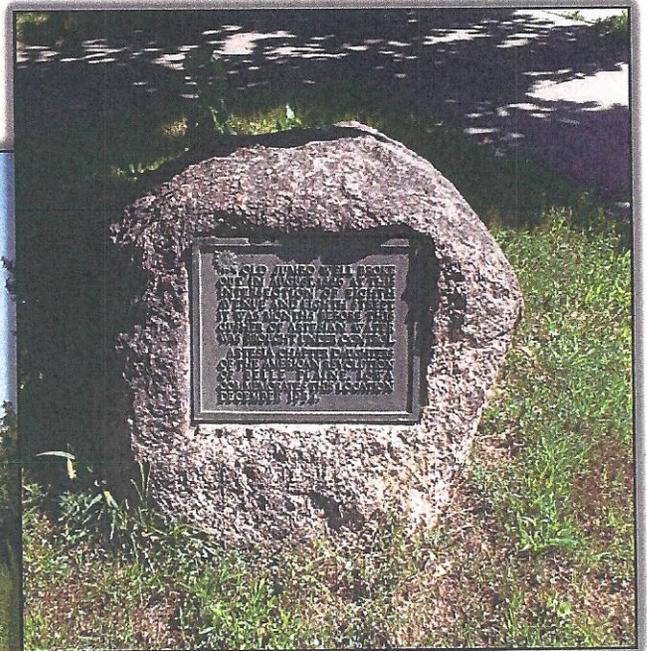
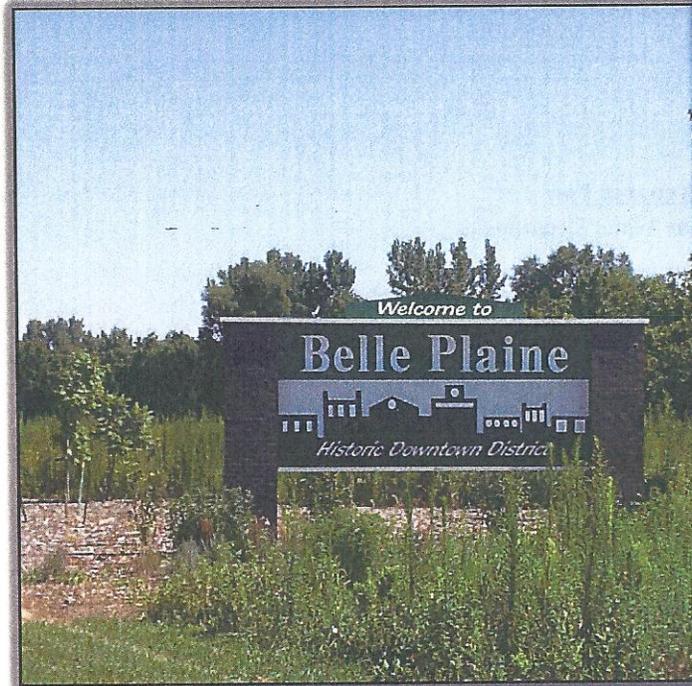


# Belle Plaine Water Department

## Source Water Protection Plan

PWS #0610099



**Prepared For**

Belle Plaine Water Department

**Prepared by**

Brent Beste, Iowa Rural Water Association, Source Water Protection Specialist

**Assistance Provided by**

City of Belle Plaine

Belle Plaine Water Department

Natural Resources Conservation Service – Toledo Field Office

Natural Resources Conservation Service – Vinton Field Office

Iowa Department of Natural Resources Field Office #1

Iowa Geological and Water Survey

**Completed:**

9/12/2013

## Introduction

### Background of Source Water Protection

In 1974 the United States Congress enacted the Safe Drinking Water Act (SDWA) with the goal of providing safe drinking water for public water supplies and their users. The SDWA gave the United States Environmental Protection Agency (USEPA) the authority to develop a uniform national drinking water protection program, and to establish standards for known or suspected drinking water contaminants. In 1996, Congress amended the SDWA to reflect a growing awareness of potential biological and chemical threats to drinking water. The amendment to the SDWA outlines a plan for communities to protect their own source and keep program effectiveness at the local level.

During 1998-1999, the Iowa Department of Natural Resources (IDNR) and the Iowa Geological Survey Bureau (IGSB) started developing a Source Water Protection Program for the State of Iowa. In October 1999, EPA approved the IDNR Source Water Protection Program, including the already active program of Wellhead Protection.

At this time, legislators in the State of Iowa indicated that Iowa will maintain a voluntary approach to Source Water Protection planning. A voluntary implementation (as opposed to regulatory) is appropriate for Iowa due to the uniqueness of each public water supply system. The voluntary approach also conveys a positive image of the Source Water Protection Program.

The Iowa Rural Water Association (IRWA) has taken an active role in developing Source Water Protection Plans for small communities. IRWA's mission in this regard is to provide technical assistance to small communities in developing Source Water Protection Plans to protect their drinking water supplies.

Currently, IRWA's Source Water Protection Program is serviced by two grants. One supplies a program through a USDA-FSA grant and another through the Iowa Department of Natural Resources (IDNR). The Belle Plaine Water Department Source Water Protection Plan has been developed through Iowa Rural Water Association's IDNR Source Water Protection Program

## Purpose

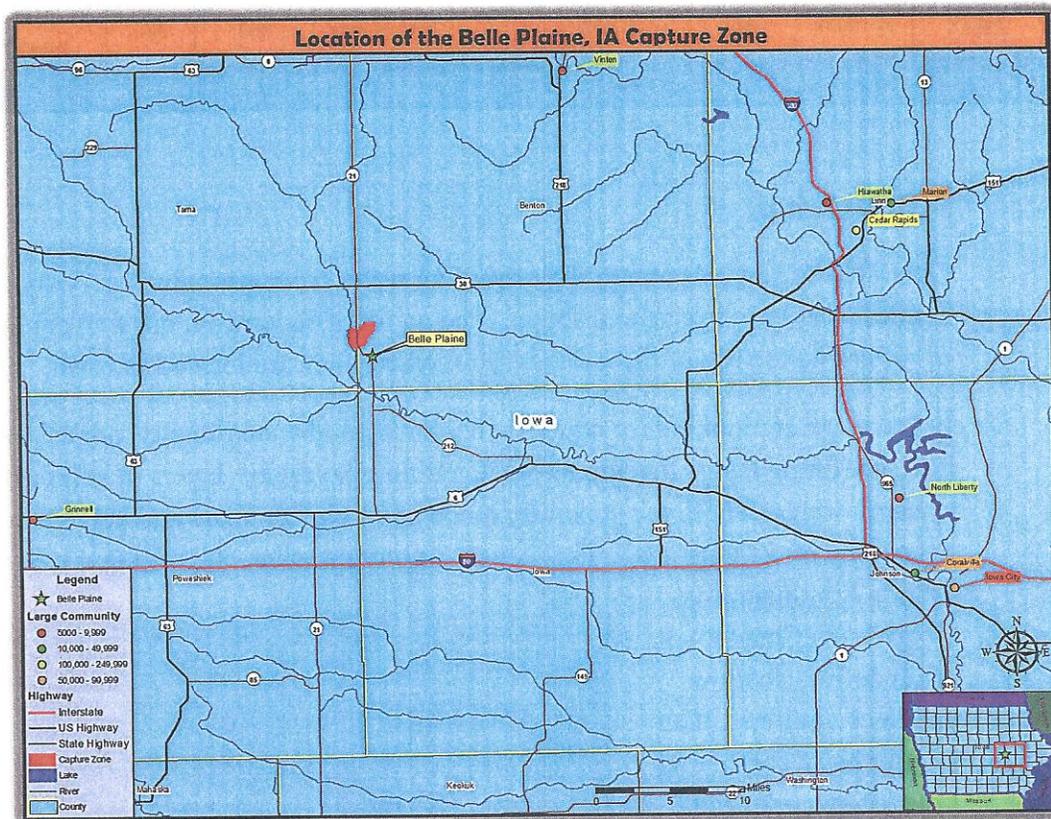
The purpose of the Source Water Protection (SWP) plan is to provide an organized approach to effectively protect public water supplies from contamination. There are many important reasons for protecting the Belle Plaine Water Department's drinking water.

- Safeguard the health of community residents
- Prevent and reduce financial burdens caused by contaminated drinking water should it occur
- Educate and promote community awareness on drinking water contamination
- Safe drinking water is the life line of the community in the present and in the future
- Develop a contingency plan in the unlikely event that your drinking water supply would happen to become contaminated
-

## Belle Plaine Water Department #0610099

### Location

Belle Plaine, IA is located in the SW Corner of Benton County in east-central Iowa. Belle Plaine is north of the Iowa River and the major thoroughfare is Iowa Highway 21. Belle Plaine is also home to Iowa's largest artesian well, Jumbo. Jumbo spewed thousands of gallons of water per minute for multiple weeks until it was brought under control, and eventually capped.



### Water Supply Information

Belle Plaine obtains water from five shallow alluvial wells drilled into the sand and gravel along Salt Creek northwest of the community. The City also operates an emergency well, Well #6, on the north edge of Belle Plaine. This well is drilled into a buried sand and gravel aquifer with unknown origins. The water quality from these shallow wells is quite good, only requiring the addition of chlorine for disinfection. The City also adds fluoride for dental health. The wells vary in age from mid 1940's to the mid 1980's.

Belle Plaine Water Department Active Public Well Inventory												
GeoSAM#	DNR Well Tag	Local #	Drill Date	Status	Aquifer	Elevation	Total Depth	SWL	PWL	Yield	Date info Gathered	Date info Updated
36436	1010079	#1	1/1/1945	Active	Alluvial	779	42	26	39	169	Jan. 2013	2/26/2013
36437	1010080	#2	1/1/1945	Active	Alluvial	778	42	20	29	162	Jan. 2013	2/26/2013
36438	1010081	#3	1/1/1950	Active	Alluvial	779	42	23	29	92	Jan. 2013	2/26/2013

Belle Plaine Water Department Active Public Well Inventory												
GeoSAM#	DNR Well Tag	Local #	Drill Date	Status	Aquifer	Elevation	Total Depth	SWL	PWL	Yield	Date info Gathered	Date info. Updated
<u>12850</u>	1010082	#4	1/1/1961	Active	Alluvial	780	42	17	24	172	Jan. 2013	2/26/2013
<u>36435</u>	1010083	#5	1/1/1977	Active	Alluvial	785	37	21	27	90	Jan. 2013	2/26/2013
<u>36439</u>	1010084	#6	1/1/1988	Emergency	Pleistocene	852	313	Not data available, being prepped for emergency use			2/26/2013	

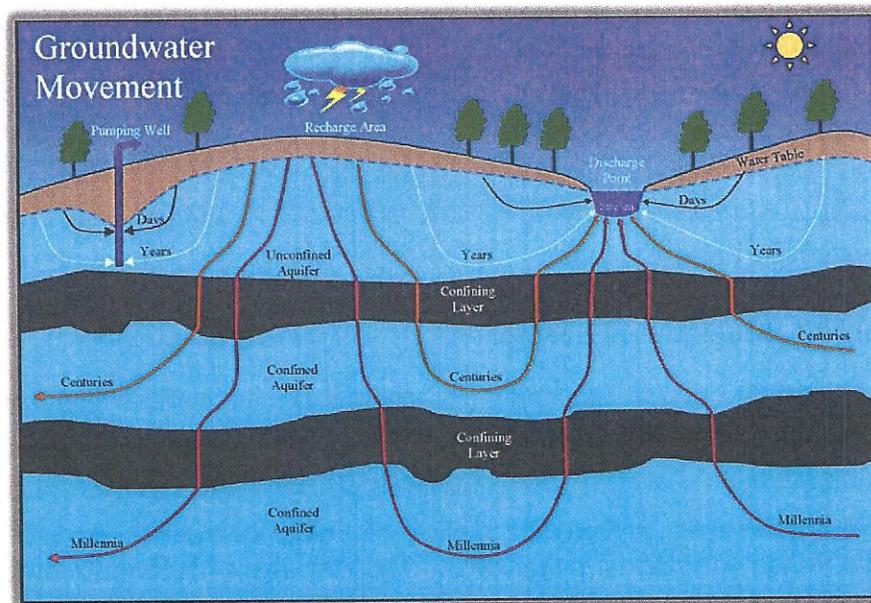
Source: Iowa DNR Source Water Tracker • Inactive Public Well Information is available on the Source Water CD, File Name: Belle Plaine Public Well Inventory

## Hydrogeology

Over 80% of Iowan's obtain their drinking water from groundwater. Groundwater is found in aquifers that vary in size and shape. The aquifers underneath our feet contain different qualities of water and the use of them depends on where they are located in Iowa.

In Iowa, we are looking for aquifers that have good water quality, are easily recharged, and also have confining layers that are thick. Confining layers are layers of soil or rock that do not easily transmit water. These are generally made up of clay or shale and act as a confining unit depending on its thickness. This is very important when classifying a well as deep or shallow.

Iowa's Administrative Code (IAC, Chapter 40.2) defines shallow and deep aquifers. If an aquifer has a continuous layer of low permeable material at least 25 feet below the ground surface and is a minimum of 5 feet thick, a well is considered a deep well. If a well does not meet these criteria, the well is considered shallow. Deep wells are less susceptible to



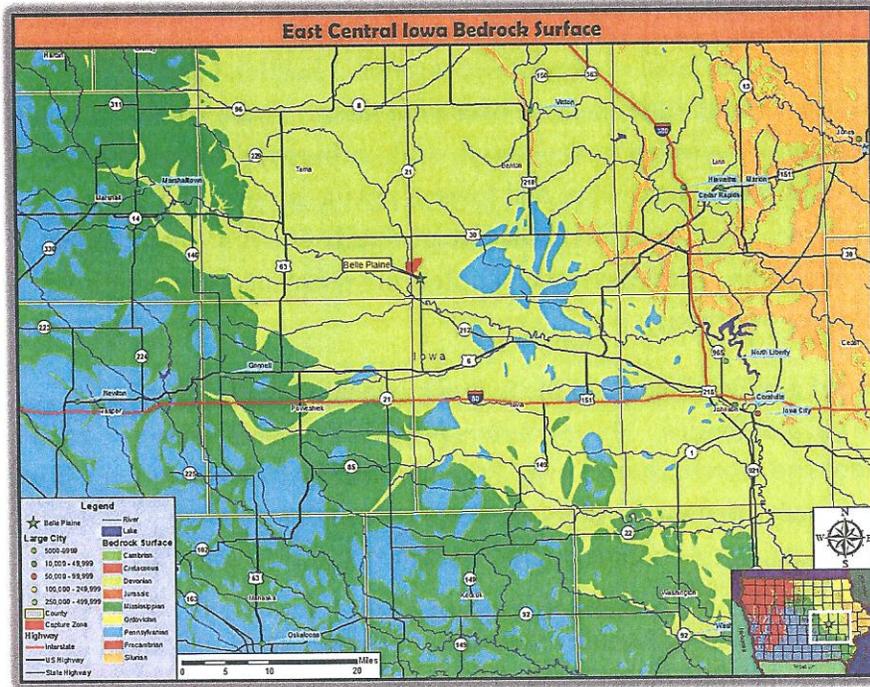
contamination, thus they are given lower susceptibility designations. Belle Plaine Water Department's wells do not meet these criteria due to the thickness of the overlying material. Belle Plaine's wells are assigned a ranking of **High Risk** due to the lack of overlying material. This indicates that the wells have the potential to be contaminated by surface contaminants such as underground storage tanks and agricultural activities.

Along many of Iowa's Rivers we find surficial or unconfined aquifers. Surficial aquifers are generally made up of sand and gravel with little material overlying them. These are found in the modern river valleys, and are generally referred to as alluvial, drift, or buried channel aquifers. Alluvial aquifers are generally exposed to the surface and located next to modern day rivers. Drift aquifers are small rogue areas of sand and gravel that are generally small in nature and are primarily used for local or private wells. Buried channel aquifers are remnants of ancient river channels and are very good sources of drinking water.

In most of Iowa we find confined aquifers located in the bedrock beneath the glacial till that makes Iowa well suited for farming activities. These aquifers provide a reliable source of good quality water in much of Central and Northeastern Iowa. From Central Iowa southward, bedrock aquifers are rarely used. This is because these aquifers are deeper as you move southwest across the state. Water in these aquifers generally contains higher levels of dissolved minerals in southern and western Iowa. If water stays in contact with the geologic materials for an extended period of time it tends to "clean" the water of harmful chemicals. If water stays in contact too long, it will dissolve minerals from the surrounding rock. This creates a poor quality of water. These aquifers are still used in industries such as ethanol production because the wells produce plenty of water, and require little treatment to be used in these industries.

Belle Plaine is a unique hydrogeologic region. There are a number of water sources that are found near the City, but few are economical. There is the shallow alluvial sand and gravel aquifer near salt creek that the City currently uses for its water supply. This is the best source in the area as it is shallow, water is plentiful, and treatment is very inexpensive. Another option is the buried sand and gravel aquifer that exists in this region. This source provides plenty of water, but requires extensive treatment before it can be consumed. This aquifer is high in iron and other minerals that require large treatment facilities to make the water safe for consumption. Other areas include alluvium near the Iowa River, however the water quality is not known and to pipe the water into town is quite expensive.

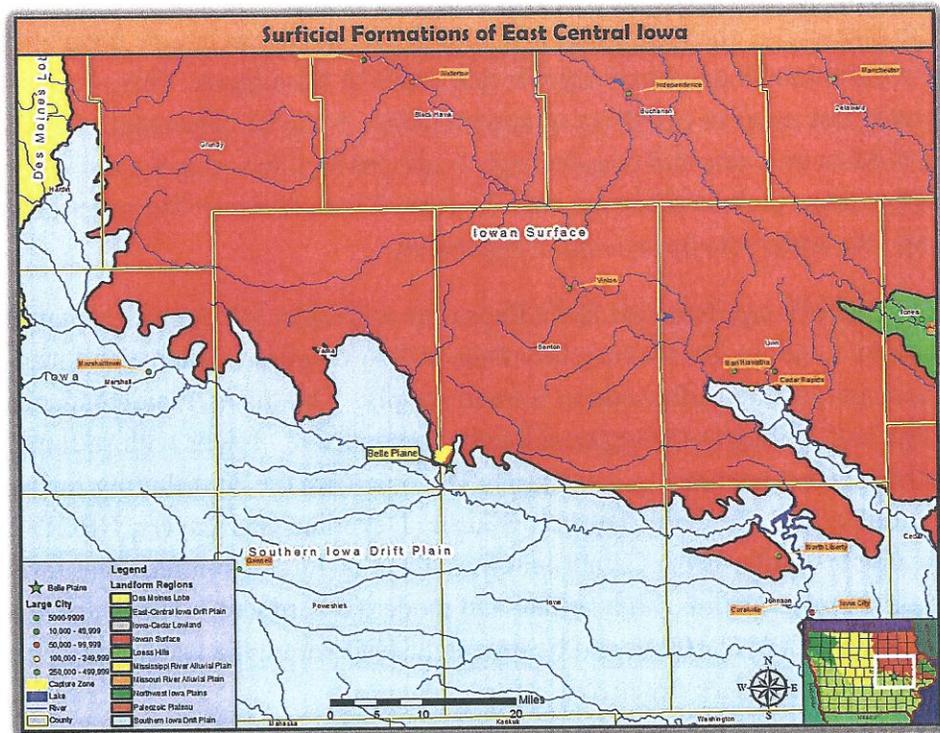
The bedrock aquifers near Belle Plaine are available, but the water quality is poor. Natural water quality issues in the Silurian-Devonian bedrock aquifer, which also forms the bedrock surface, does not economically support a water supply. Treatment, maintenance, and staffing costs are high and drilling to the required depths is expensive. Issues with sodium, sulfate, hardness, and other natural minerals in the Silurian Devonian are the contributing factors making this aquifer unusable in Belle Plaine (source: Silurian Devonian GIS Layers, NRGIS Library). The other available aquifer is the Cambrian-Ordovician or Jordan aquifer. The Jordan in Belle Plaine has high dissolved solids, high sulfate and moderate hardness. The water quality is fair, but the depth is well over 1000ft and treatment costs to soften the water and remove the sulfate and dissolved solids are expensive.



Belle Plaine lies on the edge of two landform regions. These regions represent two different eras in Iowa's geologic history. The Iowan Surface which lies to the north of Belle Plaine and stretches over most of the well field was deposited during the last ice age when strong winds and stream erosion moved till around and deposited the fine grained materials elsewhere

(Source: Geologic Guide Book Series #28, Page 15). The City lies on the Southern Iowa Drift Plane. This is a region that was deposited by glaciers over 500,000 years ago. Over time, the dominating features of this landform were created by wind and water erosion. Rolling hills, river valleys and water impoundments make up the distinguishing features of this formation.

The source of the sand and gravel deposits that make up the aquifer that Belle Plaine draws water from is not known. The aquifer is a good producing aquifer during normal periods, but is very responsive to climatic changes. This is seen in periods of drought when the Water Department experiences rapid declines in the pressure head in the wells (elevation of the groundwater). During times of flooding, rapid



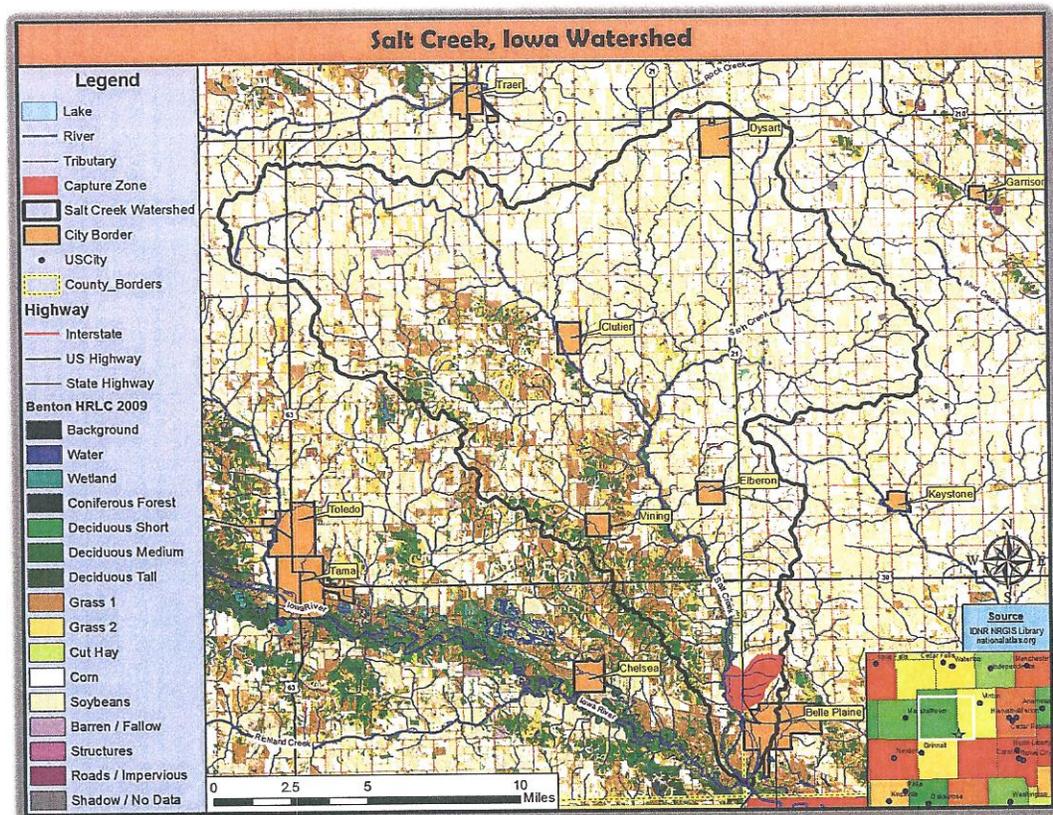
increases in the pressure head are seen. This also indicates that surface activities will have a significant impact in the water quality, and potentially the quantity of water available in the aquifer.

The other aquifer that is tapped by Belle Plaine is a buried sand and gravel channel. Research has indicates that this is likely a former river channel. . The water quality in the aquifer is fairly poor. The last time the well was used was when it was installed. This was in the late 1980's during the drought of 1988. There were numerous complaints with taste, odor, and color of the water. The well was recently rehabilitated in case it was need during an emergency during the 2012 drought. The same water quality issues still exist. To use this well on a regular basis would require extensive treatment.

The sand and gravel deposits are highly pressurized, and in many areas, wells drilled into this channel are free flowing or artesian, with the most famous well being Jumbo, drilled in August of 1886. This well flowed freely for 13 months until it was able to be plugged. The average flow rate was over 2000 gallons of water per minute freely flowing out of the well.

Locally, the surface water influence on the Belle Plaine Water Source is Salt Creek. This creek flows from north of

Belle Plaine to the south. The creek is located to the west of the city where it discharges into the Iowa River. Salt Creek drains nearly 140,000 square acres of land before it reaches the area near the water supply

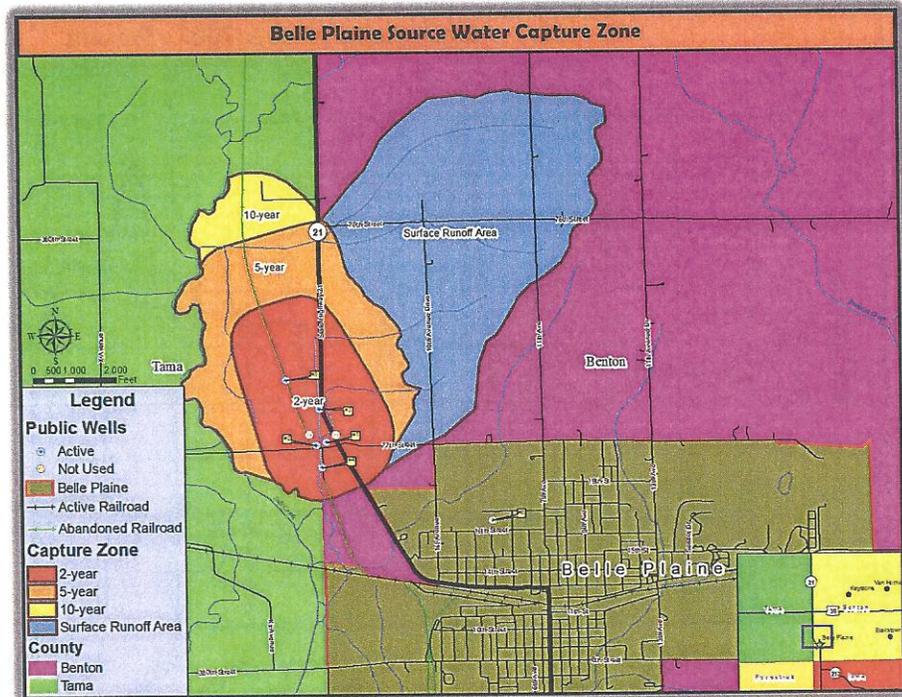


wells. There is a potential, especially during times of flooding, that the river and whatever is in it will impact the drinking water source.

# Belle Plaine Water Department Source Water Protection Plan

## Capture Zone

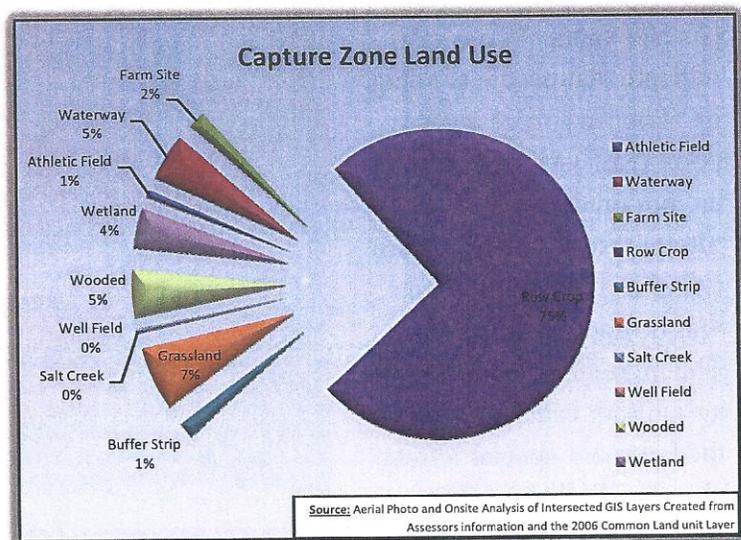
The Belle Plaine well field and capture zone are located to the northwest of the City, west of Iowa Highway 4. The capture zone is modeled using an analytical model. A 2-year, 5-year, and 10-year estimated time of travel areas. These areas were determined using available aquifer inputs that were derived from Belle Plaine's wells, pumping rates, and aquifer information.



A surface runoff was also delineated for the capture zone. Spills and surface runoff have the potential to infiltrate into the shallow alluvial aquifer.

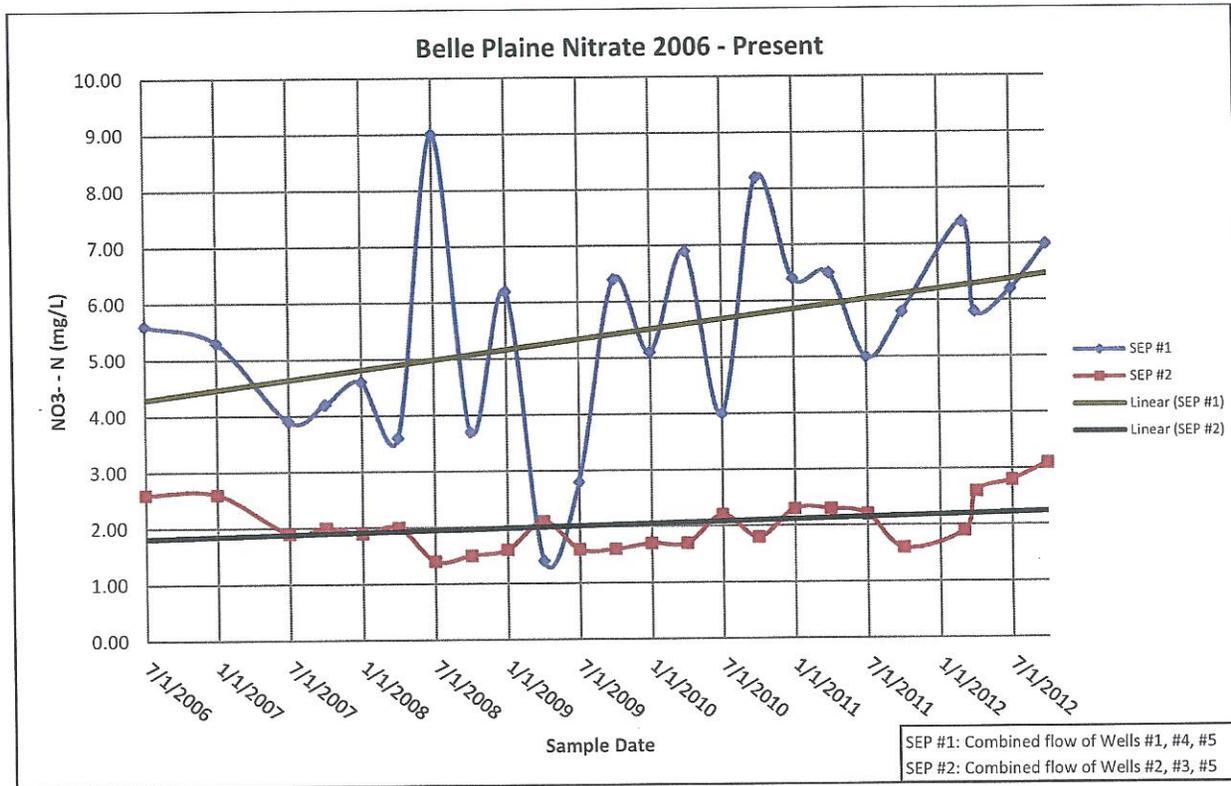
## Potential Contaminant Inventory

The potential contaminant inventory is extremely limited in Belle Plaine. There are only three locations that could impact the drinking water supply from a single point are the septic systems located at the veterinary clinic and the hunting lodge or the veterinary clinic itself. These are the only point sources of contamination in the capture zone.

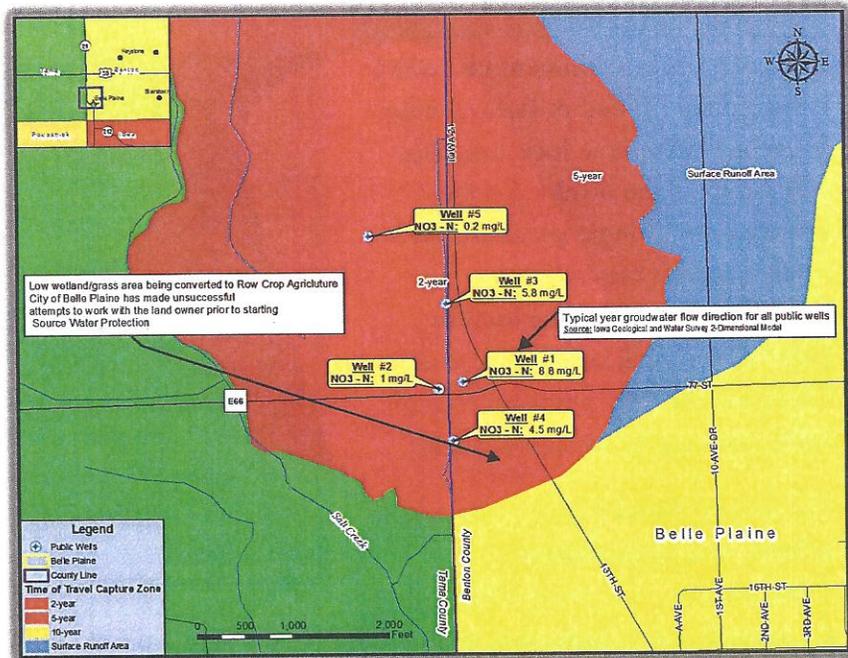


The largest threat to the water supply is from non-point source contaminants. These are threats that are spread over a large area, not coming from a single point. Non-point source contamination

lends itself mostly to the application of fertilizers (commercially applied, home use, or agricultural use) or pesticides/herbicides. All of these are chemicals that could be harmful for humans to ingest if it is unknowingly consumed in large quantities or over a significant period of time.



The above graph represents the nitrate results over the past six years. The results indicate that nitrate is going up faster in source entry point (SEP) #1. The results are not predictable. The nitrate results in SEP #2 are rising at a steady rate, one that is more predictable. The influence on row crop agriculture is best noted in the February special nitrate samples that were taken from the raw water taps at each well. The results are in



the figure to the right. These indicate that the eastern wells are higher in nitrate than the western wells. This is likely due to over pumping the areas and drawing water from deeper in the row crop regions based on IGWS modeling.

Ranking Criteria

The potential contaminants are listed below alphabetically (same addresses are given the same FieldID #). The FieldID# links to the table of potential contaminants and orange numbers on the potential contaminant maps. The potential contaminants were ranked on 3 scales. The first was a 1-5 scale based on the chemical type and storage threat with 5 being the highest. The second was on the basis of the aquifer susceptibility. In Belle Plaine, the aquifer being taken into consideration is an **alluvial** aquifer that is **highly susceptible** to contamination. All potential contaminants were given a ranking of 4 for aquifer susceptibility. The third scale was the proximity to the well. If the contaminant was in the 2-year it was given a 3, 5-year was given a 2 and 10-year was assigned a value of 1. The assigned risk assessment was developed using the total risk number. If a potential contaminant had a total risk value of 9 or larger, it was ranked as a High threat of contamination, 6-8 were ranked as a Moderate threat of contamination and 5 or lower is a Low threat of contamination.

Belle Plaine Water Department Potential Contaminant Source Inventory										
Field ID#	Facility ID#	Facility Name	Site Type	Local Address	Other Information	Status	Well Field	Capture Zone	Total Risk	Risk Assessment
1	N/A	Hunting Lodge	Septic System		Little used hunting lodge	Active	N/A	10-year	7	Moderate
2	N/A	Veterinary Clinic	Septic System		Veterinary Clinic waste disposal system	Active	N/A	5-year	8	Moderate
3	N/A	Veterinary Clinic	Veterinary Clinic		Medical Treatment for Animals	Active	N/A	5-year	8	Moderate

Belle Plaine Water Department Known Private Wells							
ID#	Well ID	Owner	Source	Capture Zone	Depth of Well	Drill Date	Status
1	54898	Dutchman's Hunting Club	IGS Database	10-year	46ft	10/18/2001	Active
2	19382	Dvorak	Permitted Private Wells	Surface Runoff Area	40ft	9/11/1989	Active

Belle Plaine Water Department Potential Non-Point Sources of Contamination				
Contaminant	Location	Type	Size/Amount	Description
Row Crop	Majority of Capture Zone	Agriculture	~1000 acres	~1000 acres of commercial row crop agriculture
Salt Creek	West edge of capture zone	Surface Water	2.5 acres of Meandering Stream Bank	Salt creek is a creek that drains more than 140,000 acres of land north of Belle Plaine, most of which is row crop agriculture

Belle Plaine Source Water Protection Committee								
Name	Affiliation	Email	Phone	Mailing Address	City	State	Zip	
Brent Beste	Iowa Rural Water Assn.	<a href="mailto:bbeste@iowaruralwater.org">bbeste@iowaruralwater.org</a>	515-205-4026	4221 S. 22 <sup>nd</sup> Ave East	Newton	IA	50208	
Bill Daily	City of Belle Plaine – City Administrator	<a href="mailto:cityadminbp@netins.net">cityadminbp@netins.net</a>	319-444-2200	1207 8 <sup>th</sup> Ave	Belle Plaine	IA	52208	
Stephen Beck	City of Belle Plaine – Water Superintendent	<a href="mailto:beckspb@gmail.com">beckspb@gmail.com</a>	319-310-3918	1207 8 <sup>th</sup> Ave	Belle Plaine	IA	52208	
Dave Fish	City of Belle Plaine - Mayor	<a href="mailto:Mayorfish2012@gmail.com">Mayorfish2012@gmail.com</a>	319-444-2200	1207 8 <sup>th</sup> Ave	Belle Plaine	IA	52208	
Larry Jones	NRCS – Toledo Field Office	<a href="mailto:Larry.e.jones@ia.usda.gov">Larry.e.jones@ia.usda.gov</a>	641-484-2702	102 Hwy 30 West	Toledo	IA	52342	

Belle Plaine Source Water Protection Committee							
Name	Affiliation	Email	Phone	Mailing Address	City	State	Zip
James Brown	NRCS – Vinton Field Office	James.brown@ia.usda.gov	319-472-2161	1705 W D St.	Vinton	IA	52349
Amber Sauser	IDNR Field Office #1	Amber.Sauser@dnr.iowa.gov	563-927-2075	909 W Main Suite #4	Manchester	IA	52057

### Focus Area

The primary focus for the City is the area around Well #4. The City is extremely concerned about this area because it is currently being converted from Conservation Reserve Program land to row crop agriculture. This is a concern because of the overlap of Well particle tracks in this area and the possibility of water quality changes due to the increased application of fertilizers and agricultural chemicals. The worry is that with increased application in this area, nitrate concentration in the wells will increase. Well #4, Well #1, and Well #2 are the wells Belle Plaine is concerned about. If this scenario occurs, there is a possibility that the water supply will exceed the EPA maximum contaminant level for nitrate. Belle Plaine is concerned about this possibility because of existing nitrate levels in Well #1 being over 8 parts per million (ppm).

Other areas of concern are educating the public about what and why the water department is currently working on a source water protection plan. The potential that the City will need to act in the future to further protect the water supply by investing in protection measures is possible. Gathering public support before action is better than reacting after problem becomes severe and the utility is required to invest instead of mitigating the threat before it becomes an issue.

Public education is also important because of issues with water quantity availability, specifically during drought periods. Belle Plaine had conservation measures in place from the spring of 2012 until the spring of 2013. The concern is that residents became complacent because water usage returned to pre-conservation levels in 2013. The goal is to work with the residents to change the way they currently irrigate and use water to more conservative methods.

### Management Strategies

Initial Projects Prepared: 7/8/2013

Small Committee Discussed and updated: 8/1/2013

Project List Finalized by the Committee: 8/20/2013

1. **Conduct an informational meeting for landowners and operators in the Capture Zone to discuss issues facing the Belle Plaine Water Department and conservation practices**
  - a. Cost: Staff Time to develop presentations
  - b. Goal: Meeting to discuss SW Protection and conservation practices with Landowners
  - c. Timeline: Summer 2013
  - d. Primary Contact:
    - i. Brent Beste, Source Water Specialist, Iowa Rural Water Assn.
    - ii. Bill Daily, City Administrator, City of Belle Plaine
    - iii. Vinton NRCS Office

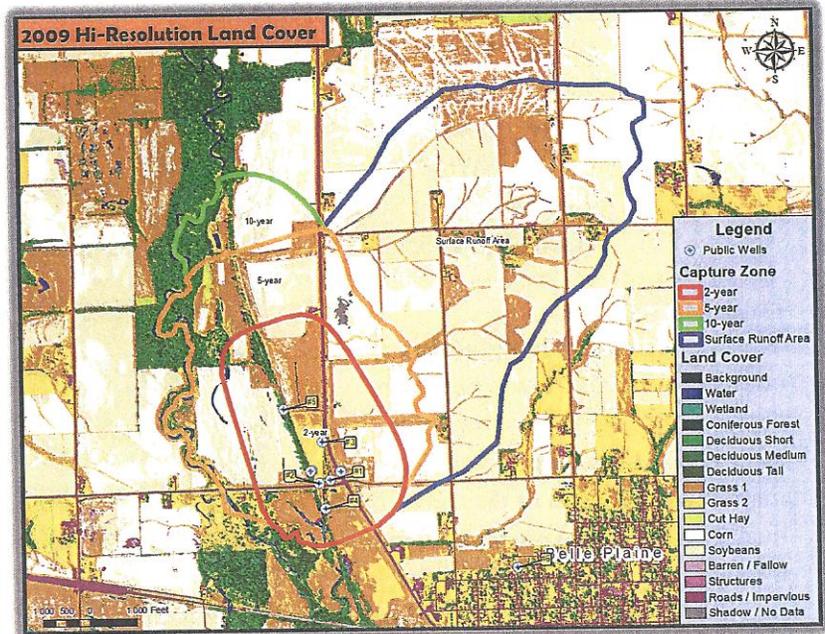
- iv. Toledo NRCS Office
- e. Implementation  
Status: Meeting  
conducted,  
6/20/2013

Project Description

This project is to discuss conservation projects, what source water protection is, and what the goals of Belle Plaine Water Supply are. The recommendation of NRCS was to hold the meeting in place of a letter or inviting them to be on a committee.

Goal

Invite all landowners in the water supply capture zone to a meeting to discuss source water protection, the issues facing Belle Plaine Water Supply, and what conservation practices will work to decrease N and increase infiltration.



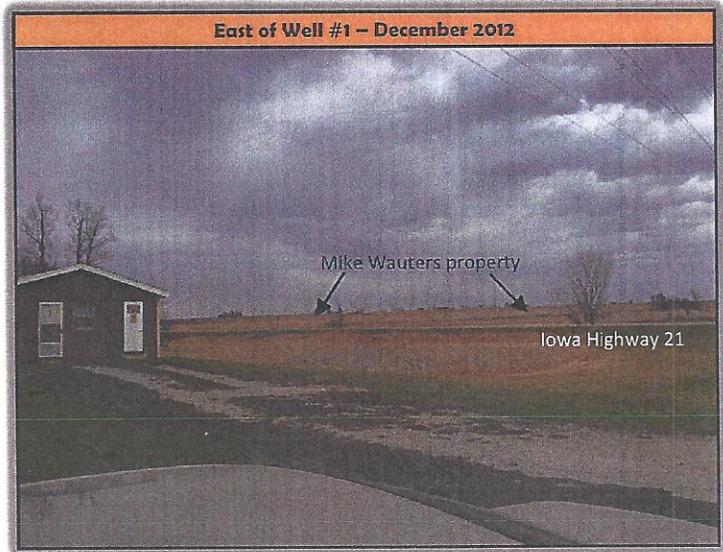
Results

On 6/20/2013 the Source Water Committee conducted a meeting inviting all landowners in the Source Water Area. The only attending land owner (out of 9 invites) was Mike Wauters. Other attendees included a representative from the SWCD and other NRCS staffers from the NRCS offices involved. Brent discussed source water protection, Bill discussed the City’s goals and Jim Brown from the Vinton NRCS office discussed conservation practices. An open discussion occurred with all involved in the meeting. Mike agreed to explore his options in cooperation with the Vinton NRCS Field Office and Benton County Soil and Water Conservation District. Specific options include exploring Wellhead CRP on additional property and cover cropping. Mike operates a majority of the property in the surface runoff area. He along with the Dutchman’s Hunting Club and Golden Grain Enterprises operate a significant majority of the land in the capture zone.

**2. Work with Mike Wauters to install cover crops where he currently operates row crop agriculture land east of the well field and CRP expansion**

- a. Cost:
  - i. Staff Time to develop
  - ii. Possible SWCD Funds for Cover Crops available to seed the field
- b. Goal:
  - i. 40 acres closest to the City
  - ii. Small expansion on existing CRP property
- c. Timeline: Yearly follow up starting Fall 2013 to determine status

- d. Primary Contact:
  - i. Bill Daily, City Administrator, City of Belle Plaine
  - ii. Make Wauters, Land Owner
  - iii. Vinton NRCS  
Field Office
  - iv. Benton County  
SWCD
- e. Implementation Status:  
Internally deliberated



### Project Description

Working with Mike to install this conservation practice will hopefully decrease nutrient loss and improve infiltration. Cover crops work by improving the health of the soil through increased biological process that is lost through tillage. Working with Mike to provide incentives in the establishment of the cover crops over the course of time and to prove that this is actually improving the quality of water will also demonstrate to other landowners and operators in the area that it can be done.

### Goal

Work with Mike Wauters, the land owner and operator to areas east of the well field to plant cover crops to decrease nutrient loss and improve soil health. The ultimate goal is to see a reduction in nitrate in the drinking water wells and an increase in infiltration.

Conduct nitrate monitoring in individual wells (#1, #3) once implementation occurs.

### Results

During the landowner meeting, Mike expressed interest in planting the cover crops by working with the local Soil and Water Conservation District. The District is currently providing a cost share of \$25 an acre up to \$1000 dollars to establish cover crops. Mike's request from the City is to monitor the water quality to determine if cover crops are improving the nitrate levels in the drinking water source.

## **3. General Public Education Initiative**

- a. Cost:
  - i. Staff Time to develop materials
  - ii. Publication costs of materials
- b. Goal:
  - i. Brochures – Lawn Care, Source Water Protection – mailed to residents
  - ii. Website Articles/Information
  - iii. Water Conservation Materials posted on the website
  - iv. Website links to learn about water

- c. Timeline: First distribution in Late Fall 2013
- d. Primary Contact:
  - i. Brent Beste, Source Water Specialist, Iowa Rural Water Assn.
  - ii. Bill Daily, City Administrator, City of Belle Plaine
- e. Implementation Status: Internally deliberated

### Project Description

The goal of this project is to develop and publish educational materials to inform the public about the water supply and initiatives that are being implemented to protect the drinking water supply. These materials could include information articles in the City newsletter about where the water comes from, what local landowners are doing to help protect the drinking water quality, and water conservation measures during normal and drought periods.

### Goal

- Produce water conservation articles with projects that can be implemented by residents
  - Brochures
  - Articles
  - Flyers
- Produce an article about where water comes from
- Work with Mike Wauters to promote his activities, such as an article, to help improve water quality

### Results

Brent is working to develop source water protection educational materials for Belle Plaine Water Supply. Bill will be working on distributing the materials.

- 4. Contact landowners to speak one on one to determine what conservation measures could be implemented to decrease nutrient application on other properties in the Well Field**
  - a. Cost: Staff Time
  - b. Goal: Properties to the south and west of the well fields
  - c. Timeline: Summer 2014
  - d. Primary Contact:
    - i. Steve Beck, Water Operator, City of Belle Plaine
  - e. Implementation Status: Internally deliberated

### Project Description

The committee knows that landowner involvement in the capture zone is necessary to protecting the drinking water source. After attempting a meeting for the landowners/operators and having low participation, the City and Committee need to focus on how to contact and promote the available conservation practices to the landowners that did not attend. This could include phone calls and personal meetings with the landowners or potentially a meeting that is sponsored by the coop and agronomists instead of the City of Belle Plaine.

Goal

The goal is to develop personal working relationships with the property owners and operators in the capture zone by working together to solve the problem with excess nutrients in the groundwater supply.

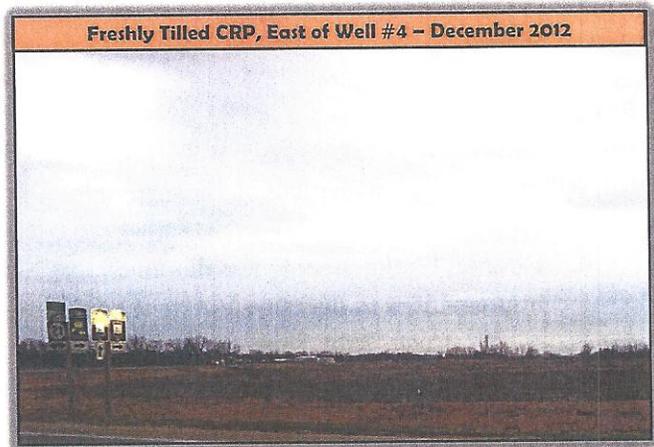
This can be achieved through conservation measures such as nutrient management, potentially cover crops, conservation practices that convert the land back to native vegetation, and other means.

Results

No results to report at this time. Attempts that have been made to work with the targeted landowner by the City of Belle Plaine during and prior to working on the source water protection plan have not worked.

**5. Develop a targeted plan to determine the costs and feasibility of converting the property near Well #4 to a wetland**

- a. Cost: TBD
- b. Goal: Entirety of the property between the old railroad bed and Highway 21 south of Co Road E66
- c. Timeline: Spring 2023
- d. Primary Contact:
  - i. Bill Daily, City Administrator
- e. Implementation Status: Internally deliberated



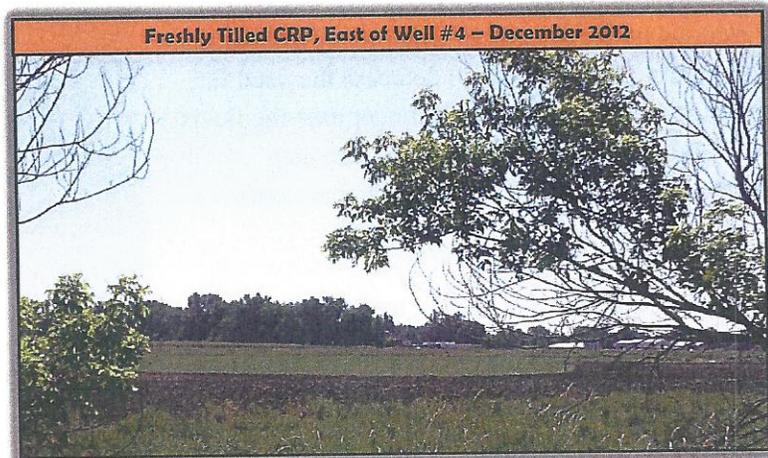
Project Description

The project would be a long term plan to develop the cropped land near Well #4 into a wetland. There are a couple of ways this could occur, starting with landowner interest in selling the land to the City of Belle Plaine. The first would be to encourage the landowner to invest in the land through a 30+ year conservation agreement through the Wetlands Reserve Program (WRP). This would be a no cost option to the City, and the property would be required to remain as a wetland for the time of the conservation program.

The second option would be for the City to purchase the land if it becomes available and convert it to lifetime reserved wetland. There are a number of groups that Belle Plaine could work with and grants available for possible funding for portions of the project. The US Fish and Wildlife Service have developed a wetland to the west of the old railroad tracks. There is the potential that the US Fish and Wildlife service may be able to assist with the project. Another potential source of funding would be through the Watershed Improvement and Review Board or WIRB. Applications for WIRB funds are only accepted if the state legislature allocates money for these projects. This is a state funded program that provides funds to enhance water quality, land purchase and to develop land to protect water resources.

Goal

Convert the row crop land between Iowa 21 and the old railroad bed to a wetland with areas reserved for new water supply wells in the sand and gravel if there the aquifer is deemed suitable for water production and programs allow.



Results

No results to report at this time.

6. **Work with the Iowa DOT to plant grasses in road ditches along Iowa 21 and work with Benton and Tama Counties along E66 and township roads**
  - a. Cost: Cost Share with REAP Program
  - b. Goal: County and State Highway ditches
  - c. Timeline: Spring 2016 (start with Highway 21)
  - d. Primary Contact:
    - i. TBD
  - e. Implementation Status:

Project Description

Planting native grasses instead of typical ditch planting with significant weed infestations could improve water quality and improve infiltration. Iowa DOT operates the Iowa Living Roadway Trust Fund that funds cost share through grant applications to convert road ditches to native plants. Native plants provide better infiltration, promote nutrient use, and beautify the roadside.

Goal

1. Work with IDOT to determine the process to convert roadside to native grasses (2016)
2. Work with Benton and Tama counties to convert E66 road ditches to native grasses (2017)
3. Work with Benton County to convert ditches along township roads to native grasses (2020)

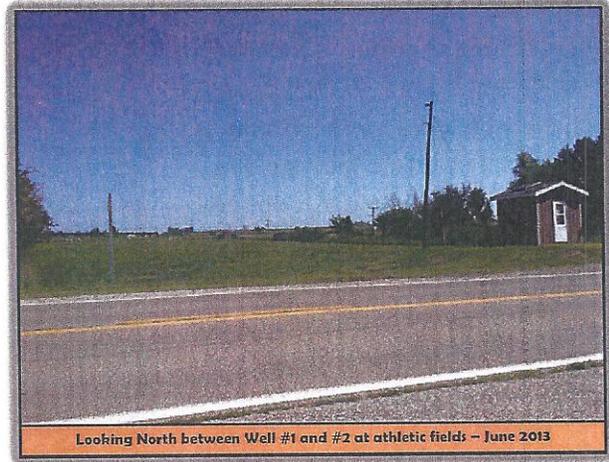
Results

No results to report at this time

7. **If the soccer club disbands and no longer uses the existing soccer fields, replace the turf grass with short native grasses (example: blue grama or buffalograss)**
  - a. Cost: TBD
  - b. Goal: Convert athletic fields to native grasses
  - c. Timeline: If soccer club stops using the fields
  - d. Primary Contact:
    - ii. Steve Beck, Water Operator, City of Belle Plaine
  - e. Implementation Status: Internally deliberated

Project Description

Planting native grasses vs. ornamental grasses (ex. Kentucky Blue Grass) will decrease the need for upkeep if the soccer club no longer uses the fields for athletic purposes. This could also help improve infiltration with longer root systems.



Goal

Plant native grasses to replace turf grasses if the Soccer club stops using it (currently very little use).

Results

No results to report at this time

**8. Install “Water Supply Protection Area” Signs**

- a. Cost: Staff Time
- b. Goal: 3 Signs
- c. Timeline: Fall 2013
- d. Contact:
  - i. Steve Beck, Water Operator, City of Belle Plaine
  - ii. Brent Beste, Iowa Rural Water Association
- e. Implementation Status: Internally deliberated

Project Description

Installing water supply protection area signs will promote awareness of the source water area. The hope is that it will deter illicit activities and illegal dumping in this area.

Goal

Signs near the edge of the time of travel areas

Results

No results to report at this time

**9. Water Conservation Educational Event – Involve Source Water Protection efforts**

- a. Cost: TBD
- b. Goal: Water Conservation event to educate the residents on conservation practices
- c. Timeline: Spring 2015
- d. Primary Contact:
  - i. Bill Daily, City Administrator, City of Belle Plaine
- e. Implementation Status:

### Project Description

The water conservation initiative goal is to work with local businesses and organizations to promote water conservation initiatives in Belle Plaine. My initial idea is to encourage the City to work with a local hardware store/lumber yard etc to promote EPA Water Sense water fixtures (i.e. faucets, toilets, and shower heads). The idea is to promote this as a multiple hour event. Other sponsors could include the City to promote water activities and why we need to conserve. The Soil and Water Conservation District to promote the use of Rain Barrels etc that can be used to use less water around the home. A sprinkler company (or 2) that could demonstrate good lawn watering techniques to save water (i.e. when to water, new products), this could also work for a sprinkler distributor from the hardware store. Another option would be to also speak with the ISU Extension office to speak about turf grass management and how to use less water.

### Potential Partners

- Local Hardware Store/Lumber Yard
  - Speak with them, see if any of their vendors might be interested in promoting their product, maybe their vendors providing some refreshments
- City of Belle Plaine
- IRWA
- ISU Extension
- Benton County Soil and Water Conservation District

### Potential Exhibits

- Where your water comes from
- Water Reuse (Rain Barrels)
- Turf Grass Management
  - Watering
  - Fertilizers
- Product Show Cases
  - Low Flow Toilets
  - Low Flow Shower Heads
  - Etc

### Ideas for the event

- 2hr Event (or longer?)
- Encourage Conservation
- Encourage Protection

### Goal

Conduct an event if the need for extreme water conservation continues until the utility is able to meet demand during extremely dry periods.

### Results

No results to report at this time.

# Source Water Assessment for Belle Plaine (PWS#610099) Alluvial Aquifer



**Source Water Protection**

The purpose this Source Water Protection (SWP) "Phase I" assessment is to:

- Define your source water area and susceptibility;
- locate, inventory, and rank potential contaminant sources within your source water area;
- provide the results to the public for improved protection of your drinking water.

**Introduction**

This Source Water Protection (SWP) "Phase I" assessment is meant to provide information and be used as a tool to help protect the quality and quantity of your drinking water. Within it you will find an inventory of your wells, tables showing potential contamination sources within your source water area, and maps showing your system's source water information.

The source water area defined in this report is the region directly linked to your water supply, and where land use changes have the greatest influence on your drinking water quality. Your source water area was defined based on scientific information available to the Iowa Department of Natural Resources - Iowa Geological and Water Survey (IDNR-IGWS).

This "Phase 1" source water assessment by no means protects your drinking water. To protect your drinking water your system should develop and implement a source water protection plan. Protection measures are different for each system, but commonly include reserving areas for future wells, cleaning up contaminants, and converting portions of your source water area to native vegetation. Further information on how to protect your drinking water, including guidebooks and online resources, can be found at [www.iowasourcewater.org](http://www.iowasourcewater.org).

**This SWP assessment includes the following sections:**

1. Defining Your Source Water Area
2. Susceptibility of Your Source Water Area
3. Contaminant Sources within Your Source Water Area
4. Ranking Contaminant Sources
5. How to Protect Your Drinking Water
6. Consumer Confidence Report

**Section 1: Defining Your Source Water Area**

Accurate well, aquifer, and pumping information is critical to providing the best estimate of your source water area. According to our records, Belle Plaine has five active public wells open in the sand and gravel of the Middle Iowa River alluvial aquifer. The table below shows your well and aquifer information. If you believe the table is wrong, please contact the Source Water Protection program at [www.iowasourcewater.org](http://www.iowasourcewater.org) or 319-335-1575.

W#	Local Name	Depth (ft.)	Const. date	Status	Aquifer	Aquifer thick. (ft.)	SWL (ft.)	PWL (ft.)	Rate (gpm)
<u>36435</u>	#5	37	1/1/1977	Active	Alluvial	0	12	19	120
<u>36438</u>	#3	42	1/1/1950	Active	Alluvial	15	9	15	82
<u>36961</u>	GRAVEL-PACKED	32	1/1/1924	Not Used	Alluvial	0	10	11	750
<u>36960</u>	GRAVEL-PACKED	32	1/1/1924	Not Used	Alluvial	0	10	11	750

Iowa Source Water Protection Program	Assessment
--------------------------------------	------------

36963	SANDPOINT WELL	32	1/1/1924	Not Used	Alluvial	0	10	11	750
36962	SANDPOINT WELL	32	1/1/1924	Not Used	Alluvial	0	10	11	750
36436	#1	42	1/1/1945	Active	Alluvial	0	20	32	178
36437	#2	42	1/1/1945	Active	Alluvial	18	15	21	169
12850	#4	42	1/1/1961	Active	Alluvial	10	11	19	173
36439	#6	313	1/1/1988	Not Used	Devonian	0	0	0	0

**Source Water Glossary**

**Aquifer:** An underground water-bearing layer that provides a usable quantity of water.

**Source Water Area:** An estimation of the area contributing water to your public wells.

**Capture zone:** A computer modeled source water area, typically using 2-5-and 10 year time of travel periods.

**Time of travel:** A duration of time specified to determine the distance and area that water will travel.

**Susceptibility:** A measure of an aquifer’s potential to become contaminated. Does not imply either good or poor water quality.

**Confining layer:** A layer of material which slows the movement of water.

Sufficient information was available concerning your wells, aquifer and pumping conditions to use a computer model to estimate your source water area. For your water supply, the source area was divided and prioritized to show the areas we estimate groundwater to flow during “time of travel” periods, typically 2, 5, and 10-years. These source areas for your facility were estimated using an analytical element model for the purpose of delineating source water protection areas. The model requires certain input data for your aquifer, wells, and pumping rate, listed below:

- Gradient: 0.001 ft./ft.
- Flow Direction: 287
- Porosity: 0.25
- Transmissivity: 3800 ft.2/day
- Aquifer Thickness: 14 ft.
- Average Gallons per Day: 291000.

In addition to the modeled capture zone mentioned previously, surface runoff areas that contribute to the modeled capture zone were also delineated. Contaminant spills and runoff have the potential to infiltrate into your source aquifer through the floodp

**Section 2: Susceptibility of Your Source Water Area**

Research by IDNR-IGWS has determined that thickness of confining layers such as till, clay, and shale between the aquifer and the land surface provide a good measure of aquifer susceptibility. Aquifers overlain by thicker confining beds are less susceptible to contamination than aquifers overlain by thin confining beds. The table below summarizes susceptibility by confining layer thickness.

Confining layer thickness	Susceptibility designation
<25 feet	Highly susceptible
25 to 50 feet	Susceptible
50 to 100 feet	Slightly susceptible
>100 feet	Low susceptibility

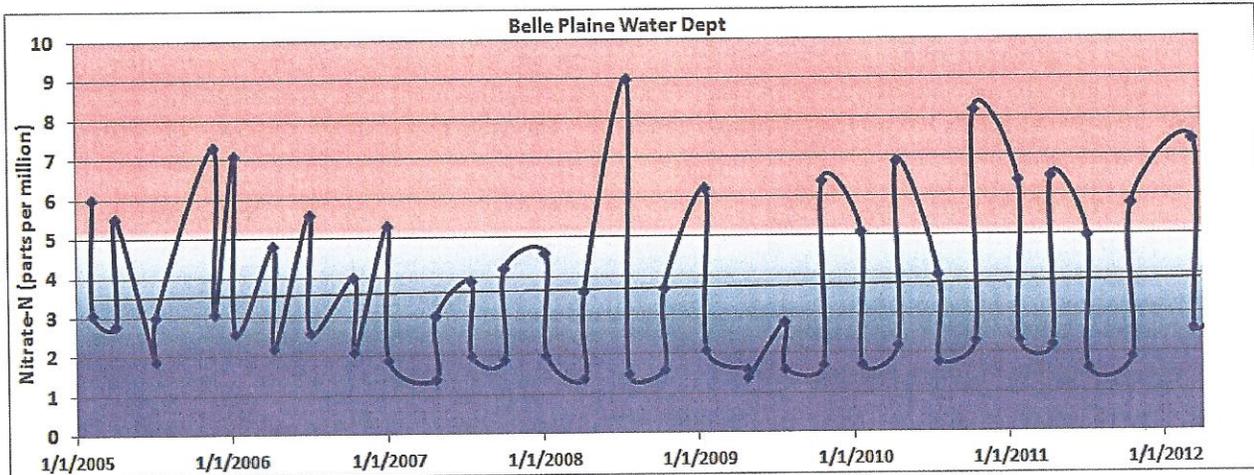
Based on our data, your wells have a cumulative confining layer thickness of less than 25 feet. Your aquifer was therefore determined to be highly susceptible to surface contamination.

Another method for determining the susceptibility of your aquifer is by using nitrate concentrations to evaluate the risk of surface contamination. Wells with higher nitrates typically have less protection from contamination at the land surface and are more at risk than wells with low nitrates. Based on our records, finished water at Belle Plaine has a six-year average nitrate-N concentration of 3.54 parts per million (ppm), based on 42 total samples.

Nitrate concentrations in your public water supply are generally medium. The concentrations measured somewhat lower than the EPA maximum contamination level (MCL) of 10 ppm, indicating some contamination

from surface nonpoint, fertilizer, or septic sources. Elevated nitrate concentrations can disrupt the electron transport system and cause methemoglobinemia, or blue baby syndrome, in infants.

The chart on the next page shows historic nitrate trends in Belle Plaine through time. Your public water supply's nitrate-N concentrations show a relatively stagnant trend of 0.04 ppm per year during the past six years (2005-2011). Your trend indicates little change over the past few years. Make sure to keep track of results to detect issues as they arise.



**Section 3: Contaminant Sources within Your Source Water Area**

To identify potential contaminant sources we searched electronic databases for facilities and land uses that fell inside your source water area. The databases used for the inventory are described in Table 1 of the *Iowa Source Water Protection plan*. The contaminant source inventory includes facilities and land uses that have been known to contaminate groundwater.

Table 1 lists the potential contaminant sources we found in your source water area. The map numbers correspond to the contaminant source list in Table 1. The potential contaminant sources are derived from databases that have varying degrees of locational accuracy, and therefore could be mapped in the wrong area or omitted from the map entirely. For this reason, locational accuracy is noted at the end of the table. You or other residents may be aware of additional contaminant sources that should be included, feel free to modify this report to reflect your knowledge.

For many aquifers, particularly those overlain by thick confining layers, the greatest threat of contamination to the aquifer is through existing wells that penetrate the confining layers. For this reason, Table 2 lists all known wells, owners, and locations identified in your source water area. A numbered symbol shown on the map at the end of this report identifies well locations. Well locations are derived from databases that have varying degrees of accuracy, and therefore could be mapped in the wrong area or omitted from the map entirely. For this reason, locational accuracy is noted at the end of the table 2.

In addition to the specific "point" sources listed in Table 1, nonpoint sources of contamination also exist in your source water area. In Iowa, a potentially significant nonpoint source of contamination is row crop agriculture. Your source water area was determined to have over 50% of its area in row crop agriculture in 2011. Common potential contaminants from row crop agriculture include nitrate, pesticides, and phosphorus. If your water chemistry indicates elevated nitrate-N levels, we suggest your community pursue non-point management practices such as conservation reserve program or permanent easements within your source water area. Land use percentages and acreages are presented in Table 3.

**Section 4: Ranking Contaminant Sources**

We have attempted to prioritize the relative risk based on a three component ranking system; 1) the location of the potential contaminant source in the source water area, 2) the susceptibility ranking of the aquifer to contamination, and 3) the type of contaminant source. Points are assigned for each category and a cumulative score calculated for each potential contaminant source using the scores for each of the three components. Higher numbers always correspond to higher risk in this report.

1) Location of potential contaminant sources

Your potential contaminant sources are ranked from 1-3 based on the capture zone they are located in, with greater weight given based on proximity to the well. Fixed radius capture zones also received greater risk as they represent unknown or poorly known hydrogeologic conditions. The table below shows the risk score assigned to each source water area.

Source Water Area	Risk score
2-year time of travel, hydrologic boundary, fixed radius, 1-mile, modified karst - high	3
5-year time of travel, modified karst – medium	2
10-year time of travel, aquifer retrieval area, surface runoff area	1

2) Aquifer susceptibility to contamination

Susceptibility rankings were given scores to give more priority to aquifers with less confining layers. Aquifer susceptibilities were given ranks of 1-4, from low susceptibility to highly susceptible. If your well depth or confining layer thickness is unknown, the source water area was automatically designated “highly susceptible” and ranked 4.

3) Land-use type

The land-use type combines the potential for different facility classes or land uses to release contaminants with an estimate of the toxicity of the contaminants that may be released. Land-use risks are assigned values from 1 to 5 (least to greatest risk).

The final “Risk Score” for the source water area is the result of summing the three components of relative risk. For a list of land-use types and additional information regarding the ranking classification, please refer to the *Iowa Source Water Protection plan*.

The goal for ranking potential contaminants is to provide your system with a list to help prioritize potential risks. These risks can only be addressed through local initiatives and strategies started by your community. To begin a SWP plan, it is up to your local community to decide which potential contaminant sources carry the most risk, and to proactively engage problems you might find to your drinking water. The risk rankings provided in this report are only a guide; the final decision on the priority of potential contaminant sources rests with your local source water protection team.

**Section 5: How to Protect Your Drinking Water**

This Source Water Phase I assessment only provides information on your source water area and contaminants. Your community is responsible for taking the necessary action to ensure you have clean drinking water for future generations. To do this the Iowa Source Water Program strongly encourages you to start a Source Water Protection Plan. A SWP plan is different for each community, but the steps needed to complete one are the same for every system. Most steps have already been outlined and partially completed in the SWP “Phase 1” assessment:

[Steps for completing a Source Water Protection plan](#)

- Step 1:** Organize a source water team
- Step 2:** Identify your source water areas
- Step 3:** Inventory well and contaminant sources
- Step 4:** Assess and rank contaminant sources
- Step 5:** Develop an action plan
- Step 6:** Construct or update your emergency response plan
- Step 7:** Submit and Implement your SWP Plan

If your community is interested in protecting your drinking water, there are plenty of free resources available to help guide you through this process, [www.iowasourcewater.org](http://www.iowasourcewater.org) has many online resources available, including a detailed Guidebook and Workbook catered for Iowa community water supplies. Please contact Chad Fields (319-335-2083) of the Source Water Program for further information.

### Section 6: Consumer Confidence Report

As the agency responsible for conducting drinking water programs in the state of Iowa, IDNR must provide each public water supply with language to be included in their Consumer Confidence Report regarding source water protection. The following language, at a minimum, must be included in each Consumer Confidence Report you produce from now on:

“The Belle Plaine water supply obtains its water from the sand and gravel of the Middle Iowa River alluvial aquifer. The alluvial aquifer was determined to be highly susceptible to contamination because the characteristics of the aquifer and overlying materials provide little protection from contamination at the land surface. Belle Plaine’s alluvial wells will be highly susceptible to surface contaminants such as leaking underground storage tanks, contaminant spills, and excess fertilizer application. A detailed evaluation of your source water was completed by the Iowa Department of Natural Resources, and is available from the Water Operator at 319-444-2200.”

You may modify this language or include additional information if you so desire, but you must identify the source of your system’s drinking water and identify known sources of potential contamination.

Table 1. Inventory and ranking of potential contaminant sources.

**Belle Plaine Public Water Supply (610099)**  
**Phase I - Contaminant Source Inventory and Assessment**

Aquifer: Alluvial		Highly Susceptible ( <i>risk factor = 4</i> )		Site Type		Site Link <sup>1</sup>	Program ID	Site Address	Loc'n Acc <sup>2</sup>	Land Use Risk <sup>3</sup>	Risk Score <sup>4</sup>
Map No.	Site Name										
<b>Capture zone: 2-year time of travel (<i>risk factor = 3</i>)</b>											
1	Belle Plaine Water Dept	Above Ground Fuel Storage				<a href="#">310370344</a>	AST14032	1207 8th Ave, Elberon, IA 52225	good	5	12

<sup>1</sup>ID's are hyperlinked to detailed contaminant source information where available. Click once to open the spreadsheet, then click again to follow the link.

<sup>2</sup>Estimated horizontal accuracy: < 25m. = good; 25m. to 50m. = fair; >50m. = poor

<sup>3</sup>Score range: 1 to 5, see Table 3 of the Iowa Source Water Protection and Assessment plan

<sup>4</sup>Sum of land use, capture zone, and aquifer susceptibility risk factors

Table 2. Inventory of water wells not used in source water area.

**Belle Plaine Public Water Supply (610099)**

**Phase I - Inventory of Wells**

Map No.	Well ID <sup>1</sup>	Well Owner	Well ID Source	Depth (ft.)	Date Drilled/ permitted	Well Location	Locational Accuracy <sup>2</sup>
<b>Aquifer: Alluvial Highly Susceptible (risk factor = )</b>							
<b>Capture zone: 2-year time of travel (risk factor = 3)</b>							
1	<u>11152</u>	City Of Belle Plaine	Water Use Permit Wells	37	1/1/1977	T82N, R13W, Sec. 13	poor
2	<u>11150</u>	City Of Belle Plaine	Water Use Permit Wells	42	1/1/1950	T82N, R13W, Sec. 13	poor
3	<u>11149</u>	City Of Belle Plaine	Water Use Permit Wells	42	1/1/1945	T82N, R13W, Sec. 13	poor
4	<u>11148</u>	City Of Belle Plaine	Water Use Permit Wells	42	1/1/1945	T82N, R12W, Sec. 18	poor
5	<u>11151</u>	City Of Belle Plaine	Water Use Permit Wells	42	1/1/1961	T82N, R12W, Sec. 19	poor
6	<u>12577</u>	Belle Plaine, City Of	IGS well database	40	1/1/1960	T. 82N., R. 12W., Sec. 19, NW, NW	poor
7	<u>12578</u>	Belle Plaine, City Of	IGS well database	40	1/1/1960	T. 82N., R. 12W., Sec. 19, NW, NW	poor
8	<u>12576</u>	Belle Plaine, City Of	IGS well database	40	1/1/1960	T. 82N., R. 12W., Sec. 19, NW, NW	poor
9	<u>12579</u>	Belle Plaine, City Of	IGS well database	70	1/1/1960	T. 82N., R. 12W., Sec. 19, NW, NW	poor
10	<u>12575</u>	Belle Plaine, City Of	IGS well database	40	1/1/1960	T. 82N., R. 12W., Sec. 19, NW, NW	poor
<b>Capture zone: 10-year time of travel (risk factor = 1)</b>							
1	<u>54898</u>	Dutchman's Hunting Club	IGS well database	46	10/18/2001	T. 82N., R. 13W., Sec. 12, SE, SE	poor
2	<u>2093483</u>	Lodge, Salt Creek	Private well tracking system	-99	<Null>	T. 82 N., R. 13W., Sec. 12, SW, SW, NW, SW	good
3	<u>57834</u>	Salt Creek Hunting Lodge	IGS well database	40	7/17/2003	T. 82N., R. 13W., Sec. 12, SE, SE, SE	poor
<b>Capture zone: surface runoff area (risk factor = 1)</b>							
1	<u>19382</u>	Dvorak	Permitted private wells	40	9/11/1989	T. 82 N., R. 12 W., Sec. 7, SW, SE	poor

<sup>1</sup>Well IDs are hyperlinked to detailed well information where available.

Click once to open the spreadsheet, then click again to follow the link.

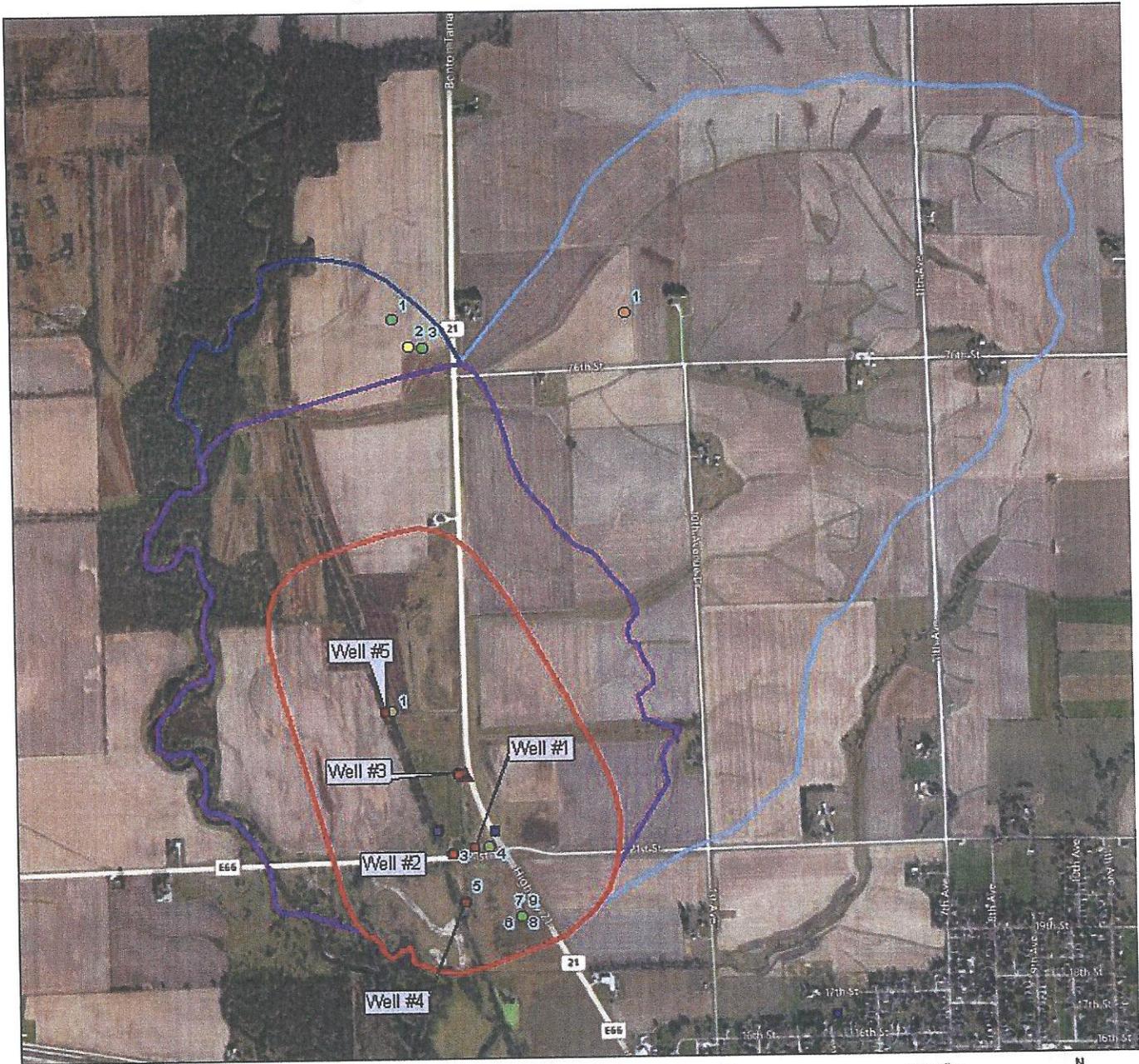
<sup>2</sup>Estimated horizontal accuracy: < 25m. = good; 25m. to 50m. = fair; >50m. = poor

Table 3. Land cover within your source water area.

**Belle Plaine - Alluvial aquifer Highly Susceptible**  
**Summary of land cover types (2010) by percentage of total**

Capture zone	Row Crop	Small Grains	Alfalfa	Grassland	Wetlands	Water	Developed Areas	Forested Areas	Total Acres
2-year	39.1	0.1	0.1	44.8	2.0	0.0	13.1	0.8	304
5-year	55.3	0.0	0.8	26.4	9.6	0.1	5.2	2.7	300
10-year	51.6	0.0	0.3	15.0	17.8	0.3	4.1	10.9	81
surface runoff area	83.9	0.0	0.0	7.6	0.0	0.0	8.3	0.2	748

# Belle Plaine Water Department 61009 Alluvial Aquifer - Source Water Protection Area



**Public Wells**

- Active
- Not Used
- Standby

**Source Water Areas**

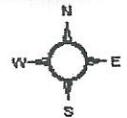
- ▭ 2-Year Capture Zone
- ▭ 5-Year Capture Zone
- ▭ 10-Year Capture Zone
- ▭ Surface Runoff Area

**Contaminant Sources**

- ▲ Above Ground Fuel Storage

**Other Wells**

- IGS well database
- Permitted private wells
- Private well tracking system
- Water Use Permit Wells



Iowa  
**SOURCE**  
**WATER**  
Protection  
Report Created: 6/11/2012

Belle Plaine Water Department  
Public Water Supply Well Inventory

Source: Iowa Geologic and Water Survey Source Water Tracker

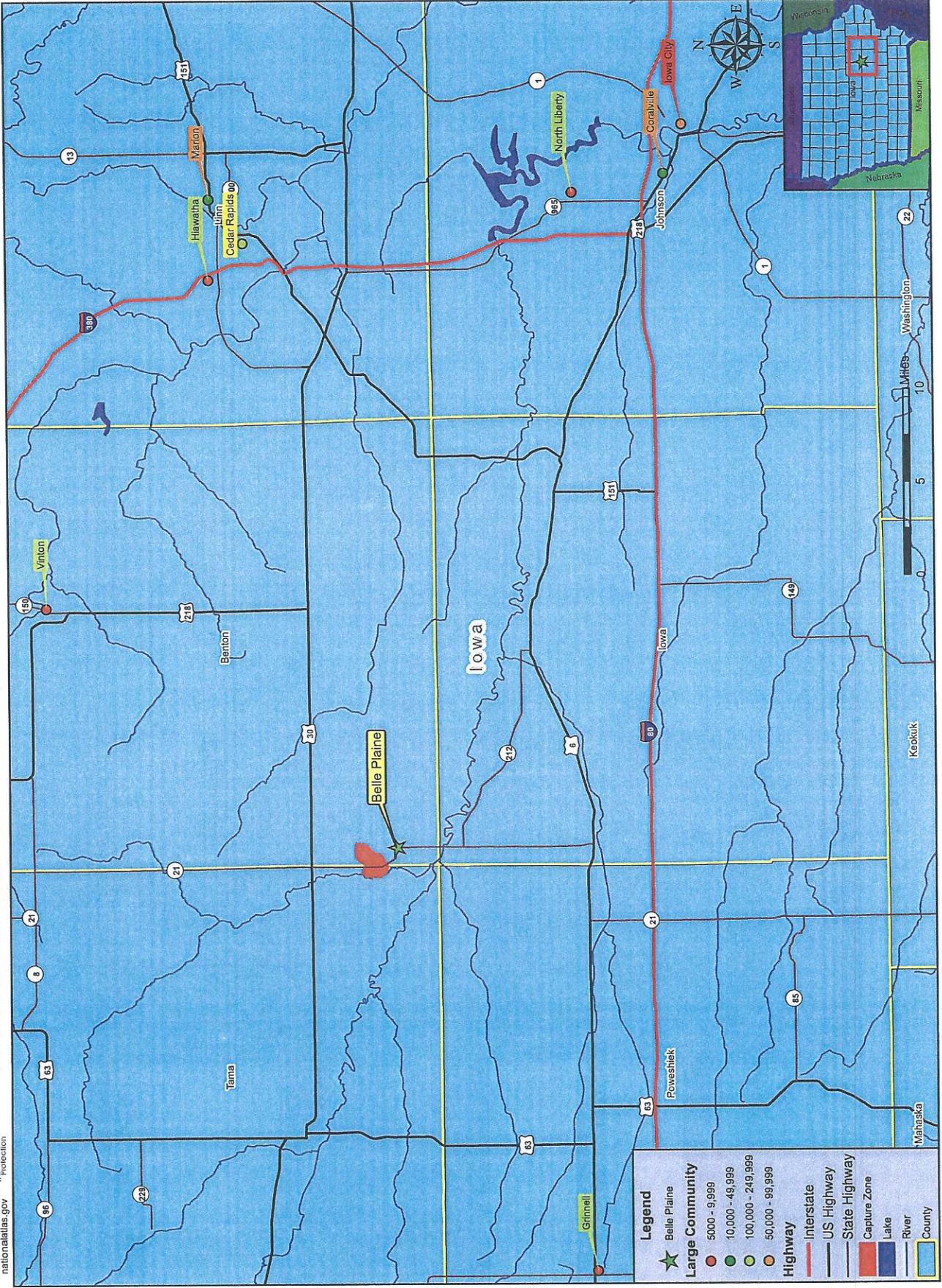
GeoSAM#	DNR Well Tag	Local #	Drill Date	Status	Aquifer	Elevation	Total Depth
36436	1010079	#1	1/1/1945	Active	Alluvial	779	42
36437	1010080	#2	1/1/1945	Active	Alluvial	778	42
36438	1010081	#3	1/1/1950	Active	Alluvial	779	42
12850	1010082	#4	1/1/1961	Active	Alluvial	780	42
36435	1010083	#5	1/1/1977	Active	Alluvial	785	37
36439	1010084	#6	1/1/1988	Emergency	Devonian	852	313
36961		#Gravel-Packed Well	1/1/1924	Not Used	Alluvial	780	32
36960		#Gravel-Packed Well	1/1/1924	Not Used	Alluvial	780	32
36963		#Sandpoint Well	1/1/1924	Not Used	Alluvial	780	32
36962		#Sandpoint Well	1/1/1924	Not Used	Alluvial	780	32

Local #	PWL	Yield	Date of Pump Test	Geology	Strip Log	Drill Log	Casing Notes
#1	32	178	1/1/2001	No	No	No	14" Diameter
#2	21	169	1/1/2001	No	No	No	14" Diameter
#3				No	No	No	16" Diameter
#4				No	No	No	No casing information
#5	19	120	1/1/2001	No	No	No	12" Diameter
#6				No	No	No	10" Diameter to 275'
#Gravel-Packed Well	11	750	1/1/1941	No	No	No	8" Diameter
#Gravel-Packed Well	11	750	1/1/1941	No	No	No	8" Diameter
#Sandpoint Well	11	750	1/1/1941	No	No	No	8" Diameter
#Sandpoint Well	11	750	1/1/1941	No	No	No	8" Diameter

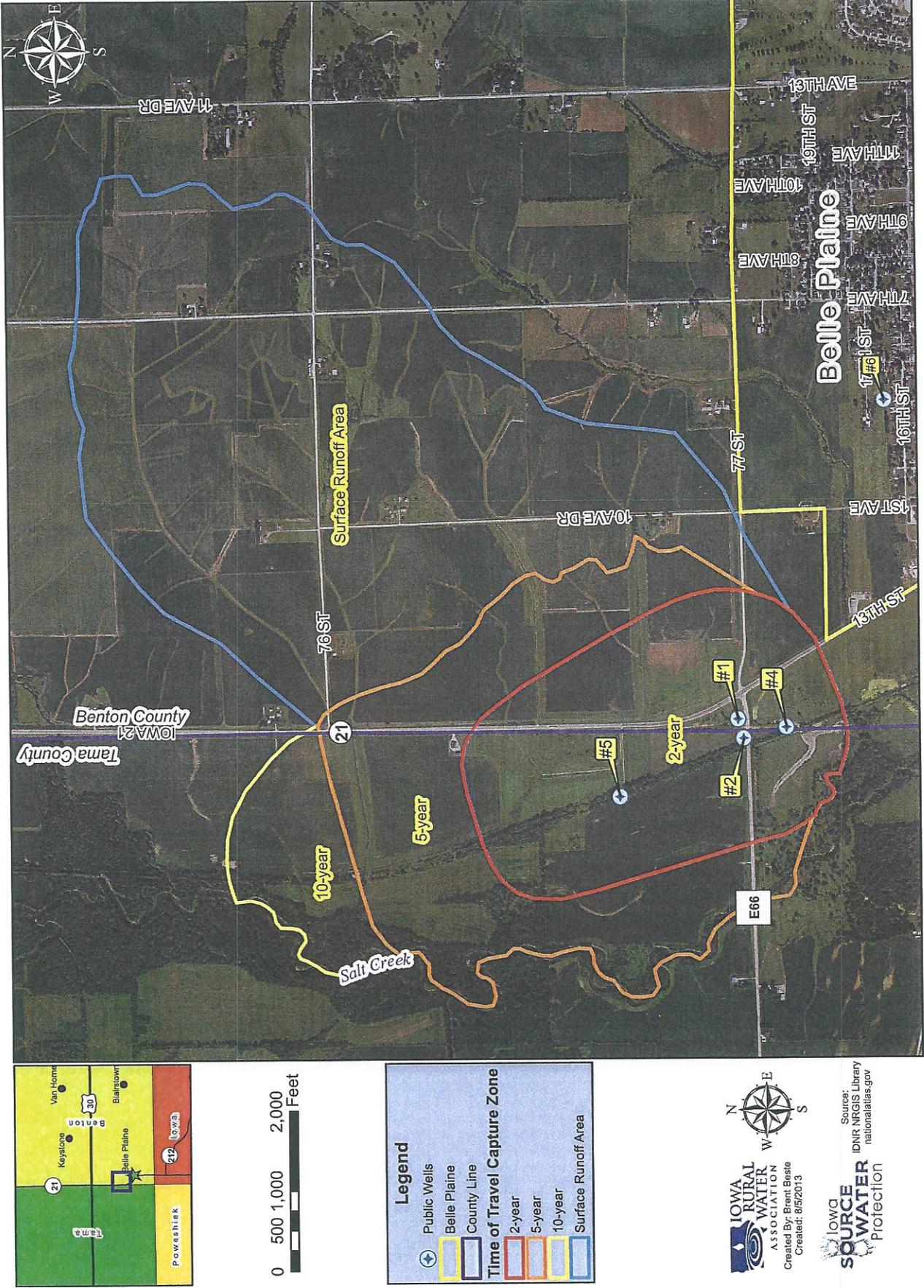
# Location of the Belle Plaine, IA Water Supply PWS# 0610099

Source: IDNR NRGIS Library  
[nationaliaaas.gov](http://nationaliaaas.gov)

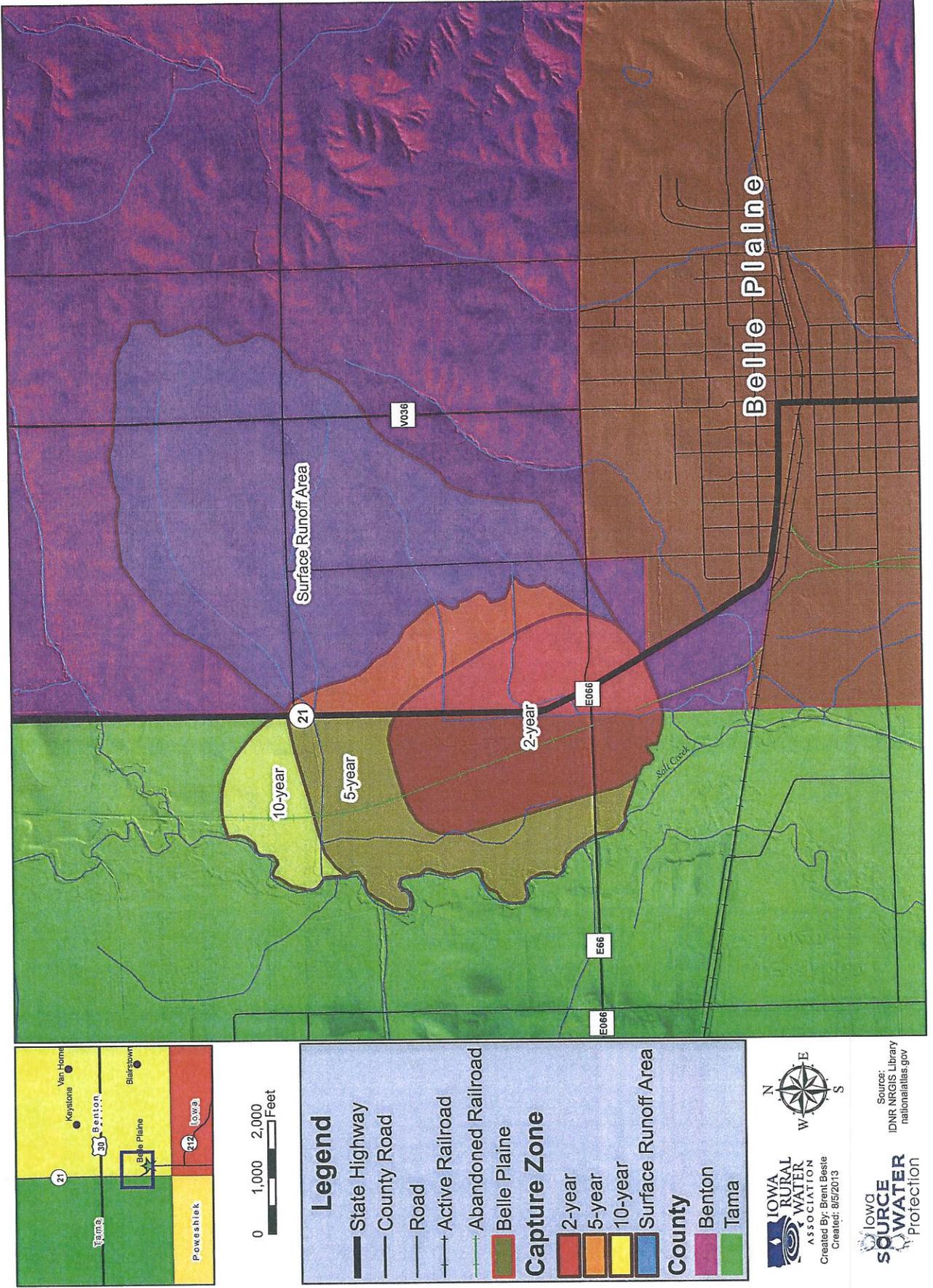
Created By: IOWA RURAL  
 Brent Besse  
 WATER ASSOCIATION  
 7/30/2013



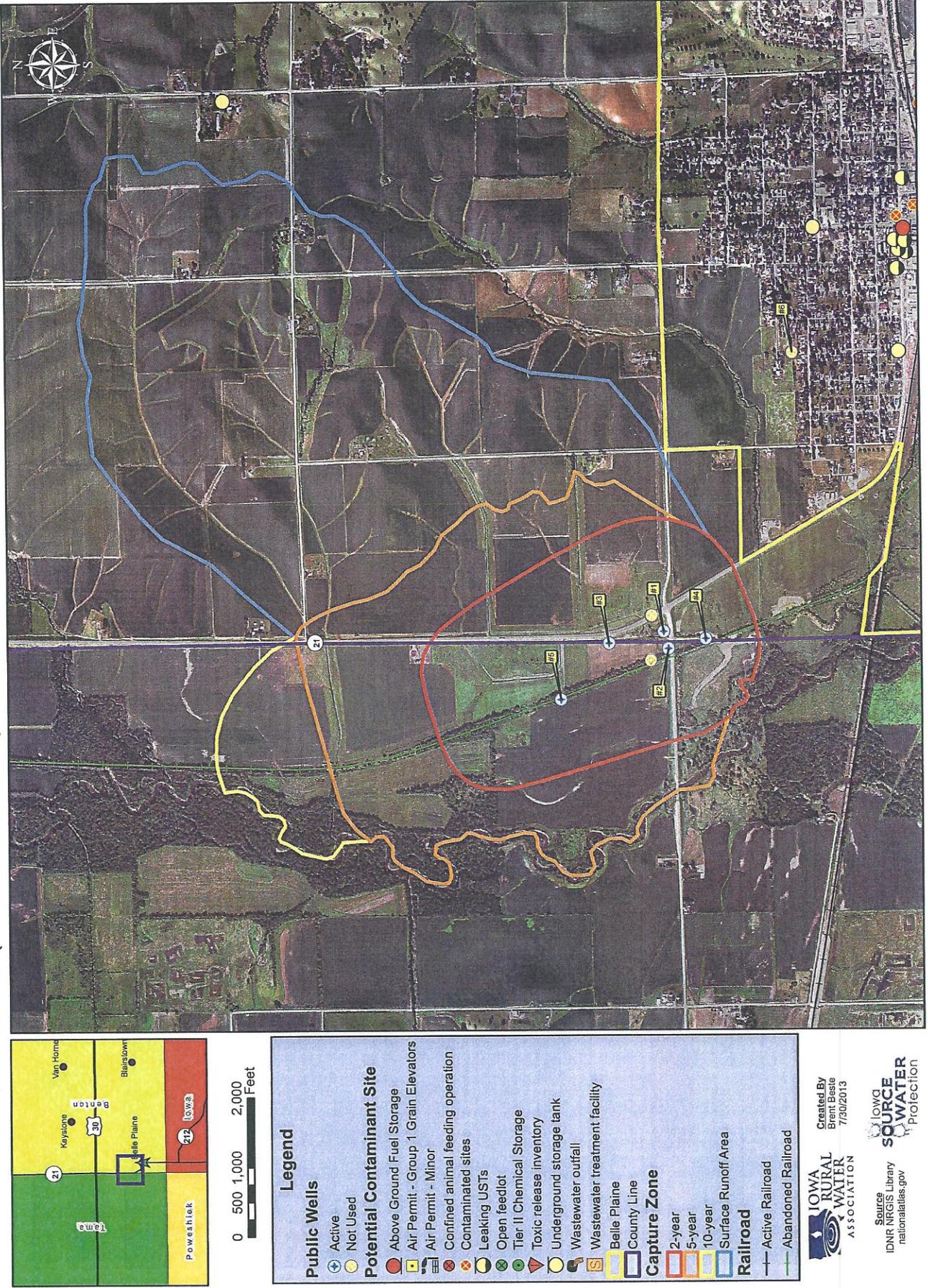
# Belle Plaine Water Supply (PWS# 0610099) Time of Travel Capture Zone



# Belle Plaine (PWS# 0610099) Time of Travel Capture Zone



# Belle Plaine (PWS# 0610099) Point Sources of Potential Contamination



Created By  
Brent Besie  
7/30/2013

Source  
IDNR NRGIS Library  
nationalatlas.gov

IOWA RURAL WATER ASSOCIATION

LOWA SOURCE WATER Protection

# Belle Plaine Hi-Resolution Land Cover - 2009

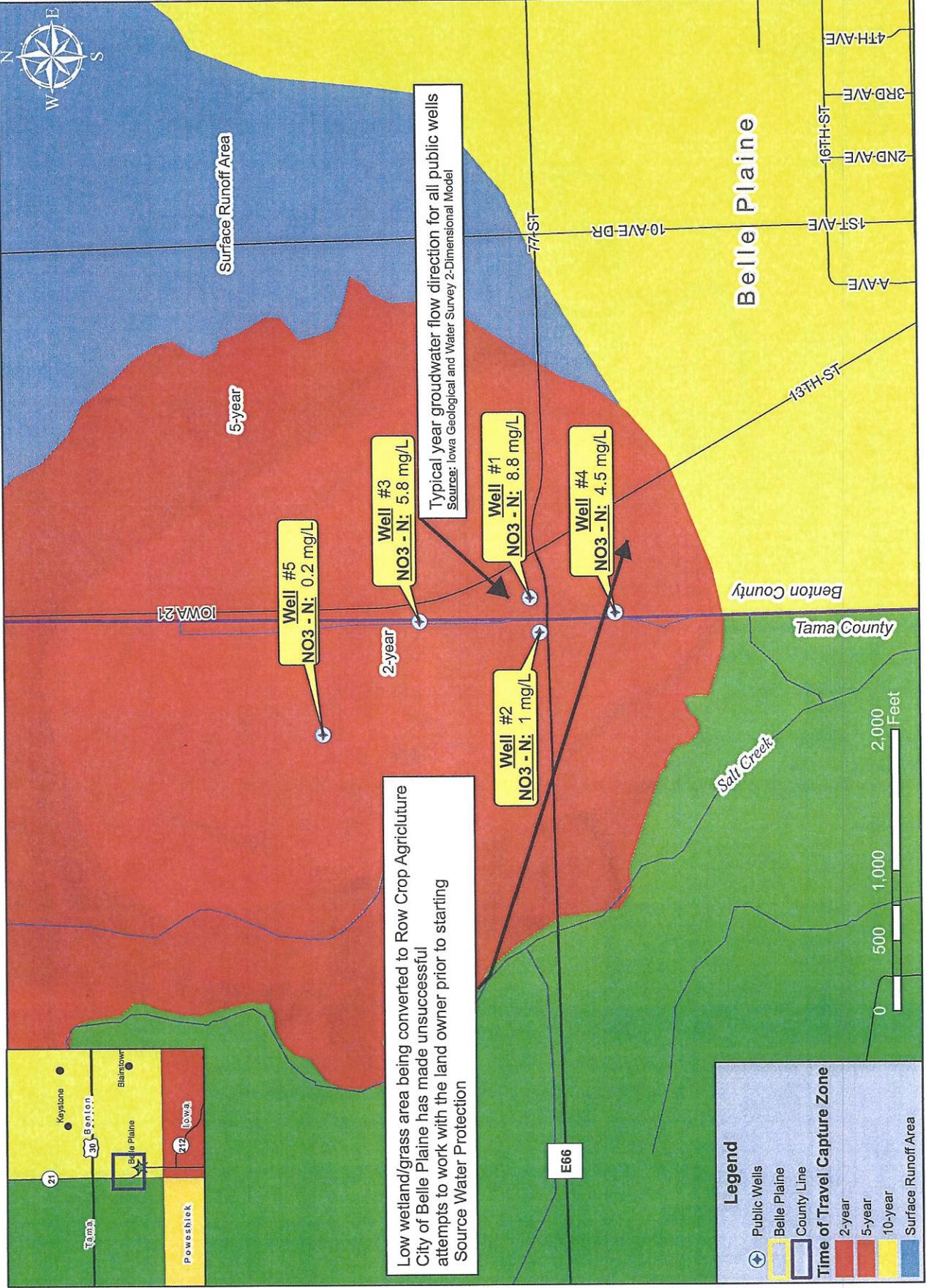
Created By  
IOWA RURAL  
Brent Besie  
RURAL WATER  
ASSOCIATION  
7/30/2013

Source  
IDNR NRGIS Library  
SOURCE  
nationalatlas.gov  
Protection



# Belle Plaine Special Nitrate Samples - Feb. 2013

SOURCE LIBRARY  
IOWA RURAL WATER ASSOCIATION  
nationalities.gov



Low wetland/grass area being converted to Row Crop Agriculture  
City of Belle Plaine has made unsuccessful attempts to work with the land owner prior to starting Source Water Protection

Typical year groundwater flow direction for all public wells  
Source: Iowa Geological and Water Survey 2-Dimensional Model

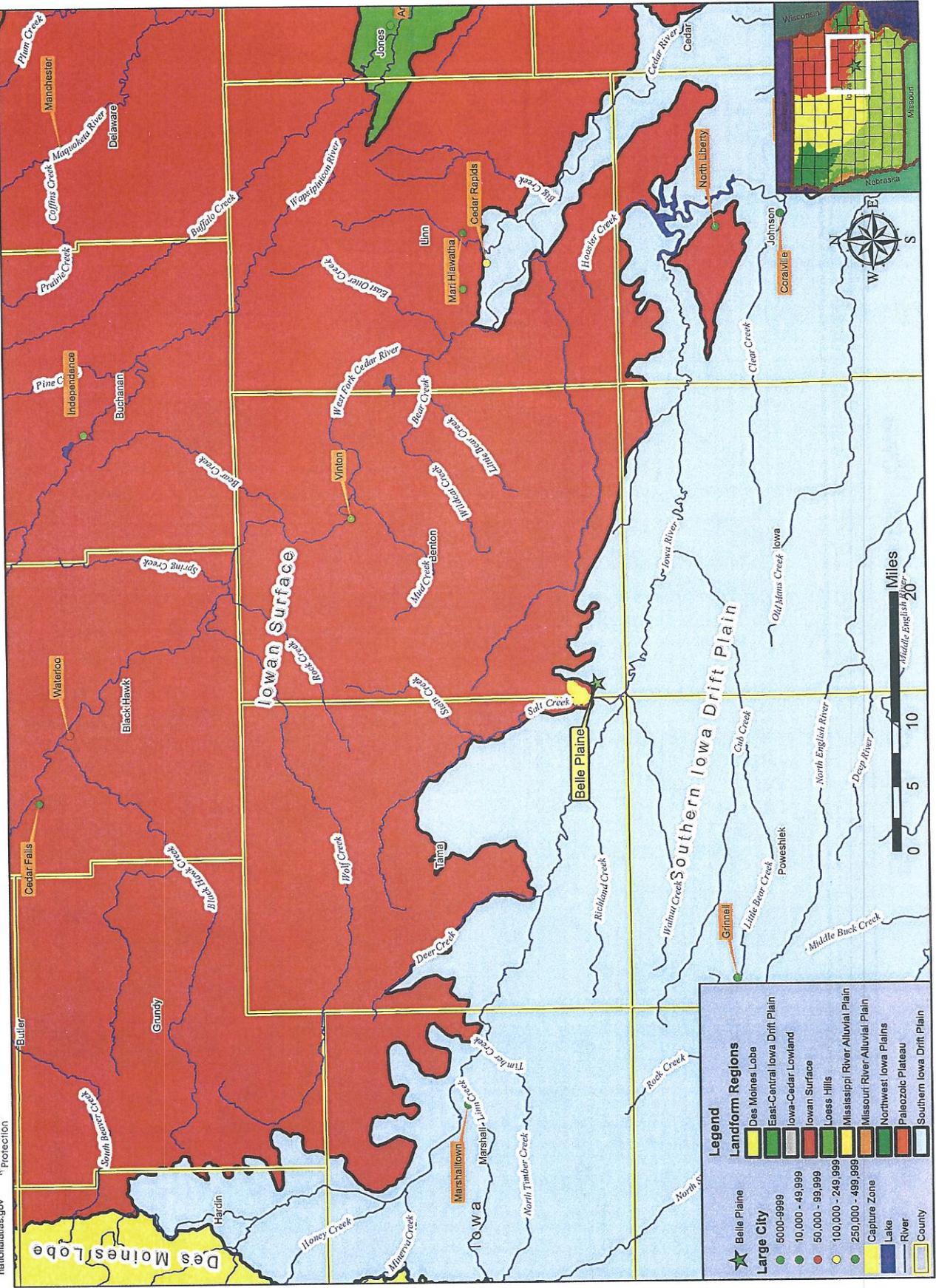
**Legend**

- Public Wells
- Belle Plaine
- County Line
- Time of Travel Capture Zone
  - 2-year
  - 5-year
  - 10-year
- Surface Runoff Area

Created By  
Brent Bestie  
7/30/2013  
IOWA RURAL WATER ASSOCIATION

# Surficial Landforms of Central Iowa

Source  
IDNR NGIS Library  
SOURCE  
nationalatlas.gov  
WATER  
Protection



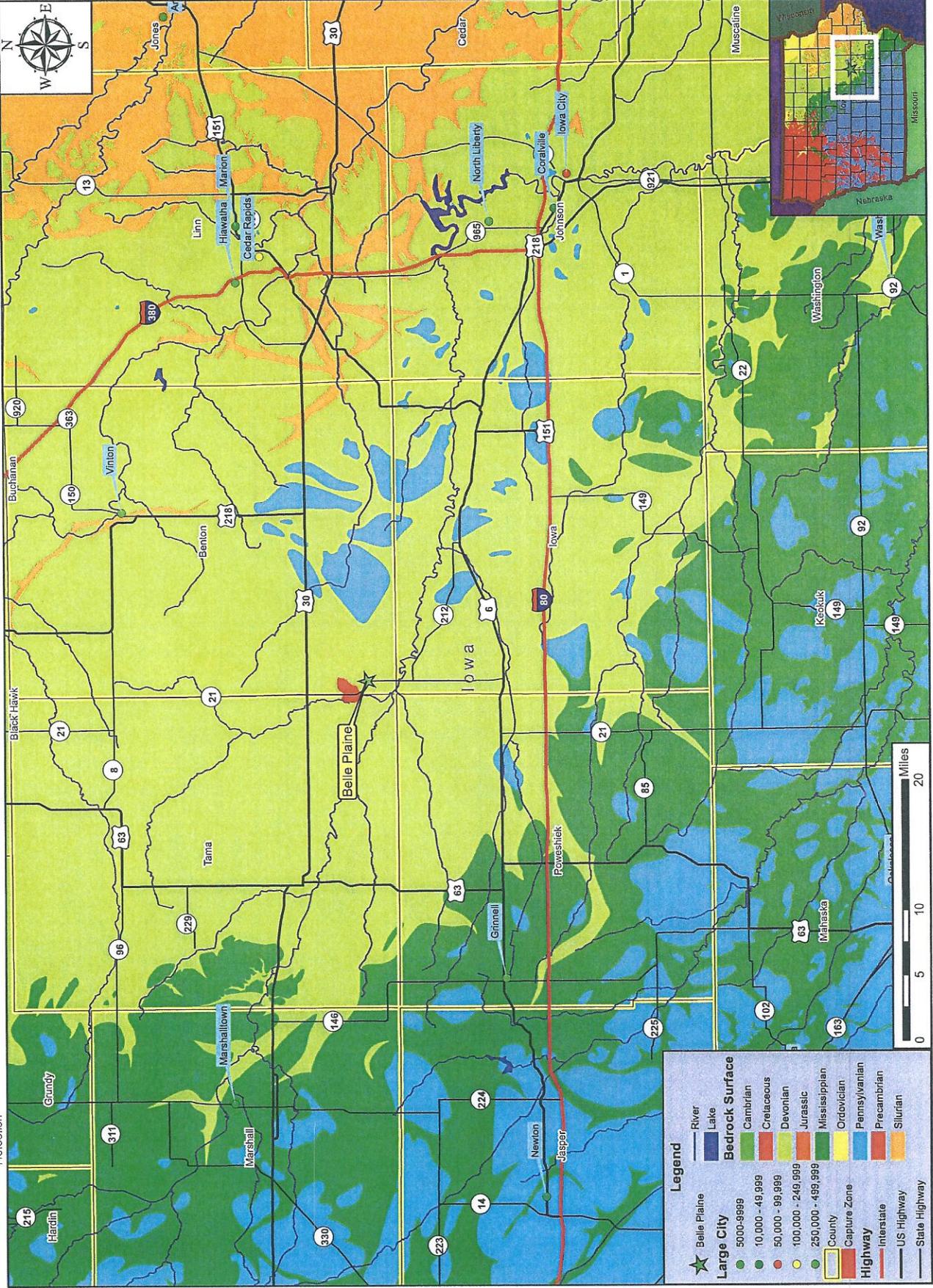
**Legend**

	Belle Plaine
	Large City
	Des Moines Lobe
	East-Central Iowa Drift Plain
	Iowa-Cedar Lowland
	Iowan Surface
	Loess Hills
	Mississippi River Alluvial Plain
	Missouri River Alluvial Plain
	Northwest Iowa Plains
	Paleozoic Plateau
	Southern Iowa Drift Plain
	Capture Zone
	Lake
	River
	County

Source  
IDNR NRGIS Library  
SOURCE  
nationalatlas.gov  
WATER  
Protection

Created By  
Bright Beste  
7/30/2013  
IOWA  
RURAL  
WATER  
ASSOCIATION

# Bedrock Surface of Central Iowa





Source: IOWA SOURCE WATER Protection  
 IDNR NRGIS Library  
 nationalatlas.gov

# Salt Creek Watershed High Resolution Land Cover - 2009

