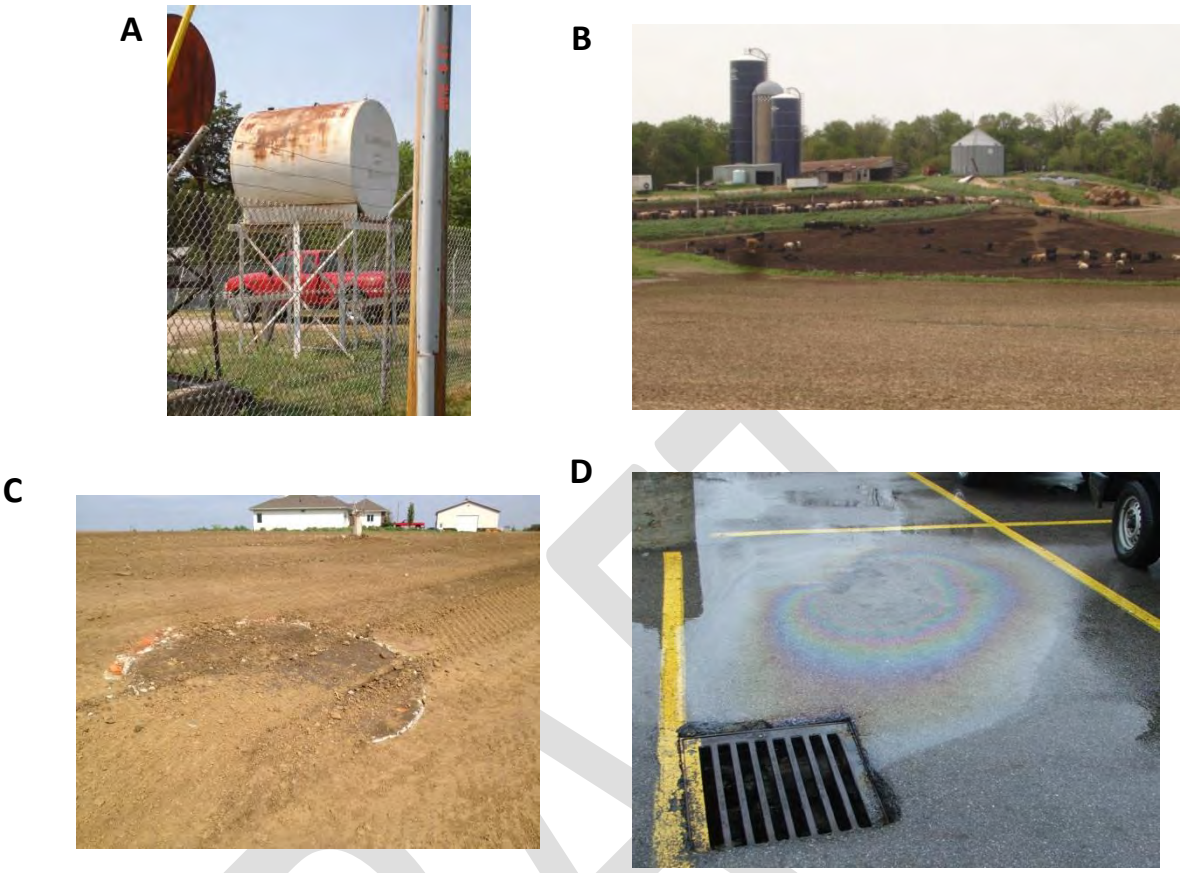


Figure 15: Common Types of Potential Contaminant Sources. (A) Leaking Fuel Drums; (B) Livestock Waste; (C) Abandoned Wells; (D) Parking Lot Runoff

Based on guidance provided by NDEQ, the inventory typically consists of the following types of points:

Agricultural
- Fuel Storage
- Grain Storage
- Water Wells
- Chemigation
- Livestock
- Abandoned Wells

Commercial and Light Industrial
- Auto Repair
- Dry Cleaners
- Fuel Stations
- Machine Shops
- Rail Yards
- Large Parking Lots

Industry
- Manufacturing Plants
- Gas/Oil Wells
- Junk Yards
- Landfills
- Sewage Treatment Facilities

Other
- Cemeteries
- Golf Courses
- Highway/Road Maintenance Yards
- Other Wells

METHODOLOGY

York's potential CSI is a compilation of multiple sources*:

- NDEQ provided (obtained 1/12/2016):
  - NDEQ Regulated Facilities Database
- Nebraska Department of Agriculture provided (obtained 5/23/2016)
  - Registered Pesticide Dealers Database
- State Fire Marshall provided (obtained 1/12/2016):
  - Above & Below Ground Storage Tank Database
- Nebraska Oil and Gas Conservation Commission provided (obtained 1/12/2016):
  - Gas and Oil Wells Database
- DNR provided:
  - Registered Wells Database (obtained 2/17/2016)
- JEO Consulting Group, Inc. conducted:
  - On-the-ground field inventory completed December 22, 2015

**The data made available through outside agencies was furnished for interpretive reasons. To the extent possible, the data is current, accurate, and reliable. However, there may be discrepancies in the information and not all map location coordinates have been verified. In addition, JEO assumes no legal responsibility, either implied or expressed, about the accuracy, completeness, reliability, or appropriateness of this data made available through or retrieved from these agencies.*

The field inventory was completed on December 22, 2015 using GIS software and aerial photography. JEO prepared a CSI geodatabase to collect locations on potential contaminant sources as identified in the field through a windshield survey. Due to the use of a tablet computer with GIS, field data sheets were not used to collect data on potential contaminant sources. Information collected in the field was entered directly into the database, as seen in Table 7. Information compiled from NDEQ and DNR was sorted out separately.

The planning team reviewed and discussed the potential contaminant source inventory to ensure local accuracy, to add any historical items that may not be recorded in state-maintained databases, and to ensure nothing was missed in the field inventory.

SUMMARY

A summary of all sites identified through the CSI is displayed in Table 6. This includes points that are within a one-half mile radius outside the WHPA, due to the variability and uncertainty in the groundwater modeling and because the WHPA boundaries could change in the future. A full map of York's CSI is found in the following figures (Figure 16, Figure 17, and Figure 18), where each potential contaminant is numbered on the map and then included in a database (Table 7), with information on each potential

contaminant. Due to the high number, Regulated Facilities and Registered Wells are shown in Figure 19 and Figure 20.

All rural residences (farmsteads and acreages) were assumed to have both a private well and septic system. Asides from residences; agriculture supply, automotive service, livestock operations, and other commercial/industrial activities were the most prevalent potential sources identified in the field survey. There was a high number of NDEQ Registered Facilities, however, those are typically assumed to be meeting regulatory requirements. There is a high number of underground storage tanks (76), however, that data source was unable to be georeferenced. This could be done in future plan updates or implementation activities.

Wells, in general, were found in a very high number. Irrigation wells were found to be a primary potential contaminant source at 266. Monitoring wells, associated with various NDEQ registered facilities were also very high (224), but are not likely sources of contamination themselves. There were no Oil & Gas wells identified in the CSI. According to NRD records, there are 78 abandoned wells in the area, however, these likely aren't current sources of contamination as they have been documented to be properly sealed and abandoned. There are likely additional wells in the area that have been abandoned, but not properly sealed. Additional studies could identify those locations for proper sealing. Due to the high number of potential contaminant sources, it is recommended that the City systematically review the CSI to reduce threats to the groundwater.

Table 6: York Potential Contaminant Source Summary

Registered Wells		NDEQ (Applicable) Registered Facilities		Potential Contaminant Source Site Type	Total
DNR Well Type	**Count**	**Facility/Program Type**	**Count**	Acreage	7
Aquaculture	0	Underground Storage Tank Sites*	76	Ag Supply	15
Commercial/Industrial	20	Pesticide Dealers**	11	Airport	1
Domestic	58	Unknown	19	Automotive Service	12
Pit - Irrigation	0	Agricultural Chemicals	0	Car/Junk Car Lot	6
Ground Heat Exchanger Well - close loop	16	Brownfields***	0	Equipment Storage	10
Heat Pump - open loop	0	Continuous Release	0	Farmstead	43
Irrigation	266	Groundwater***	0	Gas Station/Fuel Storage	7
Injection	11	Integrated Waste Management	5	Golf Course/Park/Cemetary	3
Observation (GW Levels)	2	Leaking Storage Tanks***	23	Grain Storage	8
Other (wetlands, test, vapor monitoring, etc)	15	Livestock Waste Control	12	Landfill	4
Monitoring (GW Quality)	164	Mineral Exploration	0	Livestock Operation	10
Recovery	2	NPDES Permits and Compliance	6	Machine Shop	1
Livestock	3	Onsite Wastewater Treatment	33	Medical Clinic/Hospital/Office	20
Geothermal	0	Release Assessment***	1	Nursery	2
Oil & Gas Wells*	0	Remedial Action Plan Monitoring***	0	Onsite Wastewater/Septic System	1
Abandoned Wells**	78	Resource Conservation Recovery***	7	Other	6
		SARA Title III	27	Vet Clinic	2
		Superfund	2		
		Toxic Release Inventory System	0		
		Underground Injection Control	2		
		Wastewater Facilities	0		
Total DNR Registered Wells	**635**	**Total**	**224**	**Total**	**158**

**Regulated by Oil & Gas Conservation Commission*

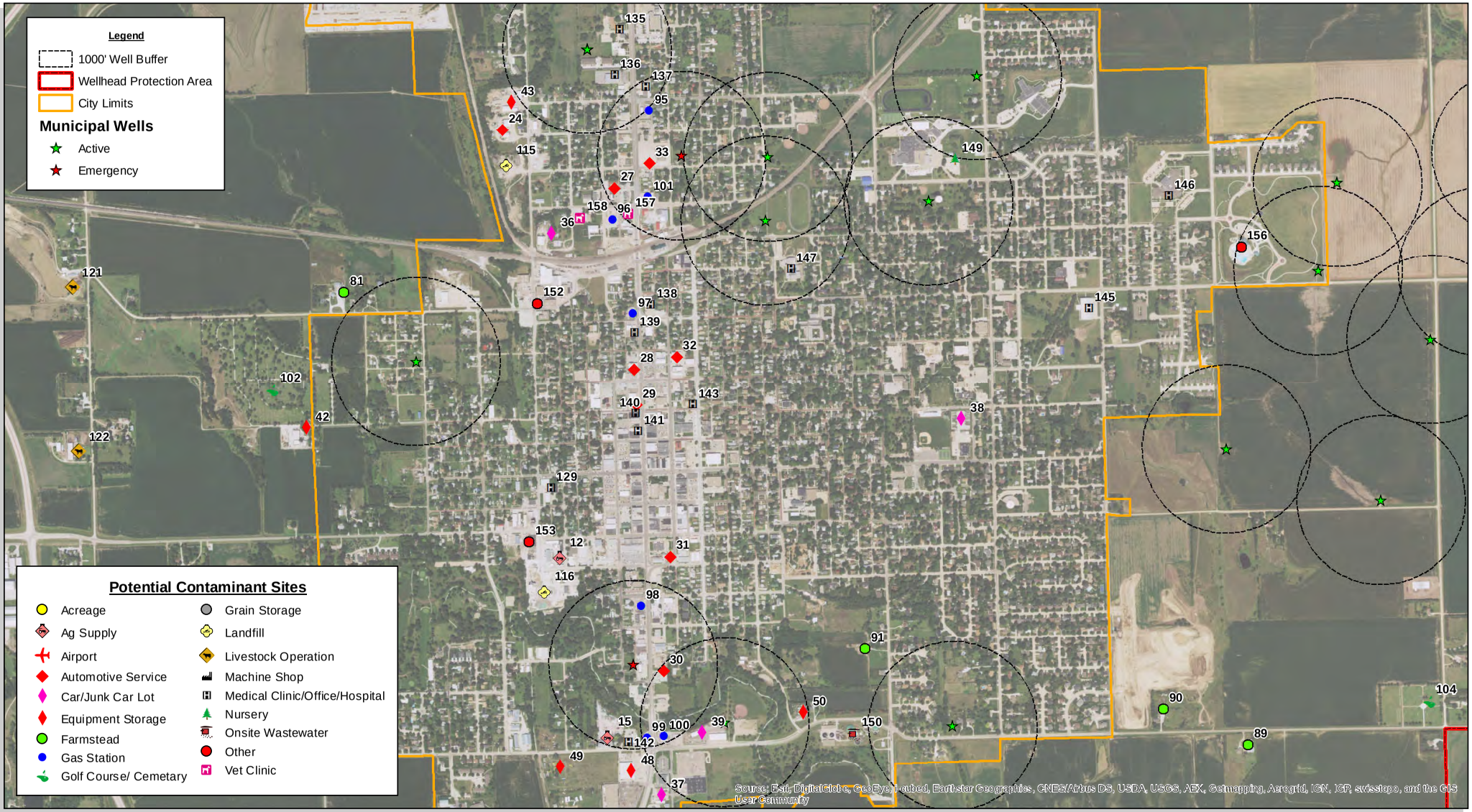
***Provided by UBBNRD*

Note: Active and Inactive status not separated out

**Regulated by State Fire Marshall*

***Maintained by NE Department of Agriculture*

****Additoinal information provided in Appendix*



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York Wellhead Protection Plan

Figure 18: Potential Contaminant Sources Inventory Map
City Center

0 0.25 0.5 Miles

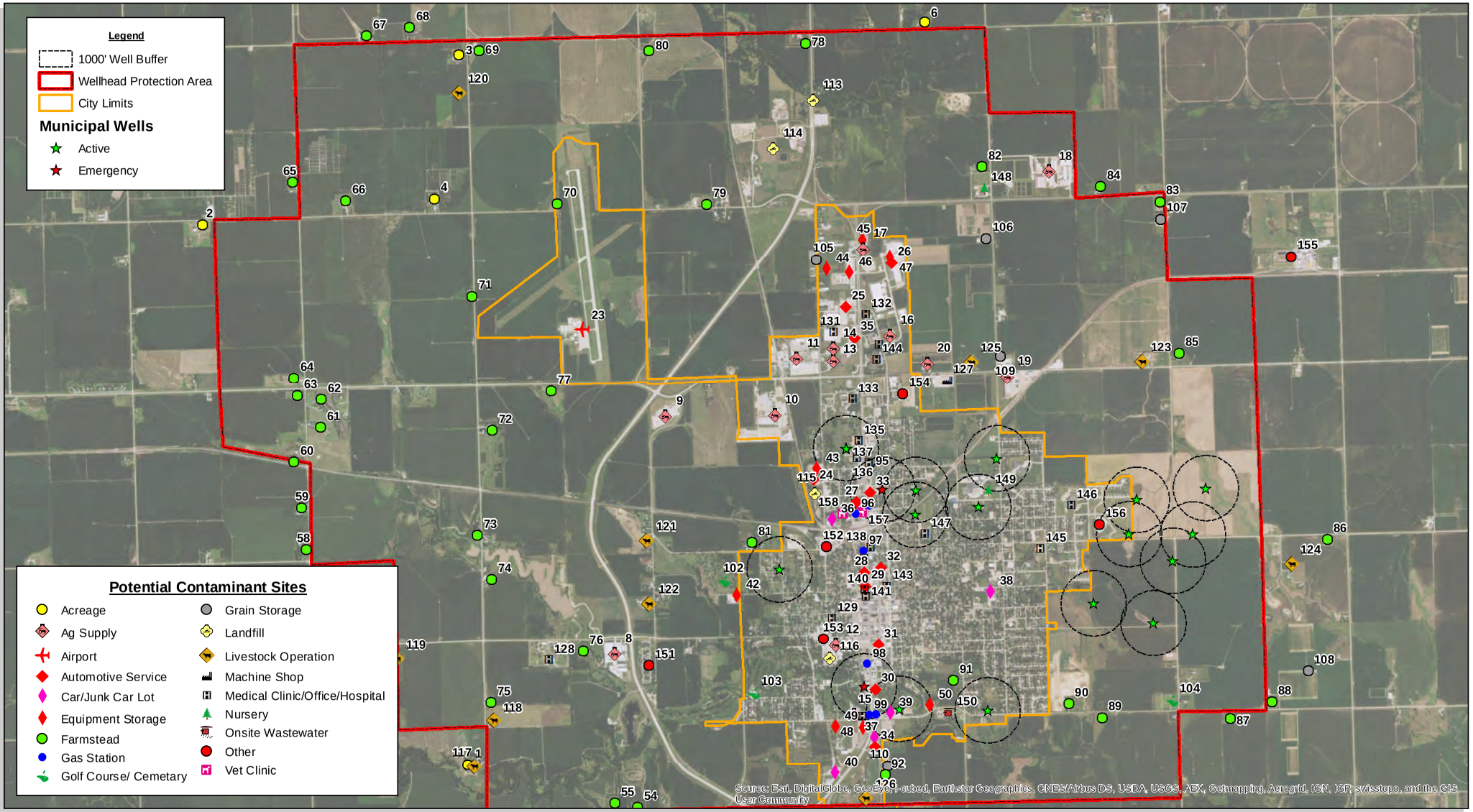

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Figure 18: Potential Contaminant Sources Inventory Map
Main WHPA

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York Wellhead Protection Plan

Figure 18: Potential Contaminant Sources Inventory Map South WHPA

0 0.25 0.5 Miles

ID Number	Site Description	Above Ground Fuel Storage	Below Ground Fuel Storage	Automotive Chemicals	Solvents	Fertilizer Storage	Chemical Storage	Septic System	Private Well	Grain Fumigant	Structure Fumigant	Comments
1	Acerage	Y						Y	Y			
2	Acerage							Y	Y	Y		
3	Acerage							Y	Y			
4	Acerage							Y	Y	Y		
5	Acerage	Y						Y	Y			Livestock
6	Acerage							Y	Y	Y		
7	Acerage							Y	Y			Church barn grain storage
8	Ag Supply	Y	Y	Y	Y	Y	Y					Mycogen
9	Ag Supply	Y	Y	Y	Y	Y	Y					
10	Ag Supply	Y	Y	Y	Y	Y	Y					
11	Ag Supply	Y	Y	Y	Y	Y	Y					
12	Ag Supply	Y	Y	Y	Y	Y	Y					Miller seed
13	Ag Supply	Y	Y	Y	Y	Y	Y					
14	Ag Supply	Y	Y	Y	Y	Y	Y					
15	Ag Supply	Y	Y	Y	Y	Y	Y					
16	Ag Supply	Y	Y	Y	Y	Y	Y					
17	Ag Supply	Y	Y	Y	Y	Y	Y					
18	Ag Supply	Y	Y	Y	Y	Y	Y					
19	Ag Supply	Y	Y	Y	Y	Y	Y					
20	Ag Supply	Y	Y	Y	Y	Y	Y					
21	Ag Supply	Y	Y	Y	Y	Y	Y					
22	Ag Supply	Y	Y	Y	Y	Y	Y					
23	Airport	Y										
24	Automotive Service			Y	Y							Collision repair
25	Automotive Service			Y	Y							
26	Automotive Service			Y	Y							
27	Automotive Service			Y	Y							Car wash
28	Automotive Service			Y	Y							
29	Automotive Service			Y	Y							
30	Automotive Service			Y	Y							
31	Automotive Service			Y	Y							
32	Automotive Service			Y	Y							
33	Automotive Service			Y	Y							
34	Automotive Service			Y	Y							
35	Automotive Service			Y	Y							
36	Car/Junk Car Lot			Y	Y							Towing
37	Car/Junk Car Lot			Y	Y							
38	Car/Junk Car Lot			Y	Y							Army vehicle lot
39	Car/Junk Car Lot			Y	Y							
40	Car/Junk Car Lot			Y	Y							Towing
41	Car/Junk Car Lot			Y	Y							Truck stop
42	Equiptment Storage	Y		Y							Y	
43	Equiptment Storage			Y							Y	
44	Equiptment Storage			Y							Y	
45	Equiptment Storage			Y							Y	
46	Equiptment Storage			Y							Y	
47	Equiptment Storage			Y							Y	
48	Equiptment Storage			Y							Y	Orscheln
49	Equiptment Storage			Y							Y	Used equipment salvage yard
50	Equiptment Storage			Y							Y	Cars and trucks
51	Equiptment Storage			Y							Y	
52	Farmstead				Y			Y				
53	Farmstead				Y			Y				
54	Farmstead	Y			Y			Y				
55	Farmstead	Y			Y			Y				Propane

ID Number	Site Description	Above Ground Fuel Storage	Below Ground Fuel Storage	Automotive Chemicals	Solvents	Fertilizer Storage	Chemical Storage	Septic System	Private Well	Grain Fumigant	Structure Fumigant	Comments
56	Farmstead				Y			Y				
57	Farmstead				Y			Y				
58	Farmstead	Y			Y			Y		Y		
59	Farmstead	Y			Y			Y		Y		White tank gasoline
60	Farmstead	Y			Y			Y				
61	Farmstead				Y			Y				Horse
62	Farmstead				Y			Y				Livestock area/horses
63	Farmstead				Y			Y				
64	Farmstead	Y			Y			Y				
65	Farmstead	Y			Y			Y		Y		
66	Farmstead	Y			Y	Y		Y				Chemical tank
67	Farmstead	Y			Y			Y		Y		
68	Farmstead				Y			Y				
69	Farmstead				Y			Y		Y		
70	Farmstead				Y			Y				
71	Farmstead				Y			Y				Cows and chickens
72	Farmstead	Y			Y			Y				
73	Farmstead	Y			Y			Y				
74	Farmstead	Y			Y			Y				
75	Farmstead				Y			Y				
76	Farmstead	Y			Y			Y				
77	Farmstead	Y			Y			Y				
78	Farmstead				Y			Y				
79	Farmstead				Y			Y		Y		
80	Farmstead	Y			Y			Y				
81	Farmstead				Y			Y				
82	Farmstead				Y			Y		Y		
83	Farmstead				Y			Y				
84	Farmstead				Y			Y				
85	Farmstead				Y			Y				
86	Farmstead	Y			Y			Y		Y		
87	Farmstead	Y			Y		Y	Y				
88	Farmstead				Y			Y				
89	Farmstead				Y			Y		Y		
90	Farmstead				Y			Y		Y		
91	Farmstead				Y			Y				
92	Farmstead				Y			Y		Y		
93	Farmstead	Y			Y			Y				
94	Farmstead	Y			Y			Y				
95	Gas Station		Y	Y								
96	Gas Station		Y	Y								
97	Gas Station		Y	Y								
98	Gas Station		Y	Y								
99	Gas Station		Y	Y								Abandoned
100	Gas Station		Y	Y								
101	Gas Station		Y	Y								Abandoned
102	Golf Course/ Cemetary					Y						
103	Golf Course/ Cemetary					Y						
104	Golf Course/ Cemetary					Y						
105	Grain Storage									Y	Y	
106	Grain Storage									Y	Y	
107	Grain Storage									Y	Y	
108	Grain Storage									Y	Y	
109	Grain Storage									Y	Y	
110	Grain Storage									Y	Y	

ID Number	Site Description	Above Ground Fuel Storage	Below Ground Fuel Storage	Automotive Chemicals	Solvents	Fertilizer Storage	Chemical Storage	Septic System	Private Well	Grain Fumigant	Structure Fumigant	Comments
111	Grain Storage									Y	Y	
112	Grain Storage									Y	Y	
113	Landfill		Y	Y	Y	Y	Y					
114	Landfill		Y	Y	Y	Y	Y					Rock quarry
115	Landfill		Y	Y	Y	Y	Y					
116	Landfill		Y	Y	Y	Y	Y					
117	Livestock Operation											
118	Livestock Operation	Y										
119	Livestock Operation											
120	Livestock Operation											
121	Livestock Operation											
122	Livestock Operation	Y										
123	Livestock Operation											
124	Livestock Operation	Y										New res development. Some cows and above ground fuel tanks
125	Livestock Operation											
126	Livestock Operation											
127	Machine Shop			Y	Y							
128	Medical Clinic/Office/Hospital											Prison
129	Medical Clinic/Office/Hospital											Usda
130	Medical Clinic/Office/Hospital	Y										Roofing
131	Medical Clinic/Office/Hospital											
132	Medical Clinic/Office/Hospital											Physical therapy
133	Medical Clinic/Office/Hospital											
134	Medical Clinic/Office/Hospital											Hospital
135	Medical Clinic/Office/Hospital											
136	Medical Clinic/Office/Hospital											
137	Medical Clinic/Office/Hospital											Dentistry
138	Medical Clinic/Office/Hospital											
139	Medical Clinic/Office/Hospital											
140	Medical Clinic/Office/Hospital											
141	Medical Clinic/Office/Hospital											
142	Medical Clinic/Office/Hospital											Abandoned sonic
143	Medical Clinic/Office/Hospital											
144	Medical Clinic/Office/Hospital											
145	Medical Clinic/Office/Hospital											Indoor field house
146	Medical Clinic/Office/Hospital											
147	Medical Clinic/Office/Hospital											Abandoned school
148	Nursery											Greenhouse
149	Nursery											School greenhouse
150	Onsite Wastewater											
151	Other											Mobile home area
152	Other											Crystal lake foods
153	Other											Nutrition services Inc
154	Other											County fair
155	Other											Abengoa Ethanol Facility
156	Other						Y					Aquatic facility
157	Vet Clinic											
158	Vet Clinic											Adopt a pet

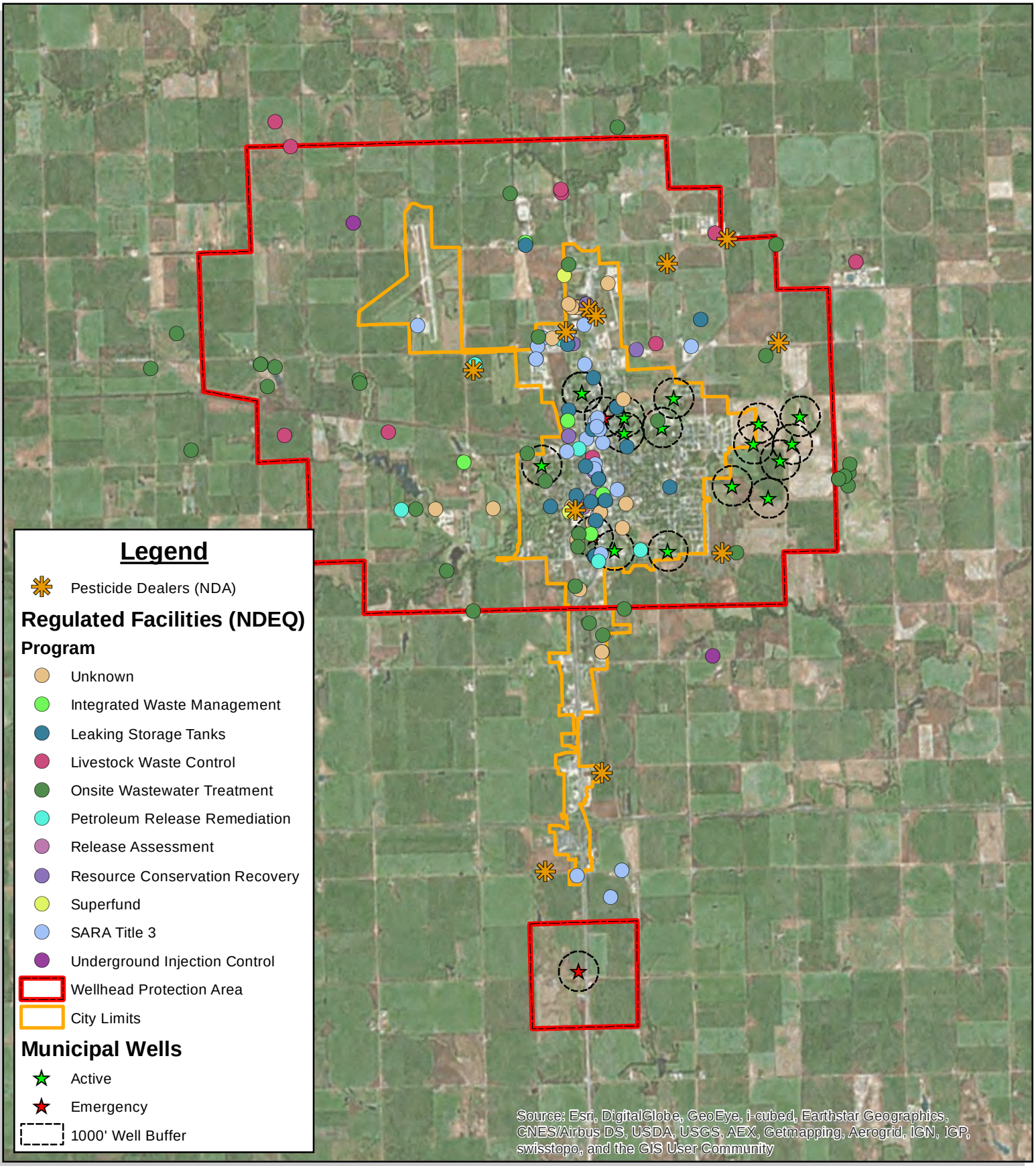

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Figure 19: Regulated Facilities

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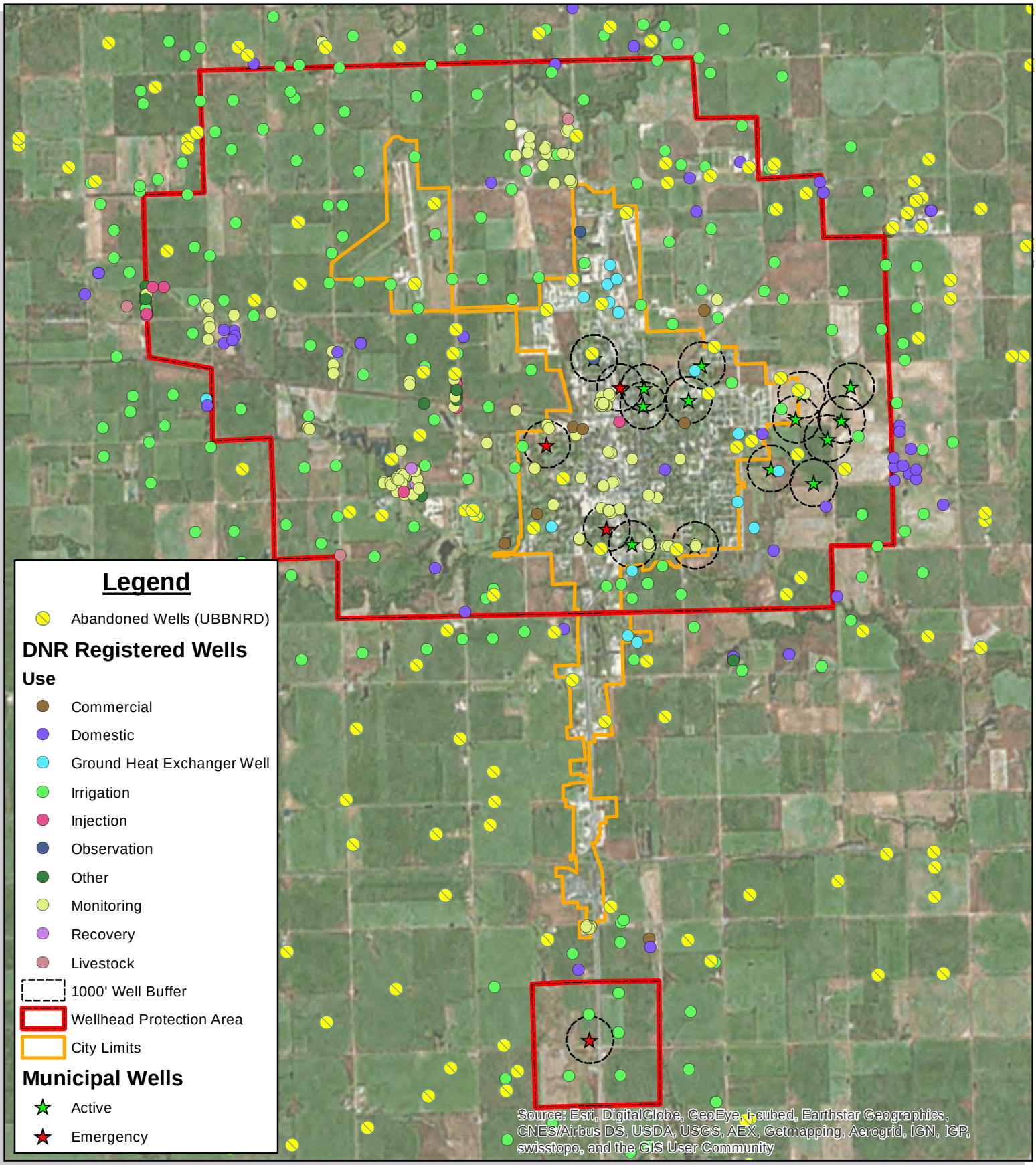

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Figure 20: Registered Wells

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SECTION 5. REGULATORY AUTHORITY

JEO makes NO judgment or guarantee as to the legality or effectiveness of any approach and recommends consulting with legal counsel before enacting any ordinances, zoning, regulations, or entering into any legally binding agreement.

5.01 CITY OF YORK

Due to the different threats and limits of jurisdiction in the well field, it is important that any current or future ordinances and/or zoning districts are flexible, enforceable, and developed with citizen/landowner input.

YORK MUNICIPAL CODE

Ordinances are part of the police power authority of a community, which is simply the power of the community to regulate, in order to protect the public health, safety, and general welfare of its residents. This power gives the City the ability to regulate actions within the corporate limits and potentially within its extraterritorial jurisdiction (ETJ), which is discussed in detail below. Currently, Chapter 31 and 37 of the City's municipal code provide information on the Water Department's authorizations, operations, and protection of the community's drinking water, within the City and its jurisdiction. Currently, specific ordinances protecting groundwater are weak. Specific ordinances that may protect groundwater include:

- Division 6, Section 28-300 – Backflow Requirements

The actual text of the Municipal Code is available online at the following website:

https://www.municode.com/library/ne/york/codes/code_of_ordinances

WELL SETBACK DISTANCES AND ENCROACHMENTS

At the time this plan was being developed, well setback distances within the State of Nebraska are established in the latest version of Nebraska Title 179 – *Public Water Systems*, Chapter 7 (Effective date April 4, 2010) – see Table 8. It is the responsibility of the local public water system and community to actively enforce these setback distances, to the extant they are able to. Any violations of setback distances or encroachments found by DHHS must be eliminated or justified by an engineer to DHHS. If necessary, DHHS will take enforcement measures against the water system, but not on the violator or owner of the encroachment. This could include, but is not limited to, identifying a system as "vulnerable" and requiring additional monitoring. Essentially, if a community does not adopt these setbacks there is no active protection.

It is recommended by NDEQ that communities formally recognize and enforce well setback distances through ordinance or zoning. This should be done in a way that the distances are automatically updated in accordance with Title 179 Chapter 7. At the time of plan preparation, the City of York does not formally

recognize these through in the Code of Ordinances; however, the City does intend to adopt the well setback distances in conjunction with the adoption of this plan.

Table 8: Well Setback Distances, According to Nebraska Title 179, Chapter 7 (April 4, 2010)

Category	Distance (Feet)
Water Well	1,000
Sewage Lagoon	1,000
Land application of municipal/ industrial waste material	1,000
Feedlot or Feedlot Runoff	1,000
Underground disposal system (septic system, cesspool, etc.)	500
Corral	500
Pit Toilet/Vault Toilet	500
Wastewater Holding Tanks	500
Sanitary Landfill/Dump	500
Chemical or Petroleum Product Storage	500
Sewage Treatment Plan	500
Sewage Wet Well	500
Sanitary Sewer Connection	100
Sanitary Sewer Manhole	100
Sanitary Sewer Line	50

ZONING CONTROLS

The City of York has an adopted comprehensive plan, zoning ordinance and set of subdivision regulations that were most recently updated in January 2007. A copy of that ordinance can be found in Appendix D. Through the process of planning and zoning, and as a "City of the First Class", York gained land use control up to two miles beyond the corporate limits, through the adoption of an ETJ. Additional jurisdiction may be ceded to the City by the county through resolution and ordinance in accordance Nebraska Revised Statute 13-327. Figure 21 illustrates the location of the City's ETJ, in relation to the 2016 WHPA. All of the WHPA falls within the City's ETJ, therefore there is no need at this time for the City to request additional jurisdiction. The York Zoning Ordinances may only be applied to areas within the City's ETJ.

Currently, York's planning and zoning documents do not specifically mention wellhead protection planning or groundwater protection, nor do they currently provide for a wellhead protection district. However, concurrent with the adoption of this Wellhead Protection Plan, the City intends will amend their zoning regulations and adopt a wellhead protection overlay district. Such amendment will involve a public hearing and recommendation by the Planning Commission and a public hearing and ordinance adoption by the City Council. The wellhead protection overlay district will be illustrated on the Official Zoning Map and any adopted wellhead regulations would take priority over the underlying zoning district. An "overlay" district does not replace other zoning districts that may be located in the same area, it simply adds

additional requirements (related to the districts purpose) that uses in the district must meet. A floodplain overlay district is a common use of an overlay district in most communities.

York County has adopted a Comprehensive Plan, according to the Nebraska Association of County Officials, which gives them the authority to enact zoning. York County Planning and Zoning Department has jurisdiction over the unincorporated areas of the County. York County does currently have a wellhead protection overlay district within their regulations. However, because the City's WHPA does not fall outside the City ETJ, County zoning regulations have not impact on the City.

It should be noted that the City is unable to utilize the Nebraska Revised Statute 17-536 (the 15-mile Statute). This State Law, which only applies to villages and second class cities, allows communities to protect sources of drinking water outside the community's ETJ. Given that York is a first class city, it will be unable to utilize this statute. In this event, should the city need to pursue protection to their WHPA outside of their ETJ in the future, the City will coordinate closely with the County.

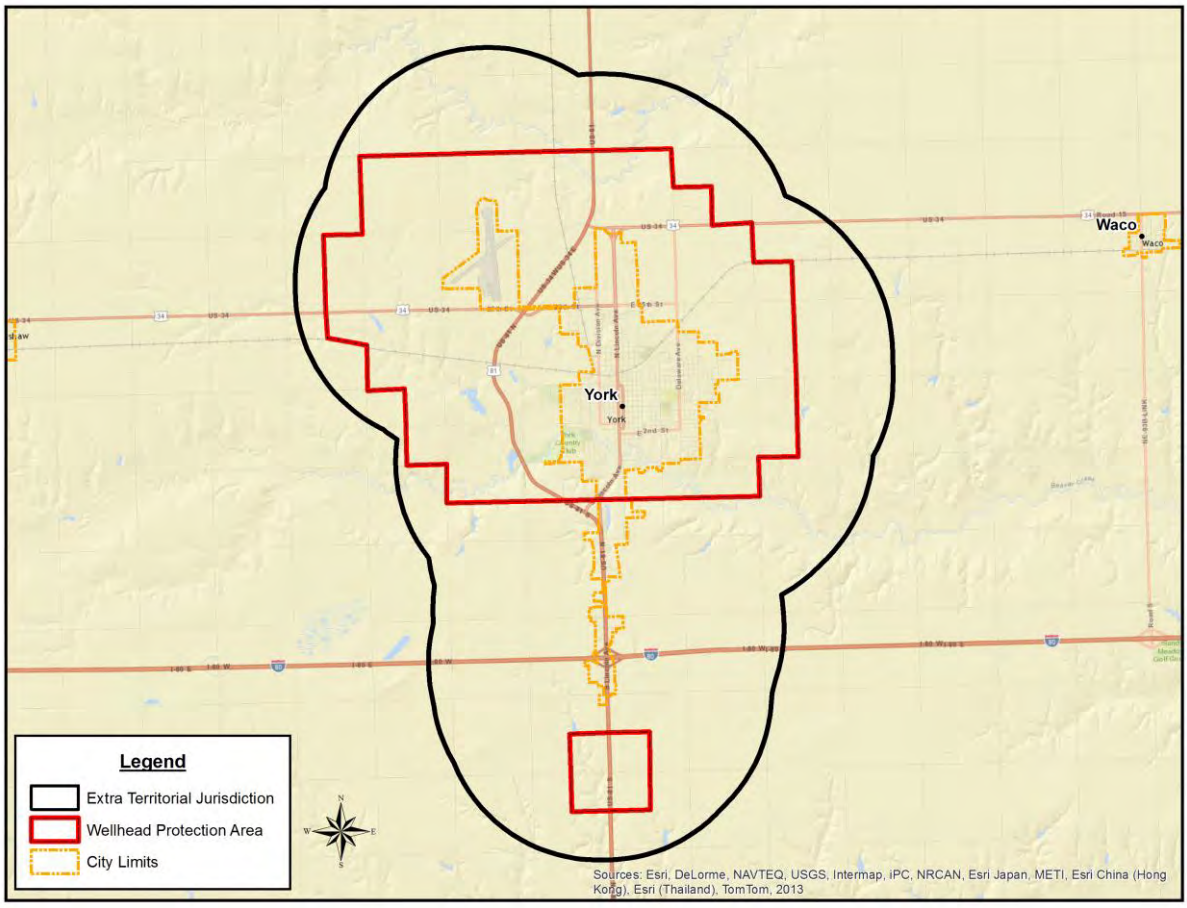

Figure 21: York's Extraterritorial Jurisdiction (ETJ) and 2016 WHPA

5.02 NATURAL RESOURCES DISTRICTS

All Natural Resource Districts, including the Upper Big Blue NRD have the ability to require best management practices (BMPs) or to regulate practices in ground water management areas (GWMAs) to protect groundwater quality and quantity. This authority originated in the Groundwater Management and Protection Act (GWMPA), which was passed by the Nebraska Legislature in 1984. In 1985, 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 Natural Resources (NDNR). In 1991, LB 51 was enacted, requiring NRDs to expand their management plans to include ground water quality protection. The Upper Big Blue's policies and rules are outlined in their Groundwater Management Plan. Pertinent sections are summarized below, but the entire document can also be found online at:

http://www.upperbigblue.org/PAGES_ancillary/PAGE_rules_regs.htm

GROUNDWATER MANAGEMENT PLAN SUMMARY

The Upper Big Blue NRD is divided into Water Quality Management Zones that each have a specific management phase associated with it. Within these areas, the NRD has adopted specific controls to prevent further, or reverse present, nitrate levels in the groundwater for each area. For each of these areas the NRD has identified the management phases, triggers, and special rules to achieve these goals, as summarized in Table 9.

The York WHPA overlays two management zones (#5 and #6), and within one half mile of Zone 7. As illustrated in Figure 22, Zone 5 is in phase 3 management, Zone 6 is in phase 2 management, and Zone 7 is in phase 1 management. This overlap in management areas and differences in management phase levels, creates inconsistencies within the wellhead protection area. The City and NRD will continue to work closely together to ensure protection is provided to the groundwater in an administratively and realistically feasible way.

Table 9: Summary of UBBNRD Groundwater Management Zone Requirements

Phase 1 Area	
Trigger Level	**Management Requirements**
All Operators of land within the District are subject to the requirements of Phase I (Entire District)	Pre-plant anhydrous ammonia may not be applied prior to November 1
	Pre-plant nitrogen fertilizer in liquid or dry forms may not be applied prior to March 1
	Various exemptions for these activities
Phase 2 Area	
Trigger Level	**Management Requirements**
A Phase II Management Area will be designated when the median nitrate level, in the District designated monitoring wells, is seven (7) milligrams per liter or more. No more than one management zone shall be designated a Phase II management area each year. If more than one (1) management zone meets the criteria for Phase II designation, the zone with the highest median nitrate shall be designated a Phase II management area.	*All Phase 1 requirments, plus:*
	Operators required to pass a nitrogen certification test/operator training every four years
	Prior to applying Nitrogen Fertilizer each year, the Operator must obtain specific composite soil samples (per field) for or oganic matter and residual nitrogen in years that corn or sorghum will be grown following a non-legume crop and/or when livestock, municipal or industrial waste was applied within the last twelve (12) months.
	Prior to applying Nitrogen Fertilizer the Operator must calculate the nitrogen application rate needed for each field, based on University of Nebraska recommended procedures and must account for soil analysis and all other nitrogen credits.
	Each Operator must schedule irrigation in one field that is at least 65 acres in size or in their largest irrigated field in the Phase II area by one (1) of the following methods: Capacitance probes, resistance blocks, or other methods approved by the District.
	By April 1 of each year, each Operator must report information regarding the use of best management practices. A copy of the soil analysis must be included with the annual report.
Phase 3 Area	
Trigger Level	**Management Requirements**
A Phase III Management Area will be designated when the median nitrate level, in the District designated monitoring wells, is equal to or greater than ten (10) milligrams per liter	*All Phase 1 and 2 requirements, plus:*
	Soil sampling is increased from every field to every 40 acres
	The Operator must have the irrigation water tested for nitrates at least once every three (3) years.
	If anhydrous ammonia is applied between November 1 and February 29, a District approved nitrification inhibitor must also be applied at the manufacturer's recommended rate.

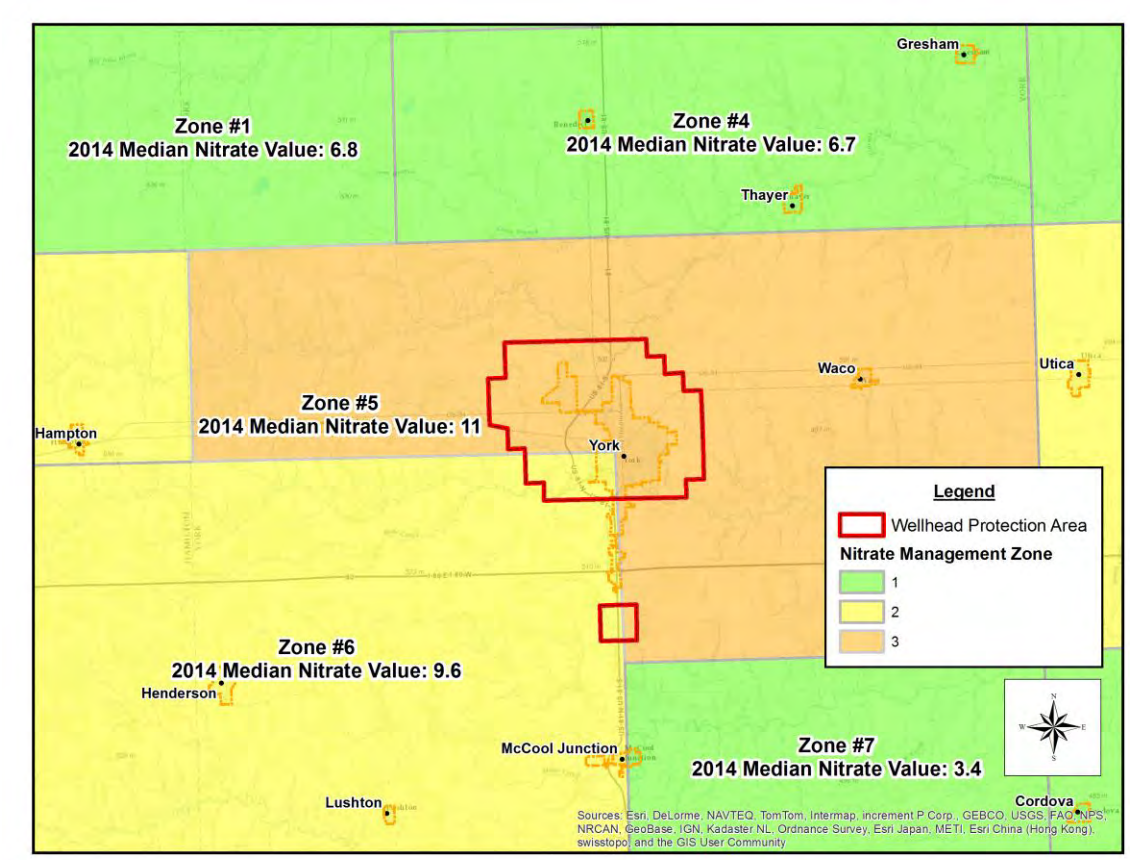

Figure 22: UBBNRD Groundwater Quality Management Zones and Management Phases

5.03 STATE OF NEBRASKA

State statues and laws are summarized in Appendix D as well as a listing of Nebraska's legislature statutes that allow local jurisdictions to protect public health and safety. NDEQ administers the Wellhead Protection Program and provides technical assistance to any entity with a designated WHPA.

SECTION 6. EMERGENCY, CONTINGENCY, AND LONG TERM PLANNING

6.01 EMERGENCY AND CONTINGENCY PLANNING

York's Public Water System Emergency Response Plan is required by DHHS and is located in Appendix E. The plan contains emergency water supply contact information, contingency plans, and emergency contact information to deal with the following emergencies/contingencies:

- Power failure at wells, reservoirs, elevated tanks ,or service center
- Water main or service line break
- Chemical or bacteriological contamination
- Loss of storage
- Floods, tornadoes, earthquake or other acts of nature
- Acts of terrorism

NEBRASKA WATER/WASTEWATER AGENCY RESPONSE NETWORK

The City is not currently a member of the Nebraska Water/Wastewater Agency Response Network (NEWARN). NEWARN is a statewide Water/Wastewater Agency Response Network (WARN) of "utilities helping utilities" to:

- Prepare for the next natural or human-caused emergency.
- Organize response according to established requirements.
- Share personnel and other resources statewide, by agreement.

NEWARN provides water and wastewater utilities with:

- A Mutual Aid Agreement and process for sharing emergency resources among water and wastewater agencies statewide.
- A mutual assistance program consistent with other statewide mutual aid and assistance programs and the National Incident Management System.
- The resources to respond and recover more quickly from a natural or human caused disaster.
- A forum for developing and maintaining emergency contacts and relationships.

Additional information can be found at http://www.newarn.org/

6.02 LONG TERM PLANNING

Currently the City has an adequate supply and acceptable quality of source drinking water. However, given the City's historical growth pattern, identifying future sources of water is very important. Given the extensive amount of time it can take to locate, construct, and bring online a new supply well it is important to start sooner rather than later. No potential well locations were analyzed as part of this planning effort. However, the City recently construct six (6) new wells in 2009 and has no immediate plans or needs for new wells.

Figure 23: Test Wells are often helpful in identifying future well fields

Should the City decide to begin to plan for new wells, they will need to ensure siting criteria (Title 179, NHHS-R&L) are met. Identifying a new well or well field will be a long term process outside the scope of this plan; however, a few considerations have been identified during the development of this plan:

- Establishing a Conservation Plan, will help extend the lifespan of the existing water system. See Section 6.03.
- Vadose zone sampling could be completed, to identify areas with high concentrations of nitrates percolating into the aquifer
- Some of the City's wells are aging and therefore, replacing them may lead to an improved future water supply
- The City should work with NDEQ prior to identifying a well location or drilling a test well. The NDEQ can develop a "Provisional WHPA Map" to understand current and future threats. While this map is not official it can be a useful planning tool to help the community understand current and future threats. This should include a contaminant source inventory. Assistance from DHHS, including site inspections, will be beneficial.
- Purchasing new land, drilling wells, and building infrastructure are expensive undertakings. The City should establish or maintain a dedicated fund to assist with these efforts.

6.03 DROUGHT CONSERVATION PLANNING

Drought is defined as an extended period of time across a region with a deficit water supply and absence of precipitation. Effects from the absence of water are ecosystem and environmentally related. Prolonged effects will have adverse impacts to agriculture, people, and wildlife. Although influences of drought may have severe and far reaching impacts, it is not as tangible as other disasters, such as wildfires or tornadoes (Drought Ready Communities Guide, 2011).

Agriculture is the primary sector affected by drought; however, impacts on rural and municipal water supplies can be quite severe: conflicts between water users increase during water-short periods, water systems develop operational problems; large, industrial, independent water users may overdraft available supplies, and wells experience water quality and quantity problems.

The best approach is to anticipate these conflicts and issues well in advance in drought and initiate appropriate actions to avoid problems. A drought plan can be an effective means to improve information flow on drought conditions severity, and impact, and thus the timeliness of mitigation and emergency response actions. Mitigation actions for water supply systems commonly fall under the following categories:

- Assessment programs
- Water supply augmentation/development of new supplies
- Public awareness/education programs
- Water use conflict resolution
- Drought Contingency Plans

WATER CONSERVATION PLAN

A water conservation plan is a document developed by a public drinking water system that evaluates current and projected water use, assesses infrastructure, operations, and management practices, and describes actions to be taken to reduce water losses, waste, or consumption and increase the efficiency with which water is used, treated, stored, and transmitted.

Developing a water conservation plan also helps to optimize existing facilities and may reduce or eliminate the need to undertake new drinking water and/or wastewater projects. In addition, water conservation leads to increased energy conservation and cost savings for utilities and their customers. A water conservation plan should address conservation on the supply side (i.e., leak detection and repairs, metering, etc.); as well as on the demand side (i.e., reductions in consumer usage). Recommended actions/elements of a plan include:

- Conduct water use audits for consumers
- Offer fixture retrofits and replacements
- Offer rebates and incentives
- Promote water reuse and recycling
- Encourage landscape efficiency
- Reduce excessive distribution system pressure
- Identify Voluntary or Mandatory Water-Use Restrictions

Currently, York does not have a water conservation plan. Discussions on creating one are located in Section 7.

DROUGHT READY COMMUNITIES

The National Drought Mitigation Center, located at the University of Nebraska Lincoln, has developed a program known as "Drought-Ready Communities". The intent of the program and associated "Guide to Community Drought Preparedness" is to help communities understand and reduce their drought risk. A certified drought ready community has taken steps to:

1. Involve a representative cross section of the community;
2. Learn how drought has affected them in the past and how it would likely affect them in the future;
3. Set up a system to monitor and communicate about drought conditions in the community;
4. Prepare and document a set of actions to take before and in response to drought;
5. Educate the public about water, drought, and community's drought plan.

Currently, York is not a certified Drought Ready Community. Discussions on becoming one are located in Section 7.

Additional Information can be found at:
http://drought.unl.edu/Planning/PlanningProcesses/DroughtReadyCommunities.aspx

WATER CONSERVATION ORDINANCE DEVELOPMENT

Often, the most visible result of a water conservation plan is the development of a water conservation ordinance. Typically, a water conservation ordinance is written to guide water conservation promotion and impose water use restriction, when necessary. An ordinance enables a community to:

1. Keep water use within pumping capacity and delivery capability, based on professional judgment, water conditions, weather forecasts, water system operations, and groundwater conditions
2. Define procedures to be used when the above criteria cannon be met, and
3. Familiarize citizens, businesses, and industry with the procedures which may be implemented when voluntary or mandatory water restrictions are required

Currently, York does not have a comprehensive water conservation plan or ordinance. Discussions on developing one are located in Section 7.

SECTION 7. MANAGEMENT STRATEGIES

This WHPP lays out a baseline approach for protecting York's drinking water source. The following identifies what York has recently done and what the community plans to do in the near future; however, York should continue to implement actions over the next 10 to 20 years, as part of a comprehensive management strategy. The following may serve as the starting point for discussion or ideas, as enactment and success will require continued efforts from City officials, residents, and land owners to actively protect York's drinking water.

In areas where non-point contamination is likely, best management practices (BPMs) will assist in maintaining and improving water supply quality. Management practices must be accepted and applied at the regional scale and not in isolated fields. In instances where well water contamination has been affected by local activities and sources of contamination (example: bacterial), improved conditions around individual wells are necessary (Gosselin, 1997).

The ultimate goal of the management practice recommendations listed below are to provide the community with the best possible management strategies, which are both implementable and protective of the water supply for the community. It is important to note that the management strategies outlined below, while endorsed by the NDEQ, were developed based on the possible pollution sources identified through the potential contaminant source inventory, land use evaluation, and comments gathered through the community planning process.

Educational activities and voluntary approaches should be considered the core of the recommended management strategies for York's WHPP because these can be implemented now. Furthermore, even though the City is owner and operator of the community water system, the WHPA may expand in the future, and the City would then not have jurisdiction over all of the land identified in the WHPA. Consequently, educational activities and voluntary approaches offer the greatest potential for more immediate and successful plan implementation.

Management strategies outlined below are general in nature; however, they should not be considered the only options available. Specific strategies should be developed on a case-by-case basis through working with landowners, the NRD, the wellhead protection stakeholder committee, and the community. Some areas within the WHPA may provide opportunities to work directly with willing landowners. These opportunities often are the low hanging fruit in a wellhead protection program, and should be pursued on a priority basis, whenever feasible.

7.01 ACTIVITIES COMPLETED TO DATE

York has completed activities prior to and as part of this wellhead protection planning effort. Documenting and tracking these items may assist in planning future activities and for keeping a record for future City leaders. The following has been completed:

Wellhead Protection Area Signage

York has posted WHPA signs along major roads that enter the WHPA. This alerts property owners and the community to WHPA boundary and reminds them of the issues. Should the boundary change in the future, the Nebraska Department of Roads (NDOR) can install signs on the State Highway System where it intersects with the WHPA. NDEQ may be able to provide assistance in purchasing additional signs.

Figure 24: Example of Installed WHPA Signage

Zoning Updates – The City intends to create a wellhead protection overlay district, concurrent with the adoption of this plan. This will ensure protection within WHPA. A copy of the ordinance can be found in Appendix D.

Update Well Setback Ordinance – The City intends to create a wellhead protection overlay district, concurrent with the adoption of this plan. This ordinance will also formally recognize and enforce well setback distances. A copy of the ordinance can be found in Appendix D.

Groundwater Foundation Green Site – Throughout the planning process the City worked with the Groundwater Foundation to apply for and receive a Green Site designation for the York City Parks and Ballfields. This is a public recognition of the City's environmental stewardship efforts. The award was given during the Public Open House. Additional information is found in Appendix F.

7.02 PLANNED ACTIVITIES FOR THE NEAR FUTURE

Through the planning process, the merits of many potential management activities were discussed. York anticipated executing the following activities in the near future.

Educational Activities with the Groundwater Foundation – The City and Groundwater Foundation plans to build on the Green Site designation by collaborating on community education efforts. At this time the particular activities are not known, but discussions will continue and additional work will need to be completed to finish this activity.

7.03 POTENTIAL MANAGEMENT ACTIVITIES

The following list of strategies is not intended to be a "step by step" guide, but rather a highlight of the potential activities which could benefit groundwater protection that York will consider for future implementation.

Ongoing Public Education – *Education is often the first step in a successful wellhead protection program*. York has provided education opportunities in the past and will continue to provide opportunities to educate all ages of citizens and property owners, in and around the WHPA, of the importance of source water protection. There are many entities which could assist in education efforts such as local schools, the NRD, the Groundwater Foundation, University Extension, and the Nebraska Rural Water Association.

Public education efforts may include, but are not limited to:

- Focus groups
- Community workshops
- Press releases
- "Test Your Well" nights
- Distributing brochures
- School poster contests
- News/information articles
- Utility bill stuffers

Education could be on a variety of topics, such as:

- Nonpoint source pollution
- Proper animal waste handling
- Aquifer and groundwater basics
- Private well and wastewater system Management
- Fertilizer and Pesticide application
- Urban and Rural BMP practices

Decommission Abandoned Wells – Abandoned wells can directly channel contaminated surface water into groundwater, and so pose a considerable risk to water supplies. Abandoned wells must be decommissioned (filled, sealed, and plugged) according to state law or they are deemed "illegal". The NRD could help implement this program.

Supplementing Wellhead Protection Area Signage – York has posted WHPA signs along major roads that enter the WHPA. These signs could also be supplemented with information regarding existing land use regulations or education information and direct interested individuals to contact the City.

Become a member of NEWARN - Joining the Nebraska Water/Wastewater Agency Response Network (NEWARN) will assist with future emergency and contingency planning and response.

Become a certified "Drought Ready Community" – As previously discussed in Section 6.03, York could work with the National Drought Mitigation Center to become a certified Drought Ready Community. This would further enhance water conservation, help York prepare for times of drought or water shortages, and provide another avenue for community involvement.

Infrastructure Security – Focusing on infrastructure security can help to reduce the immediate risk to drinking water. Installing locks, adding lighting to well houses, and installing fencing around equipment are all examples of work that is easily implementable and has an immediate effect.

Installation of Monitoring Wells – Monitoring wells are used to monitor the groundwater level and can also be used to sample the groundwater quality. Installation at different levels can allow for discrete samples to be taken at varying elevations at the same map location. The City could work with the NRD and NDEQ to install these. Data from these well could be used as a trigger as part of a conservation plan or as additional information for future planning.

Deep Soil Sampling – Deep soil sampling (36 inches in depth) enables producers to better manage fertilizer application by knowing what exists in the full crop root zone. The City and NRD can encourage producers to perform deep soil sampling. If the results are used to inform management decisions, this may ultimately reduce nitrate introduction into the source aquifer.

Groundwater Sampling – Groundwater sampling can help with evaluation of whether management practices implemented in the WHPA are effective. Groundwater sampling can help the City determine the current nitrate concentrations in the WHPAs.

Vadose Zone Soil Sampling - In order to better understand the potential level of nitrate contamination, the City or NRD could conduct vadose zone sampling (deeper than 36 inches) of nitrates in the WHPA. This would help to determine future areas of concern for nitrate contamination of the groundwater and would help identify areas to focus management strategies on.

Easements and Contracts – Some areas within the WHPA may provide opportunities to work with willing landowners. Conservation easements, cost share assistance, land purchasing/managed leasing or contracting with land owners for land use restrictions may be viable options to protect areas outside the City's jurisdictional power.

Conservation Reserve Program (CRP) – Agricultural producers with farmed land in a WHPA are eligible for increased payment amounts for enrolling land in the CRP when located in a WHPA. The local NRD and NRCS office would assist in this.

Water Conservation Planning – This encompasses polices, strategies, and activities to manage fresh water in a sustainable manner. It generally includes ways in which communities, business, households, individuals and agriculture produces work to reduce the amount of water used or wasted. See Section 6.03 for additional information.

Irrigation Water Management – Making irrigation systems more efficient will help to reduce the movement of pollutants from cropland into both groundwater and surface water. Some of these practices include irrigation scheduling, installing flow meters, using more efficient application practices, variable rate irrigation systems, and soil moisture probes. Education, outreach, and cost-share programs will be the most effective means to get agricultural users to incorporate these types of practices.

Advanced Vulnerability or Contaminant Assessment – Understanding the vulnerability to groundwater contamination is important to the implementation of management activities. Currently, no detailed model of York's source water's vulnerability exists. The DRASTIC model in Figure 6 is not a detailed model and only gives a general vulnerability of areas near the City. A tailored and up-to-date modeling effort, including an updated hydrogeological study, would be beneficial to the City. Additional chemical analysis can also be performed to identify specific pollutant sources, and source tracking can be performed to more accurately identify and sources of contamination. This would could also include a detailed evaluation of the CSI.

Best Management Practices – Both urban and agricultural BMPs offer an effective prevention strategy or solution to reduce the threat of contamination of groundwater. Agriculture BMPs focus on management of agricultural inputs and general land management to provide for economic, environmental, and agronomic efficiency in an operation. Selection of the most appropriate BMP or combination of BMPs under a voluntary approach is each land owner's decision. Additionally, The NRD, NRCS, and others could offer incentives to increase the amount of BMPs implemented. Additional information on BMP's can be obtained from the NRD or the local NRCS office.

Agricultural BMPs

- Vegetative and tillage practices
- Increase the amount of soil sampling
- Encourage no-till or low-till agriculture
- Irrigation Management
- Pesticide Management
- Livestock Waste Management
- Windbreak Management
- Nitrogen Management
- Use of Nitrogen Inhibitors
- Buffer, Filter Strips, or Strip Cropping
- Establish permanent cover on marginal cropland
- Integrated Pest Management
- Adoption of "smart technology"
- Irrigation Scheduling
- Domestic Well Registration
- Soil Moisture sensors
- Cover Crops
- Flow Meters
- Others

Urban BMP Incentives

- Use of native plants in lawns and landscapes
- Recycling
- Soil Sampling of lawns
- Mulching Lawn Clippings
- Rain Barrels/Rain Gardens
- Household hazardous waste collection
- Rain sensor rebate program
- Domestic Well Registration
- Others

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SECTION 8. PUBLIC EDUCATION AND NOTIFICATION

8.01 OPPORTUNITY FOR PUBLIC INPUT

In order for a plan to be approved by the NDEQ, there must be proper documentation of public involvement. The York WPPP approval process has followed the guidance of NDEQ to ensure proper opportunity for public input. The following steps below are the basic minimum requirements that must be documented:

1. Prepare a Wellhead Protection Plan
2. The WHPP is made available for public review at least 30 days prior to the meeting where public comment will be taken on the Plan.
3. Public comment is taken at a regularly scheduled meeting of the "controlling entity" (meaning the village board, city council, rural water district board, etc.)

Materials documenting the fulfillment of each of these items (copies of newspaper notices, affidavit of publication, minutes, etc.) is located in Appendix F.

8.02 PLANNING STAKEHOLDER COMMITTEE

A 16-member stakeholder committee was established at the initiation of the WHPP planning process. As shown in Table 10. The stakeholder committee was responsible for plan review, and serving as local contacts to residents to provide information during the planning period.

Table 10: York Wellhead Protection Stakeholder Committee Members

Name	Representing	Title
Ryan Stastny	City of York	Assistant Manager
Marie Krausnick	Upper Big Blue NRD	Water Department Manager
Courtney Widup	Upper Big Blue NRD	Resources Technician
Benjamin Danis	York County	Zoning Administrator
Cindy Adkins	UTC Aerospace	EHS Manager
Anthony Lowndes	The Groundwater Foundation	Program Manager
Dalton Johnson	Abengoa Energy	QSE Manager
Mitch Stuhr	Abengoa Energy	Plant Manager
Barry Redfern	City of York	City Councilperson
Ken Ekeler	City of York	Water Operator
Mitch Doht	City of York	Director of Public Works
Chuck Harris	City of York	Mayor
Randy Obermier	York County	County Commissioner
Margaret Brink	City of York	City Councilperson
Adam Rupe	JEO Consulting Group, Inc.	Environmental Planner
Marc Rosso	JEO Consulting Group, Inc.	Project Manager

8.03 MEETING SUMMARY

During the development of this WHPP, York established a stakeholder committee, which met multiple times, and a held public open house to offer residents and property owners an opportunity to voice their opinion or ask any questions about wellhead protection and the plan. Below is a summary of the types and dates of meetings. Sign-in sheets and other public notification materials are located in Appendix F.

Stakeholder Meeting #1 – January 13, 2016

The group discussed their responsibilities, plan progress and schedule, the updated WHPA map, the contaminant source inventory process, issues and ideas about the development of the plan, and potential timing of the next WHP Committee meeting, and the public workshop.

Notification: Committee members were invited to the meeting by email, phone calls, and word of mouth.

Stakeholder Meeting #2 – March 14, 2016

The group reviewed the draft version of the wellhead protection plan, discussed options on protection ordinances, discussed other potential implementation/next step projects, and set dates for public review and open house events.

Notification: Committee members were invited to the meeting by email, phone calls, and word of mouth.

Public Open House – May 23, 2016

An opportunity was held (Figure 25) for the public to learn about the wellhead protection plan, along with other activities currently going on to protect source water. An open house format was utilized with six (6) informational stations, that were each staffed with project or City personnel 17 individuals attended the event, and were able to ask questions, review information, and receive a copy of the draft wellhead protection plan. A comment box was provided for attendees to formally provide written comments, which were considered in finalizing this plan. Local TV and newspaper reports were present.

Notification: The public was invited to the open house through posters, email, news releases, and word of mouth.

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US Department of the Interior, Bureau of Reclamation, in cooperation with the Nebraska Natural Resources Commission. December 1999. "Nitrate and Nebraska's Small Community and Rural Domestic Water Supplies: An Assessment of Problems, Needs, and Alternatives."

Weber, K. K., Nolan, J. (2015), Natural Uranium Contamination in Major U.S. Aquifers Linked to Nitrate. Environmental Science and Technology Letters. 2015, 2, 215-220.

Guidance available from NDEQ:

- "Documenting Public Input – WHP Plan". July 25, 2013
- Thomas O'Connor. "Contaminant Source Management Options for Wellhead Protection". September 2002
- "Wellhead Protection Area Management Planning Manual: A Community-based Approach to the Wellhead Protection Area Management Planning Process in Nebraska" (2008)
- "Wellhead Protection Plan Guidance Checklist"

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LIST OF APPENDICES

APPENDIX A: ANNUAL WATER QUALITY REPORT AND SANITARY SURVEY

APPENDIX B: EXISTING GROUNDWATER POLUTION INFORMATION

APPENDIX C: GROUNDWATER MODELING REPORT

APPENDIX D: SELECT ORDINANCES AND MUNICIPAL CODES

APPENDIX E: YORK PUBLIC WATER SUPPLY EMERGENCY RESPONSE INFORMATION

APPENDIX F: DOCUMENTATION OF STAKEHOLDER INVOLVEMENT