APPENDIX E
NEMAHA NRD COMMUNITY DROUGHT ASSESSMENT METHODOLOGY AND MAPS

CONTENTS:

CONNECTING WATER TO LIFE

June 17, 2020

Becky Appleford
JEO Consulting Group Inc.
2700 Fletcher Ave.
Lincoln, NE 68504

RE: Nemaha Natural Resources District-Wide Community Drought Assessment Results - Final
Tecumseh, NE

Dear Becky,

The purpose of this correspondence is to provide JEO Consulting Group Inc. (JEO) with the results of LRE Water's (LRE) Nemaha Natural Resources District-Wide (NNRD) Community Drought Vulnerability Assessment (Assessment). The Assessment included completing Task 1 from the task order presented to LRE in December 2019 for JEO Project #181481, and supports JEO's Nemaha NRD Hazard Mitigation Plan 2020 Update.

PROJECT UNDERSTANDING AND OBJECTIVES

The purpose of this Assessment was to create an ESRI ModelBuilder model (GIS Model) to qualitatively compare the relative susceptibility or vulnerability of different aquifers to potentially being affected by a hypothetical prolonged drought condition across the NNRD Watershed Management Plan Boundary (Plan Boundary) and near each Public Water Supply System (PWS). The NNRD and PWS system well locations are shown on **Figure 1**. The GIS Model was developed to provide a qualitative ranking system, and not to definitively say how much groundwater would be available (groundwater storage) during drought conditions. The resulting rankings can be used to target specific PWS systems for further analysis, and the recommendations can be included in JEO's Nemaha Hazard Mitigation Plan 2020 Update. The model was developed taking into consideration the following three primary conditions.

1. Assumes the NNRD is under prolonged drought conditions.
2. Assumes a significant precipitation event (inches of rain) may occur during the prolonged drought conditions.
3. The resulting qualitative drought vulnerability is based on current conditions including: 1) number of existing PWS and high-capacity wells across the NNRD Plan Boundary, 2) permitted rates for PWS and high-capacity wells, and 3) current groundwater levels across the NNRD Plan Boundary.

To meet the objectives of this Assessment, LRE completed the following tasks.

TASKS COMPLETED

- Reviewed existing data completed as part of Nemaha Natural Resources District Mapbook 2019 Update completed by LRE and the Hydrogeologic Assessment Report – 2017 completed by WSP.
- Analyzed each dataset in relation to how they would be affected by the three primary conditions listed above.
- Developed a GIS Model to qualitatively explain potential drought vulnerability across the NNRD Plan Boundary and near each PWS system's wells.
- Mapped GIS Model input variables and results, including 1:24k inset maps of each PWS system in the NNRD Plan Boundary.
- Communicated preliminary GIS Model results to JEO project team.
- Completed the Assessment and this summary report.

VARIABLES AND ASSUMPTIONS

There are many variables that can affect how drought will impact an aquifer. Determining which variables to include in the GIS Model was completed by assessing how a particular variable may be impacted by or interact with the three primary conditions. Additionally, some variables are inherently more significant regarding an aquifer's ability to provide a sustainable groundwater supply. Specifically, greater aquifer saturated thickness and extent, with lower demands from high-capacity well withdrawals may indicate a more sustainable aquifer, under non-drought and drought conditions alike. With these assumptions in mind, to complete this Assessment, the following variable datasets were reviewed for potential inclusion in the final GIS Model.

- Depth to Groundwater
- Aquifer Thickness
- Total Clay Thickness above Top of Aquifer
- Confined vs. Unconfined Aquifers
- High-Capacity Registered Wells
- High-Capacity Well Permitted Rates
- Proximity to Perennial Streams
- Transmissivity
- Precipitation

After reviewing the above variables and assessing them in relation to the three primary conditions and each other, the variables included in the final GIS Model include total saturated sand thickness, high-capacity well permitted pumping rate per square mile, and total clay thickness above the top of aquifer. Each of these variables, underlying assumptions, and how the variables were incorporated into the GIS Model are described in more detail below and included on **Figures 2 through** 4.

Variables

1.) **Total Saturated Sand Thickness:** This variable includes the cumulative unconfined and confined saturated sand thickness (feet) across the NNRD Plan Boundary. The data used to determine this variable is from Nebraska

Department of Natural Resources (NeDNR) well and University of Nebraska-Lincoln Conservation and Survey Division (CSD) test hole geologic logs.

The initial total saturated sand thickness grid is from the NNRD's Mapbook 2019 Update (WSP, 2017 and LRE, 2019). The ESRI GIS tool, Focal Statistics, was incorporated into the GIS Model to take into consideration the mean value of saturated sand within a one-half mile radius of each cell in the interpolated sand thickness grid. This allows for a better understanding of drought vulnerability by accounting for aquifer extent and thickness in a local area. The primary purpose of this variable is to represent the total thickness of aquifer material present, which may correlate highly to how productive a given aquifer is likely to be in non-drought and drought conditions alike, assuming the aquifer from which a well is pumping is not affected by having a limited extent or bounded by low-preamble materials (i.e., clay and silt). The input dataset for the GIS Model is shown on **Figure 2**, and the thickness categories are as follows.

- The five thickness categories used in the GIS Model include the following ranges, where the low end of the range has higher vulnerability, and the high end of the range has lower vulnerability:
  - 0 to 25 feet
  - 25 to 50 feet
  - 50 to 75 feet
  - 75 to 100 feet
  - 100 to 220 feet

2.) High-Capacity Well Density with Permitted Pumping Rate per Square Mile: This variable was selected because it is assumed that under drought conditions, there will be more demand for irrigation by producers and PWS users alike. This variable uses aggregated (i.e. combined) pumping rates per square mile and does not necessarily represent any one well's individual pumping rate. This variable uses all high-capacity wells and associated permitted pumping rates across the NNRD Plan Boundary, which is a subset of wells from the NeDNR wells database.

The ESRI Point Density tool was run on the high-capacity well database with an optional input to aggregate by a value. For this GIS Model, well density is aggregated by permitted pumping rate using a 1-mile radius search area, which results in gallons per minute (gpm) per square mile. The primary purpose of including this variable in the GIS Model is because wells with lower permitted pumping rates pump less water and, therefore, impose less inherent drought vulnerability. We assumed the withdrawal amount during the drought period cannot exceed what has been permitted, and therefore, the rates for all wells remain as they are. The opposite is true for wells with higher permitted pumping rates, which increases an aquifer's drought vulnerability at a well's location and in the surrounding area, assumed to be 1 mile as noted above. The input dataset for the GIS Model is shown on **Figure 3**, and the gpm categories are as follows.

- The five aggregated pumping rate categories used in the GIS Model include the following ranges, where the low end of the range has lower vulnerability, and the high end of the range has higher vulnerability:

  - 0 to 600 gpm (600 gpm was used to capture what one hypothetical high-capacity well may be pumping to meet irrigation needs)
  - 600 to 1,000 gpm
  - 1,000 to 2,500 gpm
  - 2,500 to 5,000 gpm
  - 5,000 to 5,151 gpm

3.) **Total Clay Thickness Above Top of Aquifer:** This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well and CSD test hole geologic logs. The purpose of this variable is to represent whether an underlying aquifer would be able to receive recharge in the event of a significant precipitation event during a prolonged drought. This assumes all other variables such as slope, infiltration rates, etc. are the same for all low-permeable materials, which may include, but not limited to silt, loess, clay, silty clay, clayey silt, etc. The input dataset for the GIS Model is shown on **Figure 4**, and the thickness categories are as follows.

- The five clay thickness categories used in the GIS model include the following ranges, where the low end of the range has lower vulnerability, and the high end of the range has higher vulnerability (i.e. would not allow recharge during a significant precipitation event):
  - 0 to 5 feet
  - 5 to 10 feet
  - 10 to 20 feet
  - 20 to 40 feet
  - 40 to 335 feet

GIS MODEL SETUP

The GIS Model created in ESRI's ModelBuilder assumes that the two variables with the most influence on whether a water supply is potentially vulnerable to drought conditions are the total saturated sand thickness and high-capacity well density with permitted pumping rate per square mile. After running several iterations of the GIS Model, the following weights were used to represent potential drought vulnerability across the NNRD Plan Boundary.

- Saturated Sand Thickness (feet): 40%
- High-Capacity Well Density with Permitted Pumping Rate (gpm) per Square Mile: 40%
- Total Clay Thickness Above Top of Aquifer (feet): 20%

The primary steps used to create the GIS Model included the following.

- Each variable was added to the GIS Model.
- An additional tool was ran on both the total saturated sand thickness dataset (Focal Statistics) and high-capacity well dataset (Point Density) to account for the effects of each variable within a neighborhood of each input data value.

- The Reclassify tool was run on each dataset to convert the values in the three input raster datasets into five categories each, as shown above.
- Weights were applied (as a percentage), as noted above, to each dataset considering its overall impact on potential vulnerability to drought.
- The individual weighted raster files were combined using the Raster Calculator tool and clipped using the Extract by Mask tool to the NNRD Plan Boundary to produce a potential drought vulnerability raster, shown on **Figure 5**.

RESULTS

The results on **Figure 5** represent one approach to determining potential drought vulnerability based on existing and current hydrogeologic conditions. There are other methods, variables to consider, and certainly limitless weighting scenarios, that could be used to determine potential drought vulnerability, but this GIS Model provides one qualitative understanding of potential drought vulnerability that can be used by JEO, NNRD, PWS systems, and stakeholders to inform groundwater and surface water management decisions.

The GIS Model results should also be used in combination with other management tools such as the groundwater development potential results presented to the NNRD by LRE in the Mapbook 2019 Update. For example, using the chosen variables within this GIS Model, the results show there is less vulnerability to drought in the southwest part of the NRD, an area where there is relatively little aquifer thickness. When looking at each input variable, this result is affected significantly by the absence or very low density of high-capacity permitted wells. Therefore, comparing the potential drought vulnerability results to the groundwater development potential results, it is clear there is relatively less potential to site additional high-capacity wells in the southwest area without increasing the potential drought vulnerability. It is important to note that site specific aquifer information determined through test hole drilling and/or aquifer testing would be required to confirm the aforementioned qualitative assertion. Both the GIS Model developed during this Assessment and the groundwater development potential model from the Mapbook 2019 Update are regional-scale assessments to assist with future water-resource management activities, and should not be solely relied upon for final decisions by JEO, NNRD, PWS systems, or stakeholders.

The results of the GIS Model are also provided at 1:24,000 scale for all PWS systems within the NNRD Plan Boundary in Attachment 1 and summarized in the table below. The summary table provides vulnerability ranges (1.2 lowest and 4.6 highest) and primary vulnerability driver(s) for each PWS system within the 1:24k map extent and not solely at the PWS well locations.

PWS System	Attachment 1 Page No.	Vulnerability Rating (range)	Primary Vulnerability Driver(s) (in order of affect)
City of Auburn	1	2.6 - 4.0	High-capacity Wells, Saturated Sand Thickness
City of Falls City	2	2.2 – 4.0	High-capacity Wells, Clay Thickness
City of Falls City	3	2.6 – 3.4	Saturated Sand Thickness, Clay Thickness
City of Humboldt	4	2.2 – 3.8	High-capacity Wells, Clay Thickness
City of Humboldt	5	1.8 – 3.8	Saturated Sand Thickness, Clay Thickness
City of Nebraska City	6	2.4 – 4.2	High-capacity Wells, Clay Thickness

PWS System	Attachment 1 Page No.	Vulnerability Rating (range)	Primary Vulnerability Driver(s) (in order of affect)
City of Pawnee	7	3.0 – 3.4	Saturated Sand Thickness, Clay Thickness
City of Peru	8	2.6 – 3.8	High-capacity Wells, Clay Thickness
City of Syracuse	9	2.4 – 4.4	High-capacity Wells, Clay Thickness
City of Tecumseh	10	2.2 – 3.8	High-capacity Wells, Clay Thickness
Johnson Co. RWD No. 1	11	2.0 – 4.6	High-capacity Wells, Clay Thickness
Lancaster Co. RWD 1	12	1.8 – 3.4	Clay Thickness, High-capacity Wells
Nemaha Co. RWD No. 1	13	2.6 – 3.4	Saturated Sand Thickness, Clay Thickness
Nemaha Co. RWD No. 1	14	2.2 – 4.0	Saturated Sand Thickness, High-capacity Wells
Otoe Co. RWD No. 3	15	2.2 – 4.2	High-capacity Wells, Clay Thickness
Nemaha Co. RWD No. 2	16	3.0 – 3.4	Saturated Sand Thickness, Clay Thickness
Nemaha Co. RWD No. 2	17	1.8 – 3.4	Saturated Sand Thickness, Clay Thickness
Nemaha Natural Resources District	18	2.2 – 3.8	Saturated Sand Thickness, Clay Thickness
Nemaha RWD No. 1 Kansas	19	2.6 – 3.0	Saturated Sand Thickness
Pawnee Co. RWD 1	20	2.2 – 3.8	High-capacity Wells, Clay Thickness
Richardson Co. RWD No. 1	21	1.8 – 3.8	Saturate Sand Thickness
Village of Adams	22	1.8 – 4.2	Saturated Sand Thickness, High-capacity Wells
Village of Bennet	23	2.6 – 3.4	Saturated Sand Thickness, Clay Thickness
Village of Brock	24	2.6 – 4.2	Saturated Sand Thickness, High-capacity Wells
Village of Burr	25	1.4 – 4.2	High-capacity Wells, Saturated Sand Thickness
Village of Cook	26	2.8 – 4.6	High-capacity Wells, Clay Thickness
Nemaha Co. RWD No. 2	27	2.8 – 4.0	High-capacity Wells, Clay Thickness
Village of Dawson	28	3.0 – 3.4	Saturated Sand Thickness, Clay Thickness
Village of Panama	29	2.8 – 3.4	Saturated Sand Thickness, Clay Thickness
Village of Salem	30	2.6 – 3.4	Saturated Sand Thickness, Clay Thickness
Village of Elk Creek	31	2.8 – 4.2	Saturated Sand Thickness
Village of Firth	32	2.2 – 4.2	High-capacity Wells
Village of Johnson	33	3.0 – 3.4	Saturated Sand Thickness, Clay Thickness
Village of Julian	34	2.6 – 3.8	Saturated Sand Thickness, Clay Thickness
Village of Lewiston	35	1.8 – 3.4	Saturated Sand Thickness, Clay Thickness
Village of Nemaha	36	2.2 – 4.2	High-capacity Wells, Saturated Sand Thickness
Village of Otoe	37	2.8 – 3.4	Saturated Sand Thickness
Village of Dunbar	38	2.6 – 3.4	Saturated Sand Thickness, Clay Thickness
Village of Shubert	39	2.6 – 3.4	Saturated Sand Thickness, Clay Thickness
Village of Steinauer	40	3.2 – 3.4	Saturated Sand Thickness, Clay Thickness
Village of Stella	41	2.6 – 3.4	Saturated Sand Thickness, Clay Thickness
Village of Sterling	42	2.2 – 3.8	High-capacity Wells
Village of Table Rock	43	2.6 – 3.4	Saturated Sand Thickness, Clay Thickness
Village of Table Rock	44	2.6 – 3.4	Saturated Sand Thickness
Village of Talmage	45	2.6 – 4.2	Saturated Sand Thickness, Clay Thickness
Village of Unadilla	46	3.2 – 3.4	Saturated Sand Thickness, Clay Thickness
Village of Verdan	47	2.2 – 3.4	Saturated Sand Thickness

RECOMMENDATIONS

Based on the work completed for this Assessment, LRE makes the following recommendations.

- Implement the Assessment results into JEO's Hazard Mitigation Plan 2020 Update.
- Provide the results of this Assessment to the NNRD for the District's use, as well as dissemination to the individual PWS systems.
- Encourage PWS systems to use the results to refine PWS and site-specific hydrogeologic conceptual models. For those PWS systems more vulnerable to drought, use the results to guide the development of a local-scale numerical groundwater flow model to complete more robust drought vulnerability scenarios that take into consideration variable pumping rates or demands on the aquifer from high-capacity wells, various precipitation scenarios, or other local site-specific data. In addition, evaluating historical water levels, critical safe-yield thresholds based on aquifer thickness and well screened intervals, and development of well field optimization plans would be beneficial. Finally, for the most vulnerable communities, evaluate potential alternative source aquifers or locations for new wells that may provide additional water.

Thank you for the opportunity to assist JEO on this project. If you have any questions regarding this report, please contact me at (651) 341-8199.

Sincerely,

LRE WATER

Roscoe Sopiwnik

Roscoe F. Sopiwnik, GISP
Senior Environmental Scientist

MCPlante

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Reviewed By

David S. Hume, PG
Vice President Midwest Operations

Job Number: 5006JEO10 (JEO Project #181481 Task 1)
RFS/mcp

Cc: Jon Mohr – JEO
Karl Dietrich – JEO

REFERENCES

LRE Water, 2019. Nemaha Natural Resources District Mapbook 2019 Update.

WSP, 2017. Hydrogeologic Assessment Report – 2017.

FIGURES

● City

🟩 Public Water Supply Well (Active and Labeled with PWS Name)

▭ Nebraska Natural Resource District Watershed Management Plan Boundary

▭ County Boundary

▭ Nebraska Natural Resource District Boundary

N

0 8 Miles

Notes:

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

Nemaha Watershed Management Plan Boundary: Provided by the Nemaha NRD and delineated using watershed boundaries.

Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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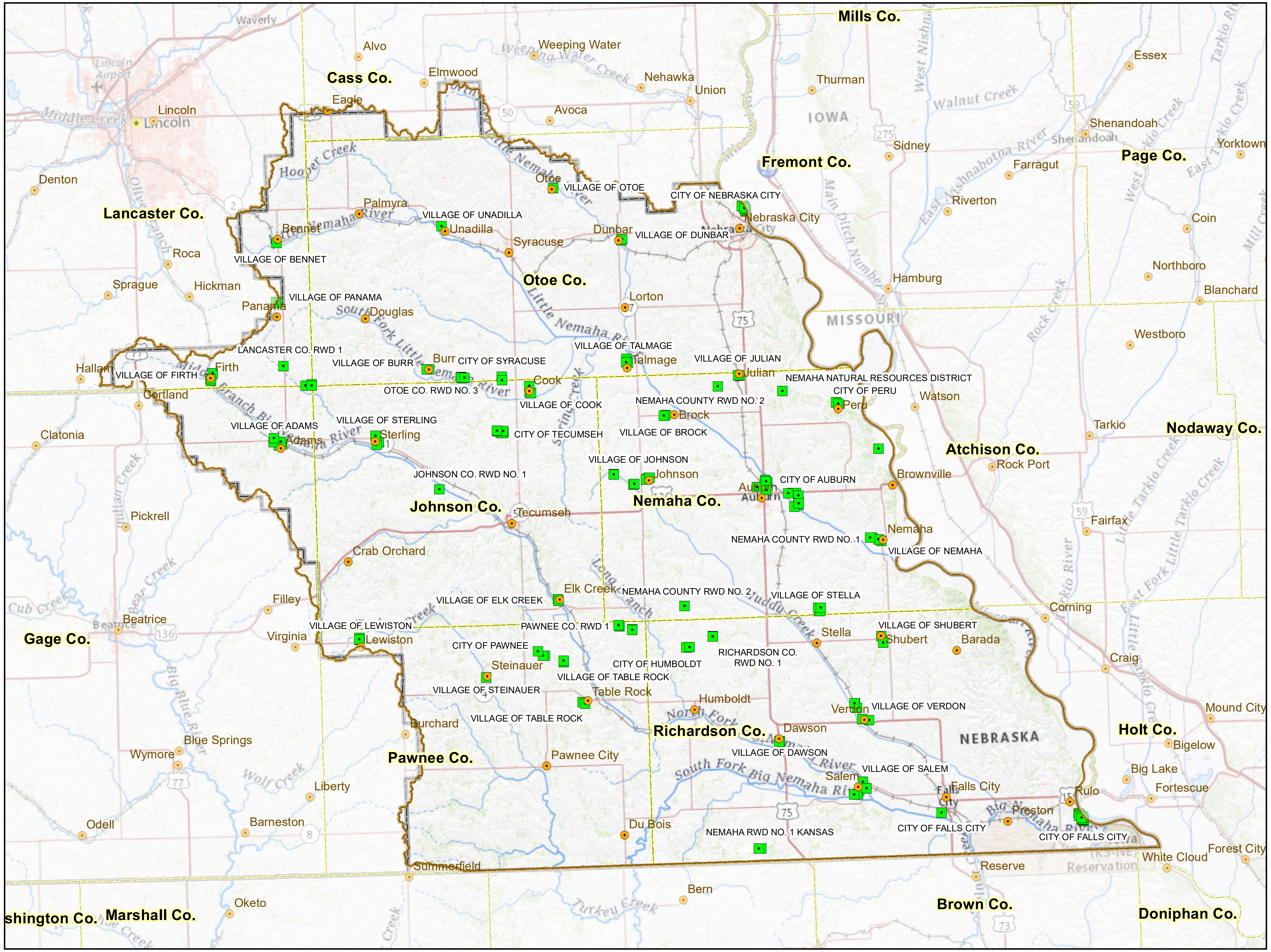

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NEMAHA DROUGHT ASSESSMENT
NEBRASKA

DROUGHT VULNERABILITY ASSESSMENT STUDY AREA

FILE: 5006jeo1001k - Study Area.MXD | DATE: 6/12/2020 | FIGURE: 1

- ● City
- 🟩 Public Water Supply Well (Active and Labeled with PWS Name)
- • Well or Test Hole Used for Interpolation
- ▭ Nebraska Natural Resource District Watershed Management Plan Boundary
- ▭ County Boundary
- ▭ Nebraska Natural Resource District Boundary

Total Saturated Sand Thickness - (feet)

- ▨ 0 to 25 (lower vulnerability)
- ▨ 25 to 50
- ▨ 50 to 75
- ▨ 75 to 100
- ▨ 100 to 220 (higher vulnerability)

N

0 8 Miles

Notes:

Saturated sand thickness within the Nemaha NRD Plan Boundary was determined by reviewing all available geologic logs from the Nebraska Department of Natural Resources All Wells Database and University of Nebraska-Lincoln Conservation Survey Division Test Hole Database. The static water level measured during each respective well or test hole installation/completion was used as the water level reference. Additionally, an interpolated water level reference was determined for each location without an install level by extracting values from a an initial water level surface grid created from all known water levels. All unconsolidated sand layers below the install or interpolated water level were considered saturated.

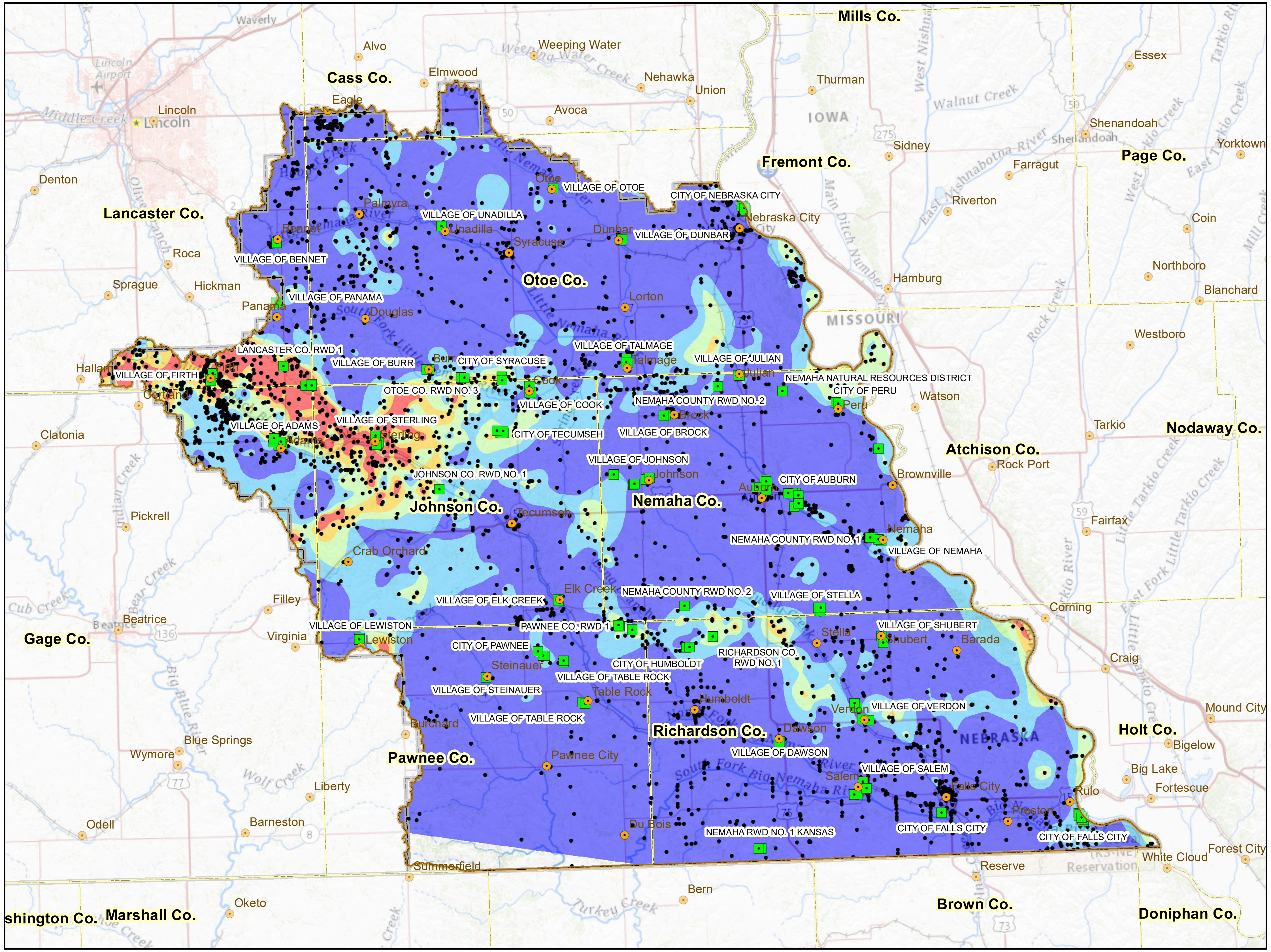
The total saturated sand values for each well or test hole location were input into ESRI's Spatial Analyst Natural Neighbor interpolation algorithm. The results provided a raster surface indicating saturated sand thickness across the NRD.

Sources:

Nemaha Watershed Management Plan Boundary: Provided by the Nemaha NRD and delineated using watershed boundaries.

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

Well, Test Hole, and Oil and Gas Well Locations: Nebraska Department of Natural Resources All Wells Database, University of Nebraska-Lincoln Conservation Survey Division Test Hole Database, and Nebraska Oil and Gas Wells Database, respectively.



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NEBRASKA

TOTAL SATURATED SAND THICKNESS

FILE: 5006jeo1001d - Aquifer Thickness.MXD | DATE: 6/12/2020 | FIGURE: 2

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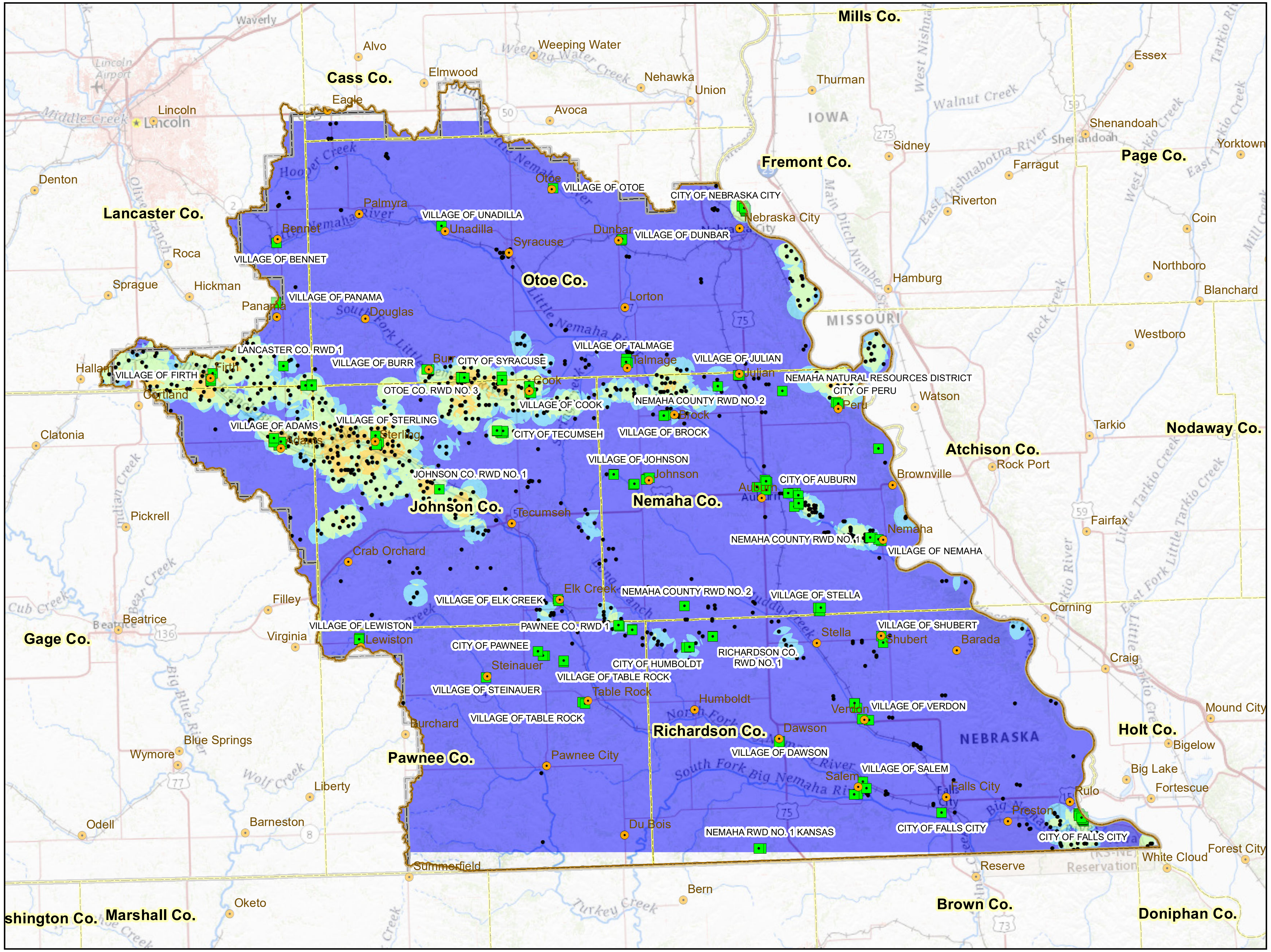
- 🟠 City
- 🟩 Public Water Supply Well (Active and Labeled with PWS Name)
- • High Capacity Registered Well
- ▭ Nebraska Natural Resource District Watershed Management Plan Boundary
- ▭ County Boundary
- ▭ Nebraska Natural Resource District Boundary

High Capacity Well Density with Permitted Pumping Rate Per Square Mile - (GPM)

- 🟦 0 to 600 (lower vulnerability)
- 🟦 600 to 1,000
- 🟩 1,000 to 2,500
- 🟨 2,500 to 5,000
- 🟥 5,000 to 5,151 (higher vulnerability)

N

0 8 Miles



Notes:

High capacity wells shown on this figure are from the Nebraska Department of Natural Resources All Wells Database, and include wells with use codes "C" (Commercial/Industrial), "I" (Irrigation), and "P" (Public Water Supply (with and without separation)).

The high capacity well pumping rates are aggregated by permitted pumping rate, and show the pumping rate in gallons per minute per square mile. The results take into consideration all pumping within 1 mile of any cell in the raster, and do not represent the pumping rate for any one well alone (unless no other high-capacity wells exist within one mile).

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Nemaha Watershed Management Plan Boundary: Provided by the Nemaha NRD and delineated using watershed boundaries.

Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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NEBRASKA

HIGH CAPACITY REGISTERED WELL DENSITY WITH
PERMITTED PUMPING RATE (GPM) PER SQUARE MILE

FILE: 5006jeo1001e - High-Cap Well Density.MXD	DATE: 6/12/2020	FIGURE: 3

- 🟠 City
- 🟩 Public Water Supply Well (Active and Labeled with PWS Name)
- • Well or Test Hole Used for Interpolation
- ▭ Nebraska Natural Resource District Watershed Management Plan Boundary
- ▭ County Boundary
- ▭ Nebraska Natural Resource District Boundary

Clay Thickness Above Aquifer - (feet)

- 🟦 0 to 5 (lower vulnerability)
- 🟦 5 to 10
- 🟩 10 to 20
- 🟨 20 to 40
- 🟥 40 to 335 (higher vulnerability)

N

0 8
Miles

Notes:

This map shows the combined amount of unsaturated and confining clay above the first aquifer system below grade within the Nemaha NRD Plan Boundary. This clay thickness was determined by reviewing all available geologic logs from the Nebraska Department of Natural Resources All Wells Database and University of Nebraska-Lincoln Conservation Survey Division Test Hole Database. The static water level measured during each respective well or test hole installation/completion was used as the water level reference. Additionally, an interpolated water level reference was determined for each location without an install level by extracting values from an initial water level surface grid created from all known water levels. All unconsolidated clay layers below the first saturated sand in each data location were excluded from the total thickness.

The clay thickness values for each well or test hole location were input into ESRI's Spatial Analyst Natural Neighbor interpolation algorithm. The results provided a raster surface indicating clay thickness above the first aquifer across the NRD.

Sources:

Nemaha Watershed Management Plan Boundary: Provided by the Nemaha NRD and delineated using watershed boundaries.

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

Well, Test Hole, and Oil and Gas Well Locations: Nebraska Department of Natural Resources All Wells Database, University of Nebraska-Lincoln Conservation Survey Division Test Hole Database, and Nebraska Oil and Gas Wells Database, respectively.

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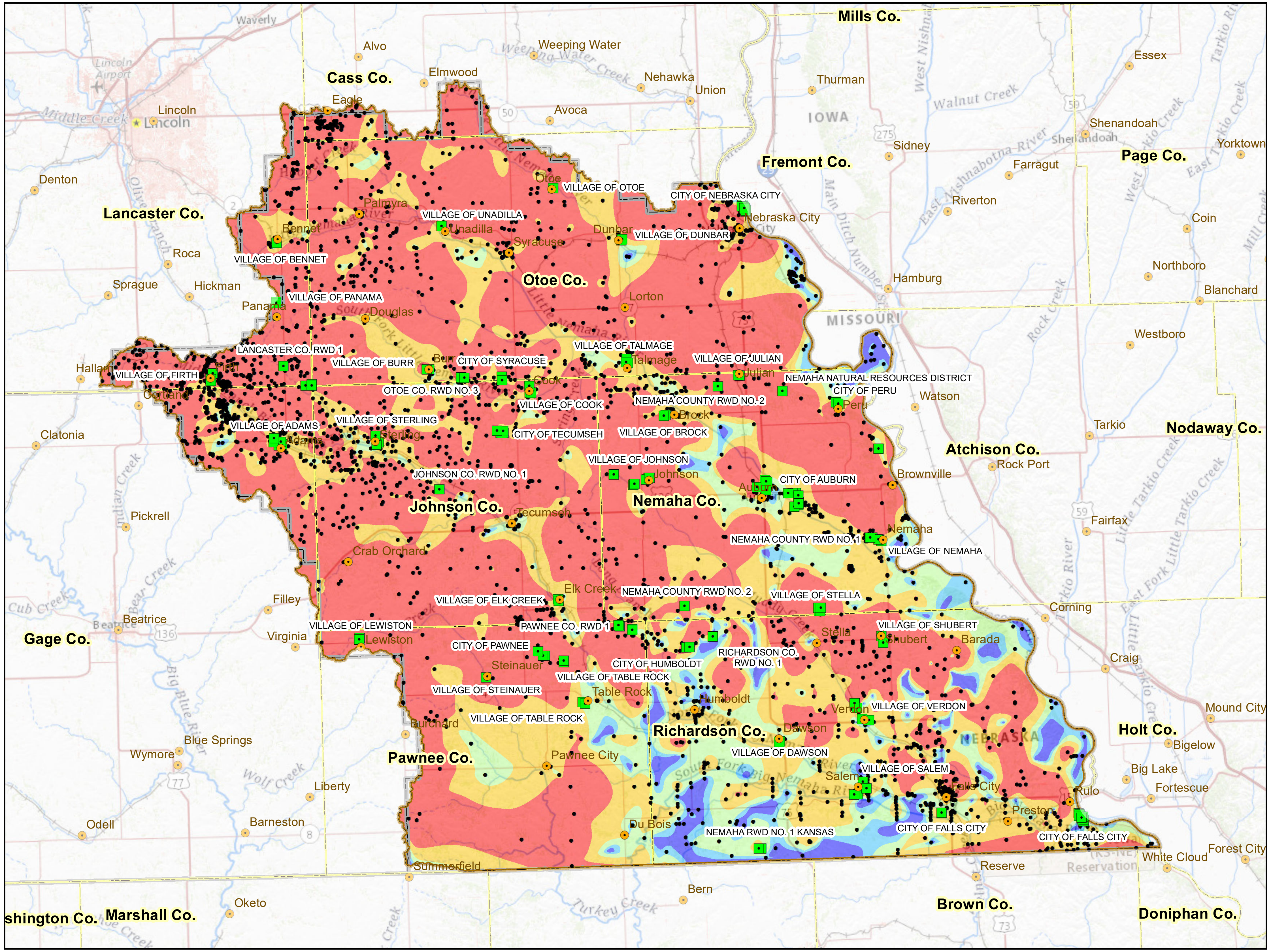

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NEMAHA DROUGHT ASSESSMENT
NEBRASKA

CLAY THICKNESS ABOVE AQUIFER

FILE: 5006jeo1001h - Clay Thickness.MXD	DATE: 6/12/2020	FIGURE: 4

●	City
🟩	Public Water Supply Well (Active and Labeled with PWS Name)
▭	Nebraska Natural Resource District Watershed Management Plan Boundary
▭	County Boundary
▭	Nebraska Natural Resource District Boundary

Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

N

0 8 Miles

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

Nemaha Watershed Management Plan Boundary: Provided by the Nemaha NRD and delineated using watershed boundaries.

Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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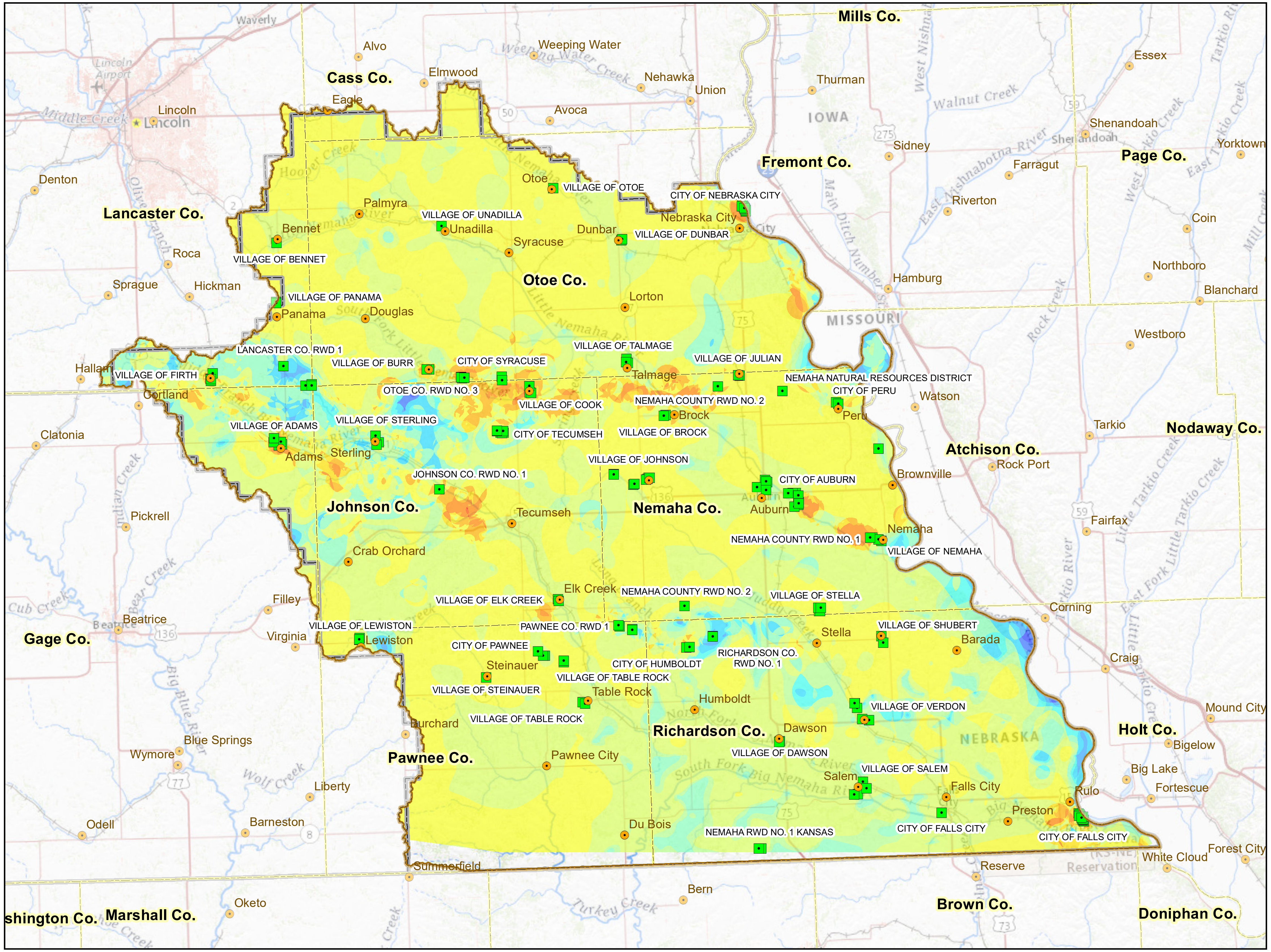

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NEMAHA DROUGHT ASSESSMENT
NEBRASKA

NEMAHA NATURAL RESOURCES DISTRICT POTENTIAL DROUGHT VULNERABILITY

FILE: 5006jeo1001j - Drought Vulnerability.MXD	DATE: 6/12/2020	FIGURE: 5

ATTACHMENT 1
NNRD PWS 1:24K INSET FIGURES

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

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The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

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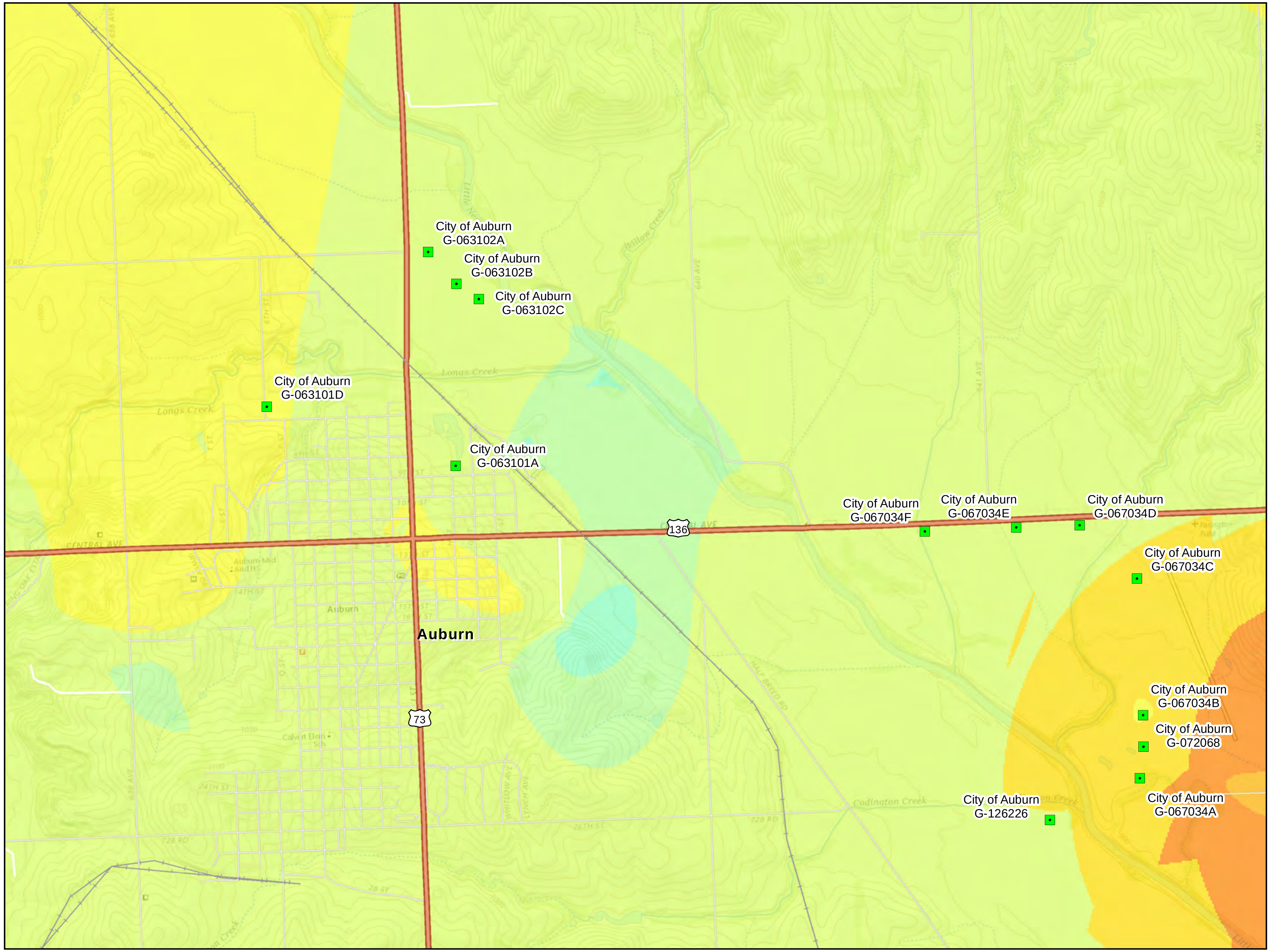

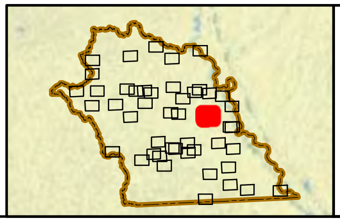

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ATTACHMENT 1
CITY OF AUBURN DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 1

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🟩 Public Water Supply Well (Active)

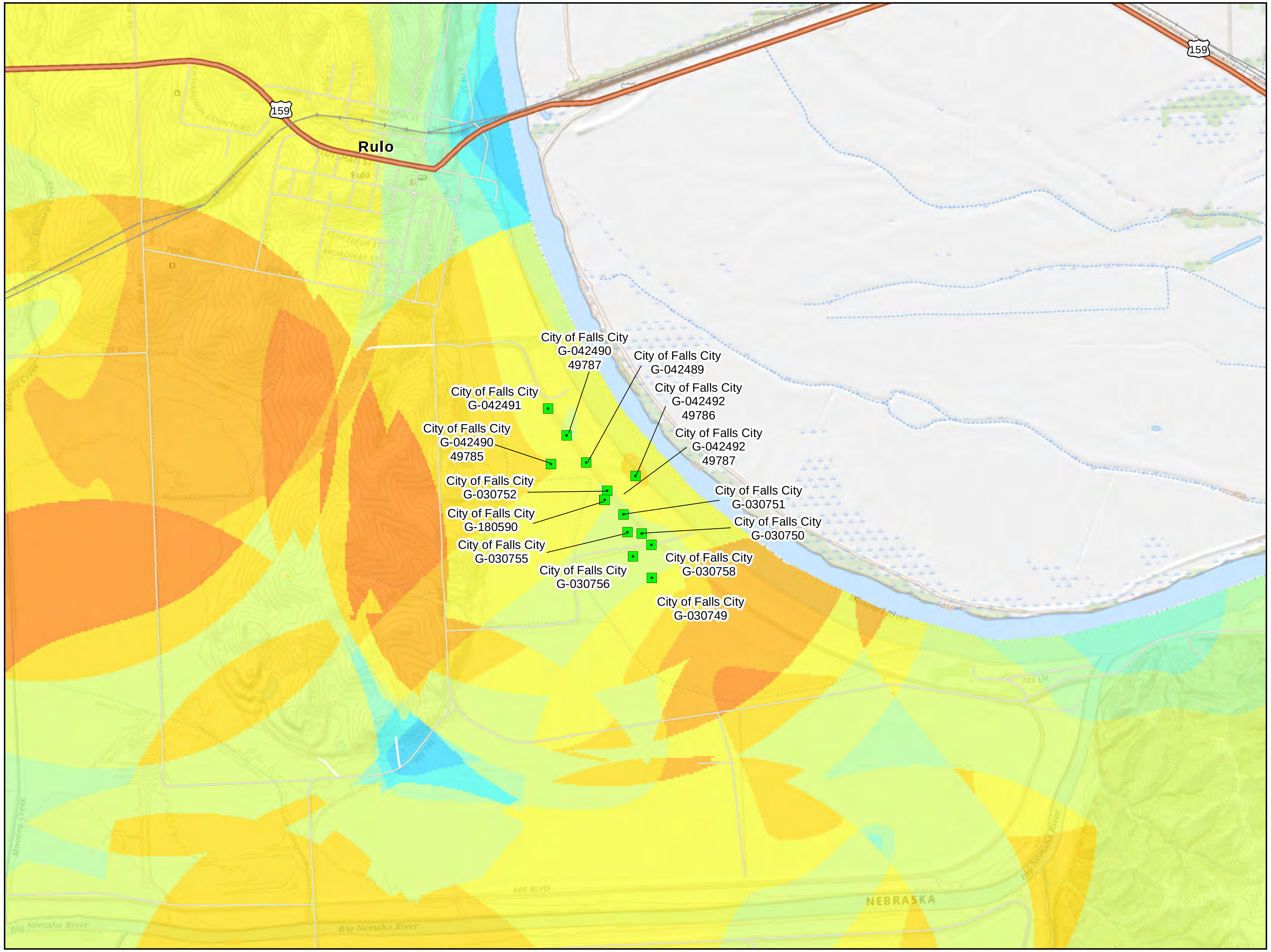
Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

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Sources:

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Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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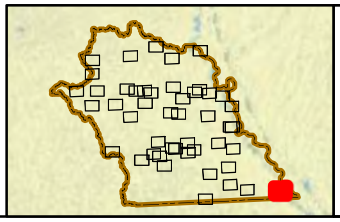

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ATTACHMENT 1
CITY OF FALLS CITY DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 2

🟩 Public Water Supply Well (Active)

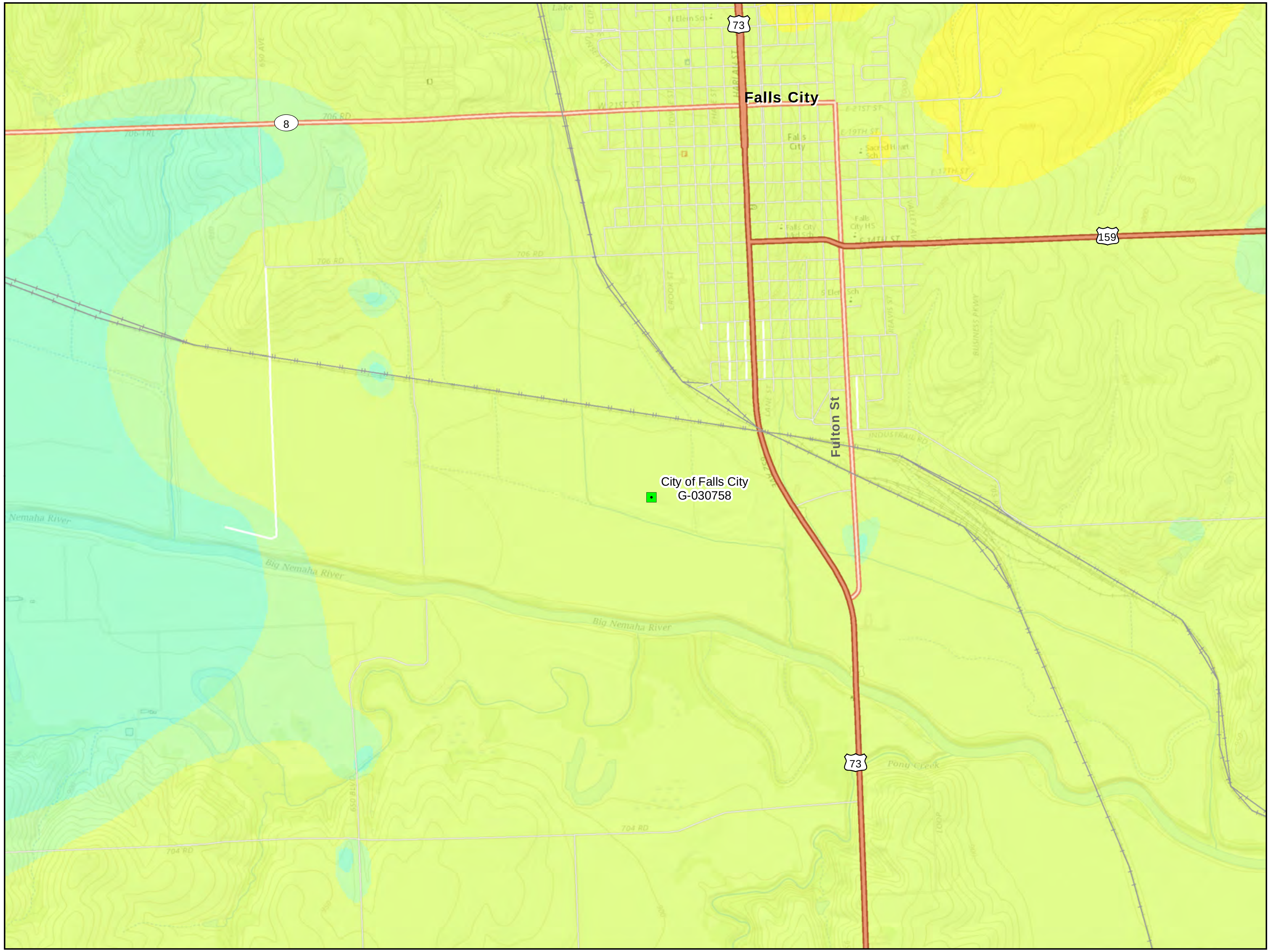
Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000
Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

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Copyright: © 2013 National Geographic Society

Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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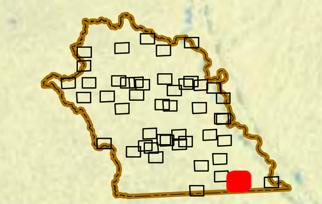

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NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
CITY OF FALLS CITY DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 3

🟩 Public Water Supply Well (Active)

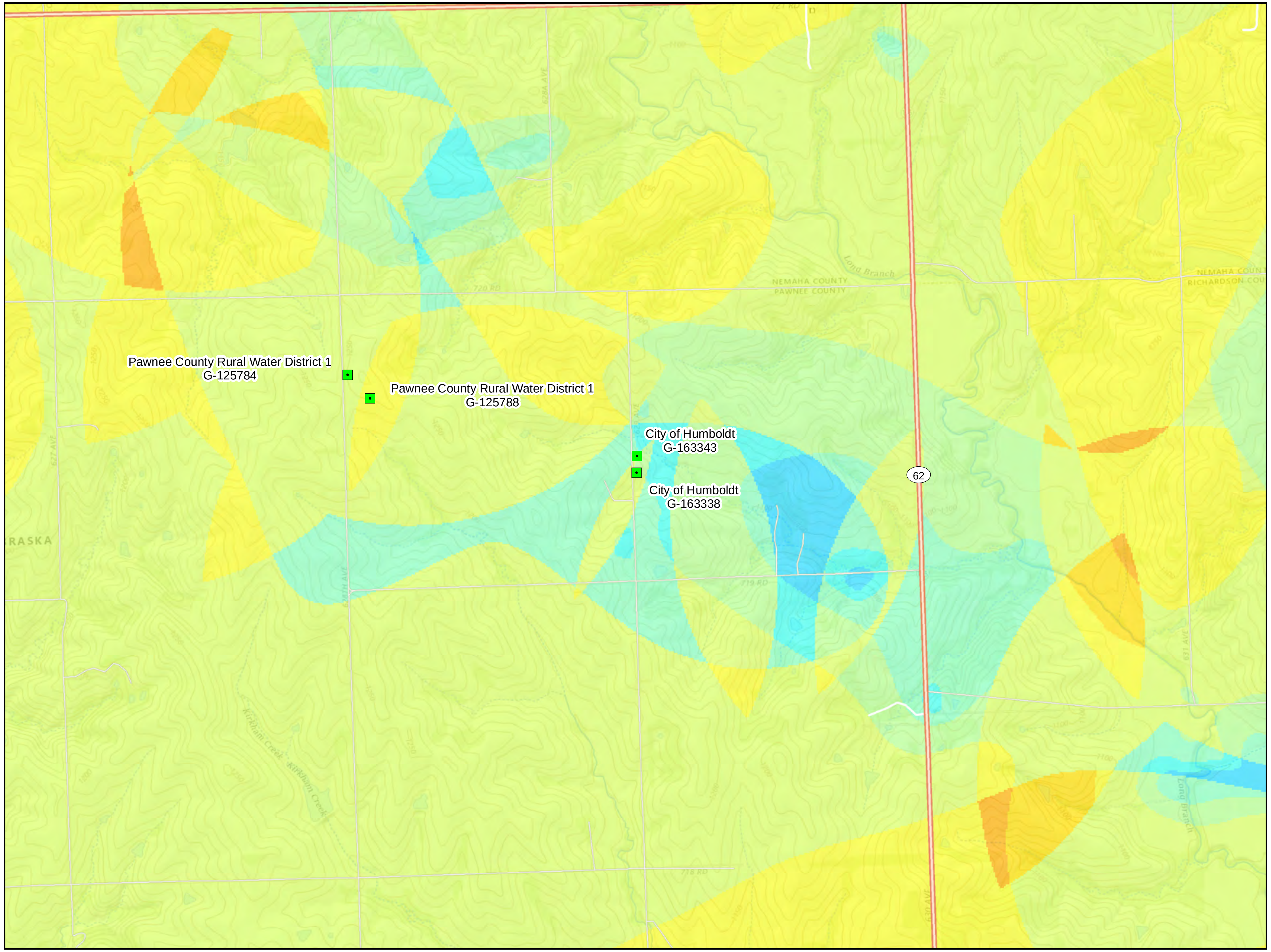
Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)
🟦 1.24 - 1.49
🟦 1.49 - 1.74
🟦 1.74- 1.99
🟦 1.99 - 2.24
🟦 2.24 - 2.49
🟩 2.49 - 2.74
🟩 2.74 - 2.99
🟨 2.99 - 3.24
🟨 3.24 - 3.49
🟨 3.49 - 3.74
🟧 3.74 - 3.99
🟧 3.99 - 4.24
🟧 4.24- 4.49
🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

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Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

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Sources:

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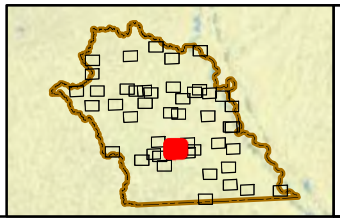

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NEBRASKA

ATTACHMENT 1
CITY OF HUMBOLDT DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 4

🟩	Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟩	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City	——	City Name
G-042490	——	Registration Number
49785	——	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000

Feet

Notes:

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Sources:

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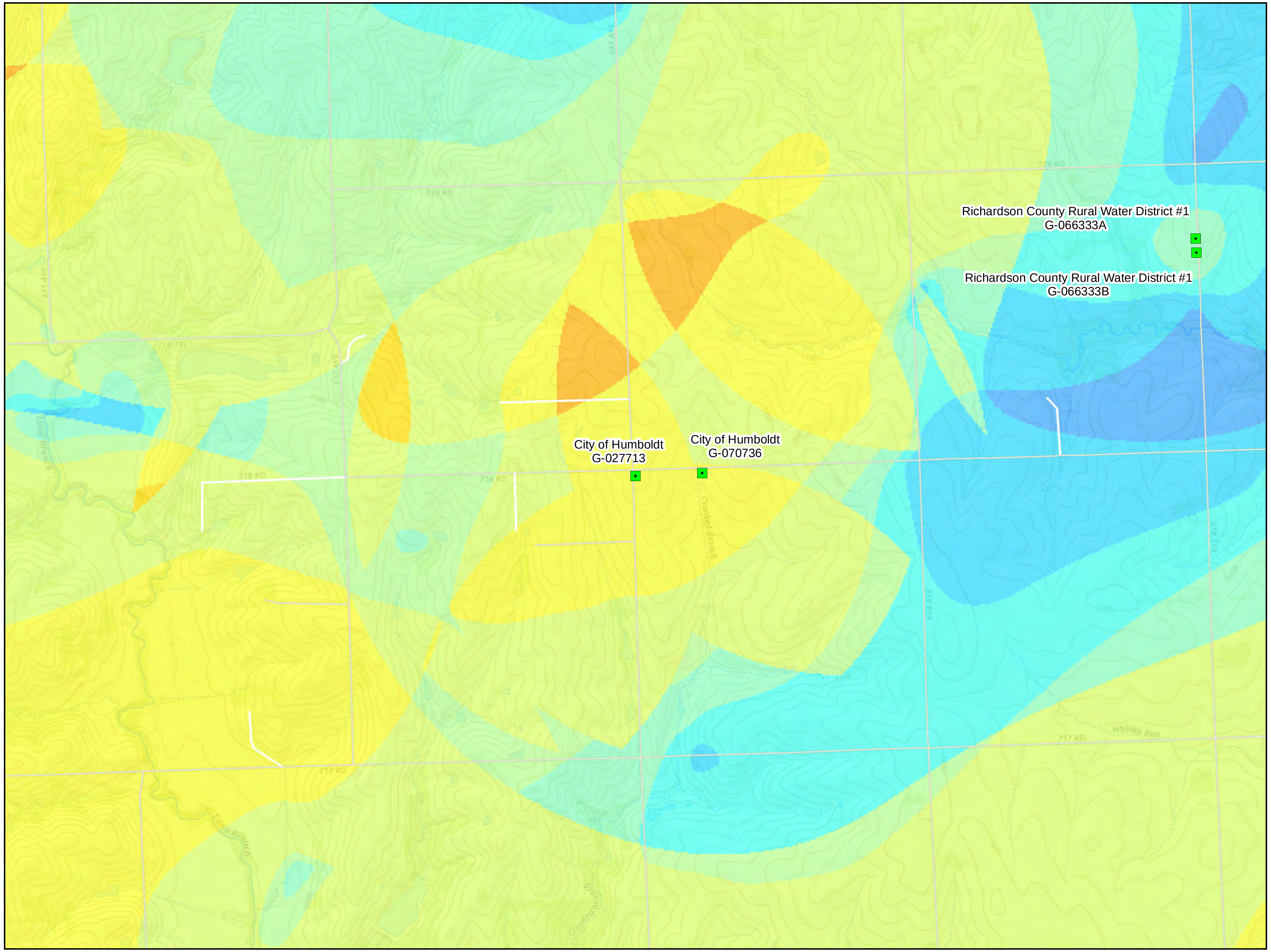

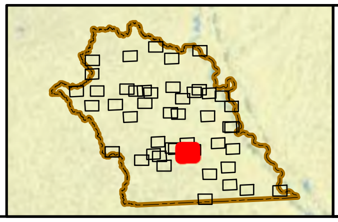

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NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
CITY OF HUMBOLDT DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD	DATE: 5/13/2020	FIGURE: 5

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🟩 Public Water Supply Well (Active)

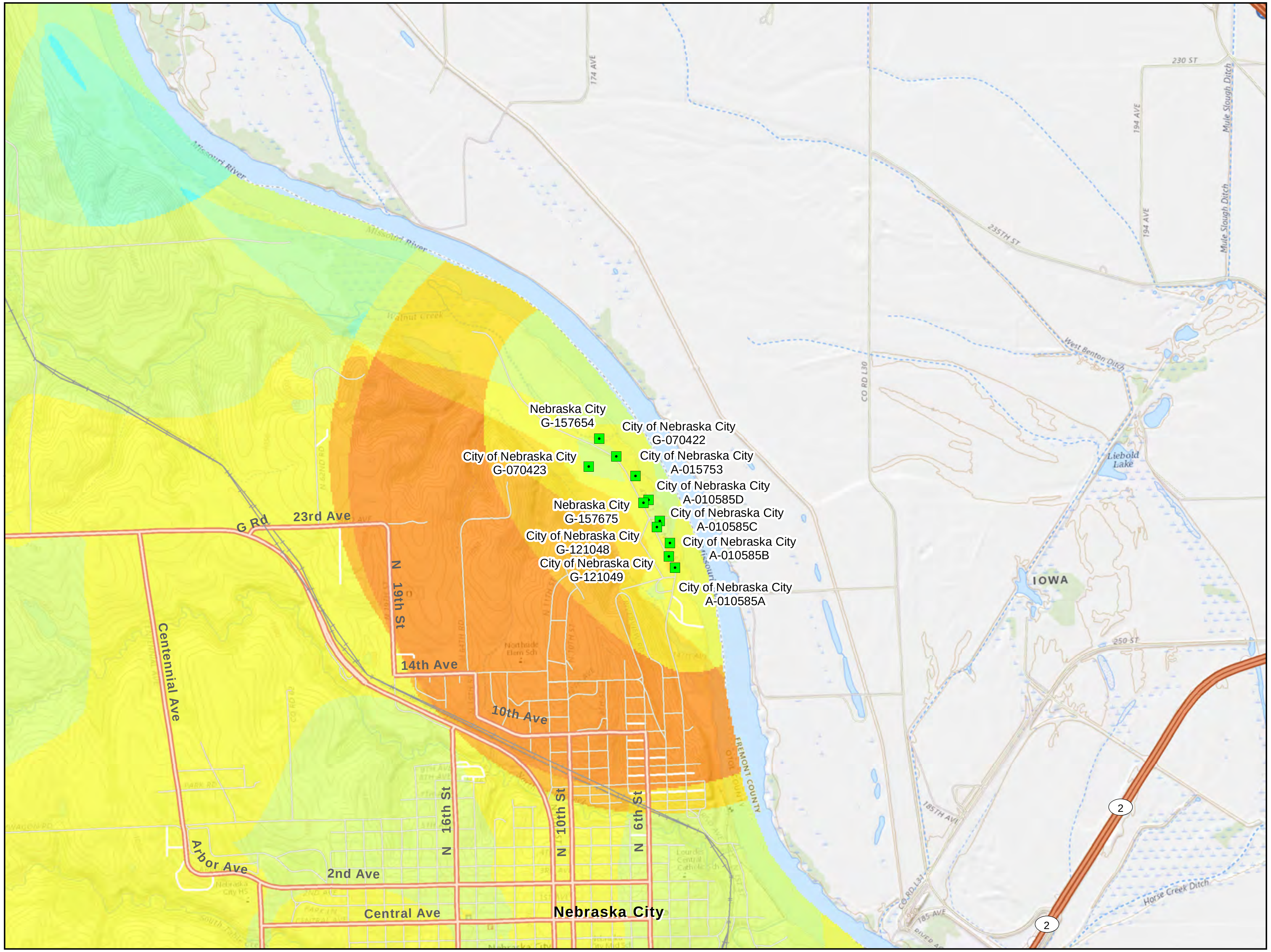
Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



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Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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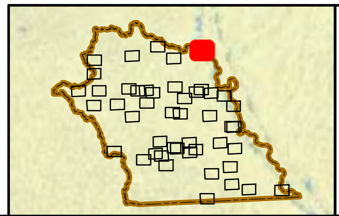

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NEMAHA NATURAL RESOURCES DISTRICT
NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
CITY OF NEBRASKA CITY DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 6

🟩 Public Water Supply Well (Active)

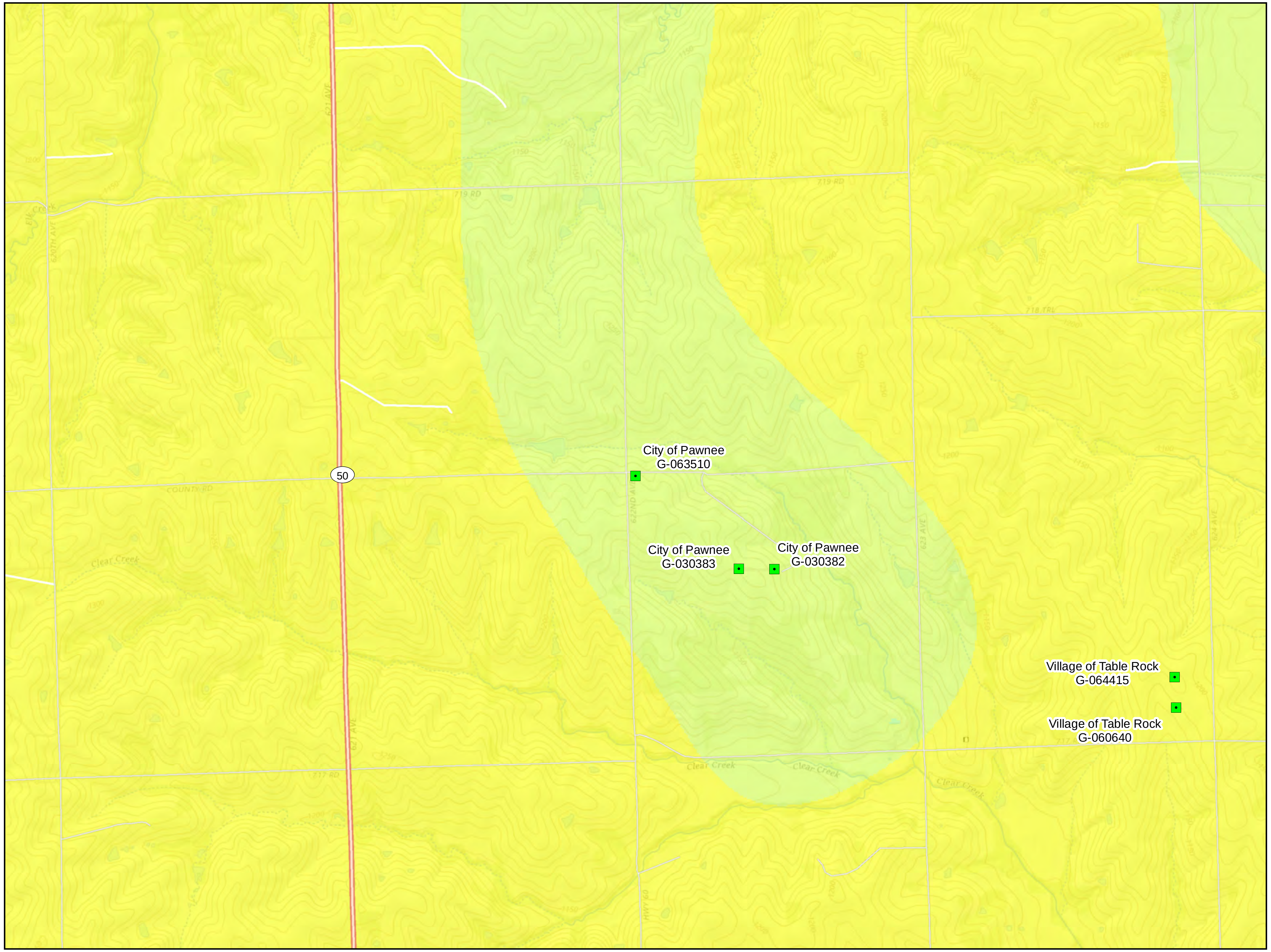
Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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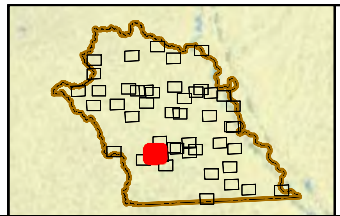

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NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
CITY OF PAWNEE DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 7

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N
0 2,000 Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

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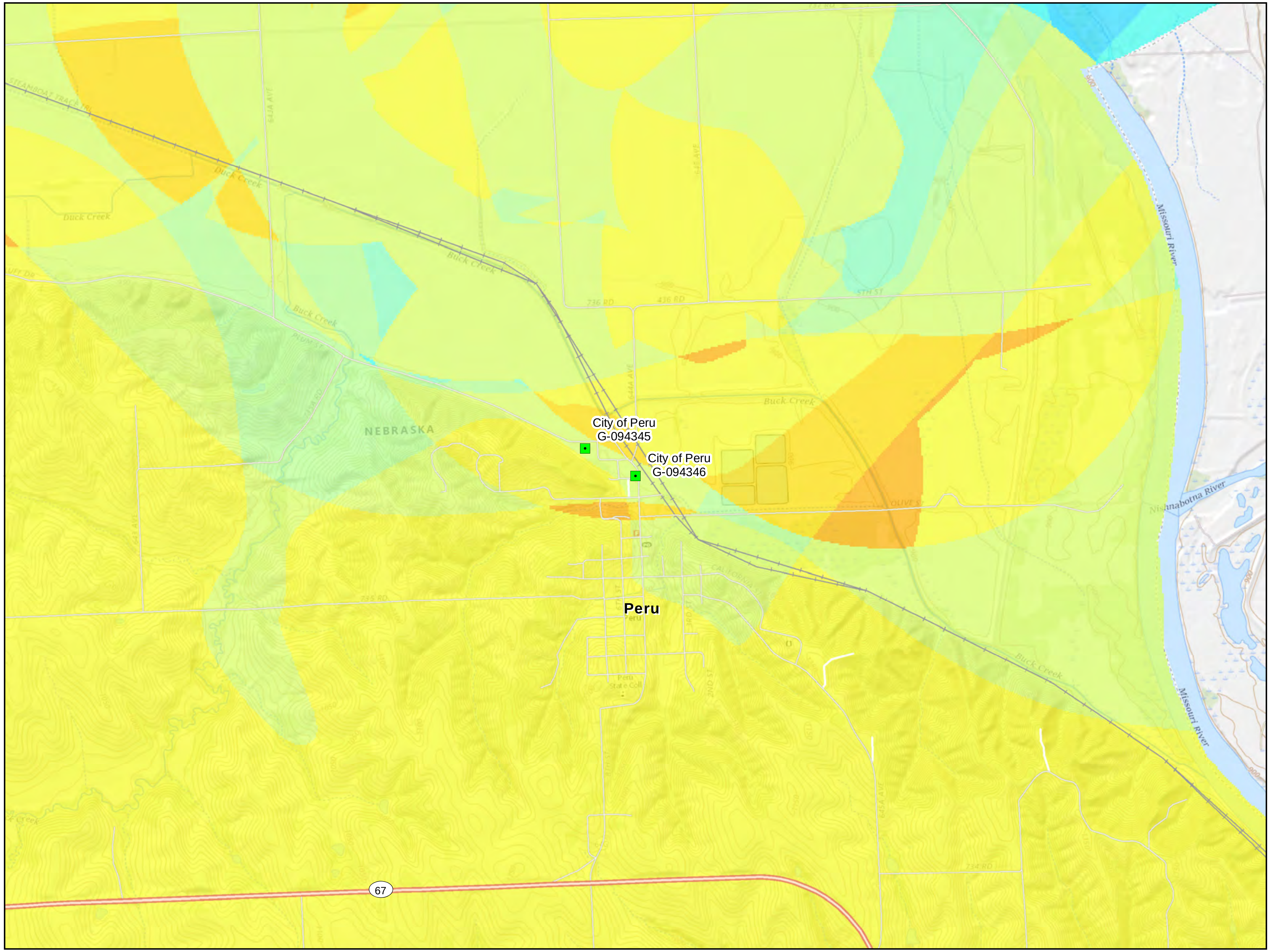

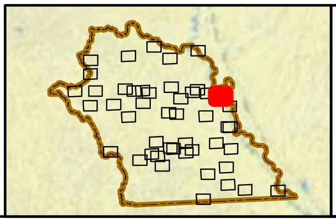

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NEBRASKA

ATTACHMENT 1
CITY OF PERU DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD	DATE: 5/13/2020	FIGURE: 8

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🟩 Public Water Supply Well (Active)

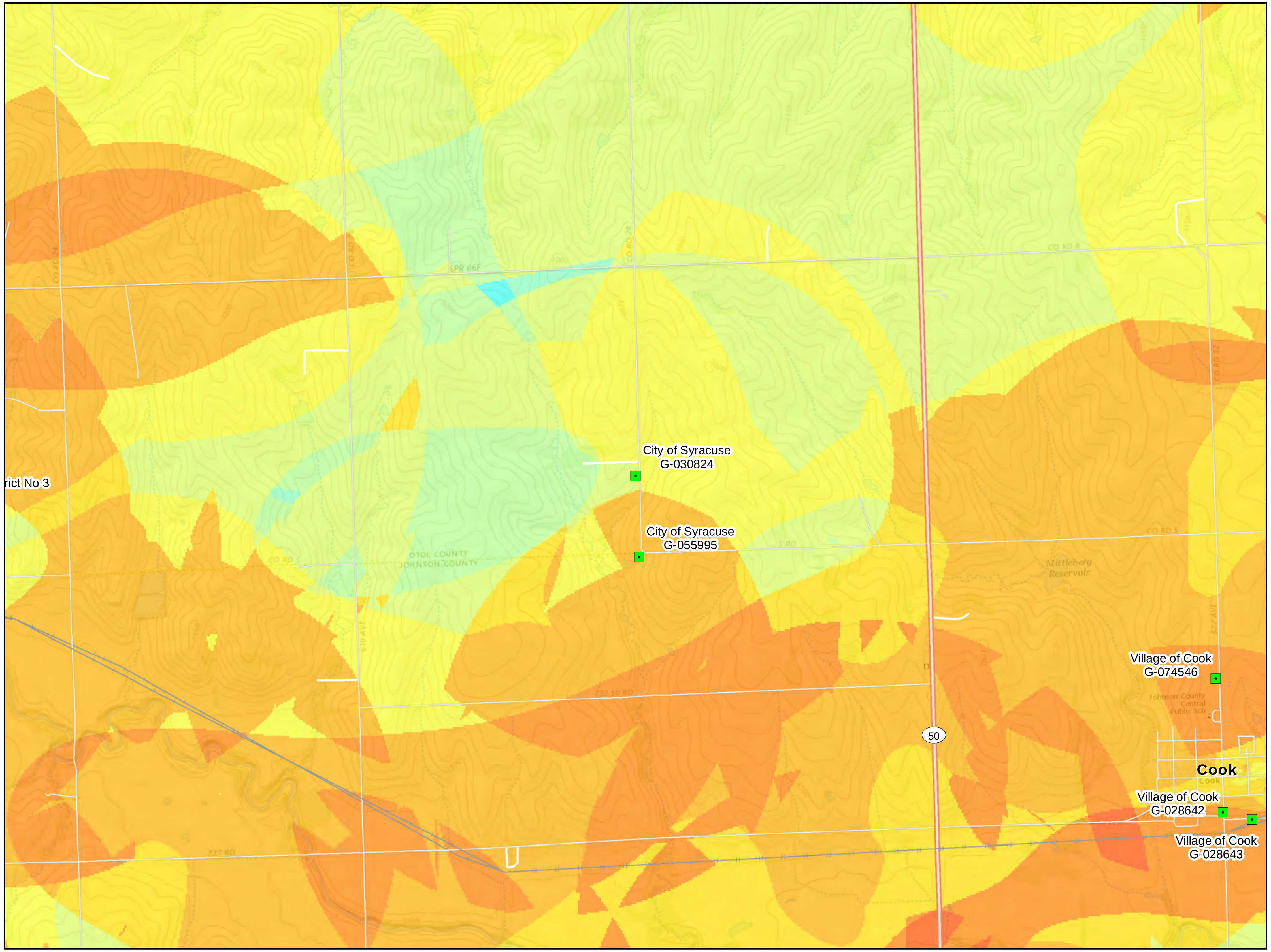
Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)	🟨 2.99 - 3.24
🟦 1.24 - 1.49	🟨 3.24 - 3.49
🟦 1.49 - 1.74	🟨 3.49 - 3.74
🟦 1.74- 1.99	🟧 3.74 - 3.99
🟦 1.99 - 2.24	🟧 3.99 - 4.24
🟦 2.24 - 2.49	🟧 4.24- 4.49
🟩 2.49 - 2.74	🟥 4.49 - 4.60 (higher vulnerability)
🟩 2.74 - 2.99	

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000
Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

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Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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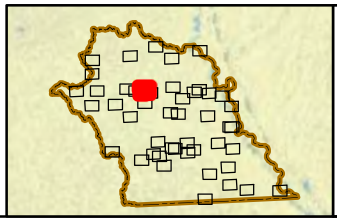

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NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
CITY OF SYRACUSE DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 9

🟩 Public Water Supply Well (Active)

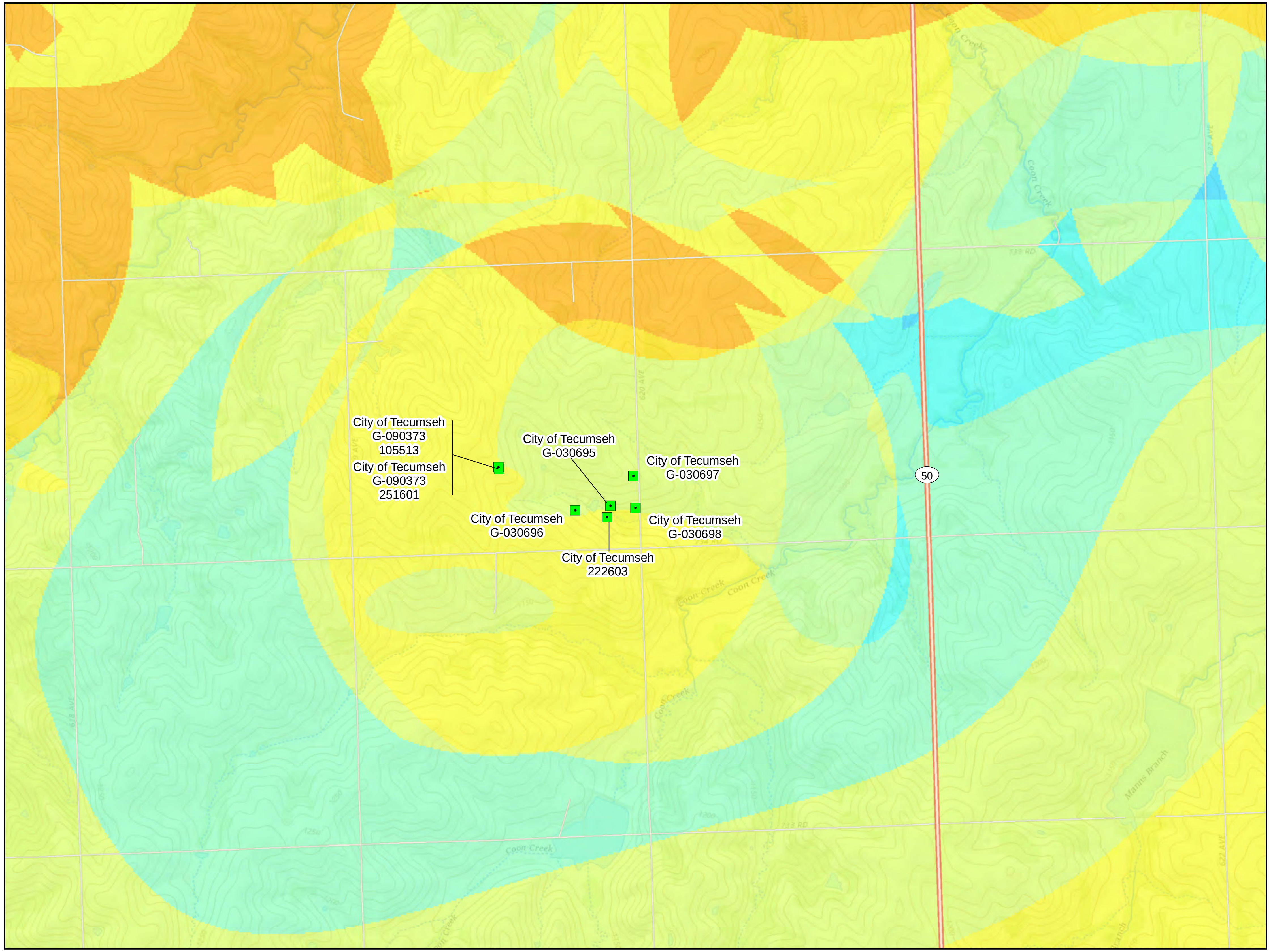
Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟩	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

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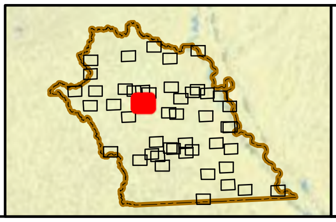

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NEMAHA NATURAL RESOURCES DISTRICT
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NEBRASKA

ATTACHMENT 1
CITY OF TECUMSEH DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD DATE: 5/13/2020 FIGURE: 10

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)	🟨 2.99 - 3.24
🟦 1.24 - 1.49	🟨 3.24 - 3.49
🟦 1.49 - 1.74	🟨 3.49 - 3.74
🟦 1.74- 1.99	🟧 3.74 - 3.99
🟦 1.99 - 2.24	🟧 3.99 - 4.24
🟩 2.24 - 2.49	🟧 4.24- 4.49
🟩 2.49 - 2.74	🟥 4.49 - 4.60 (higher vulnerability)
🟩 2.74 - 2.99	

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

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Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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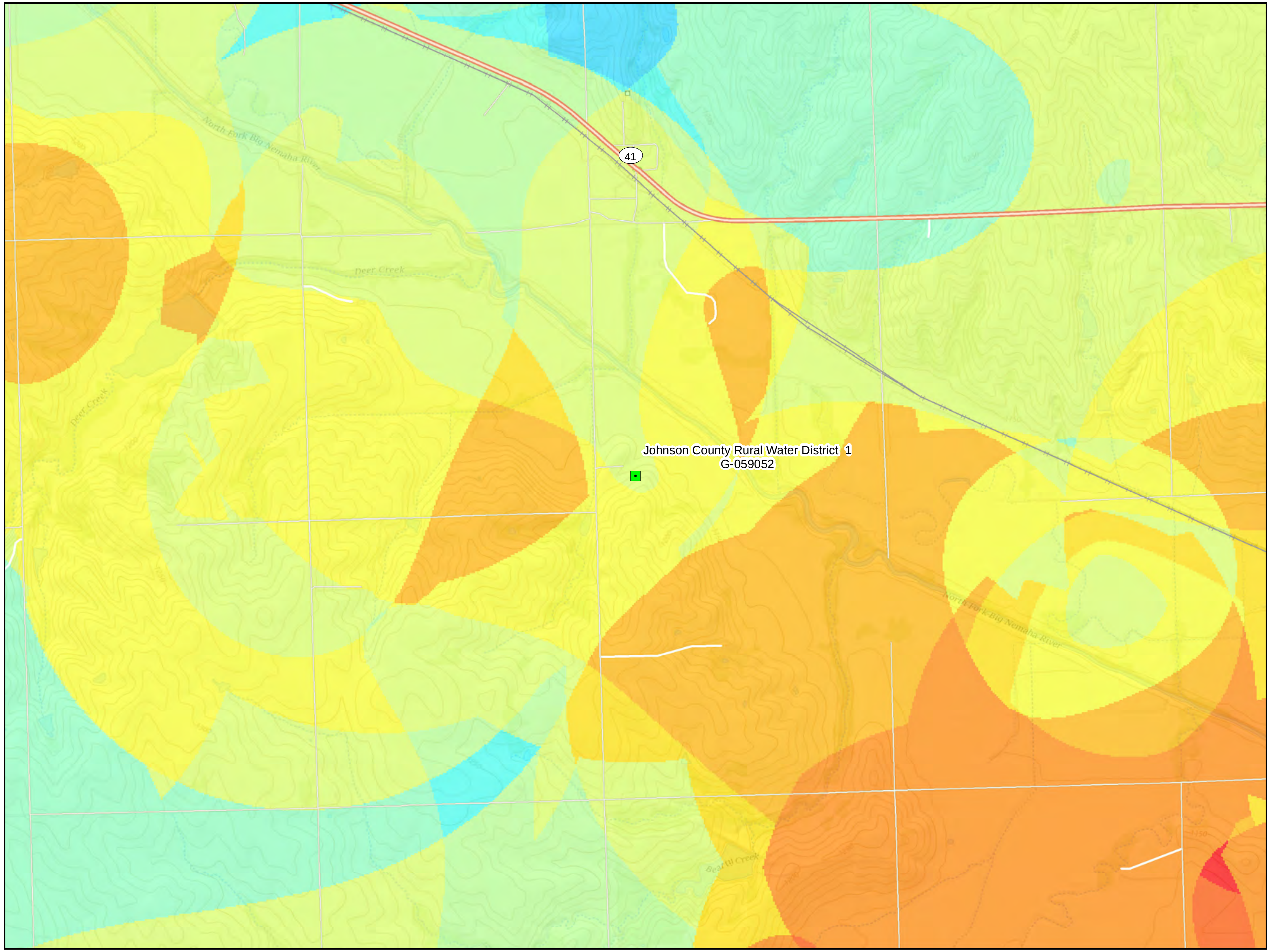

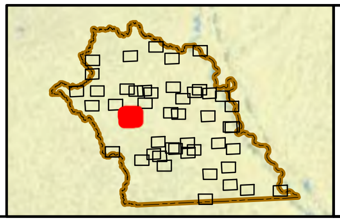

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NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
JOHNSON CO. RWD NO. 1 DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD	DATE: 5/13/2020	FIGURE: 11

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

- 🟦 1.20 - 1.24 (lower vulnerability)
- 🟦 1.24 - 1.49
- 🟦 1.49 - 1.74
- 🟦 1.74- 1.99
- 🟦 1.99 - 2.24
- 🟦 2.24 - 2.49
- 🟩 2.49 - 2.74
- 🟩 2.74 - 2.99
- 🟨 2.99 - 3.24
- 🟨 3.24 - 3.49
- 🟨 3.49 - 3.74
- 🟧 3.74 - 3.99
- 🟧 3.99 - 4.24
- 🟧 4.24- 4.49
- 🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

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Sources:

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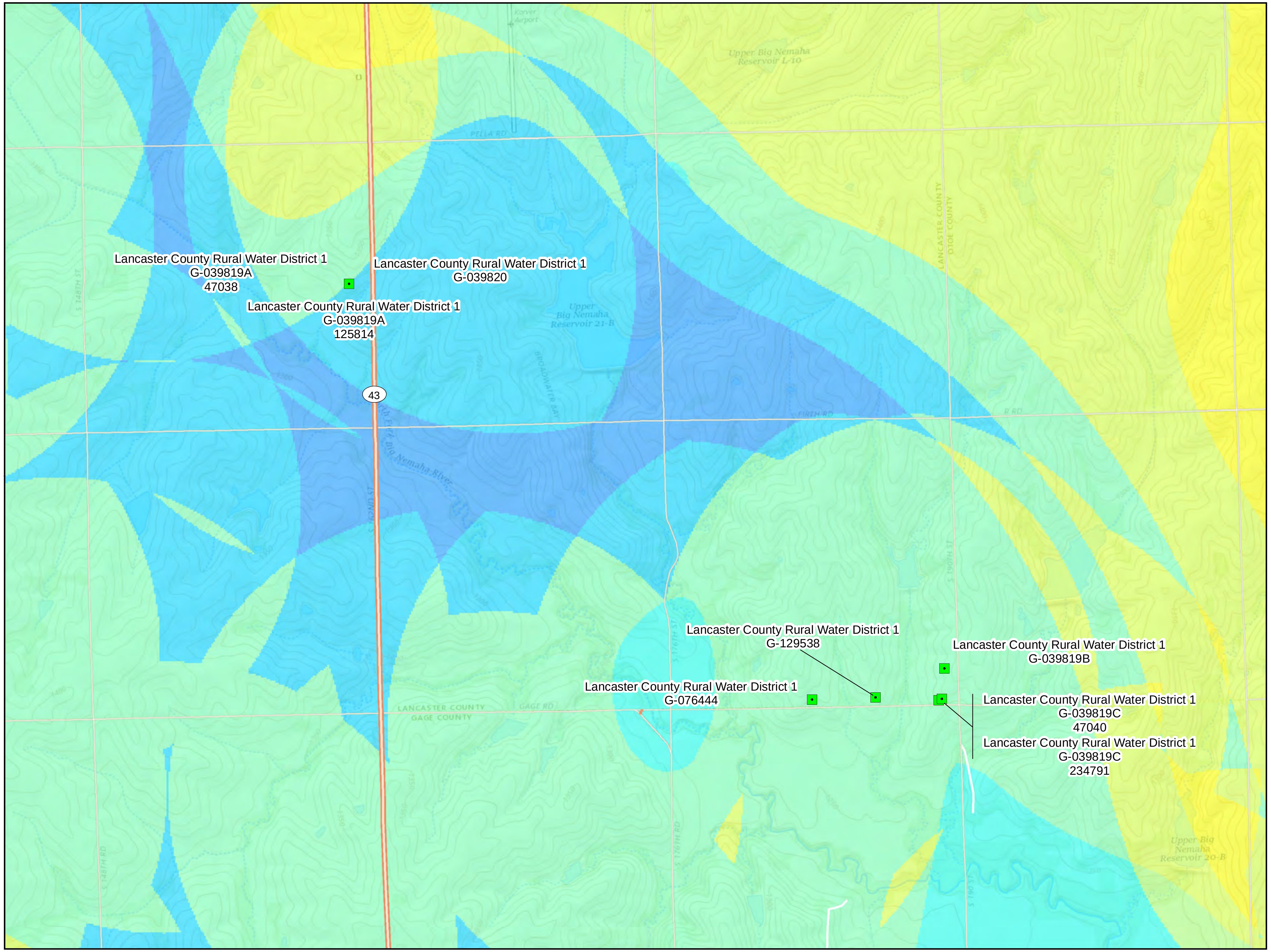

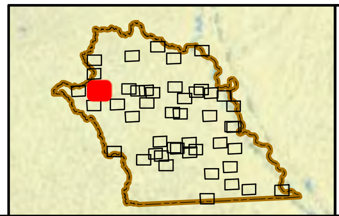

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NEMAHA NATURAL RESOURCES DISTRICT
NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
LANCASTER CO. RWD 1 DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD DATE: 5/13/2020 FIGURE: 12

🟩 Public Water Supply Well (Active)

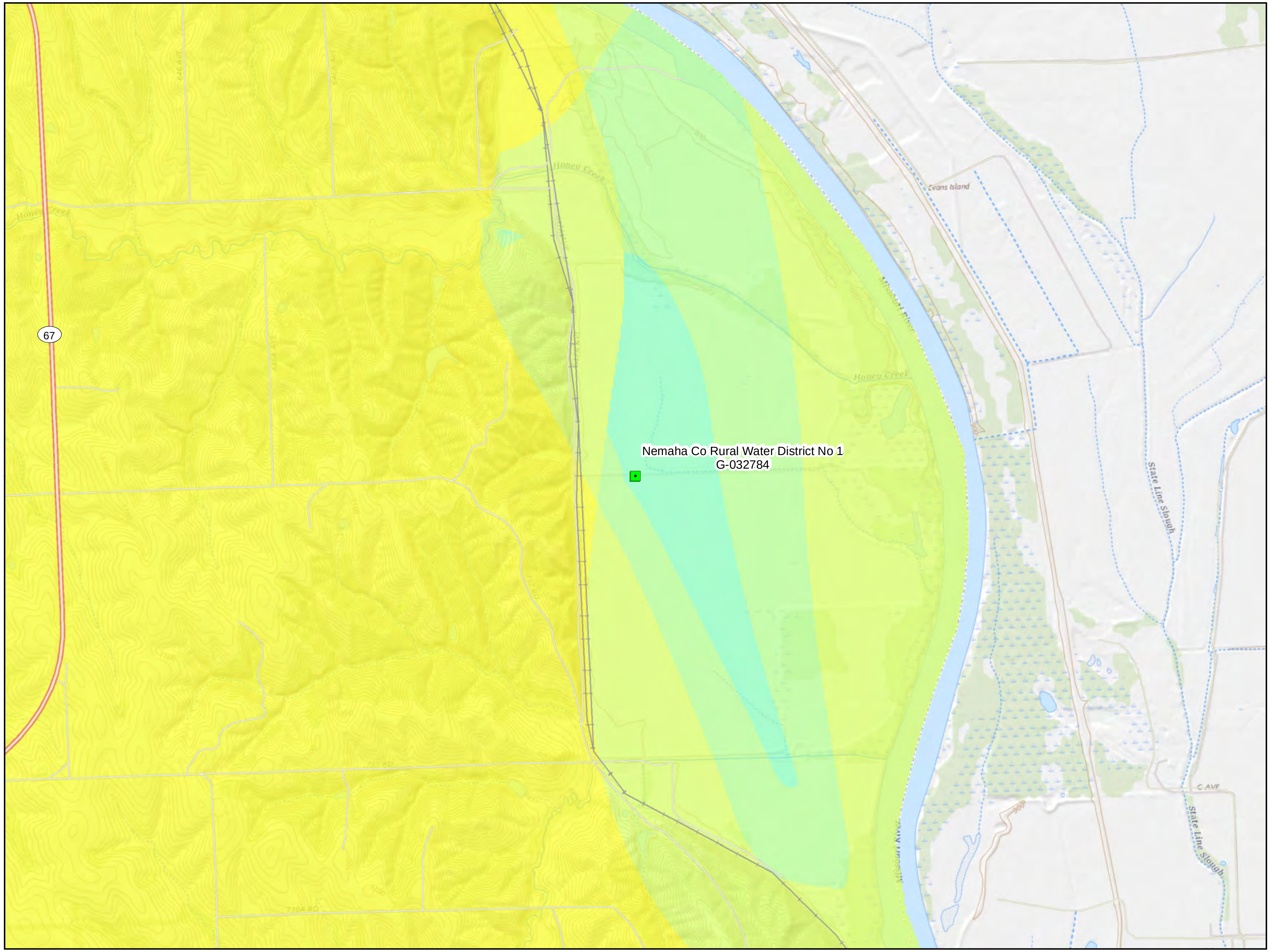
Potential Drought Vulnerability

- 🟦 1.20 - 1.24 (lower vulnerability)
- 🟦 1.24 - 1.49
- 🟦 1.49 - 1.74
- 🟦 1.74- 1.99
- 🟦 1.99 - 2.24
- 🟦 2.24 - 2.49
- 🟩 2.49 - 2.74
- 🟩 2.74 - 2.99
- 🟨 2.99 - 3.24
- 🟨 3.24 - 3.49
- 🟨 3.49 - 3.74
- 🟧 3.74 - 3.99
- 🟧 3.99 - 4.24
- 🟧 4.24- 4.49
- 🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

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The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

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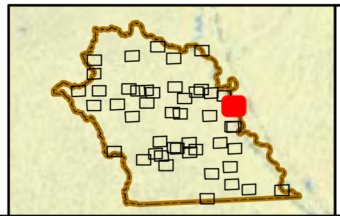

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NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
NEMAHA COUNTY RWD NO. 1 DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD
DATE: 5/13/2020
FIGURE: 13

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

- 🟦 1.20 - 1.24 (lower vulnerability)
- 🟦 1.24 - 1.49
- 🟦 1.49 - 1.74
- 🟦 1.74- 1.99
- 🟦 1.99 - 2.24
- 🟦 2.24 - 2.49
- 🟩 2.49 - 2.74
- 🟩 2.74 - 2.99
- 🟨 2.99 - 3.24
- 🟨 3.24 - 3.49
- 🟨 3.49 - 3.74
- 🟧 3.74 - 3.99
- 🟧 3.99 - 4.24
- 🟧 4.24- 4.49
- 🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

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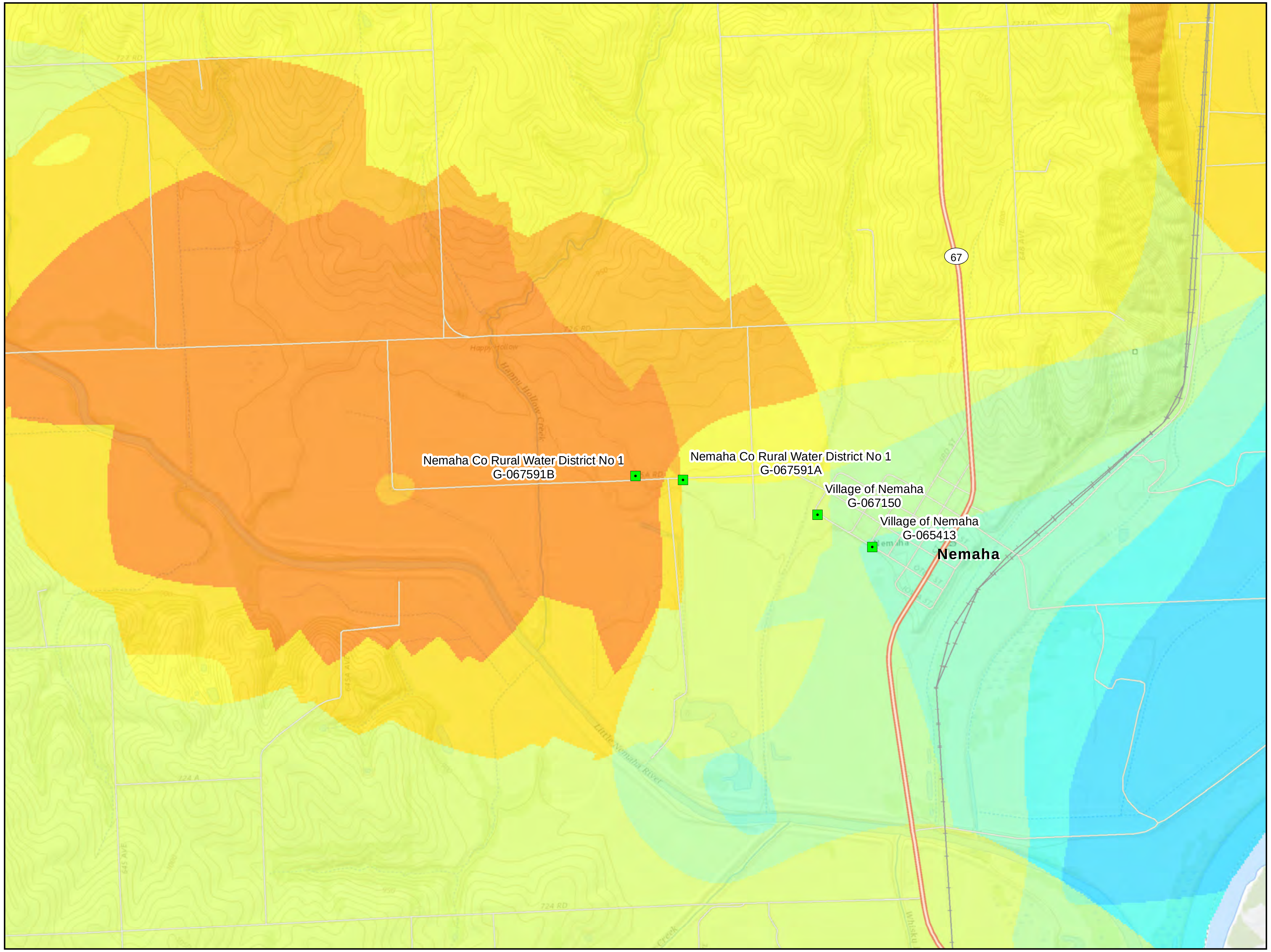

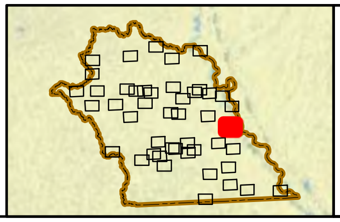

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ATTACHMENT 1
NEMAHA COUNTY RWD NO. 1 DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD
DATE: 5/13/2020
FIGURE: 14

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)
🟦 1.24 - 1.49
🟦 1.49 - 1.74
🟦 1.74- 1.99
🟦 1.99 - 2.24
🟦 2.24 - 2.49
🟩 2.49 - 2.74
🟩 2.74 - 2.99
🟨 2.99 - 3.24
🟨 3.24 - 3.49
🟨 3.49 - 3.74
🟧 3.74 - 3.99
🟧 3.99 - 4.24
🟧 4.24- 4.49
🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

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Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

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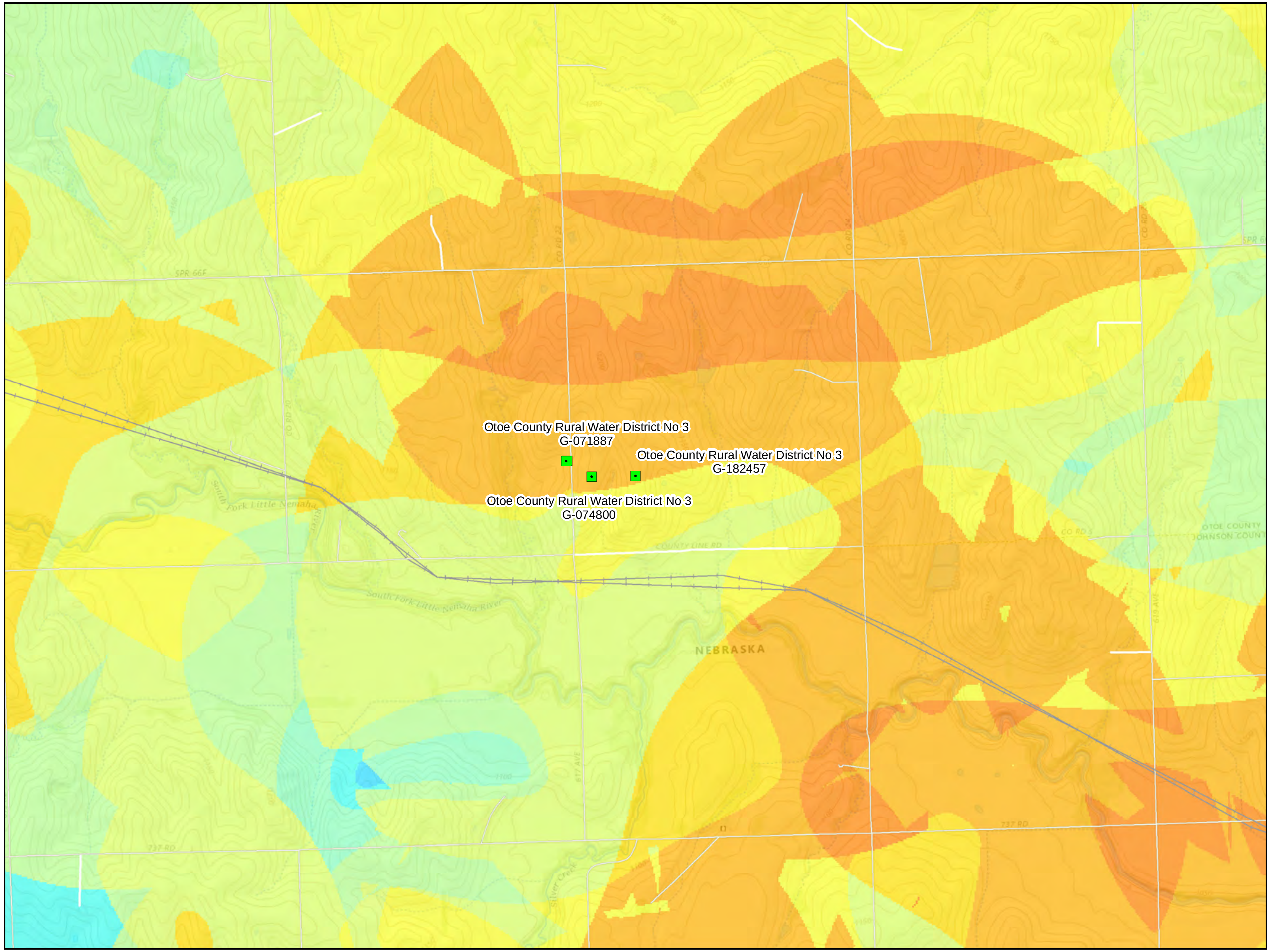

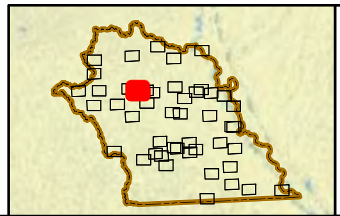

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ATTACHMENT 1
OTOE CO. RWD NO. 3 DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD	DATE: 5/13/2020	FIGURE: 15

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

- 🟦 1.20 - 1.24 (lower vulnerability)
- 🟦 1.24 - 1.49
- 🟦 1.49 - 1.74
- 🟦 1.74- 1.99
- 🟦 1.99 - 2.24
- 🟦 2.24 - 2.49
- 🟩 2.49 - 2.74
- 🟩 2.74 - 2.99
- 🟨 2.99 - 3.24
- 🟨 3.24 - 3.49
- 🟨 3.49 - 3.74
- 🟧 3.74 - 3.99
- 🟧 3.99 - 4.24
- 🟧 4.24- 4.49
- 🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

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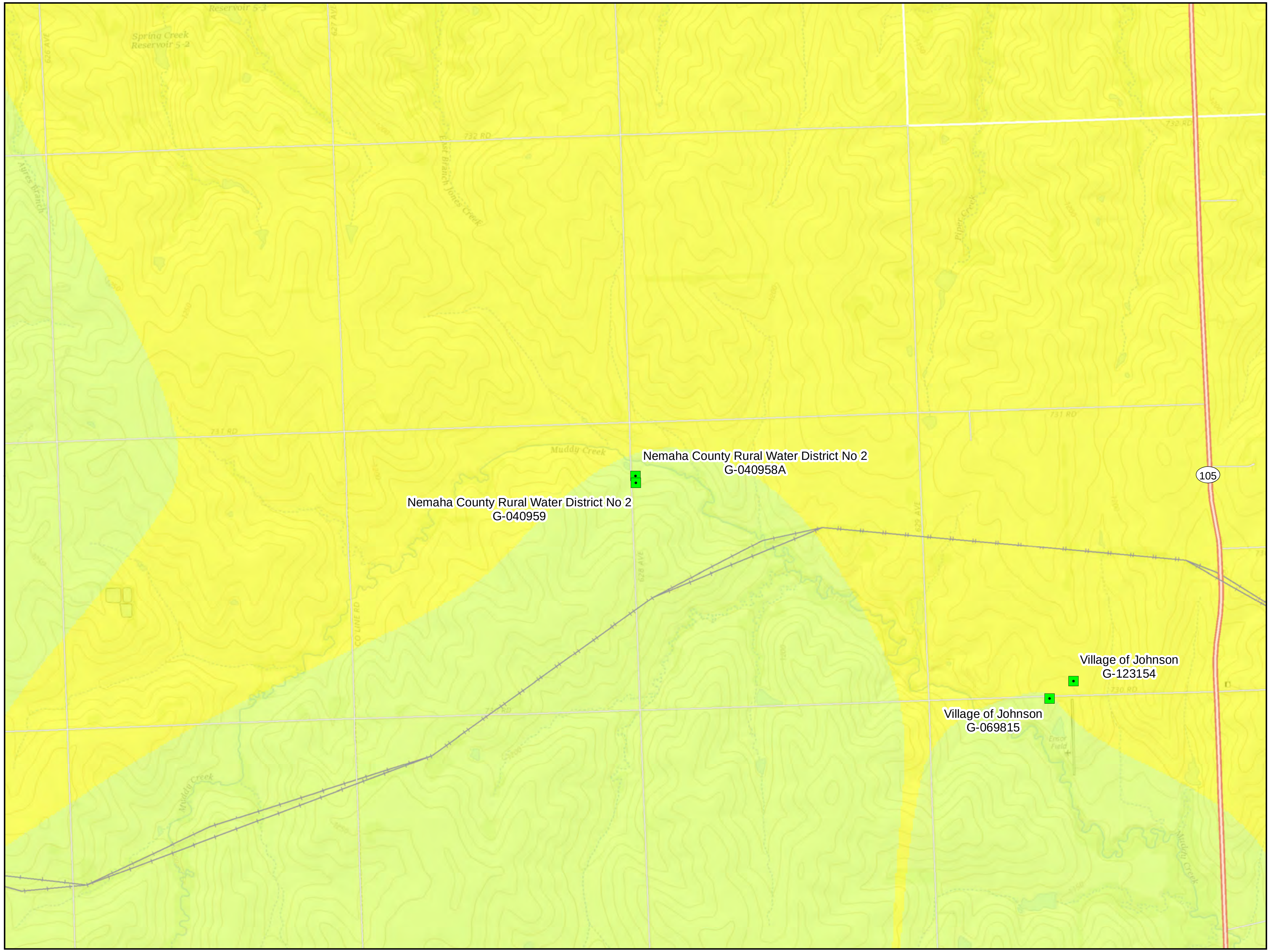

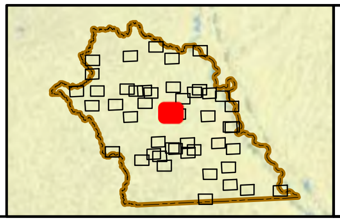

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ATTACHMENT 1
NEMAHA COUNTY RWD NO. 2 DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD DATE: 5/13/2020 FIGURE: 16

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🟩 Public Water Supply Well (Active)

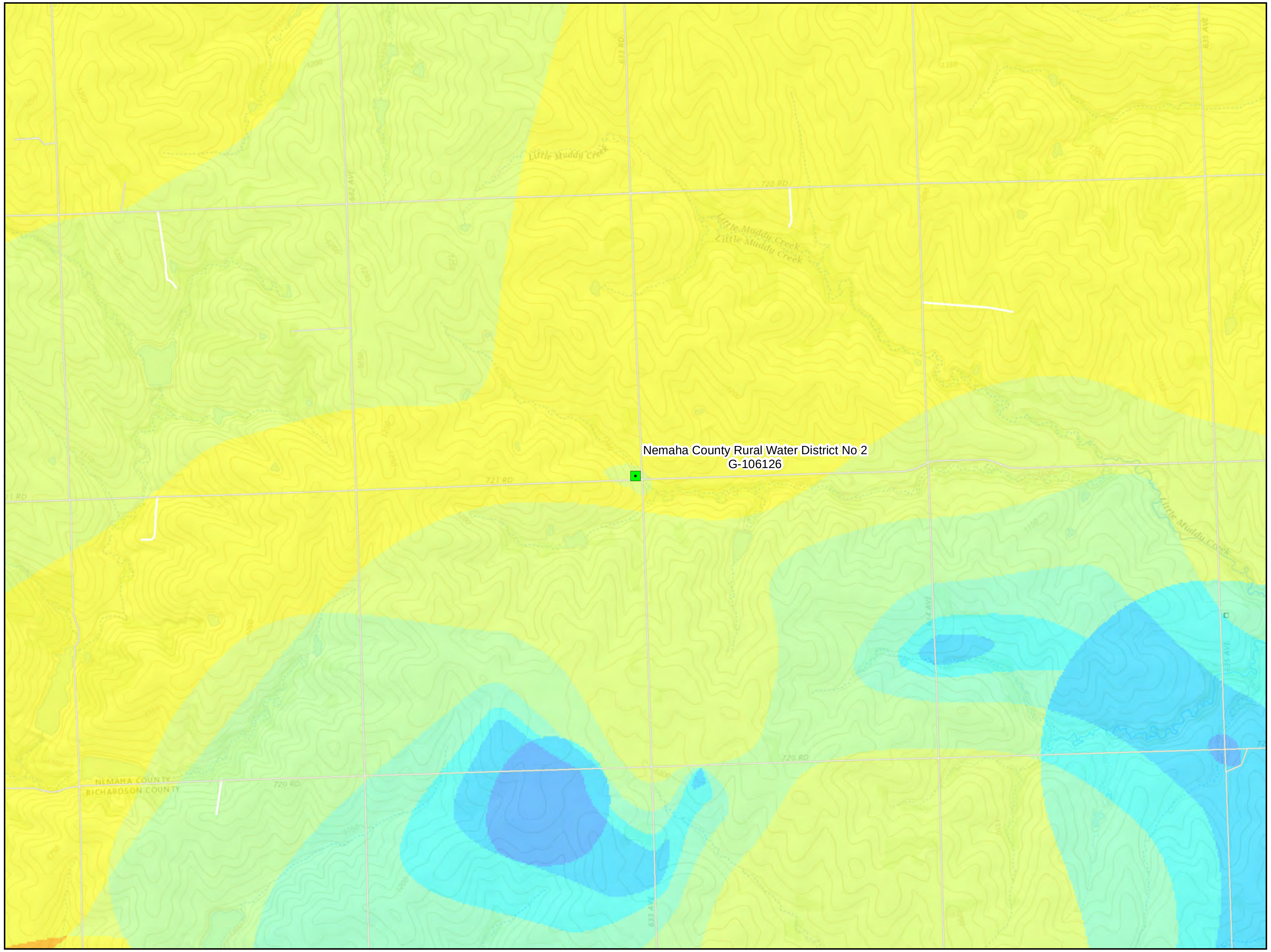
Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City ——	City Name
G-042490 ——	Registration Number
49785 ——	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000
Feet



Notes:

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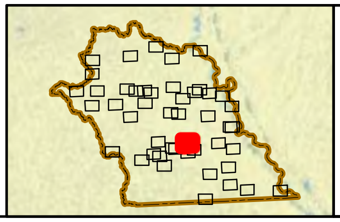

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ATTACHMENT 1
NEMAHA COUNTY RWD NO. 2 DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD	DATE: 5/13/2020	FIGURE: 17

🟩 Public Water Supply Well (Active)

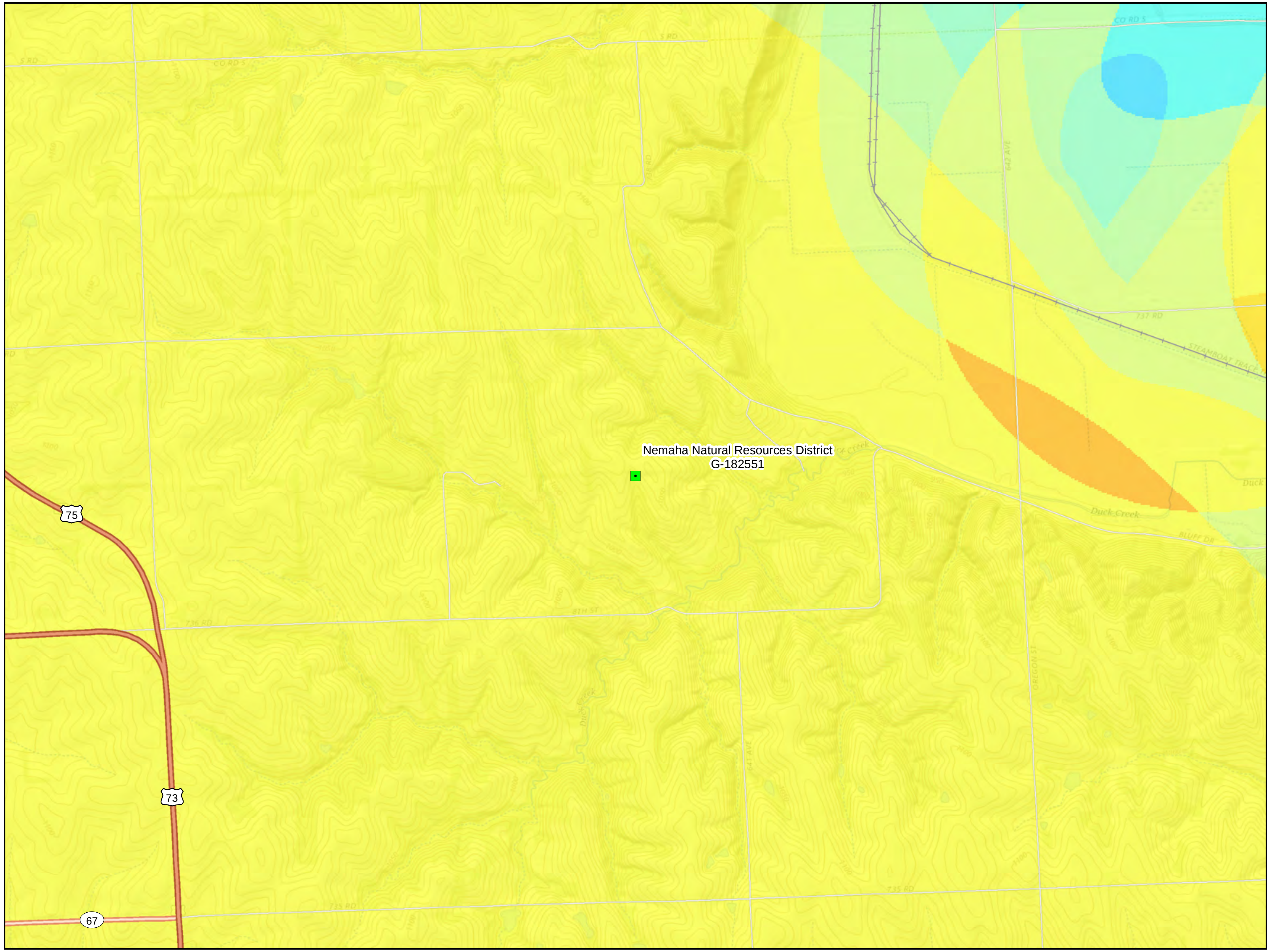
Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)	🟩 2.99 - 3.24
🟦 1.24 - 1.49	🟨 3.24 - 3.49
🟦 1.49 - 1.74	🟨 3.49 - 3.74
🟦 1.74- 1.99	🟧 3.74 - 3.99
🟦 1.99 - 2.24	🟧 3.99 - 4.24
🟦 2.24 - 2.49	🟧 4.24- 4.49
🟩 2.49 - 2.74	🟥 4.49 - 4.60 (higher vulnerability)
🟩 2.74 - 2.99	

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000
Feet



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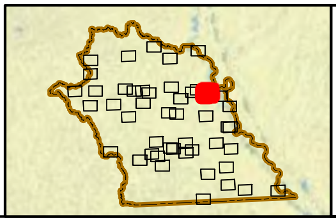

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NEBRASKA

ATTACHMENT 1
NEMAHA NATURAL RESOURCES DISTRICT DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD
DATE: 5/13/2020
FIGURE: 18

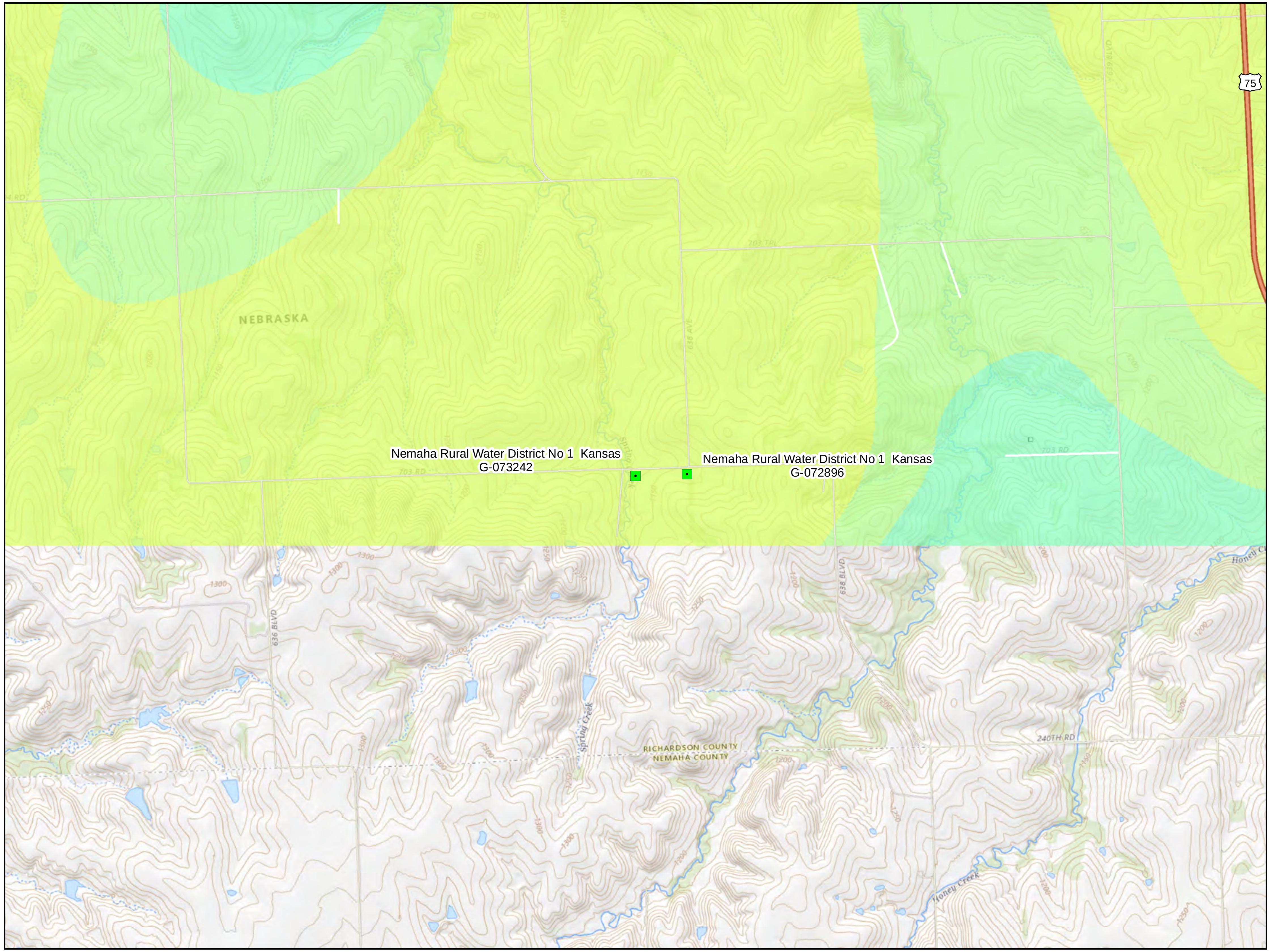
🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)
🟦 1.24 - 1.49
🟦 1.49 - 1.74
🟦 1.74- 1.99
🟦 1.99 - 2.24
🟦 2.24 - 2.49
🟩 2.49 - 2.74
🟩 2.74 - 2.99
🟨 2.99 - 3.24
🟨 3.24 - 3.49
🟨 3.49 - 3.74
🟧 3.74 - 3.99
🟧 3.99 - 4.24
🟧 4.24- 4.49
🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N
0 2,000
Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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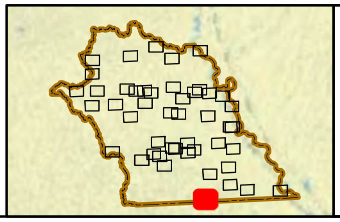

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NEMAHA NATURAL RESOURCES DISTRICT
NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
NEMAHA RWD NO. 1 KANSAS DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 19

🟩 Public Water Supply Well (Active)

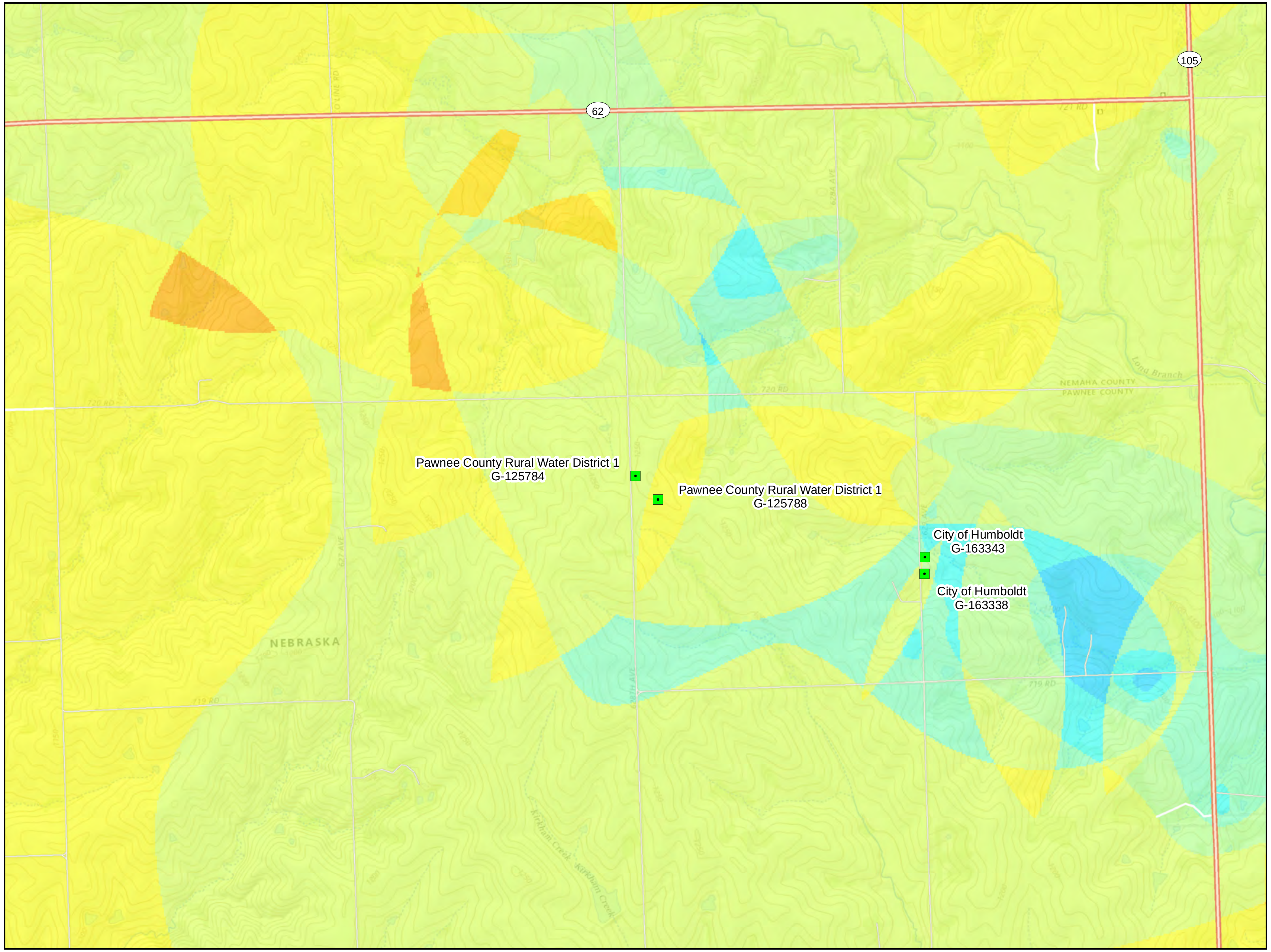
Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟩	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

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Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

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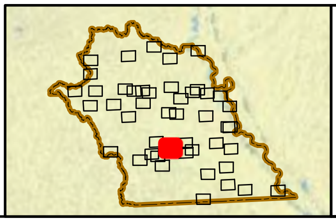

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NEMAHA NATURAL RESOURCES DISTRICT
NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
PAWNEE CO. RWD 1 DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 20

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

- 1.20 - 1.24 (lower vulnerability)
- 1.24 - 1.49
- 1.49 - 1.74
- 1.74- 1.99
- 1.99 - 2.24
- 2.24 - 2.49
- 2.49 - 2.74
- 2.74 - 2.99
- 2.99 - 3.24
- 3.24 - 3.49
- 3.49 - 3.74
- 3.74 - 3.99
- 3.99 - 4.24
- 4.24- 4.49
- 4.49 - 4.60 (higher vulnerability)

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

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Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

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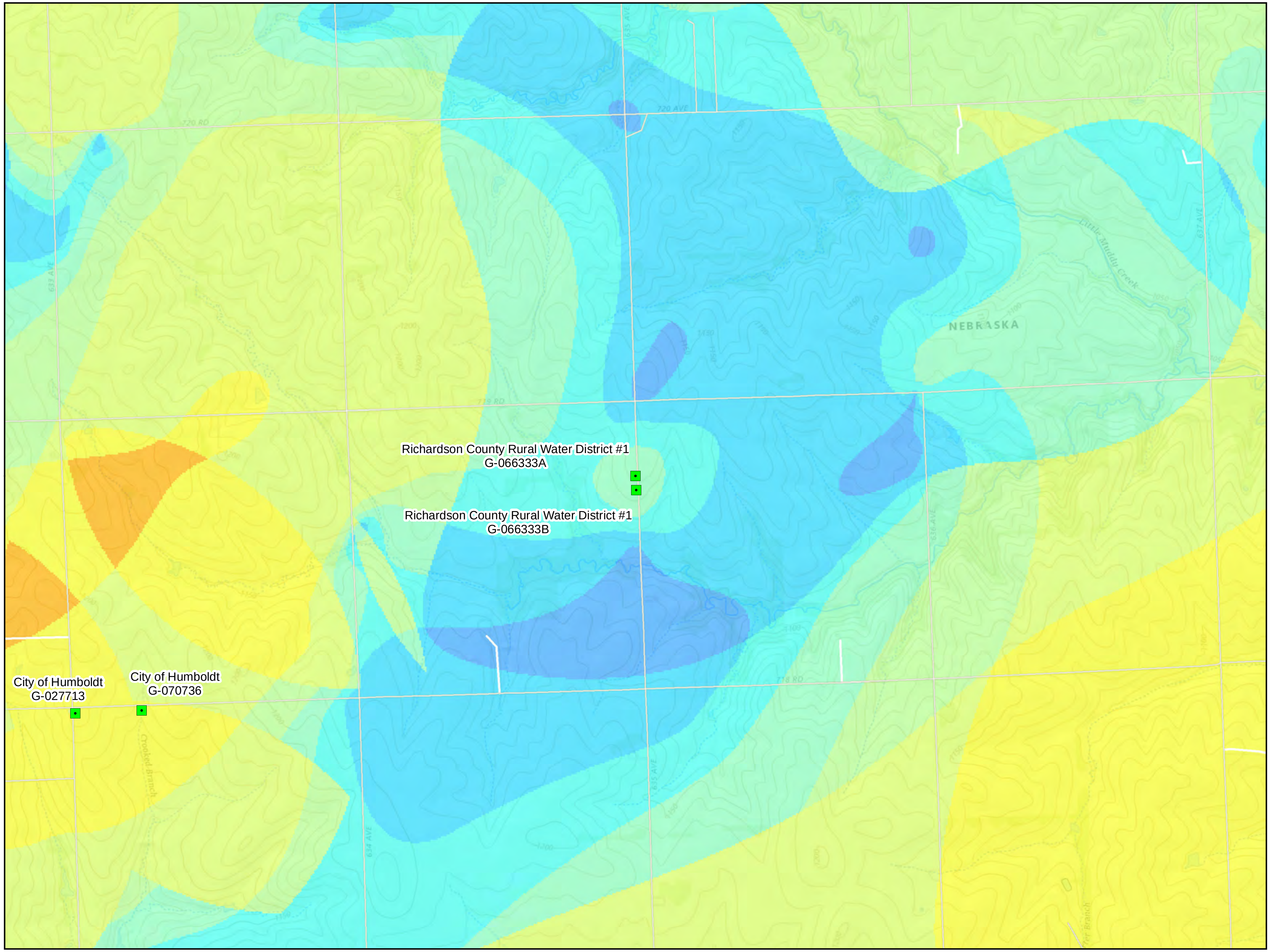

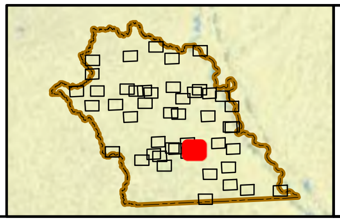

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NEMAHA NATURAL RESOURCES DISTRICT
NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
RICHARDSON CO. RWD NO. 1 DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD DATE: 5/13/2020 FIGURE: 21

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

- 🟦 1.20 - 1.24 (lower vulnerability)
- 🟦 1.24 - 1.49
- 🟦 1.49 - 1.74
- 🟦 1.74- 1.99
- 🟦 1.99 - 2.24
- 🟦 2.24 - 2.49
- 🟩 2.49 - 2.74
- 🟩 2.74 - 2.99
- 🟨 2.99 - 3.24
- 🟨 3.24 - 3.49
- 🟨 3.49 - 3.74
- 🟧 3.74 - 3.99
- 🟧 3.99 - 4.24
- 🟧 4.24- 4.49
- 🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

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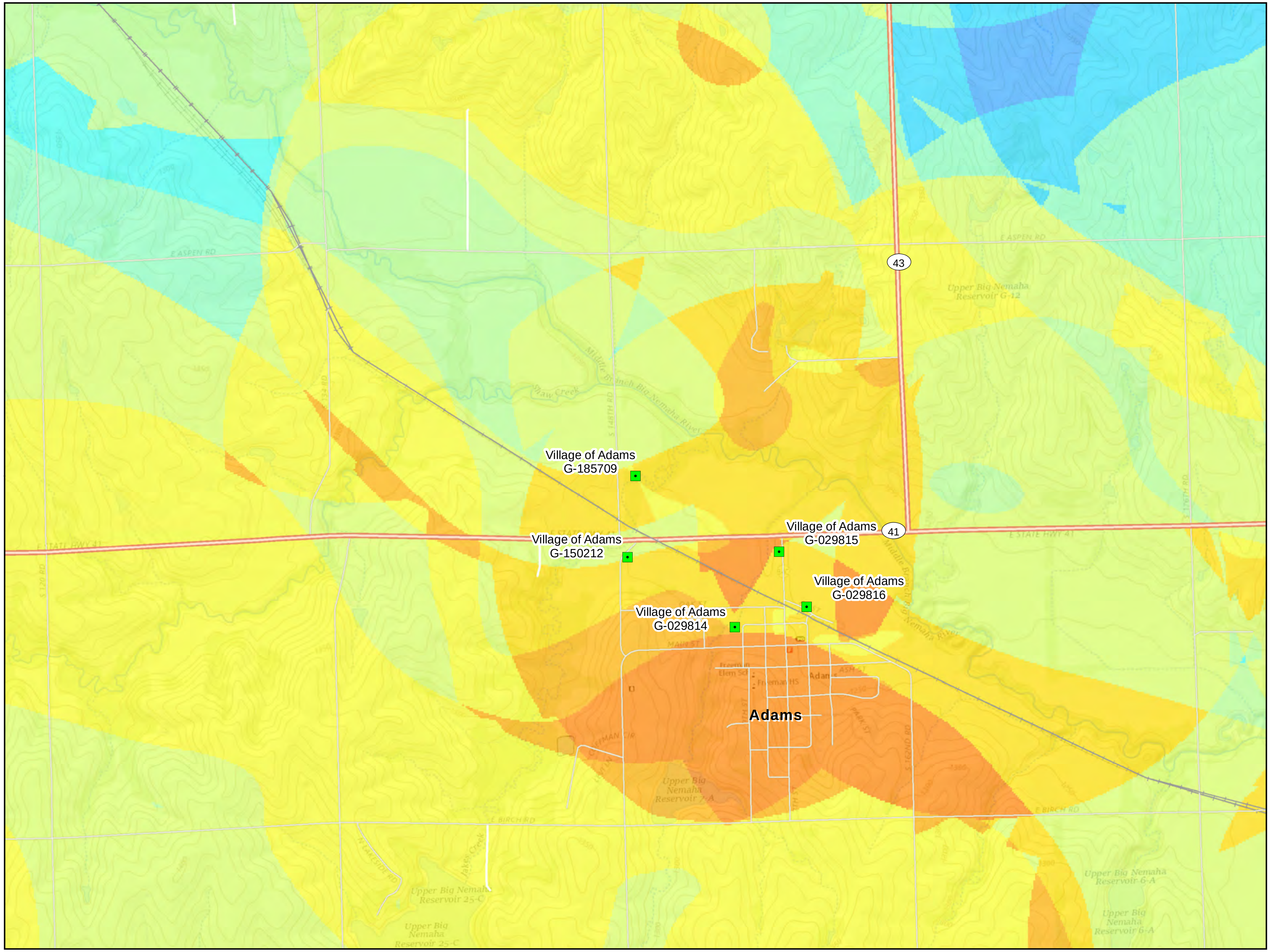

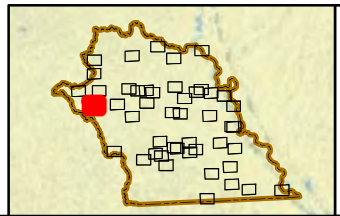

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NEMAHA NATURAL RESOURCES DISTRICT
NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
VILLAGE OF ADAMS DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD
DATE: 5/13/2020
FIGURE: 22

🟩 Public Water Supply Well (Active)

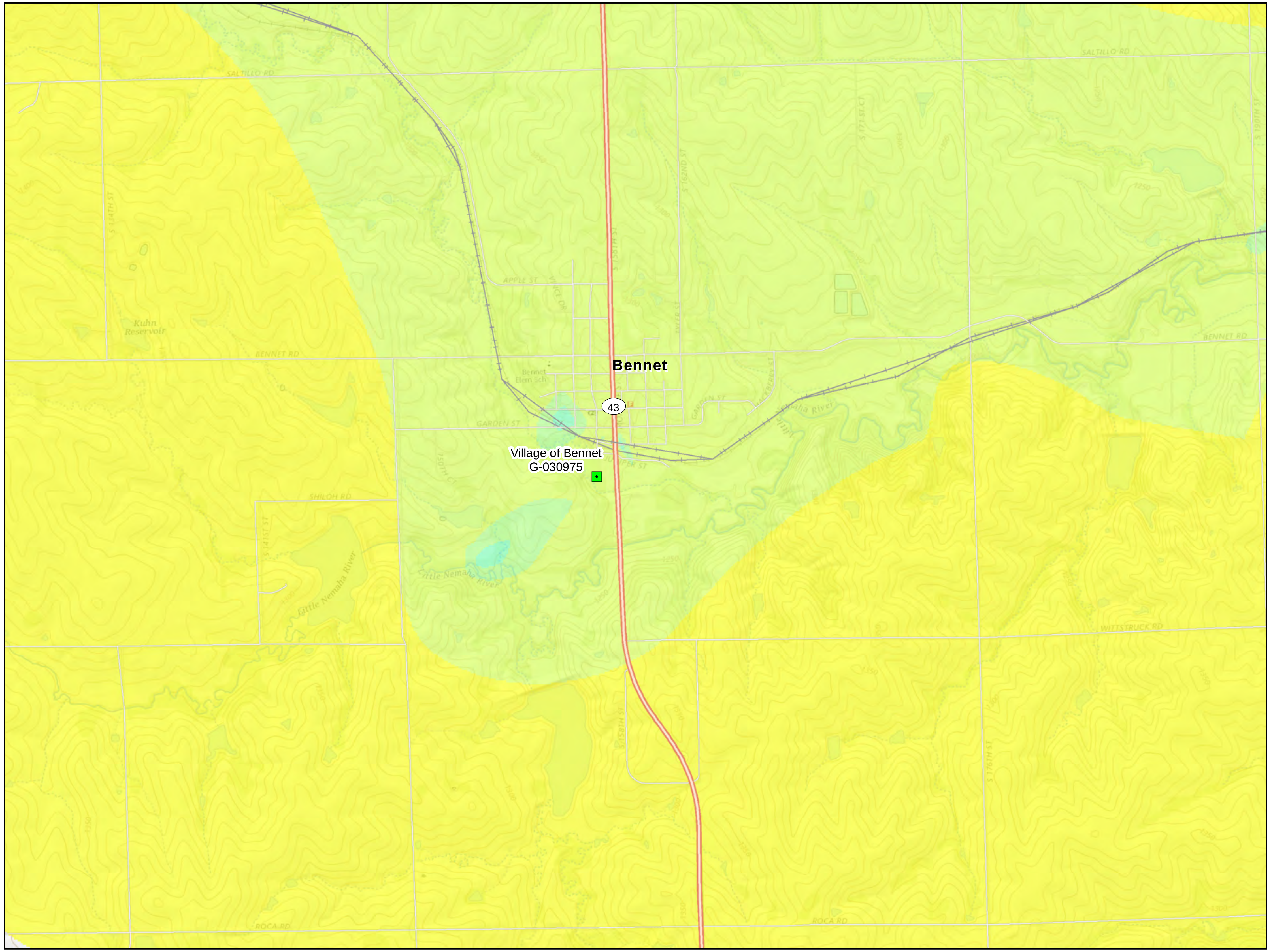
Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)	🟨 2.99 - 3.24
🟦 1.24 - 1.49	🟨 3.24 - 3.49
🟦 1.49 - 1.74	🟨 3.49 - 3.74
🟦 1.74- 1.99	🟧 3.74 - 3.99
🟦 1.99 - 2.24	🟧 3.99 - 4.24
🟦 2.24 - 2.49	🟧 4.24- 4.49
🟩 2.49 - 2.74	🟥 4.49 - 4.60 (higher vulnerability)
🟩 2.74 - 2.99	

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



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Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

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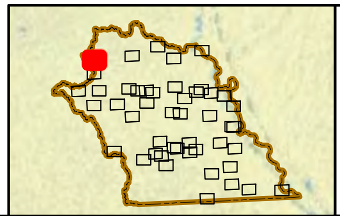

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NEMAHA NATURAL RESOURCES DISTRICT
NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
VILLAGE OF BENNET DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD
DATE: 5/13/2020
FIGURE: 23

🟩 Public Water Supply Well (Active)

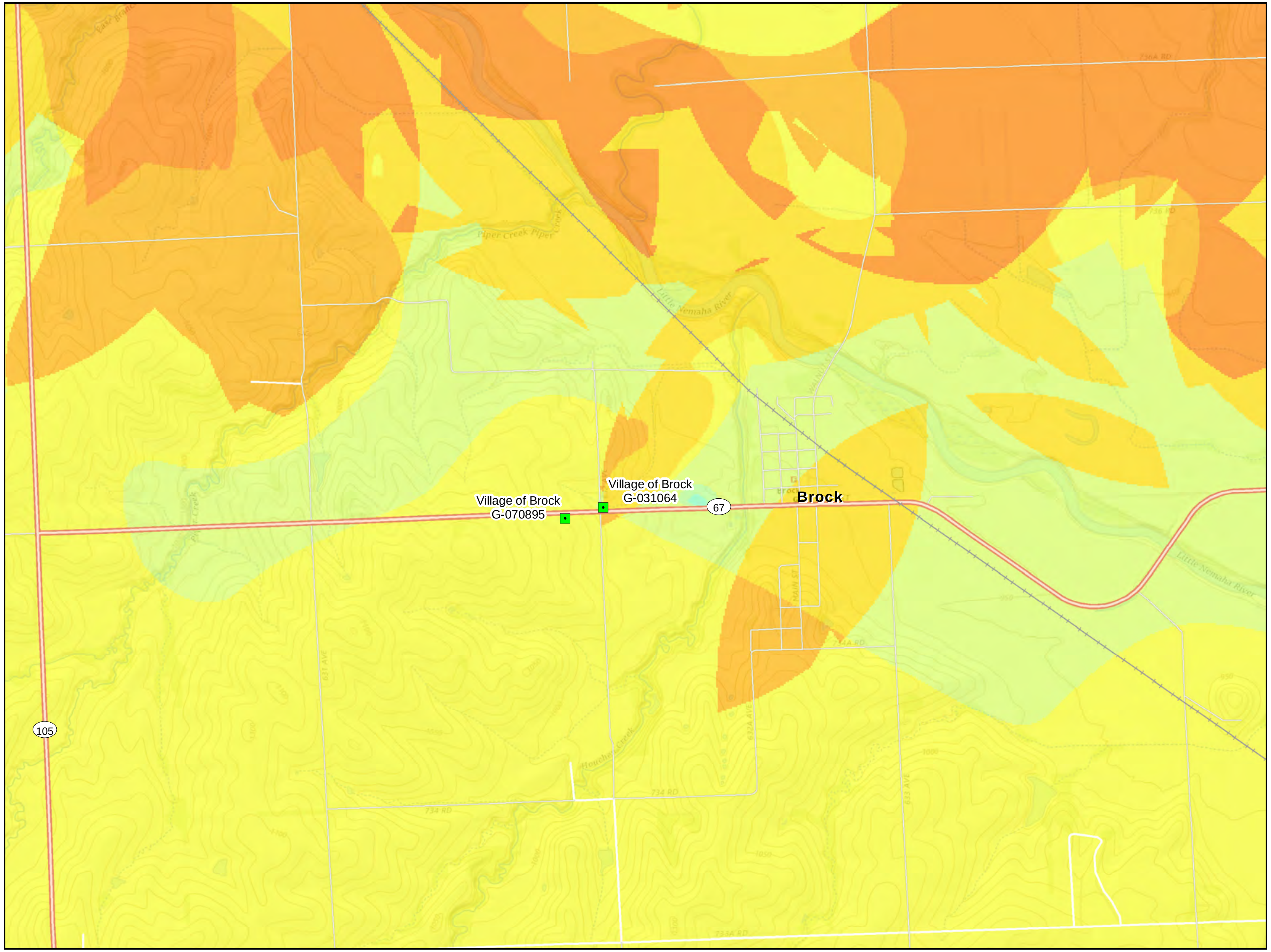
Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



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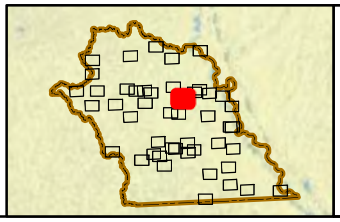

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NEMAHA NATURAL RESOURCES DISTRICT
NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
VILLAGE OF BROCK DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD	DATE: 5/13/2020	FIGURE: 24

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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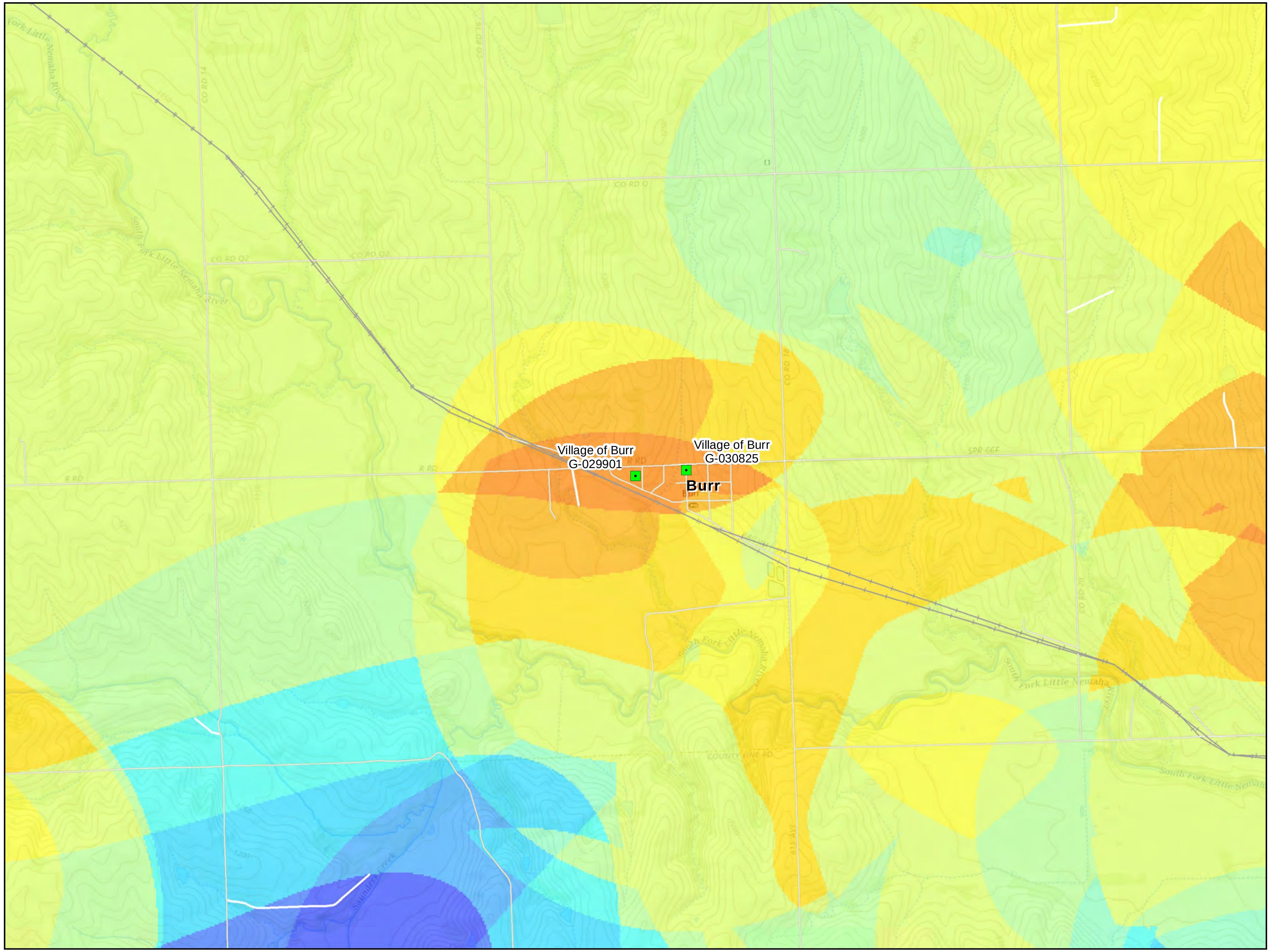

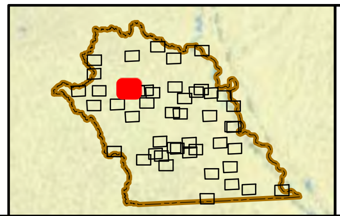

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NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
VILLAGE OF BURR DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD
DATE: 5/13/2020
FIGURE: 25

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)	🟨 2.99 - 3.24
🟦 1.24 - 1.49	🟨 3.24 - 3.49
🟦 1.49 - 1.74	🟨 3.49 - 3.74
🟦 1.74- 1.99	🟧 3.74 - 3.99
🟦 1.99 - 2.24	🟧 3.99 - 4.24
🟦 2.24 - 2.49	🟧 4.24- 4.49
🟩 2.49 - 2.74	🟥 4.49 - 4.60 (higher vulnerability)
🟩 2.74 - 2.99	

City of Falls City ——	City Name
G-042490 ——	Registration Number
49785 ——	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

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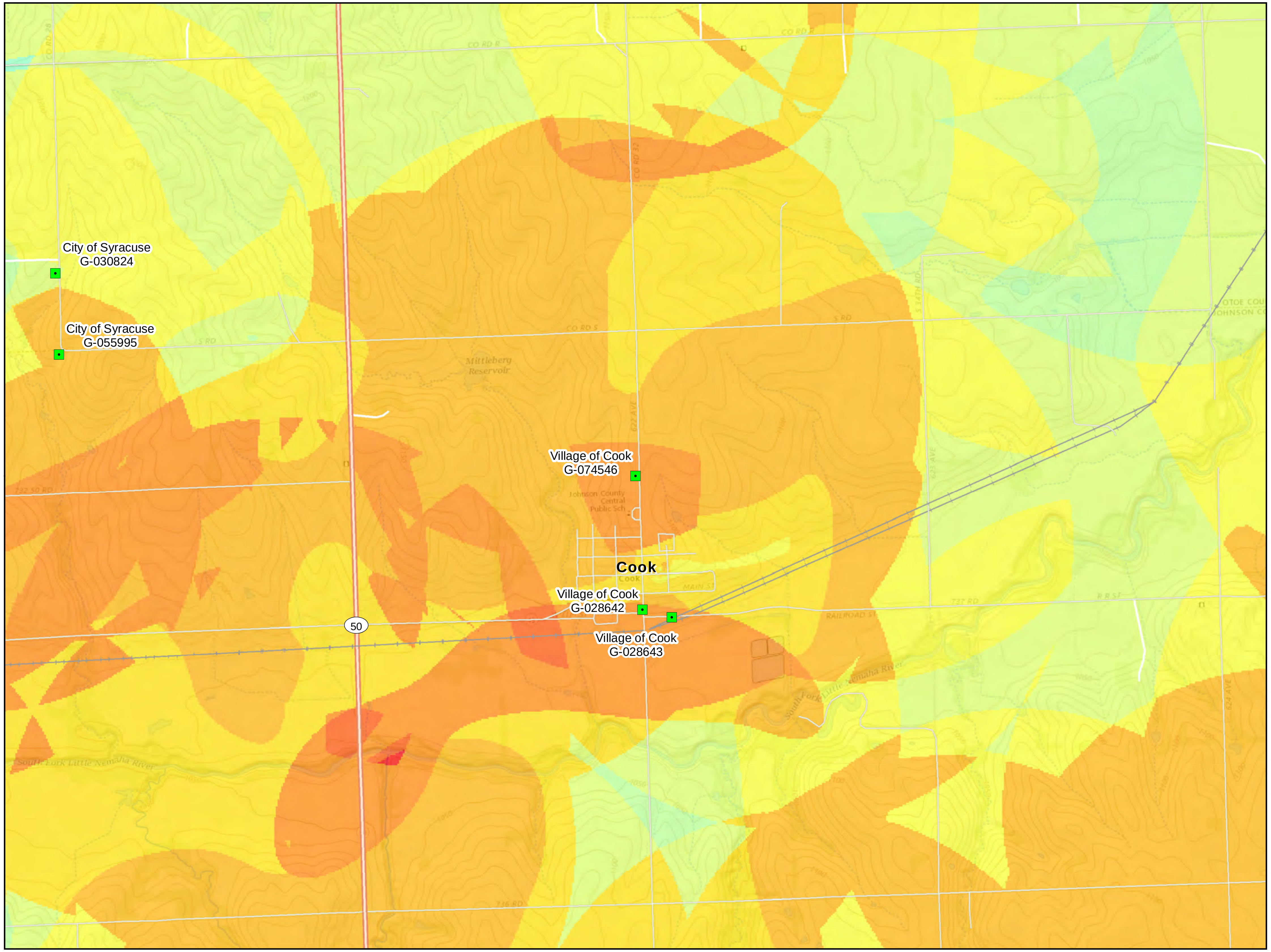

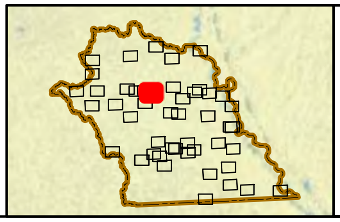

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ATTACHMENT 1
VILLAGE OF COOK DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD	DATE: 5/13/2020	FIGURE: 26

🟩 Public Water Supply Well (Active)

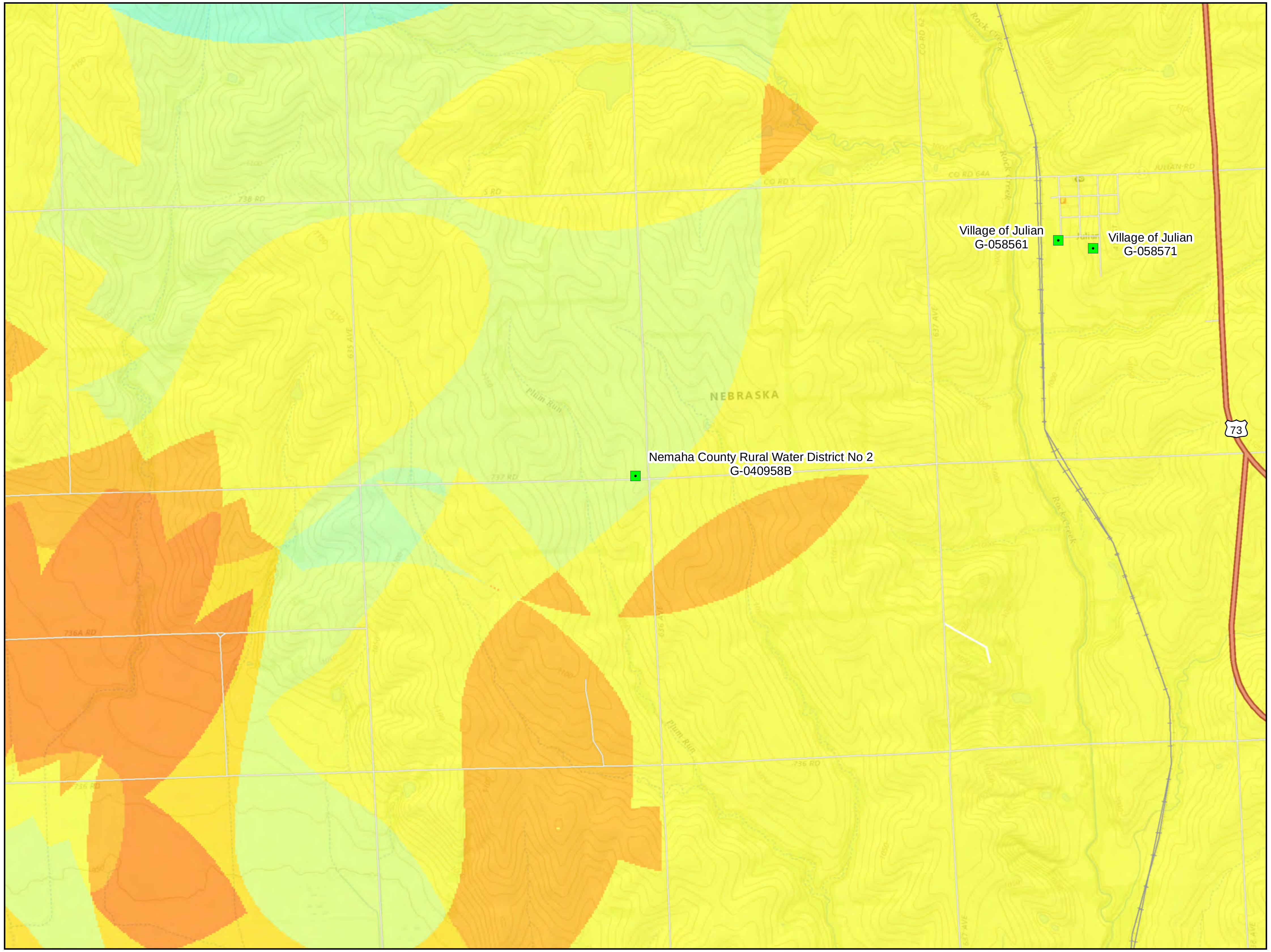
Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)
🟦	1.24 - 1.49
🟦	1.49 - 1.74
🟦	1.74- 1.99
🟦	1.99 - 2.24
🟦	2.24 - 2.49
🟩	2.49 - 2.74
🟩	2.74 - 2.99
🟨	2.99 - 3.24
🟨	3.24 - 3.49
🟨	3.49 - 3.74
🟧	3.74 - 3.99
🟧	3.99 - 4.24
🟧	4.24- 4.49
🟥	4.49 - 4.60 (higher vulnerability)

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

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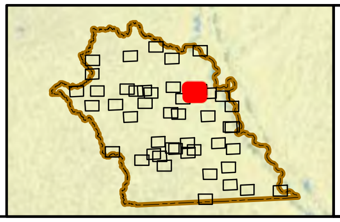

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ATTACHMENT 1
NEMAHA COUNTY RWD NO. 2 DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD DATE: 5/13/2020 FIGURE: 27

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000
Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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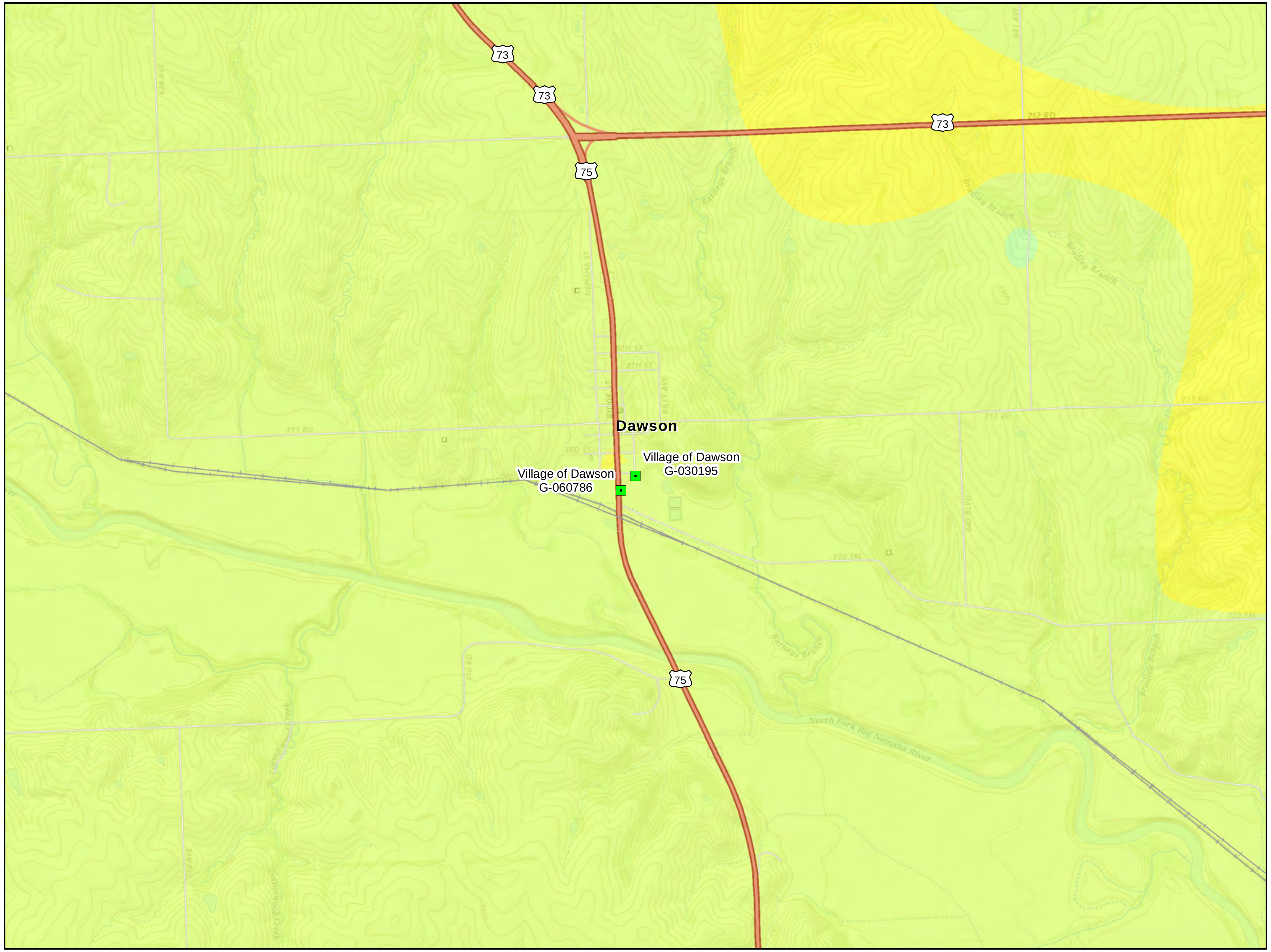

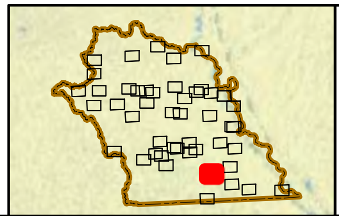

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ATTACHMENT 1
VILLAGE OF DAWSON DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD	DATE: 5/13/2020	FIGURE: 28

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)	🟨 2.99 - 3.24
🟦 1.24 - 1.49	🟨 3.24 - 3.49
🟦 1.49 - 1.74	🟨 3.49 - 3.74
🟦 1.74- 1.99	🟧 3.74 - 3.99
🟦 1.99 - 2.24	🟧 3.99 - 4.24
🟦 2.24 - 2.49	🟧 4.24- 4.49
🟩 2.49 - 2.74	🟥 4.49 - 4.60 (higher vulnerability)
🟩 2.74 - 2.99	

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000

Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

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Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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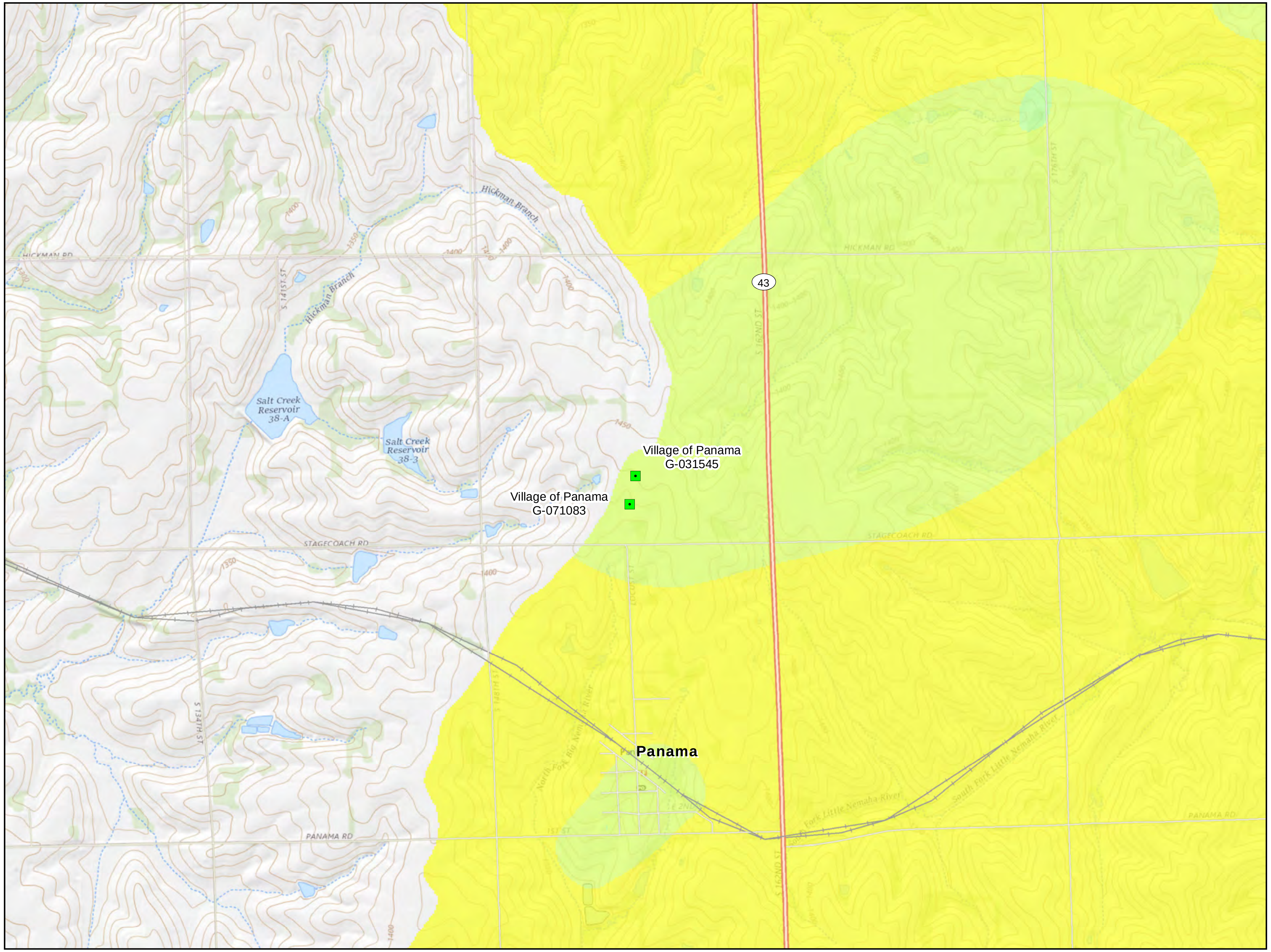

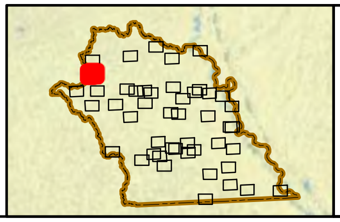

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ATTACHMENT 1
VILLAGE OF PANAMA DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 29

🟩	Public Water Supply Well (Active)

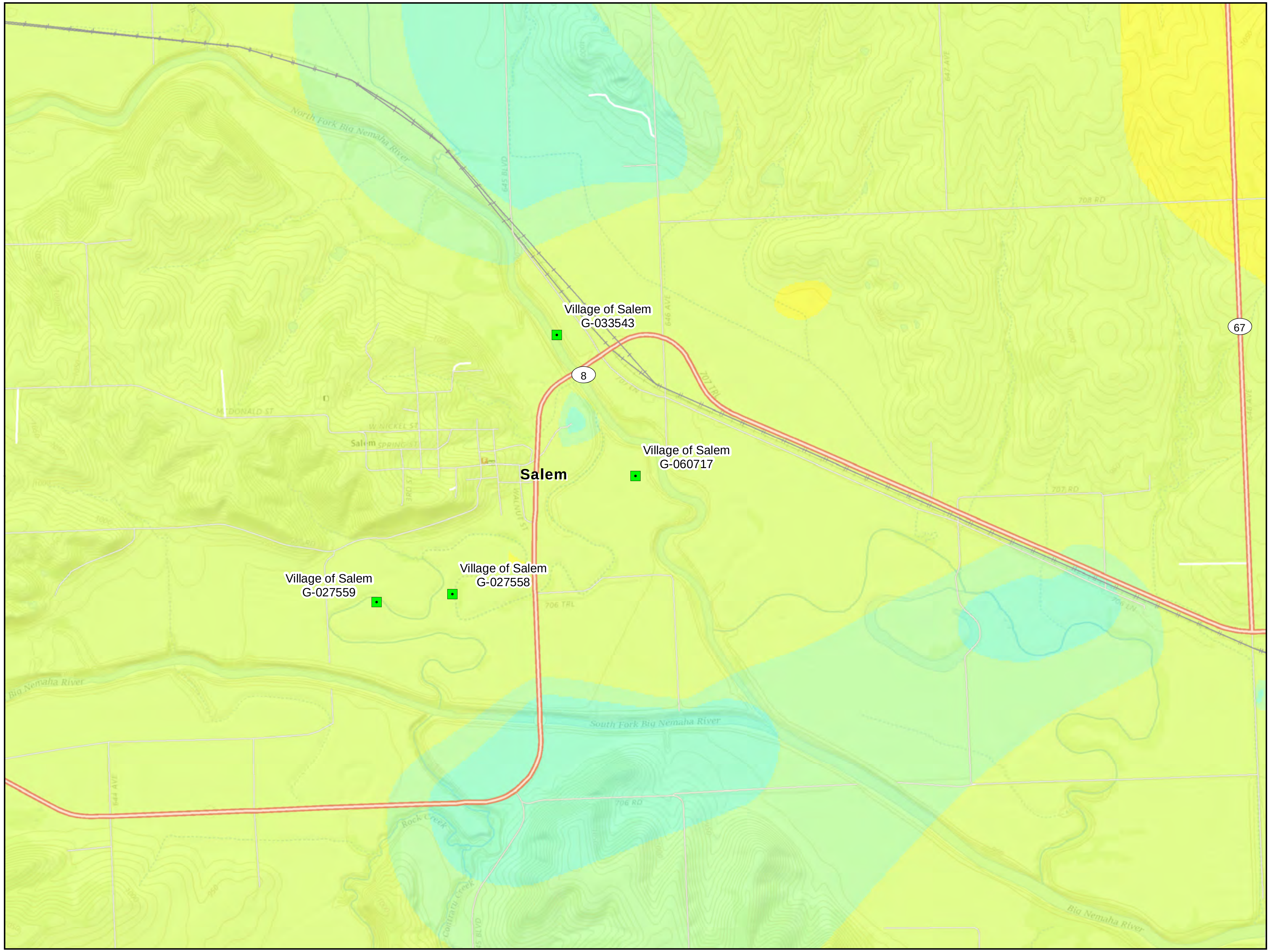
Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City ——	City Name
G-042490 ——	Registration Number
49785 ——	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000
Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

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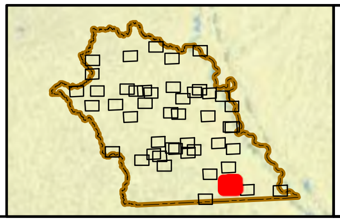

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ATTACHMENT 1
VILLAGE OF SALEM DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 30

🟩 Public Water Supply Well (Active)

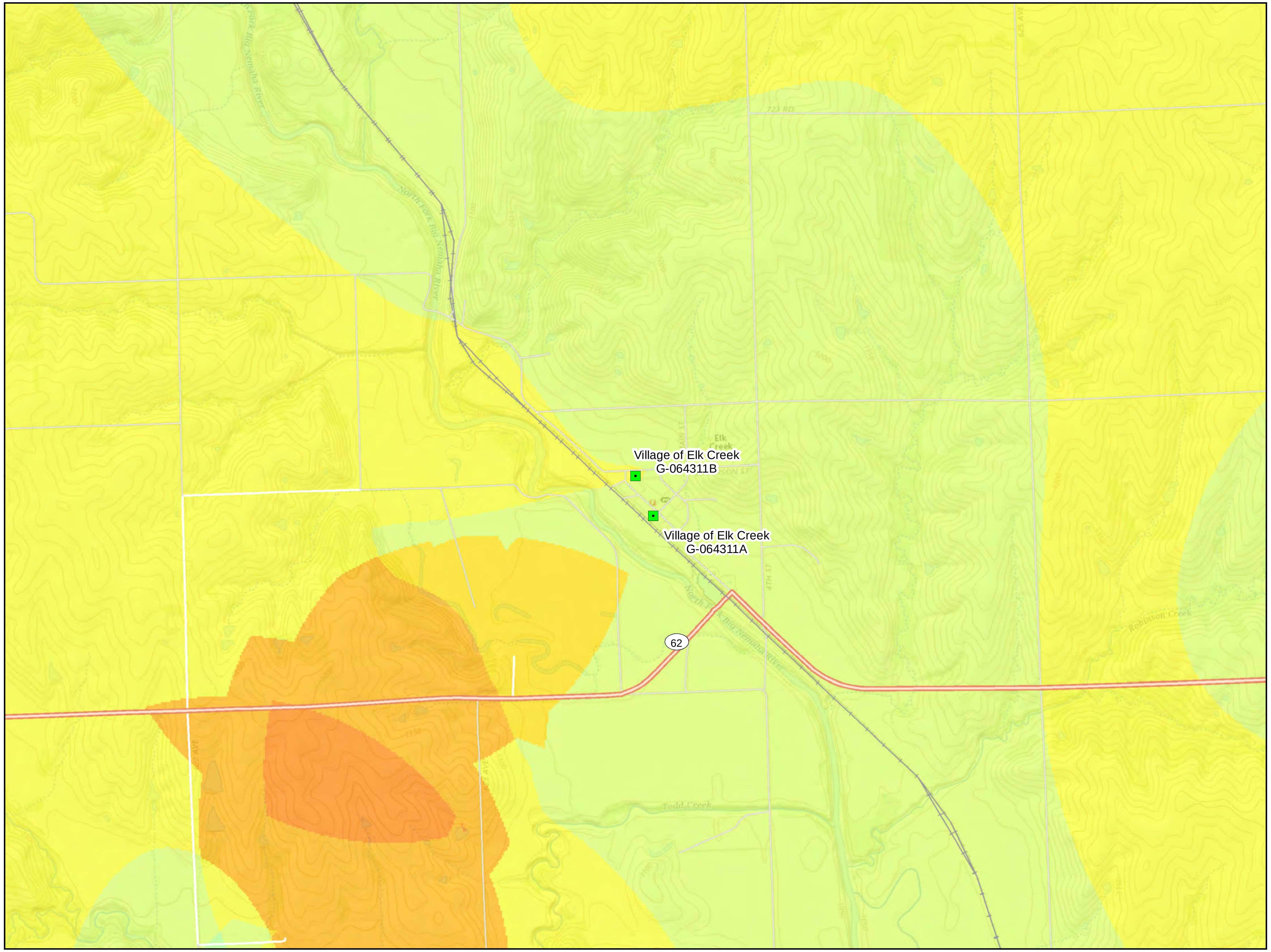
Potential Drought Vulnerability

▇	1.20 - 1.24 (lower vulnerability)	▇	2.99 - 3.24
▇	1.24 - 1.49	▇	3.24 - 3.49
▇	1.49 - 1.74	▇	3.49 - 3.74
▇	1.74- 1.99	▇	3.74 - 3.99
▇	1.99 - 2.24	▇	3.99 - 4.24
▇	2.24 - 2.49	▇	4.24- 4.49
▇	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
▇	2.74 - 2.99		

City of Falls City ——	City Name
G-042490 ——	Registration Number
49785 ——	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

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Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

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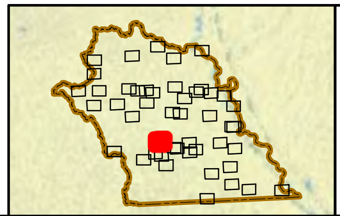

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NEBRASKA

ATTACHMENT 1
VILLAGE OF ELK CREEK DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 31

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City ——	City Name
G-042490 ——	Registration Number
49785 ——	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000
Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

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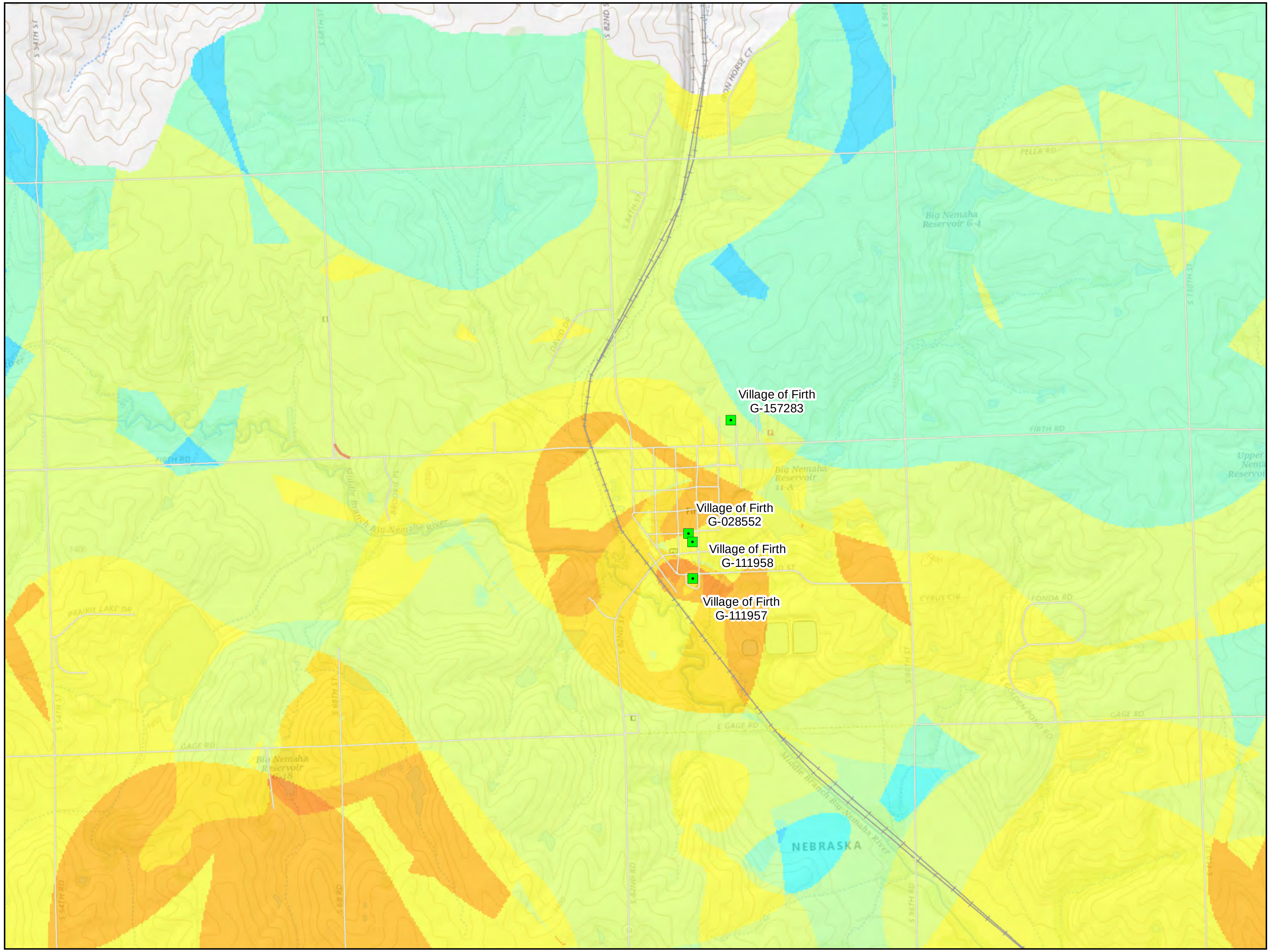

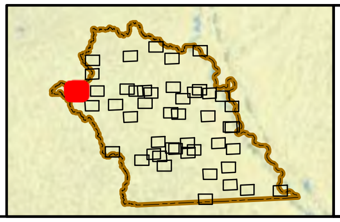

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NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
VILLAGE OF FIRTH DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 32

🟩 Public Water Supply Well (Active)

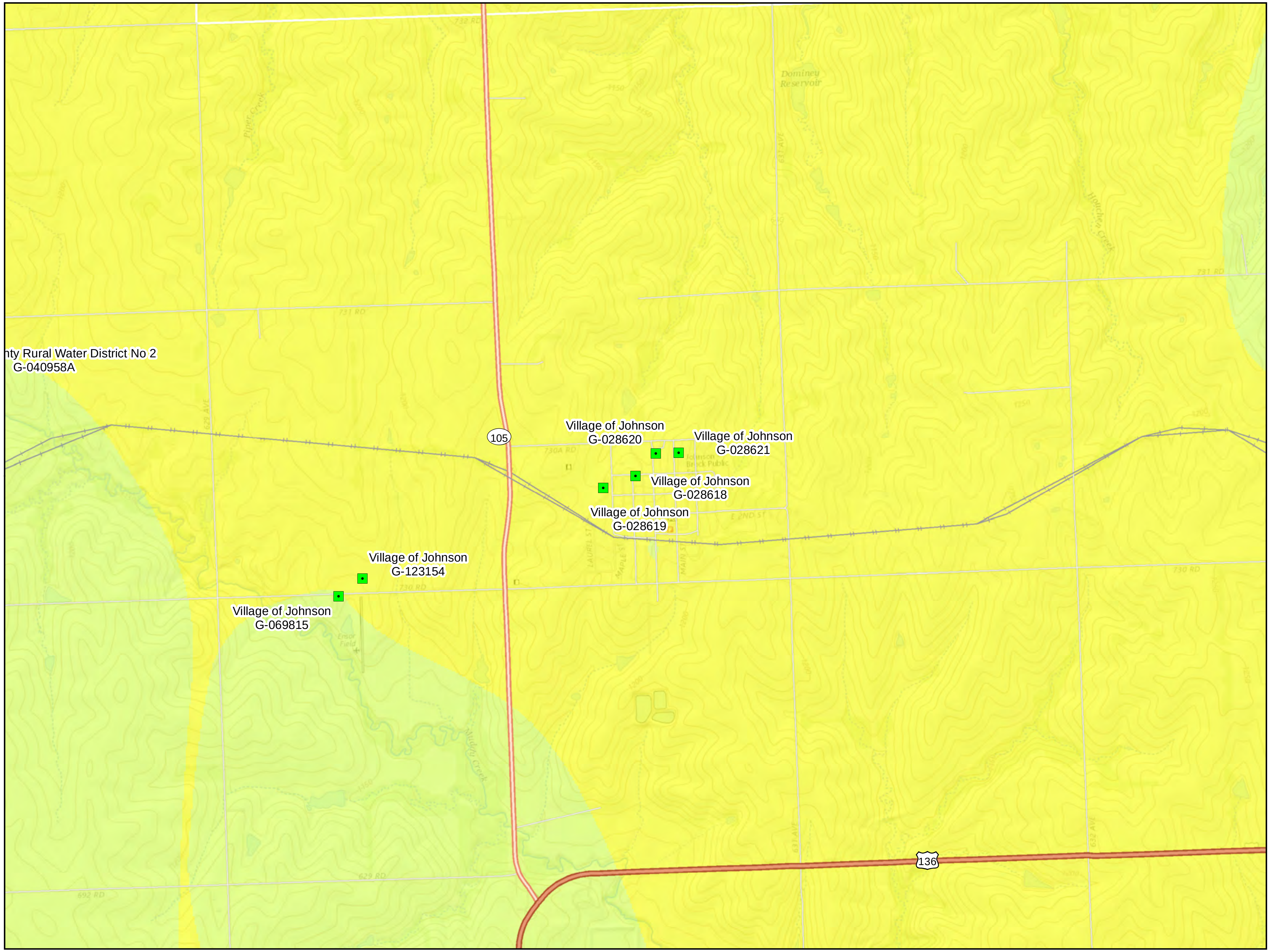
Potential Drought Vulnerability

- 🟦 1.20 - 1.24 (lower vulnerability)
- 🟦 1.24 - 1.49
- 🟦 1.49 - 1.74
- 🟦 1.74- 1.99
- 🟦 1.99 - 2.24
- 🟦 2.24 - 2.49
- 🟩 2.49 - 2.74
- 🟩 2.74 - 2.99
- 🟨 2.99 - 3.24
- 🟨 3.24 - 3.49
- 🟨 3.49 - 3.74
- 🟧 3.74 - 3.99
- 🟧 3.99 - 4.24
- 🟧 4.24- 4.49
- 🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

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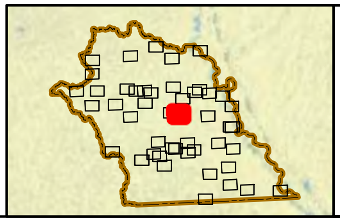

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ATTACHMENT 1
VILLAGE OF JOHNSON DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 33

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

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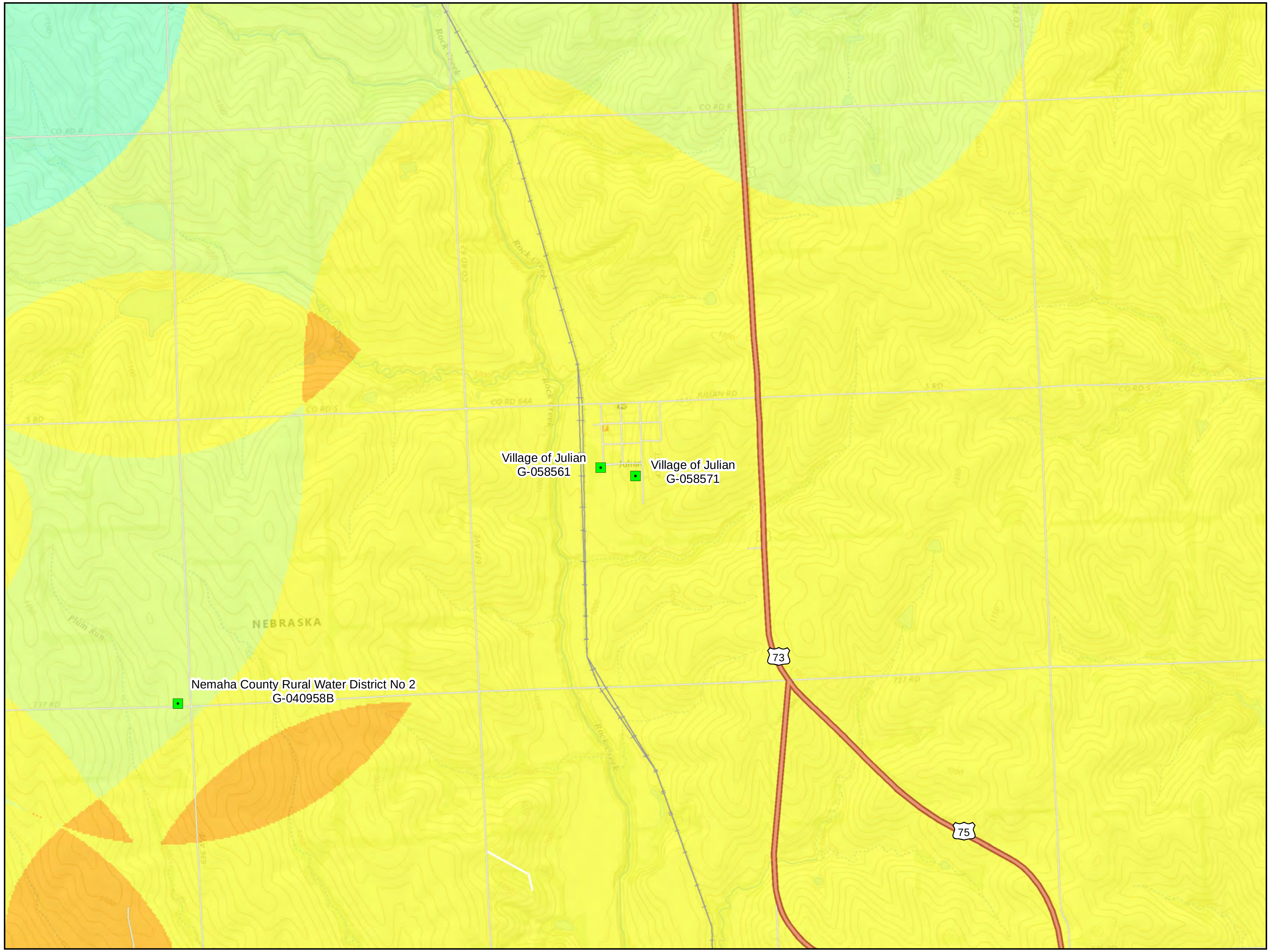

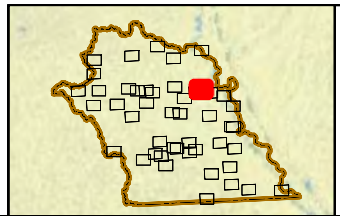

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ATTACHMENT 1
VILLAGE OF JULIAN DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD DATE: 5/13/2020 FIGURE: 34

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🟩 Public Water Supply Well (Active)

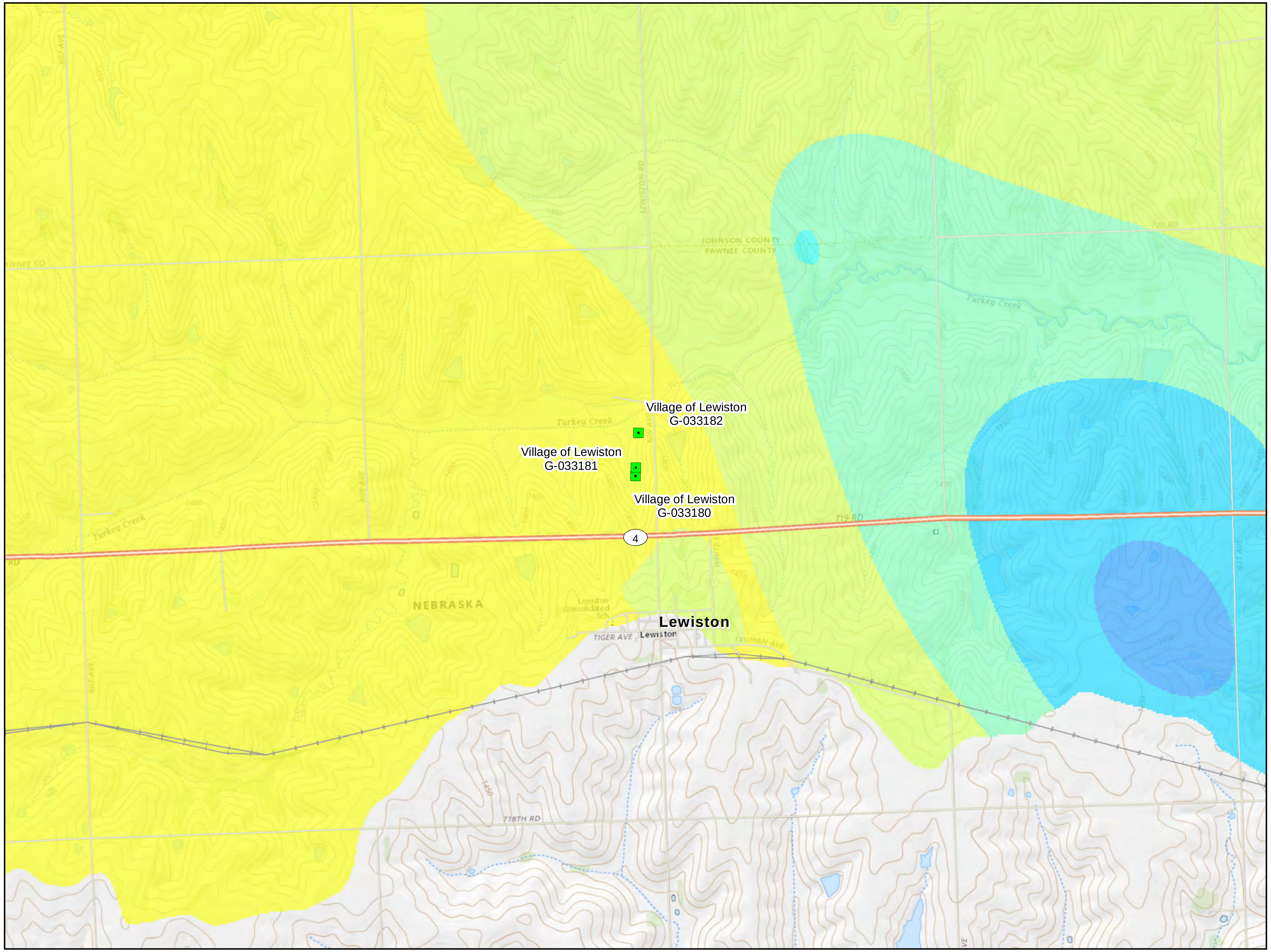
Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000
Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

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Sources:

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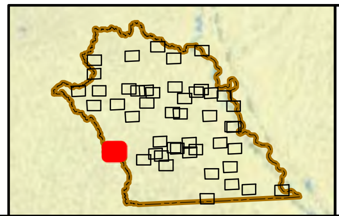

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ATTACHMENT 1
VILLAGE OF LEWISTON DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 35

🟩 Public Water Supply Well (Active)

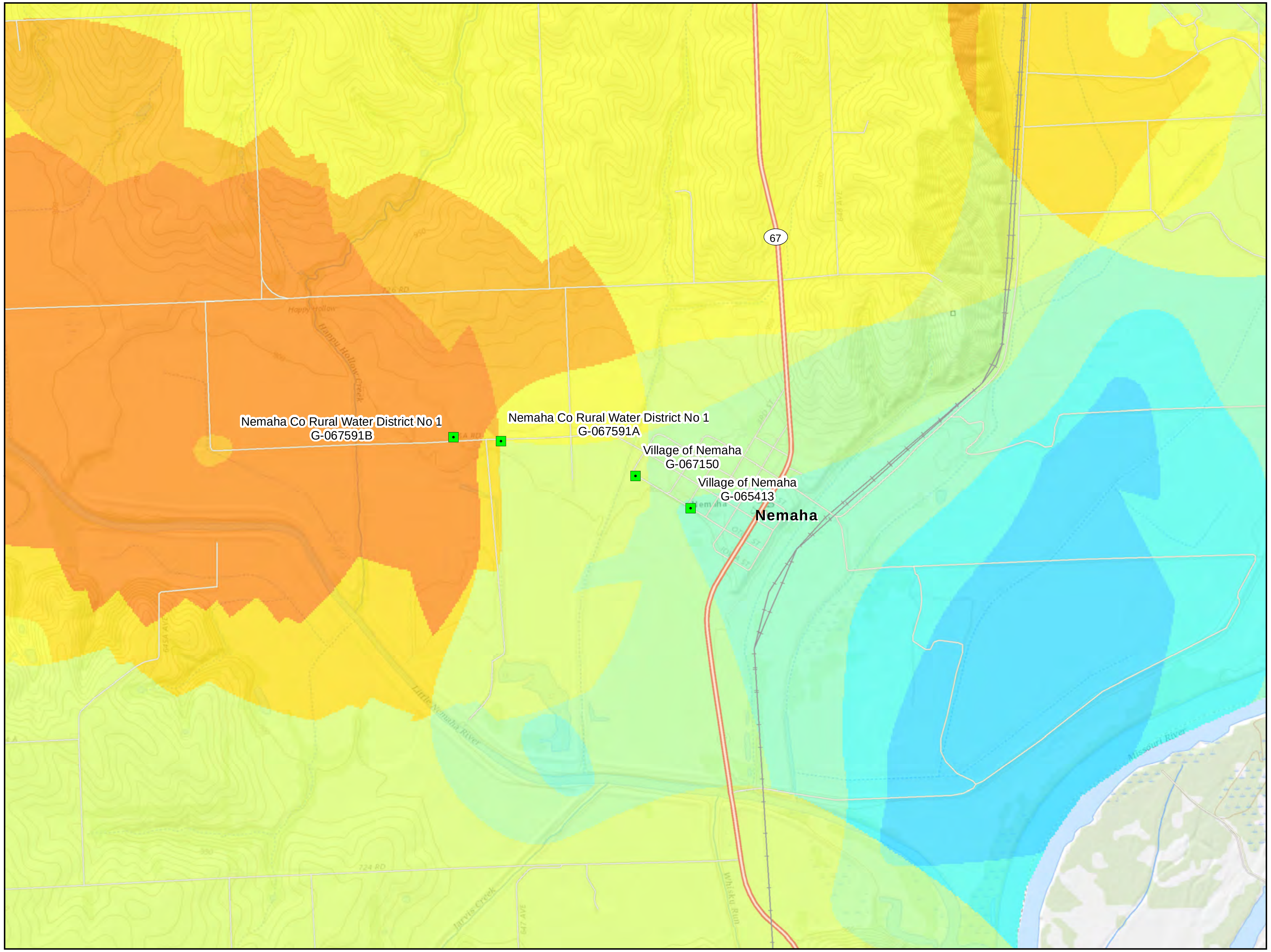
Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟩	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City	——	City Name
G-042490	——	Registration Number
49785	——	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

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Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

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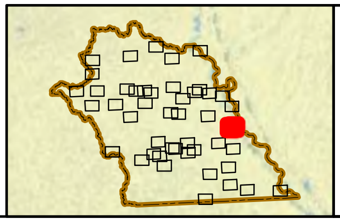

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NEBRASKA

ATTACHMENT 1
VILLAGE OF NEMAHA DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 36

🟩 Public Water Supply Well (Active)

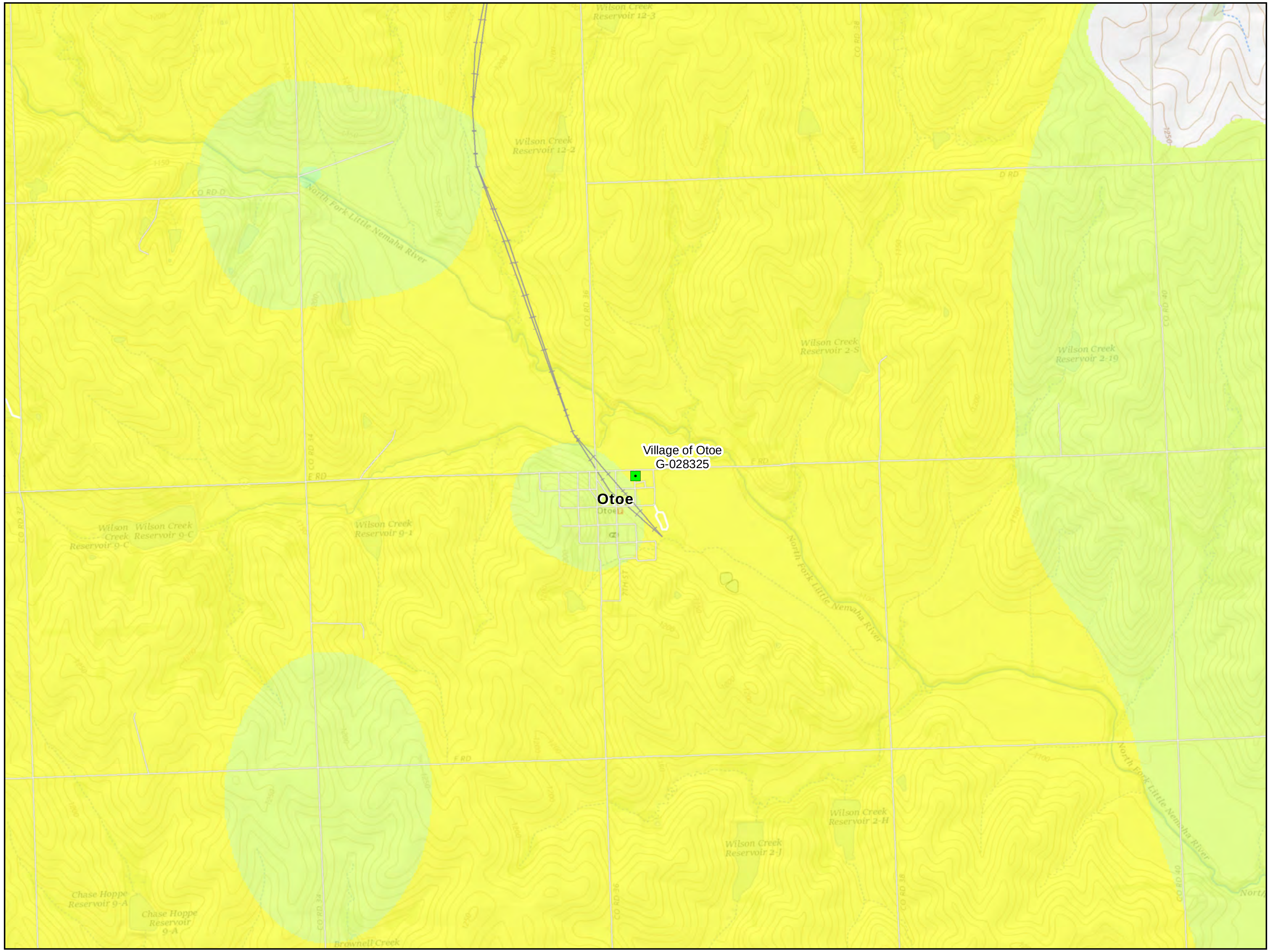
Potential Drought Vulnerability

1.20 - 1.24 (lower vulnerability)	2.99 - 3.24
1.24 - 1.49	3.24 - 3.49
1.49 - 1.74	3.49 - 3.74
1.74- 1.99	3.74 - 3.99
1.99 - 2.24	3.99 - 4.24
2.24 - 2.49	4.24- 4.49
2.49 - 2.74	4.49 - 4.60 (higher vulnerability)
2.74 - 2.99	

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

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High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

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The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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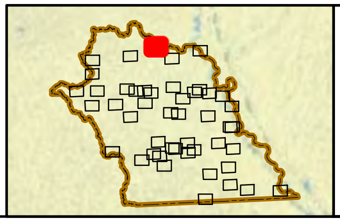

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NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
VILLAGE OF OTOE DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 37

🟩 Public Water Supply Well (Active)

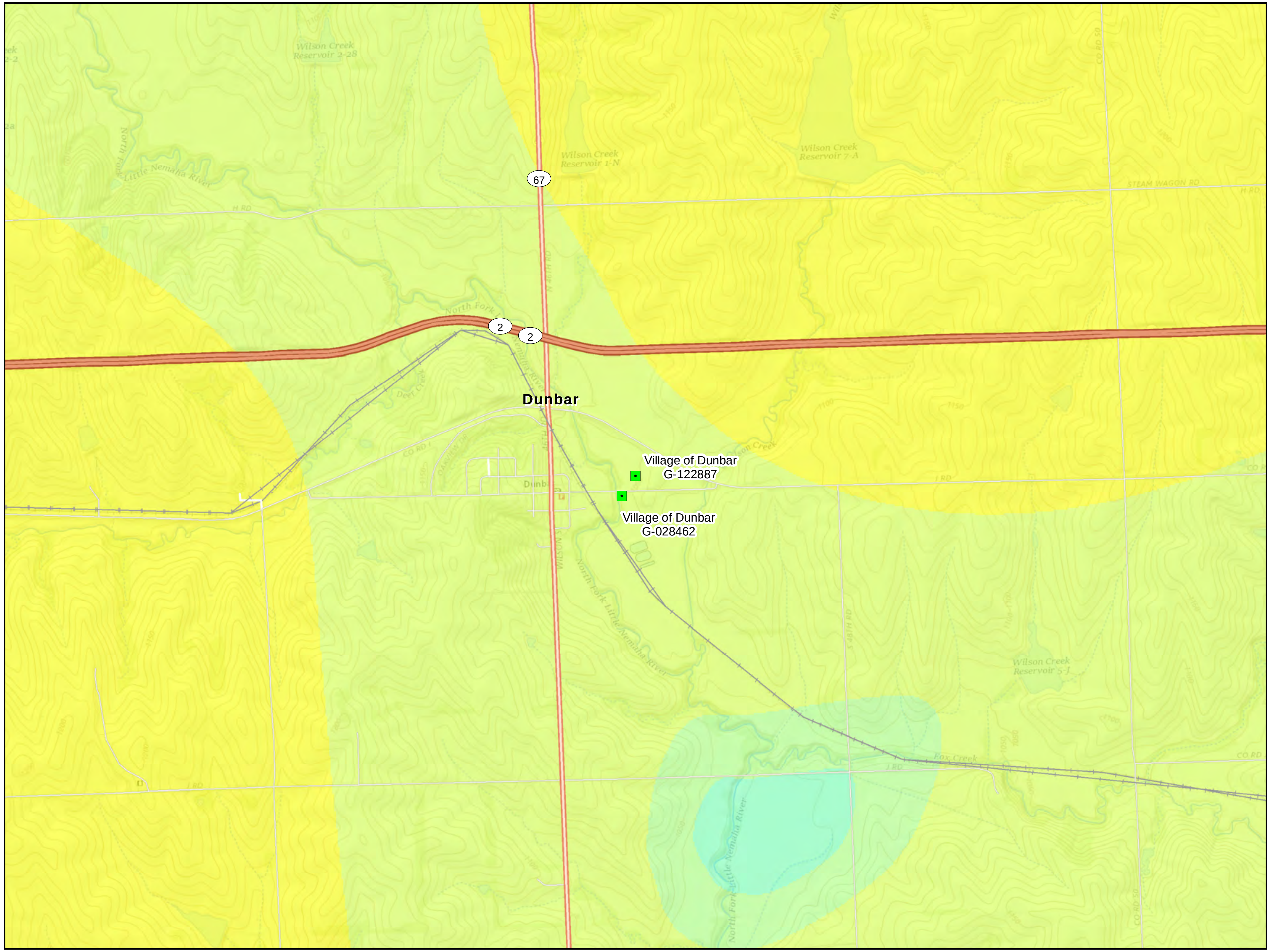
Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)
🟦 1.24 - 1.49
🟦 1.49 - 1.74
🟦 1.74- 1.99
🟦 1.99 - 2.24
🟦 2.24 - 2.49
🟩 2.49 - 2.74
🟩 2.74 - 2.99
🟨 2.99 - 3.24
🟨 3.24 - 3.49
🟨 3.49 - 3.74
🟧 3.74 - 3.99
🟧 3.99 - 4.24
🟧 4.24- 4.49
🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000
Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

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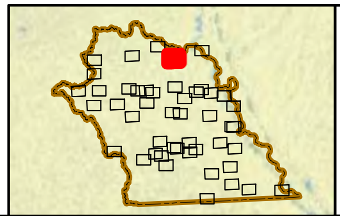

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ATTACHMENT 1
VILLAGE OF DUNBAR DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 38

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)
🟦 1.24 - 1.49
🟦 1.49 - 1.74
🟦 1.74- 1.99
🟦 1.99 - 2.24
🟦 2.24 - 2.49
🟩 2.49 - 2.74
🟩 2.74 - 2.99
🟨 2.99 - 3.24
🟨 3.24 - 3.49
🟨 3.49 - 3.74
🟧 3.74 - 3.99
🟧 3.99 - 4.24
🟧 4.24- 4.49
🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000
Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

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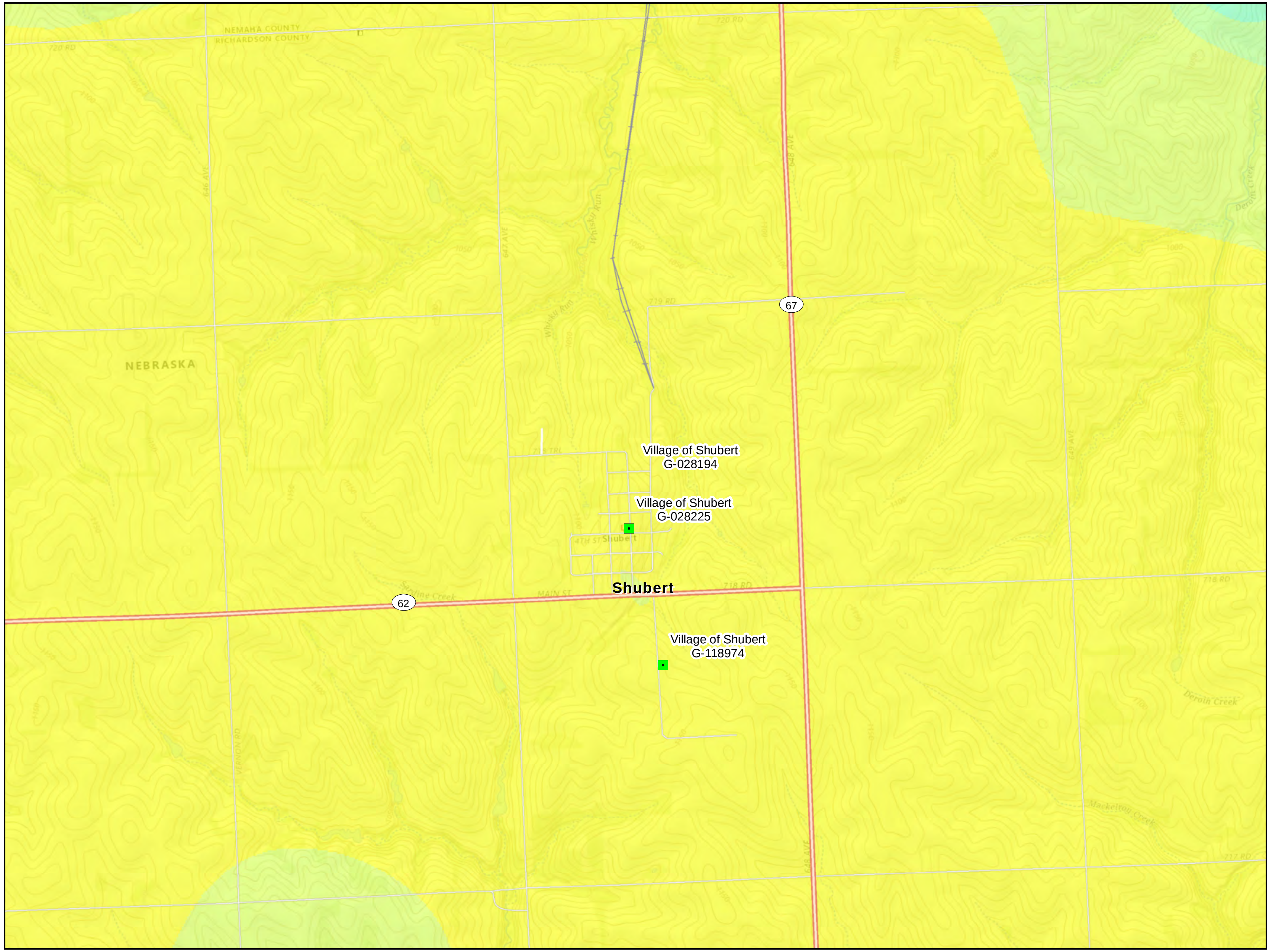

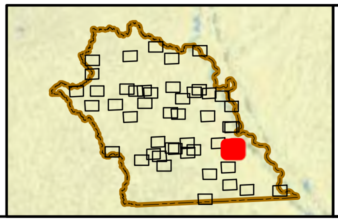

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ATTACHMENT 1
VILLAGE OF SHUBERT DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 39

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)	🟨 2.99 - 3.24
🟦 1.24 - 1.49	🟨 3.24 - 3.49
🟦 1.49 - 1.74	🟨 3.49 - 3.74
🟦 1.74- 1.99	🟧 3.74 - 3.99
🟦 1.99 - 2.24	🟧 3.99 - 4.24
🟦 2.24 - 2.49	🟧 4.24- 4.49
🟩 2.49 - 2.74	🟥 4.49 - 4.60 (higher vulnerability)
🟩 2.74 - 2.99	

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

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Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.

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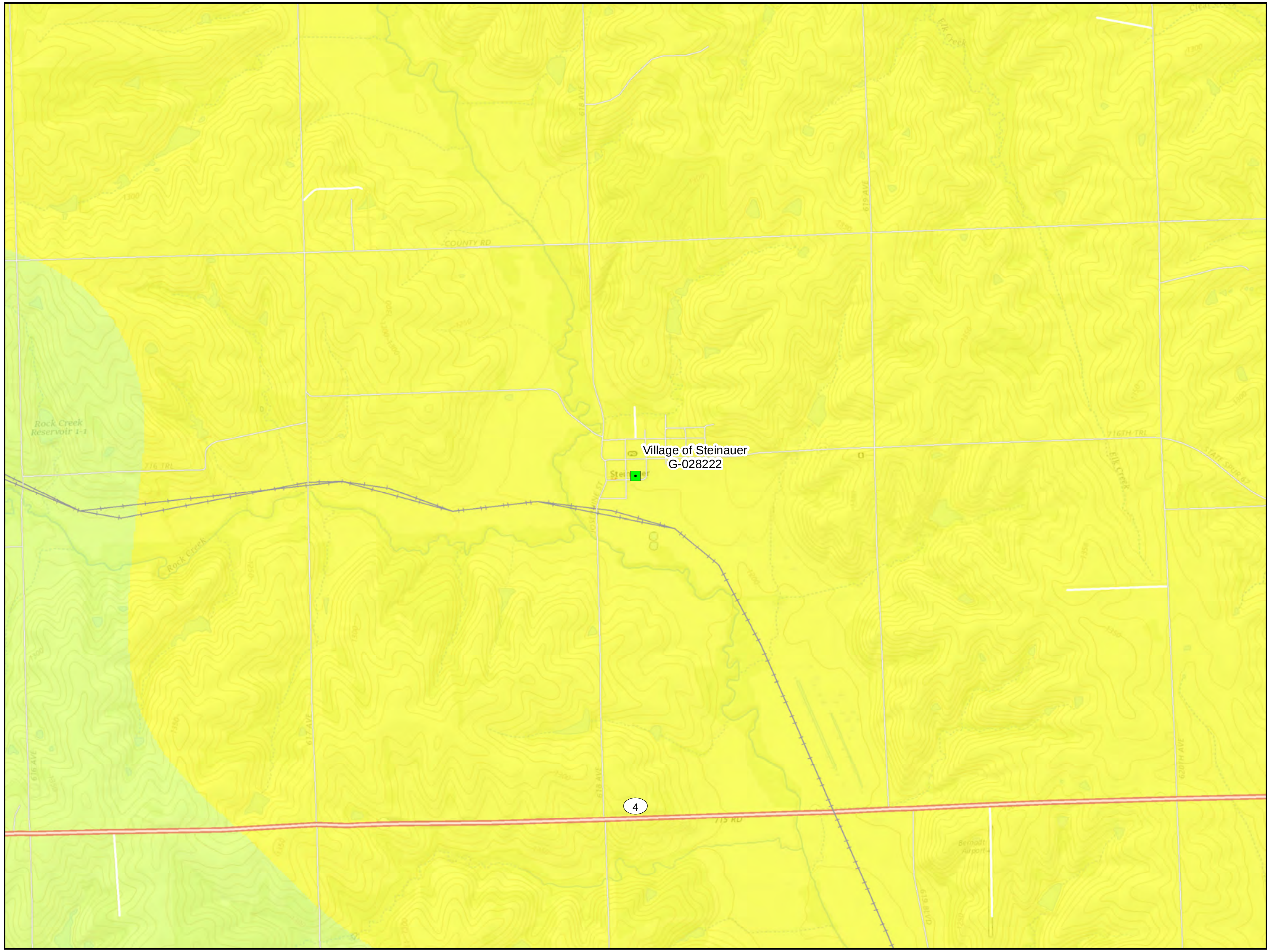

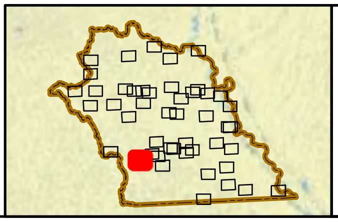

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ATTACHMENT 1
VILLAGE OF STEINAUER DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 40

🟩 Public Water Supply Well (Active)

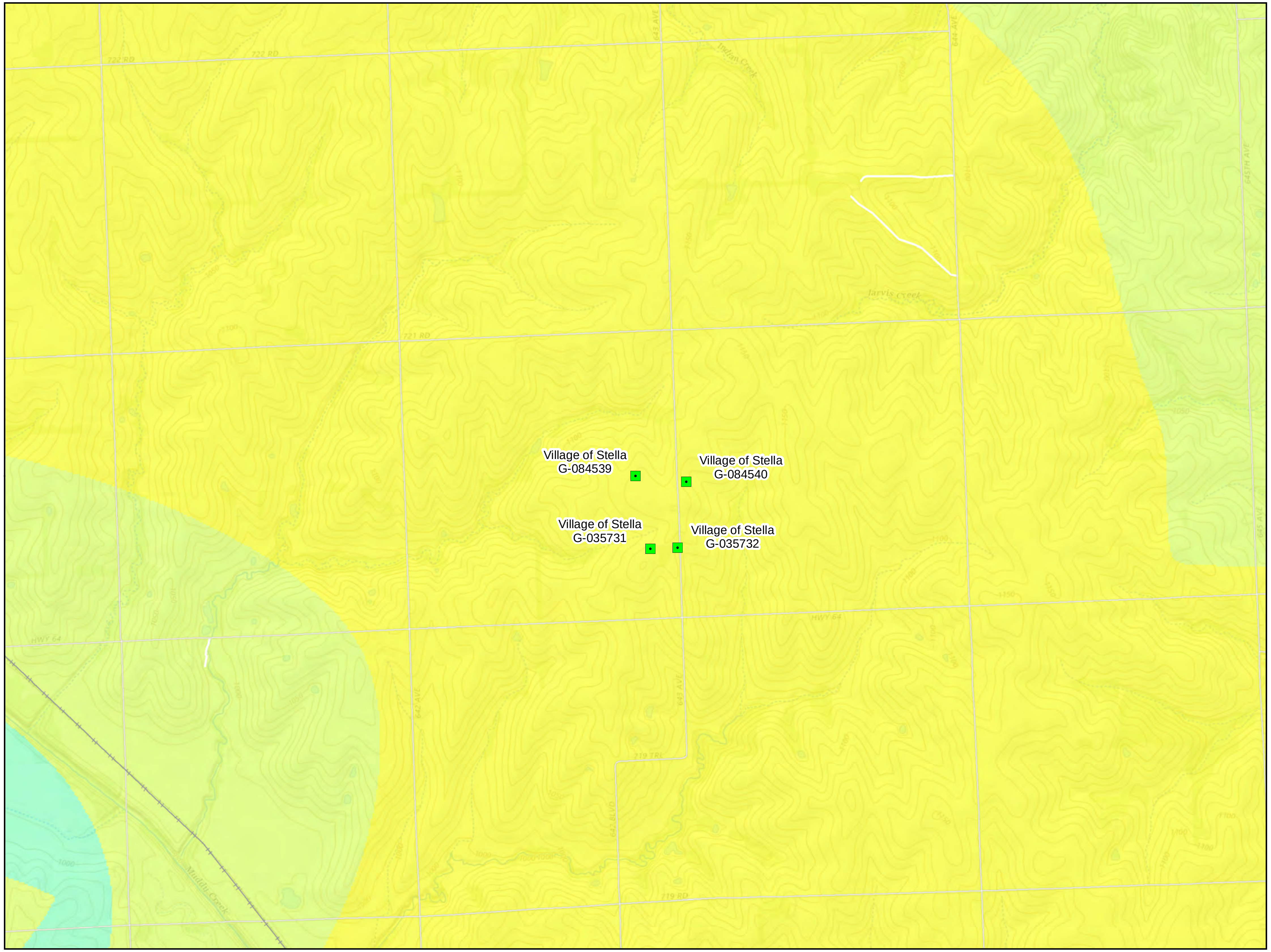
Potential Drought Vulnerability

🟦 1.20 - 1.24 (lower vulnerability)
🟦 1.24 - 1.49
🟦 1.49 - 1.74
🟦 1.74- 1.99
🟦 1.99 - 2.24
🟦 2.24 - 2.49
🟩 2.49 - 2.74
🟩 2.74 - 2.99
🟨 2.99 - 3.24
🟨 3.24 - 3.49
🟨 3.49 - 3.74
🟧 3.74 - 3.99
🟧 3.99 - 4.24
🟧 4.24- 4.49
🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000
Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

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Sources:

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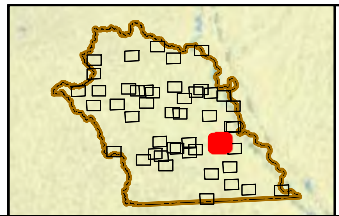

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ATTACHMENT 1
VILLAGE OF STELLA DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD DATE: 5/13/2020 FIGURE: 41

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

- 🟦 1.20 - 1.24 (lower vulnerability)
- 🟦 1.24 - 1.49
- 🟦 1.49 - 1.74
- 🟦 1.74- 1.99
- 🟦 1.99 - 2.24
- 🟦 2.24 - 2.49
- 🟩 2.49 - 2.74
- 🟩 2.74 - 2.99
- 🟨 2.99 - 3.24
- 🟨 3.24 - 3.49
- 🟨 3.49 - 3.74
- 🟧 3.74 - 3.99
- 🟧 3.99 - 4.24
- 🟧 4.24- 4.49
- 🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

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Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

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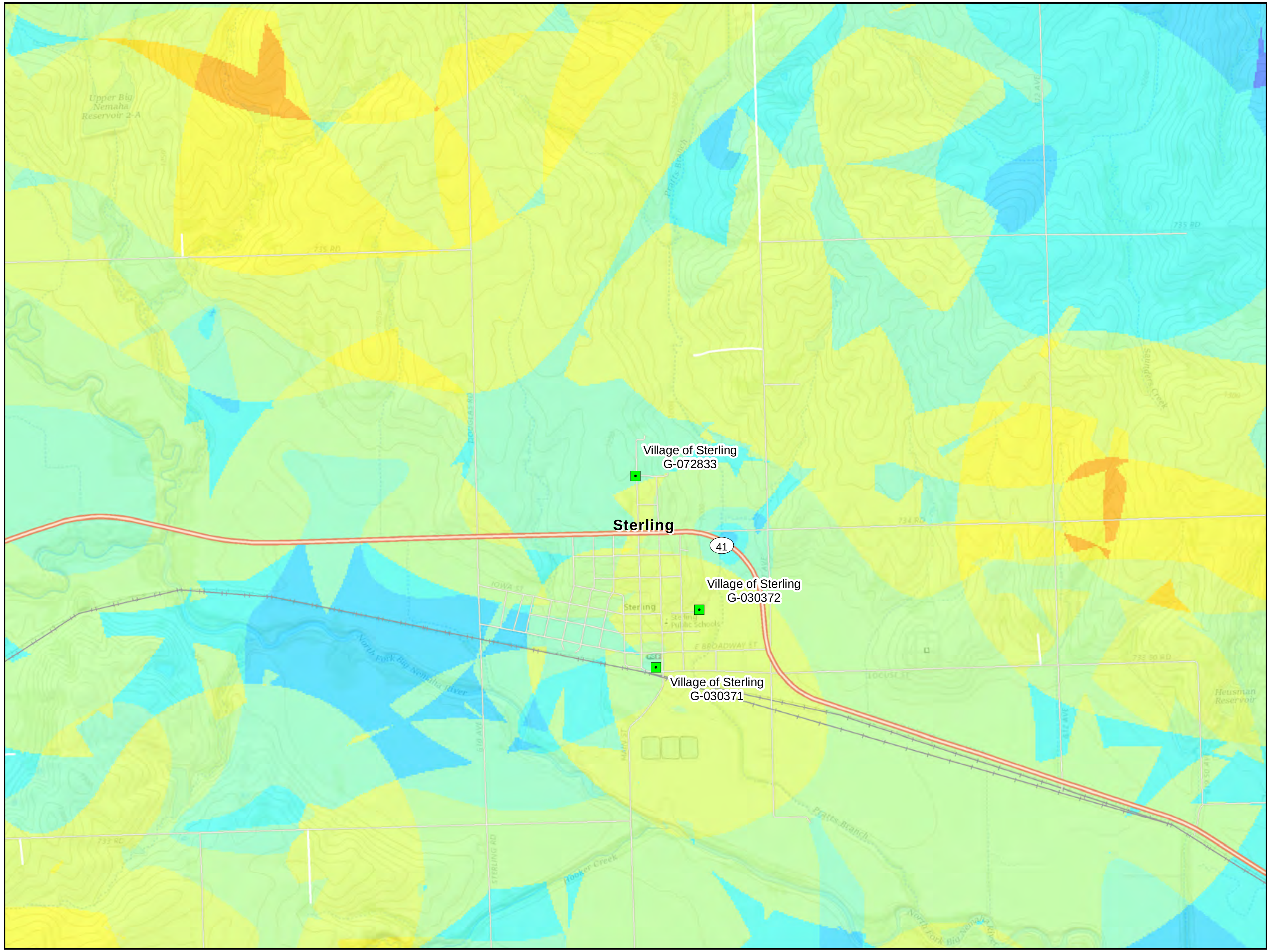

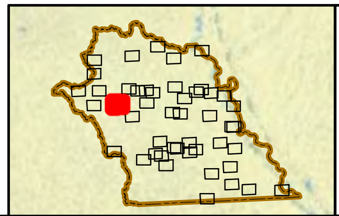

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ATTACHMENT 1
VILLAGE OF STERLING DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD
DATE: 5/13/2020
FIGURE: 42

🟩 Public Water Supply Well (Active)

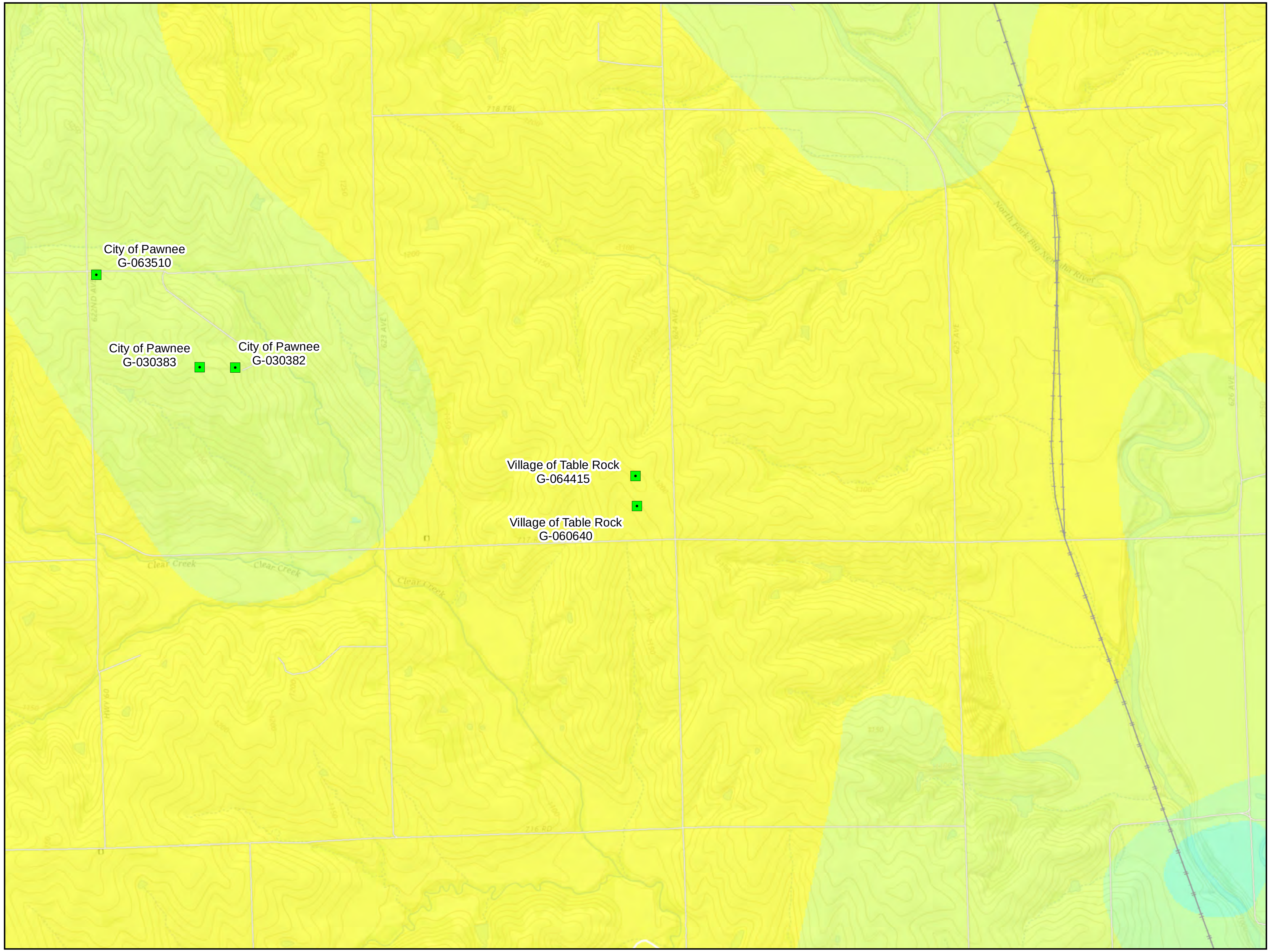
Potential Drought Vulnerability

- 🟦 1.20 - 1.24 (lower vulnerability)
- 🟦 1.24 - 1.49
- 🟦 1.49 - 1.74
- 🟦 1.74- 1.99
- 🟦 1.99 - 2.24
- 🟦 2.24 - 2.49
- 🟩 2.49 - 2.74
- 🟩 2.74 - 2.99
- 🟨 2.99 - 3.24
- 🟨 3.24 - 3.49
- 🟨 3.49 - 3.74
- 🟧 3.74 - 3.99
- 🟧 3.99 - 4.24
- 🟧 4.24- 4.49
- 🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City	City Name
G-042490	Registration Number
49785	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

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High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

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Sources:

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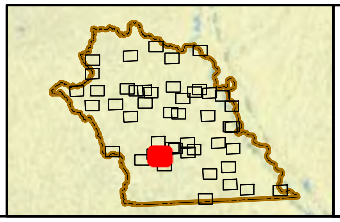

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NEMAHA NATURAL RESOURCES DISTRICT
NEMAHA DROUGHT ASSESSMENT
NEBRASKA

ATTACHMENT 1
VILLAGE OF TABLE ROCK DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD DATE: 5/13/2020 FIGURE: 43

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

- 🟦 1.20 - 1.24 (lower vulnerability)
- 🟦 1.24 - 1.49
- 🟦 1.49 - 1.74
- 🟦 1.74- 1.99
- 🟦 1.99 - 2.24
- 🟦 2.24 - 2.49
- 🟩 2.49 - 2.74
- 🟩 2.74 - 2.99
- 🟨 2.99 - 3.24
- 🟨 3.24 - 3.49
- 🟨 3.49 - 3.74
- 🟧 3.74 - 3.99
- 🟧 3.99 - 4.24
- 🟧 4.24- 4.49
- 🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City ——	City Name
G-042490 ——	Registration Number
49785 ——	Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

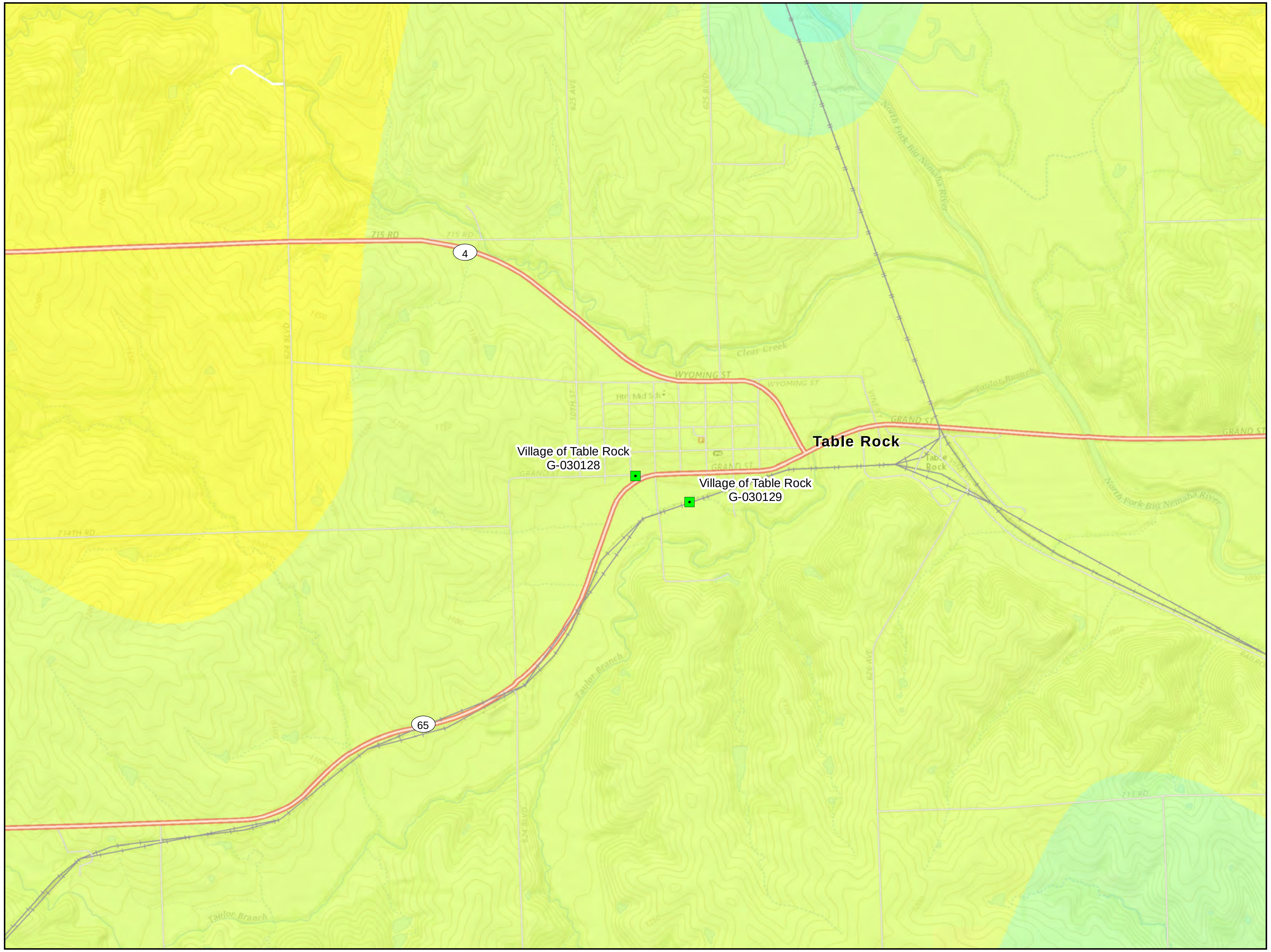
Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

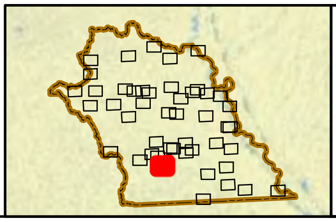
The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

Public water supply well information was provided by the Nemaha Natural Resources District, and is originally from the Nebraska Department of Natural Resources Registered Wells Database.





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NEMAHA DROUGHT ASSESSMENT
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ATTACHMENT 1
VILLAGE OF TABLE ROCK DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD | DATE: 5/13/2020 | FIGURE: 44

E:\GIS\GIS\JEO Nemaha Drought Assessment\maps\5006jeo1001g - PWS 24K Insets.mxd, 6/12/2020, 3:10:22 PM, NAD 1983 UTM Zone 14N

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

- 🟦 1.20 - 1.24 (lower vulnerability)
- 🟦 1.24 - 1.49
- 🟦 1.49 - 1.74
- 🟦 1.74- 1.99
- 🟦 1.99 - 2.24
- 🟦 2.24 - 2.49
- 🟩 2.49 - 2.74
- 🟩 2.74 - 2.99
- 🟨 2.99 - 3.24
- 🟨 3.24 - 3.49
- 🟨 3.49 - 3.74
- 🟧 3.74 - 3.99
- 🟧 3.99 - 4.24
- 🟧 4.24- 4.49
- 🟥 4.49 - 4.60 (higher vulnerability)

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet

Notes:

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Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

The three reclassed input variables were then added together using ESRI's Raster Calculator Tool and their respective weights (40%, 40%, and 20%, respectively) to get the final qualitative Potential Drought Vulnerability ranking.

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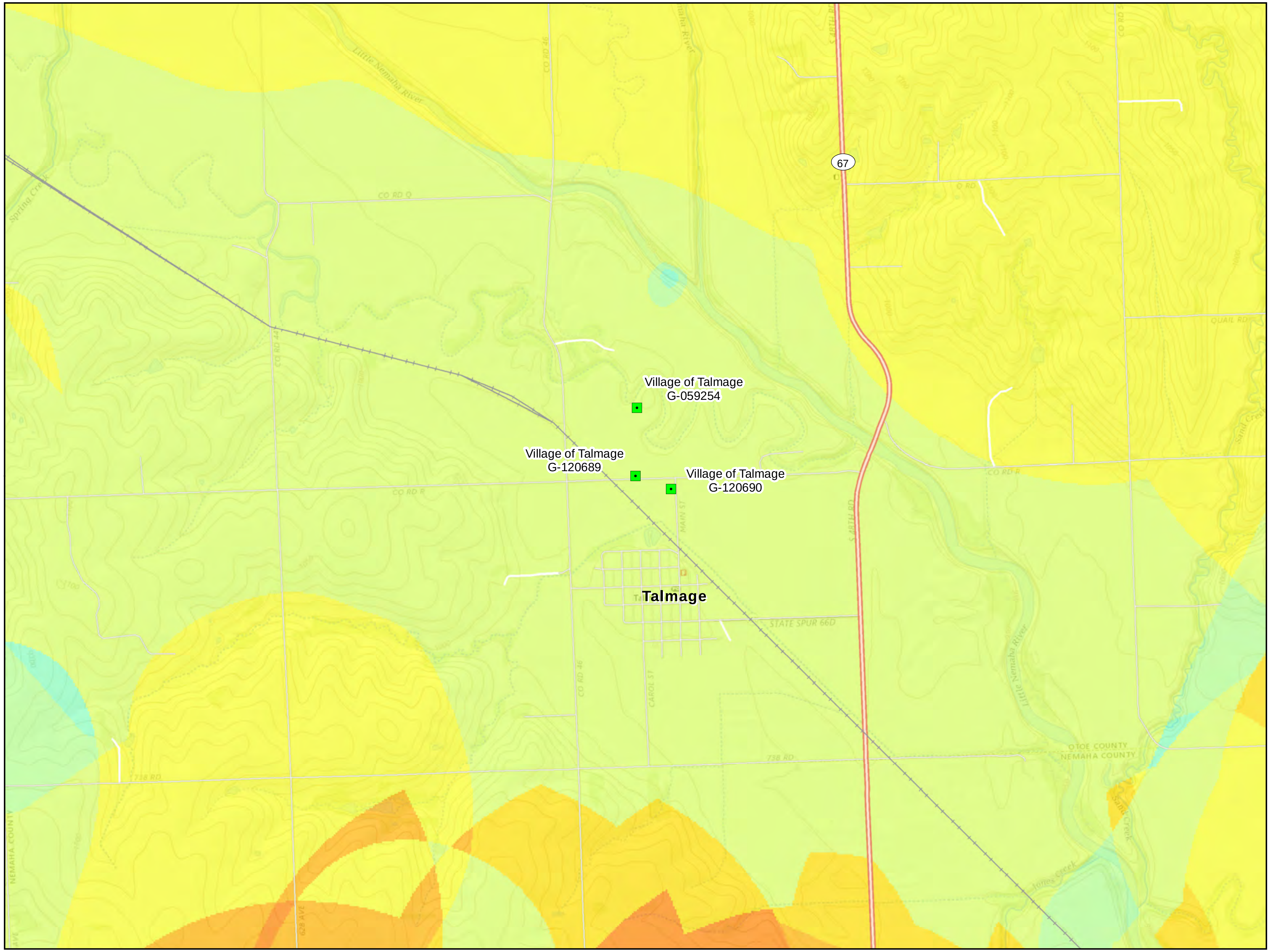

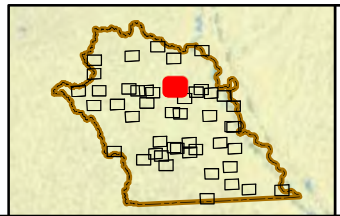

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NEBRASKA

ATTACHMENT 1
VILLAGE OF TALMAGE DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD	DATE: 5/13/2020	FIGURE: 45

🟩 Public Water Supply Well (Active)

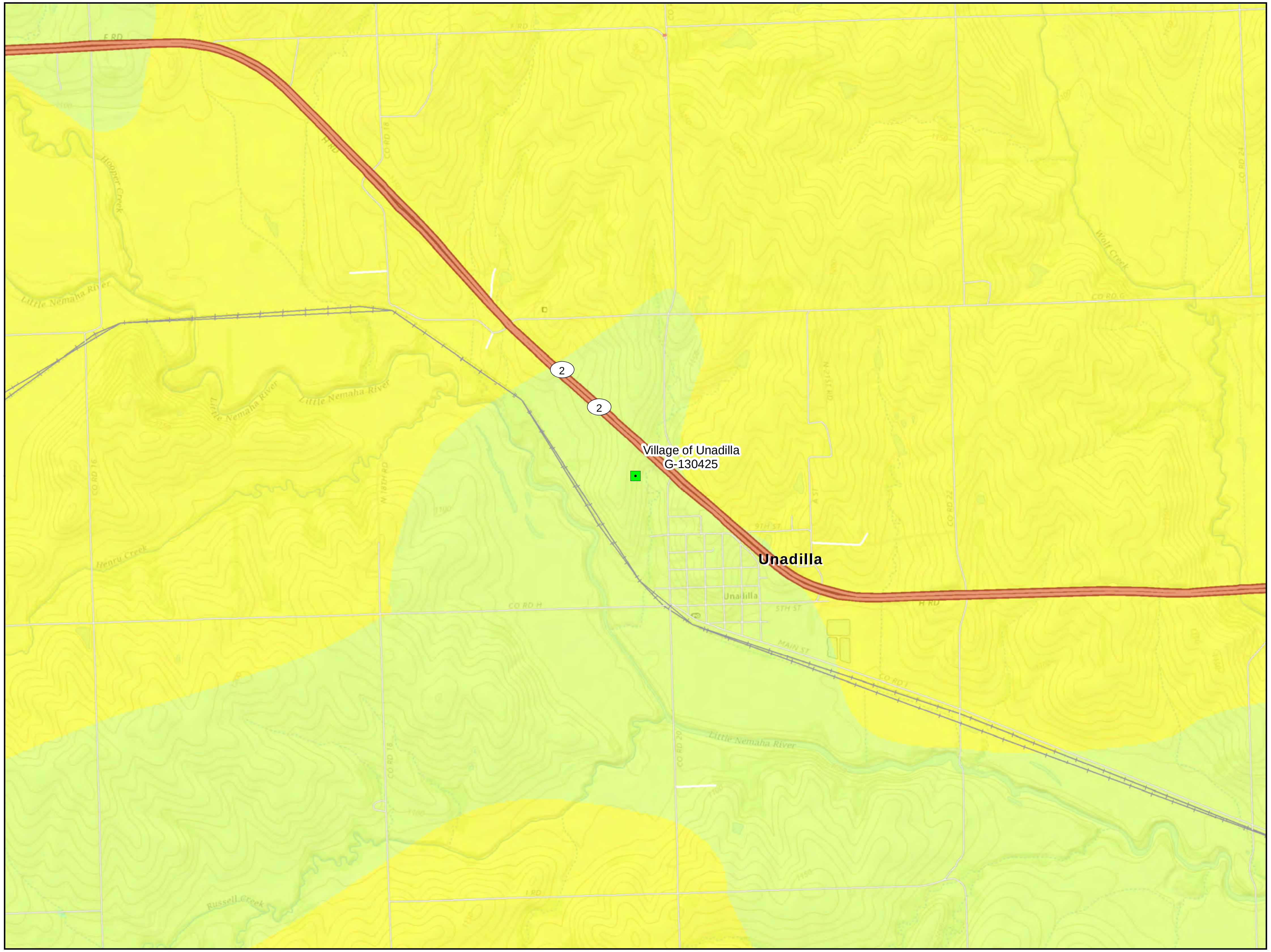
Potential Drought Vulnerability

1.20 - 1.24 (lower vulnerability)	2.99 - 3.24
1.24 - 1.49	3.24 - 3.49
1.49 - 1.74	3.49 - 3.74
1.74- 1.99	3.74 - 3.99
1.99 - 2.24	3.99 - 4.24
2.24 - 2.49	4.24- 4.49
2.49 - 2.74	4.49 - 4.60 (higher vulnerability)
2.74 - 2.99	

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000 Feet



Notes:

The Potential Drought Vulnerability results were produced using an ESRI Modelbuilder GIS Model. The following weighted variables were used to produce the ratings used on this figure.

Total Saturated Sand Thickness (40%) - This variable was created by running the ESRI Focal Statistics Tool (1/2 mile radius) on the raster of the same name from the NNRD 2019 Mapbook Update (originally created from NeDNR wells database). This variable was then reclassed into the following five categories: 0' to 25', 25' to 50', 50' to 75', 75' to 100', and 100' to 220'.

High Capacity Well Permitted Pumping Rate per Square Mile (40%) - This variable included all high capacity wells from NeDNR wells database within the Plan Boundary. The ESRI Point Density Tool (1 mile radius) was run on the dataset to account for gallons per minute (gpm) within 1 mile of any location within the Plan Boundary, and resulted in gpm per square mile across the Plan Boundary. The dataset was then reclassed into the following five categories: 0 to 600, 600 to 1,000, 1,000 to 2,500, 2,500 to 5,000, and 5,000 to 5,151 gpm.

Total Clay Thickness Above Top of Aquifer (20%) - This variable includes both unsaturated and saturated clay above the top of the first encountered aquifer at each well or test hole location. The data used to determine this variable is from NeDNR well logs and CSD test hole logs. The input point dataset was interpolated using ESRI's Natural Neighbor Algorithm with 10 meter cell size. This variable was then reclassed into the following five categories: 0' to 5', 5' to 10', 10' to 20', 20' to 40', and 40' to 335'.

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Sources:

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.
Copyright: © 2013 National Geographic Society

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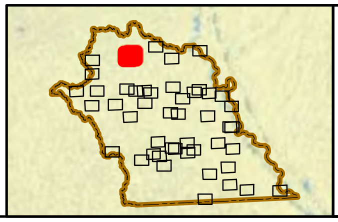

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NEBRASKA

ATTACHMENT 1
VILLAGE OF UNADILLA DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD	DATE: 5/13/2020	FIGURE: 46

🟩 Public Water Supply Well (Active)

Potential Drought Vulnerability

🟦	1.20 - 1.24 (lower vulnerability)	🟨	2.99 - 3.24
🟦	1.24 - 1.49	🟨	3.24 - 3.49
🟦	1.49 - 1.74	🟨	3.49 - 3.74
🟦	1.74- 1.99	🟧	3.74 - 3.99
🟦	1.99 - 2.24	🟧	3.99 - 4.24
🟦	2.24 - 2.49	🟧	4.24- 4.49
🟩	2.49 - 2.74	🟥	4.49 - 4.60 (higher vulnerability)
🟩	2.74 - 2.99		

City of Falls City —— City Name
G-042490 —— Registration Number
49785 —— Unique NE Well ID (listed when two wells share same Reg. Number)

N

0 2,000
Feet

Notes:

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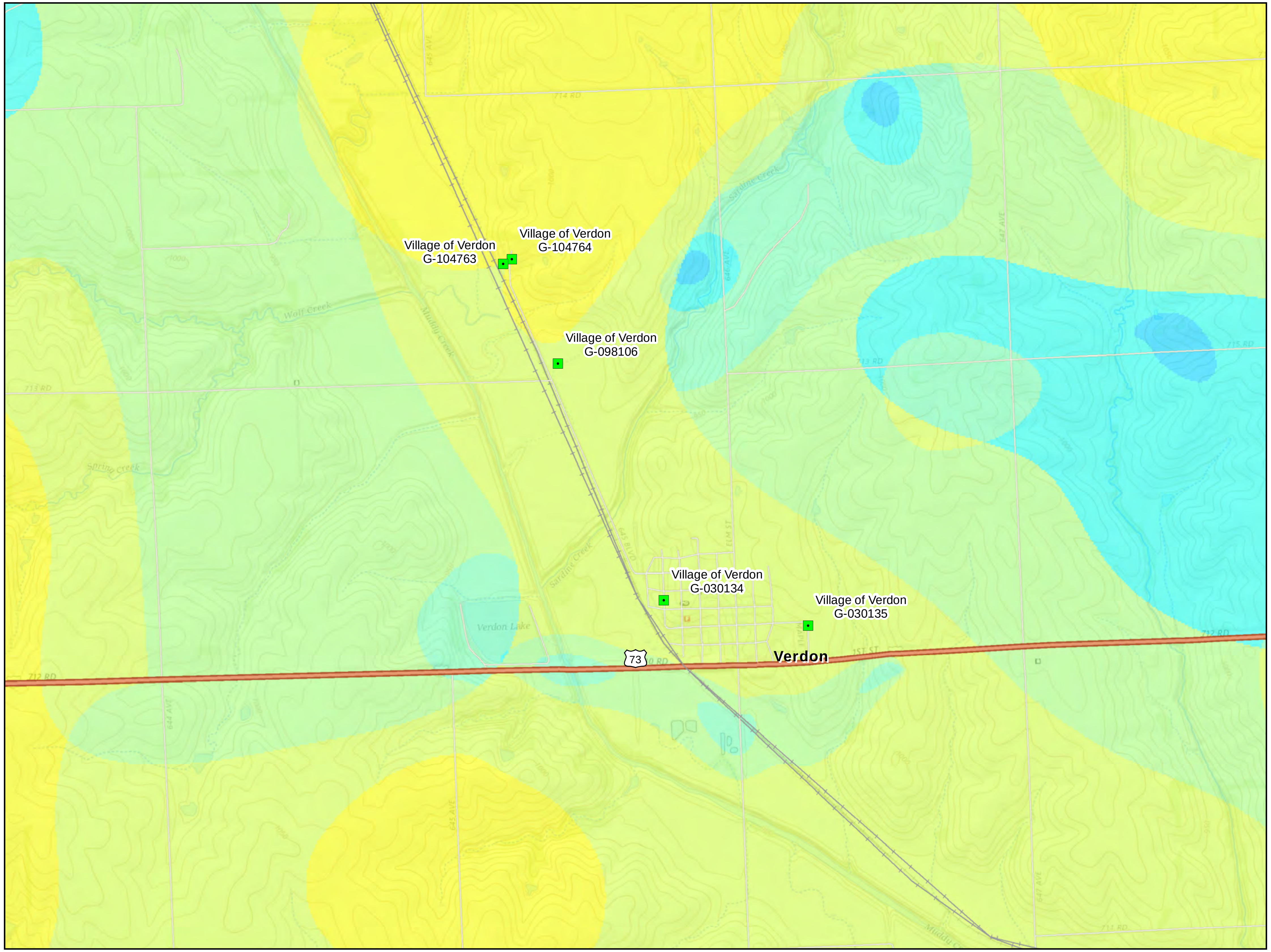

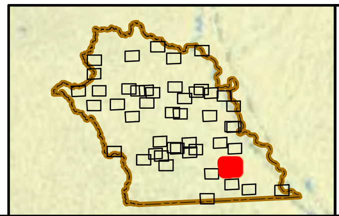

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ATTACHMENT 1
VILLAGE OF VERDON DROUGHT VULNERABILITY ASSESSMENT RESULTS

FILE: 5006jeo1001g - PWS 24K Insets.MXD	DATE: 5/13/2020	FIGURE: 47