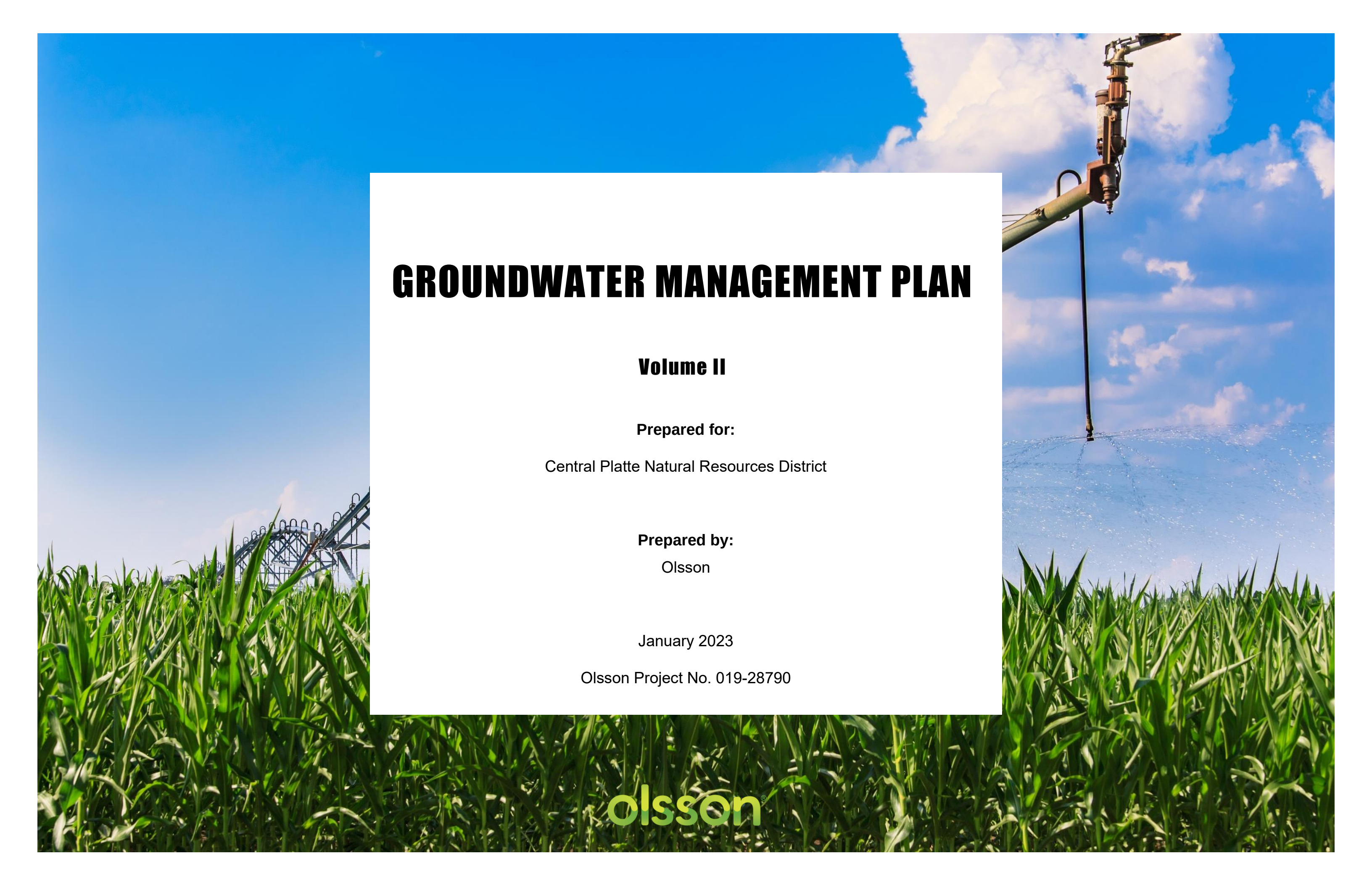




GROUNDWATER MANAGEMENT PLAN

Volume II

Prepared for:

Central Platte Natural Resources District

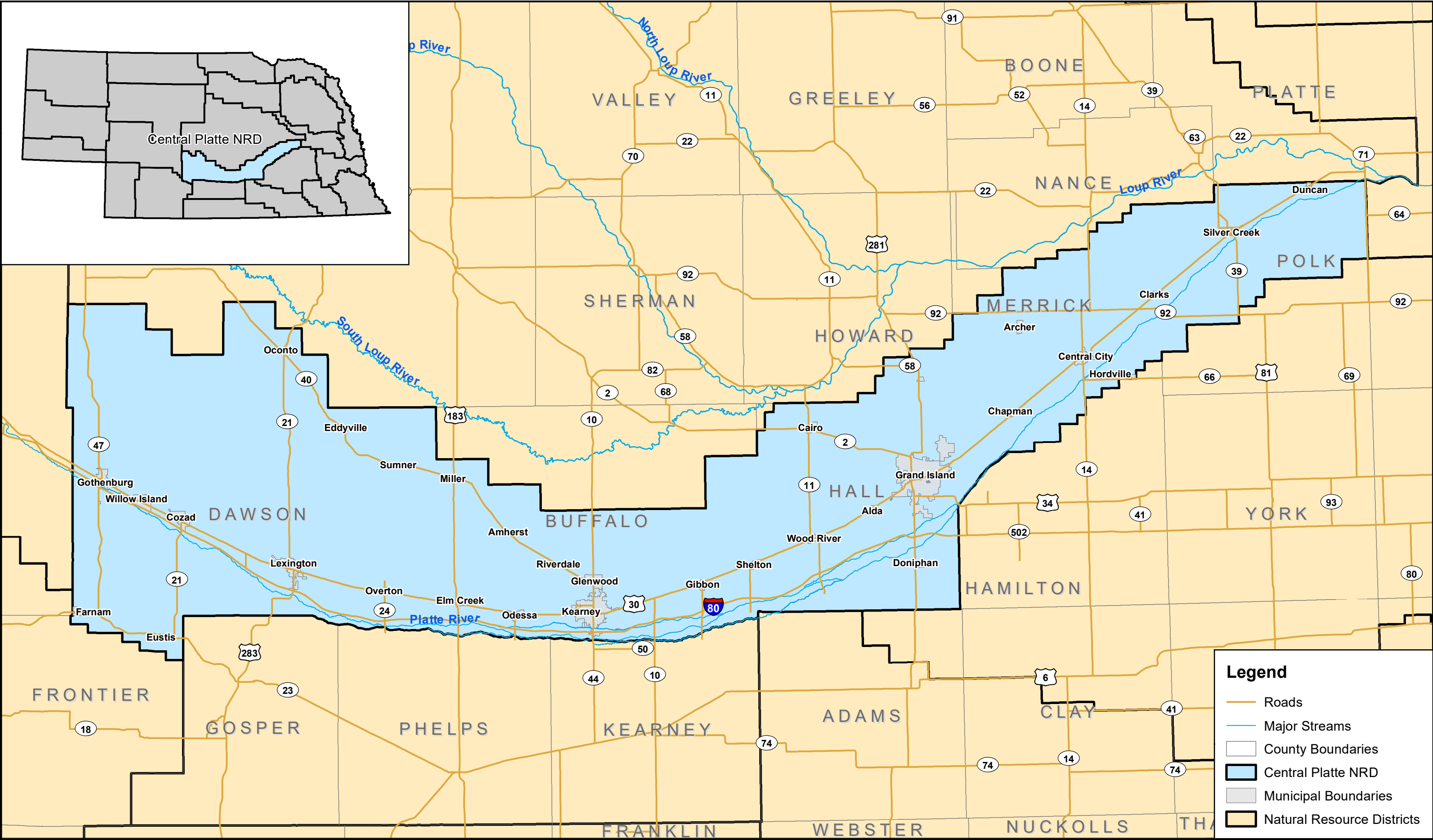
Prepared by:

Olsson

January 2023

Olsson Project No. 019-28790

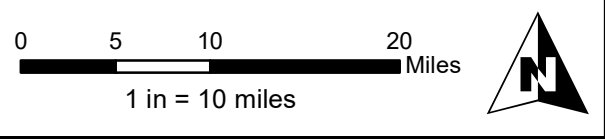
olsson[®]



F:\2019\2501-3000\019-2879\40-Design\GIS\19-11-21_GMPUpdate_LocationMap.mxd User: mmorton

PROJECT: 019-2879
DRAWN BY: MKM
DATE: May 19, 2022

Sources:
NDNR: NRD Boundaries
USGS: National Hydrography Dataset
U.S. Census Bureau: Roads, County Boundaries, Municipal Boundaries



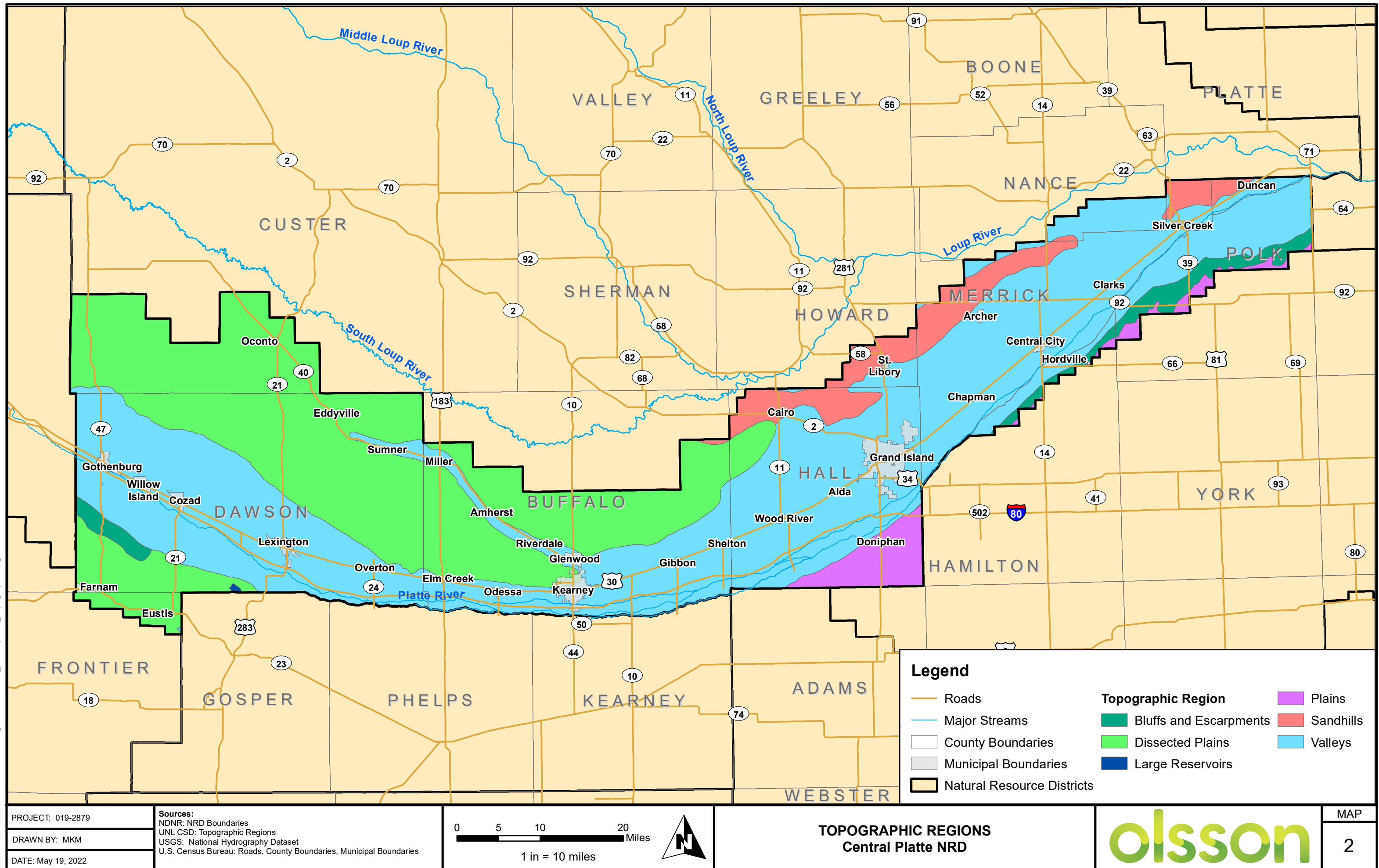
LOCATION MAP
Central Platte NRD



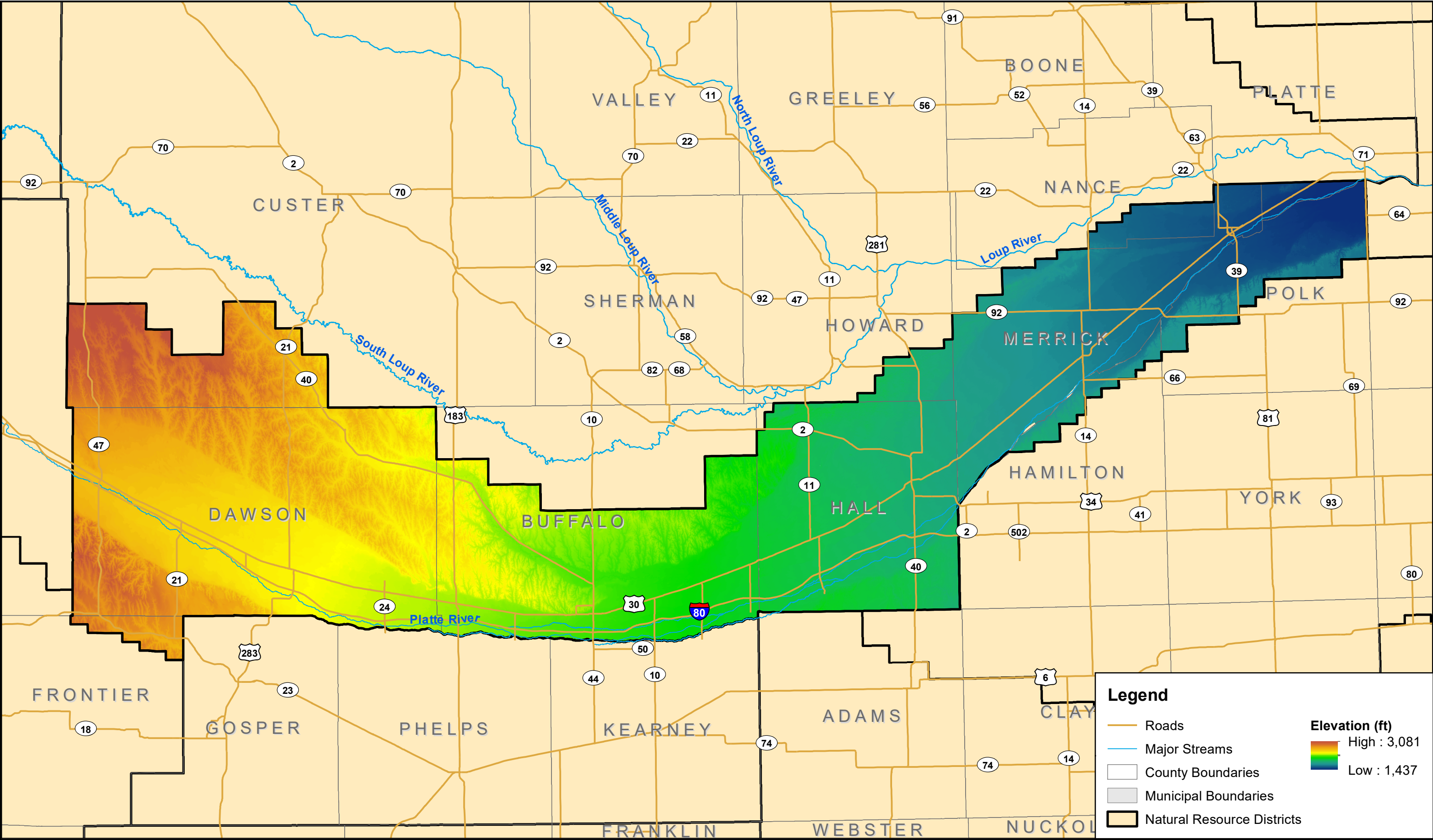
MAP
1

- Legend**
- Roads
 - Major Streams
 - County Boundaries
 - Central Platte NRD
 - Municipal Boundaries
 - Natural Resource Districts

F:\2019\2501-3000\019-2879\40-Design\GIS\19-11-21_GMPUpdate_TopographicRegions.mxd User: mmorton



F:\2019\2501-3000\019-2879\40-Design\GIS\19-11-21_GMPUpdate_TopoRelief.mxd User: mmorton



Legend

Roads

Major Streams

County Boundaries

Municipal Boundaries

Natural Resource Districts

Elevation (ft)

High : 3,081

Low : 1,437

PROJECT: 019-2879

DRAWN BY: MKM

DATE: May 19, 2022

Sources:

NDNR: LiDAR, NRD Boundaries

USGS: National Hydrography Dataset

U.S. Census Bureau: Roads, County Boundaries, Municipal Boundaries

051020

Miles

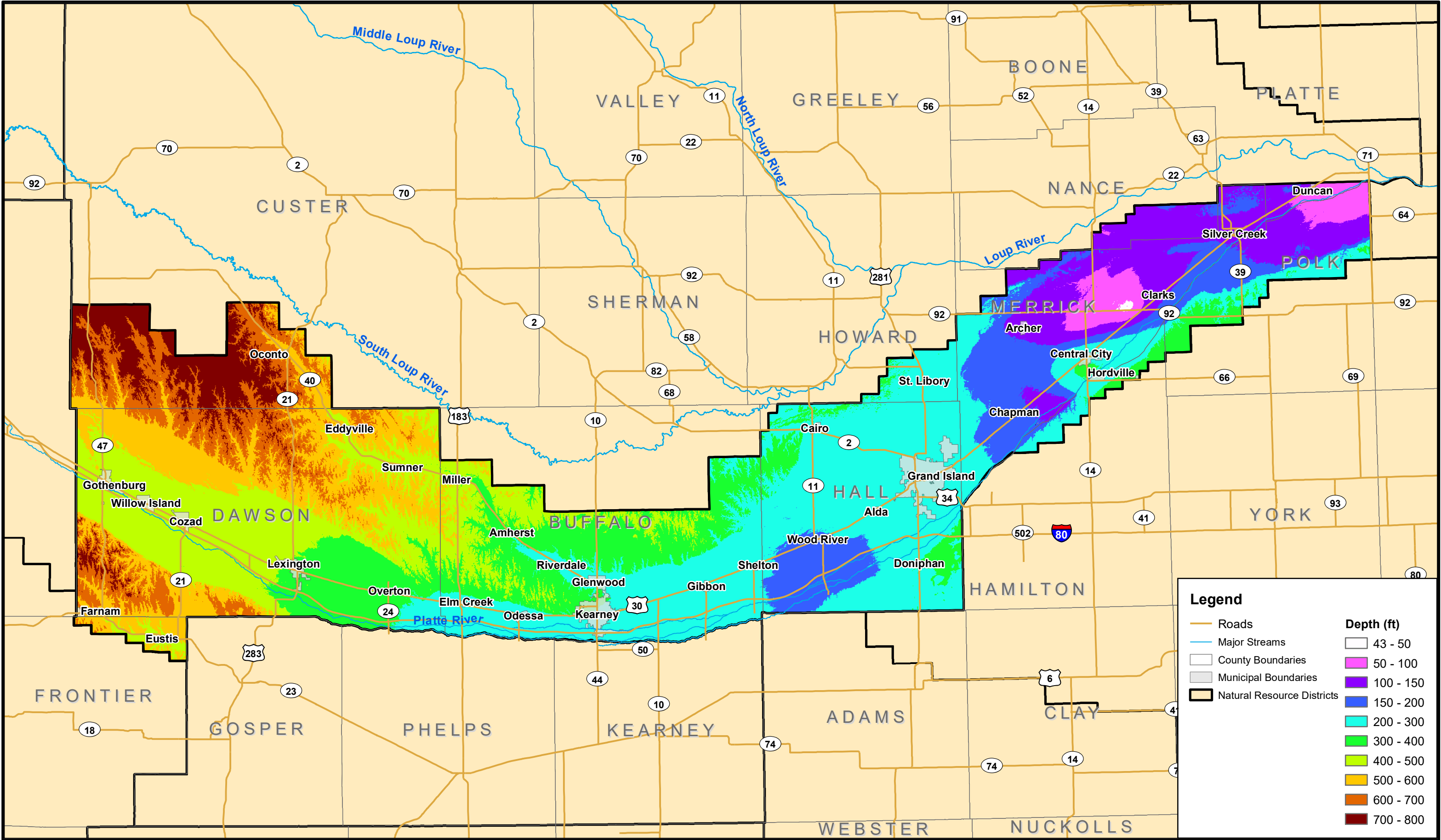
1 in = 10 miles

TOPOGRAPHIC RELIEF

Central Platte NRD

MAP

3



PROJECT: 019-2879

DRAWN BY: RTP

DATE: May 19, 2022

Sources:

NDNR: NRD Boundaries

USGS: Base of Aquifer, National Hydrography Dataset

U.S. Census Bureau: Roads, County Boundaries, Municipal Boundaries

051020

Miles

1 in = 10 miles

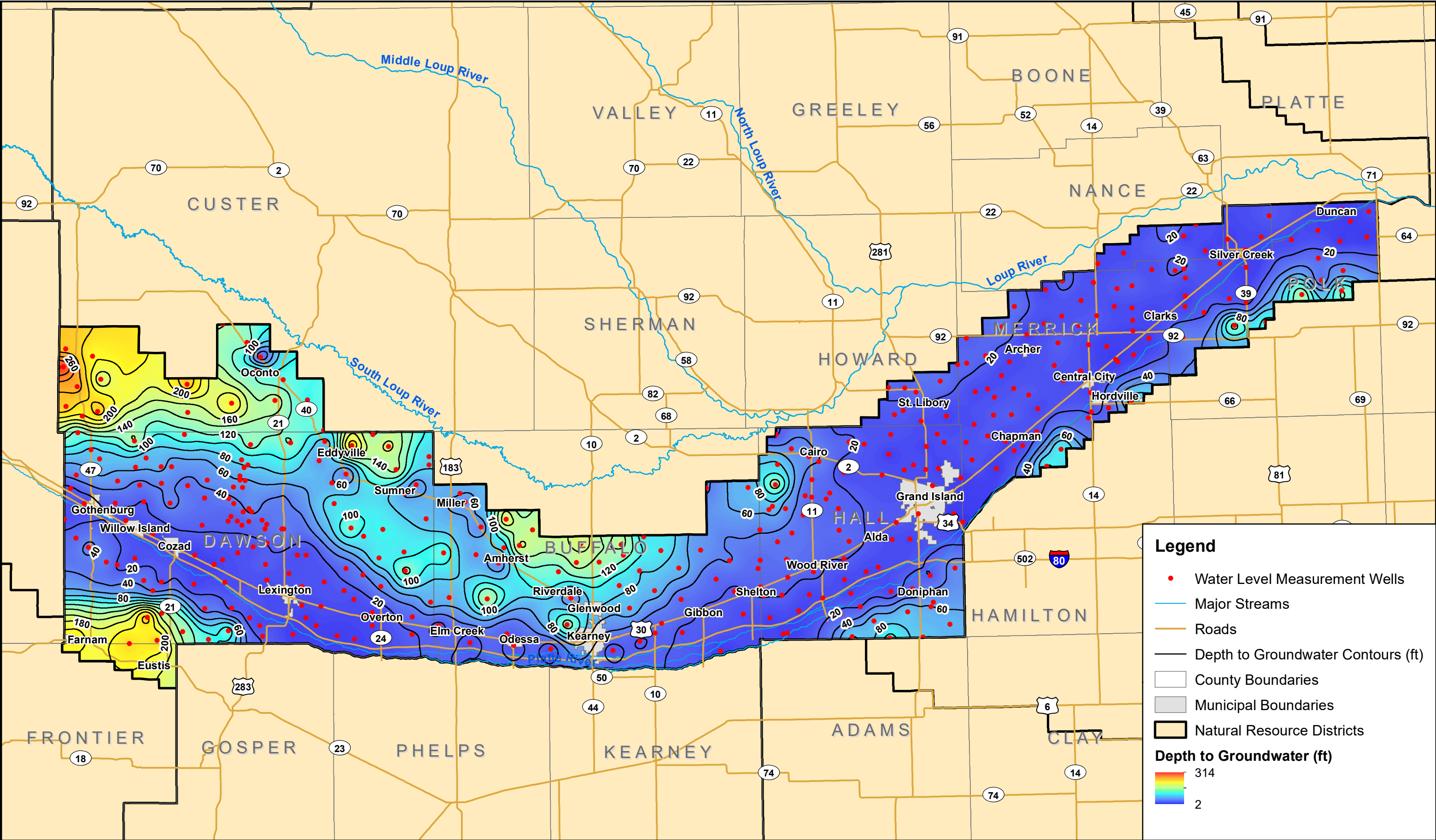
DEPTH TO BASE OF PRINCIPAL AQUIFER

Central Platte NRD

MAP

4

F:\2019\2501-3000\019-2879\40-Design\GIS\19-11-21_GMPUpdate_DepthToBaseOfAquifer.mxd User: mmorton

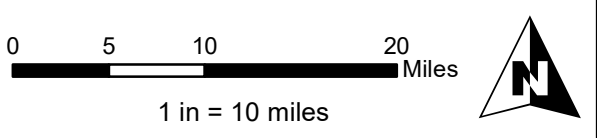


PROJECT: 019-2879

Sources:
CPNRD: Observation Wells, WL Data
NDNR: NRD Boundaries
USGS: National Hydrography Dataset
U.S. Census Bureau: Roads, County Boundaries, Municipal Boundaries

DRAWN BY: MKM

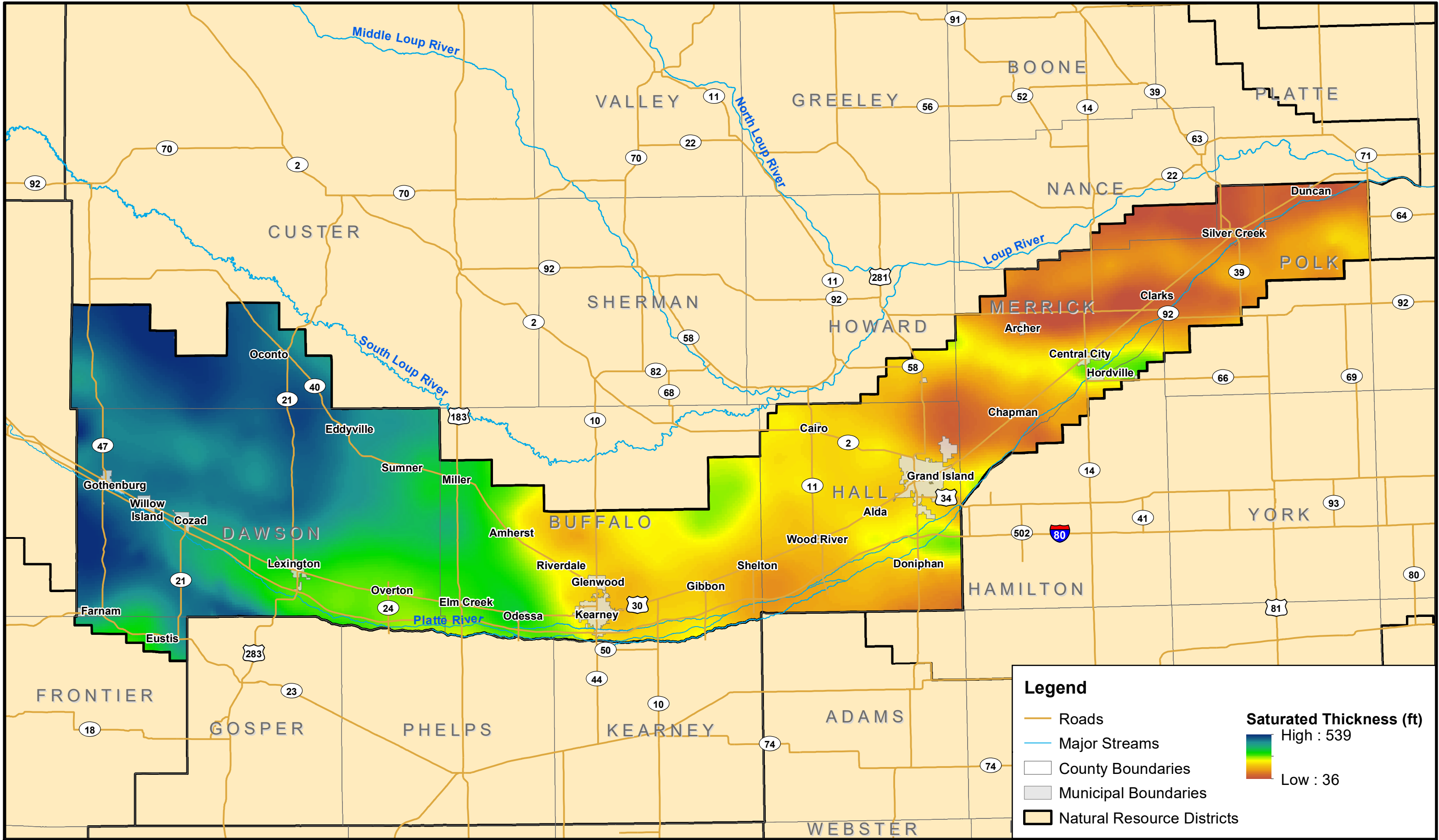
DATE: May 19, 2022



DEPTH TO GROUNDWATER
Central Platte NRD



MAP
5

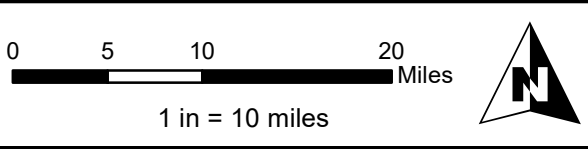


Legend

- Roads
- Major Streams
- County Boundaries
- Municipal Boundaries
- Natural Resource Districts

Saturated Thickness (ft)
High : 539
Low : 36

PROJECT: 019-2879	Sources: NDNR: NRD Boundaries USGS: Saturated Thickness, National Hydrography Dataset U.S. Census Bureau: Roads, County Boundaries, Municipal Boundaries
DRAWN BY: MKM	
DATE: May 19, 2022	

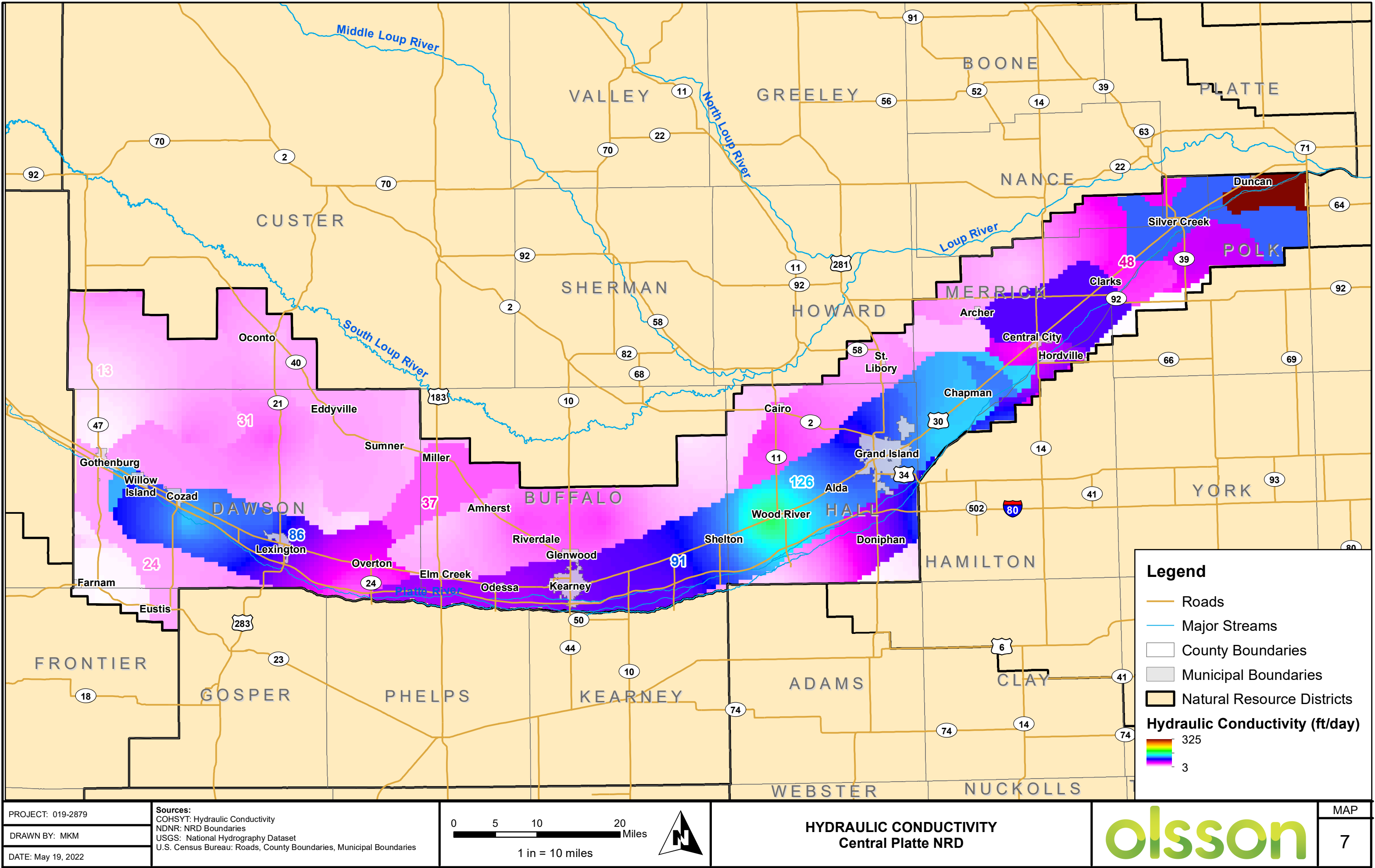


**AQUIFER SATURATED THICKNESS
Central Platte NRD**



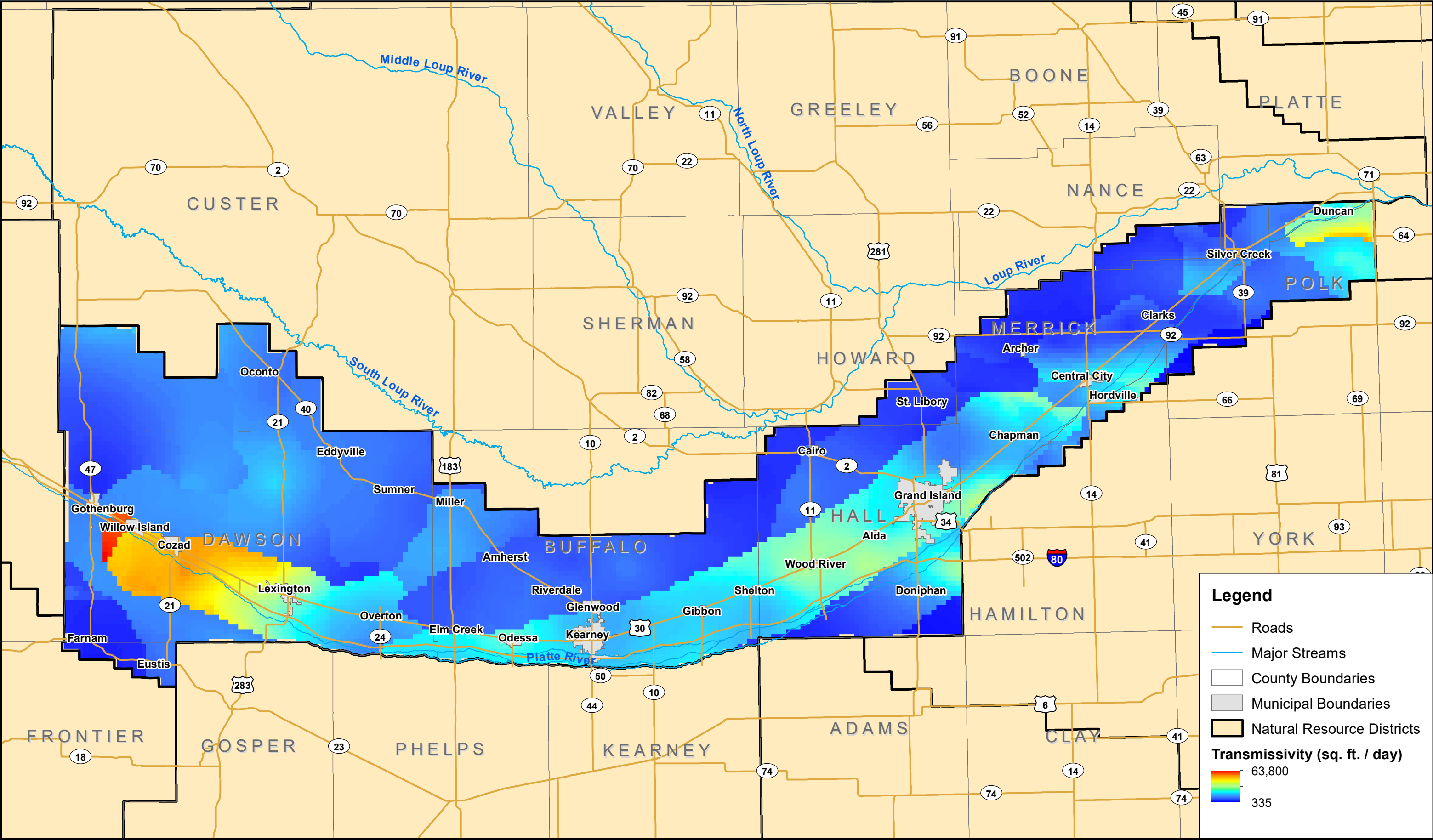
F:\2019\2501-3000\019-2879\40-Design\GIS\19-11-21_GMPUpdate_SaturatedThickness.mxd User: mmorton

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PROJECT: 019-2879	Sources: COHSYT: Hydraulic Conductivity NDNR: NRD Boundaries USGS: National Hydrography Dataset U.S. Census Bureau: Roads, County Boundaries, Municipal Boundaries
DRAWN BY: MKM	
DATE: May 19, 2022	

F:\2019\2501-3000\019-2879\40-Design\GIS\19-11-21_GMPUpdate_Transmissivity2.mxd User: mmorton



Legend

 Roads

 Major Streams

 County Boundaries

 Municipal Boundaries

 Natural Resource Districts

Transmissivity (sq. ft. / day)

63,800
335

PROJECT: 019-2879	Sources: NDNR: NRD Boundaries USGS: National Hydrography Dataset U.S. Census Bureau: Roads, County Boundaries, Municipal Boundaries
DRAWN BY: MKM	
DATE: May 19, 2022	

051020

Miles

1 in = 10 miles

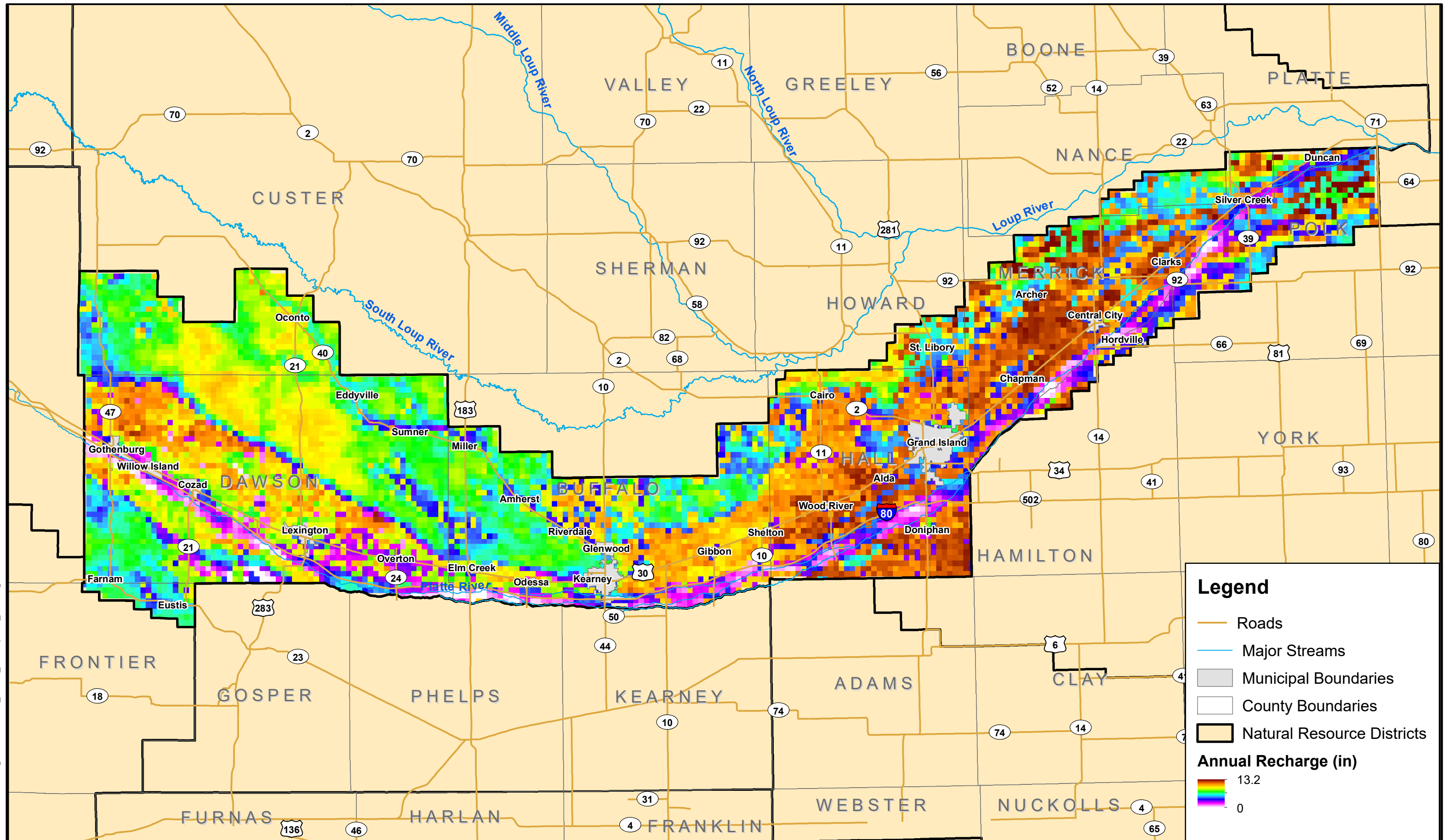


TRANSMISSIVITY
Central Platte NRD



MAP
8

F:\2019\2501-3000\019-2879\40-Design\GIS\20-01-17_WTRS_GMP\Update_Recharge.mxd User: mmorton



PROJECT: 019-2879

DRAWN BY: MKM

DATE: May 19, 2022

Sources:

NDNR: NRD Boundaries
USGS: National Hydrography Dataset, SOWAT Recharge (2000-2009)
U.S. Census Bureau: Roads, County Boundaries, Municipal Boundaries

0 5 10 20 Miles
1 in = 10 miles

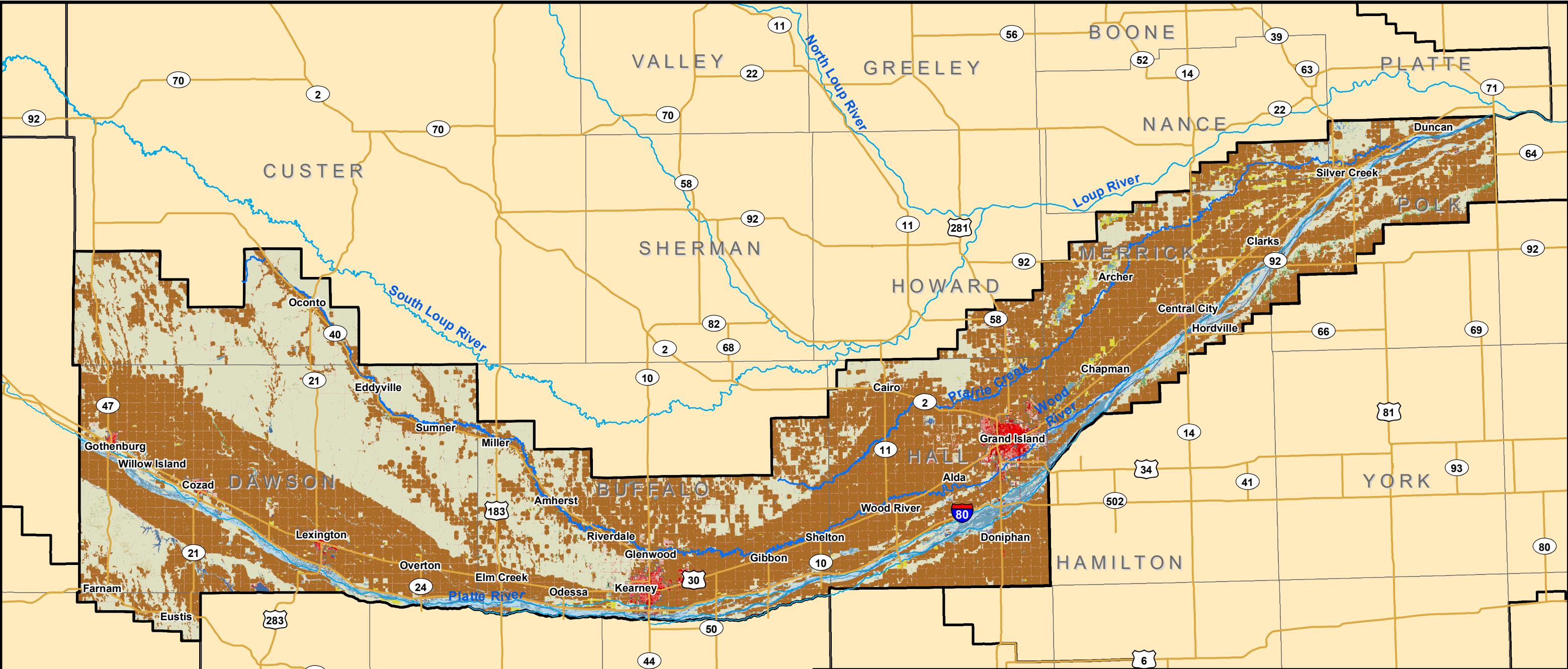


**AVERAGE ANNUAL RECHARGE
Central Platte NRD**

olsson

MAP

10



Legend

- Roads
- Major Streams
- County Boundaries
- Municipal Boundaries
- Natural Resource Districts

Land Cover Class

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest

- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Herbaceous
- Hay/Pasture
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

PROJECT: 019-2879

DRAWN BY: MKM

DATE: May 19, 2022

Sources:

- MRLC: National Land Cover Dataset
- NDNR: NRD Boundaries
- USGS: National Hydrography Dataset
- U.S. Census Bureau: Roads, County Boundaries

051020

Miles

1 in = 10 miles

N

LAND USE

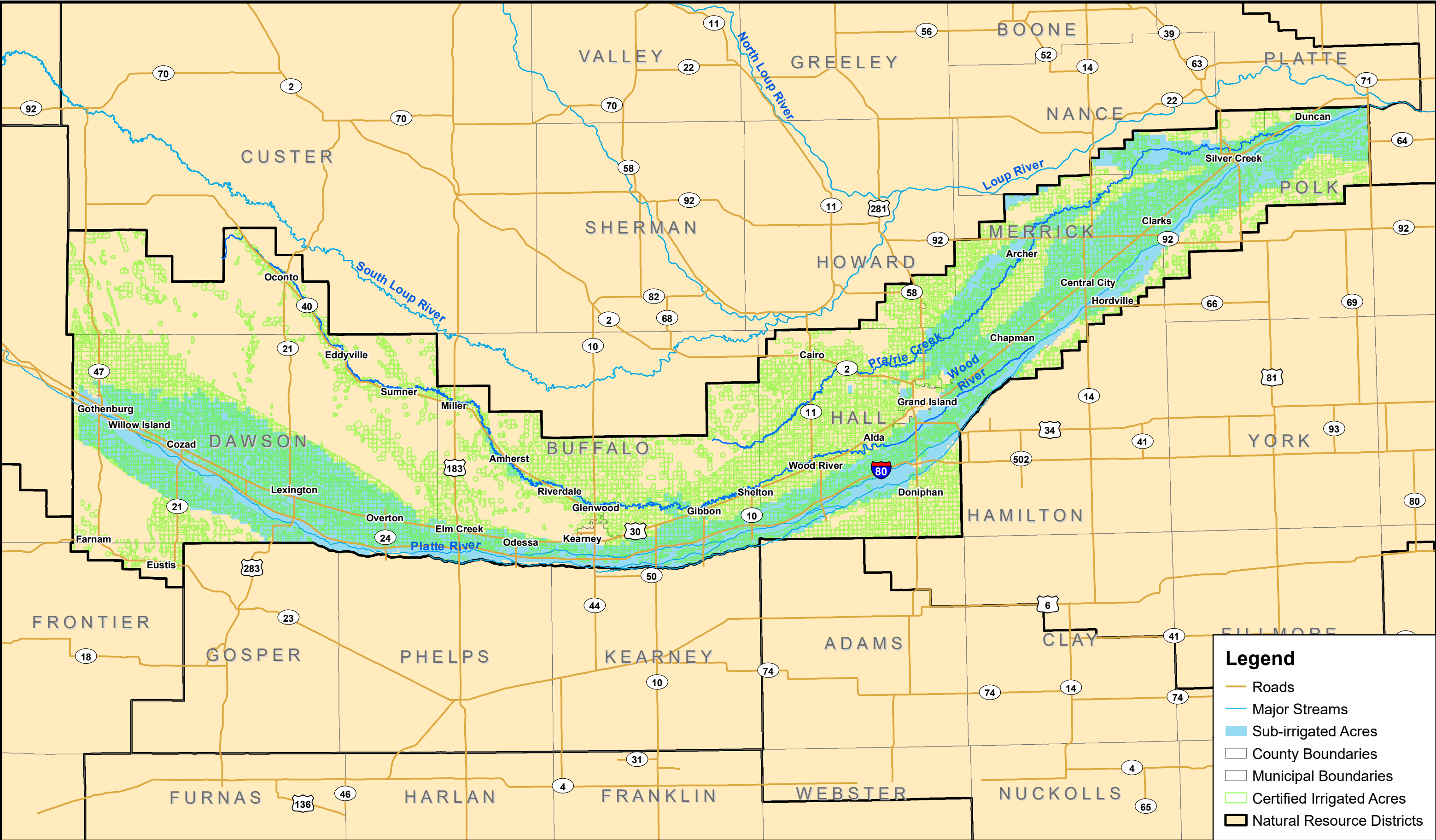
Central Platte NRD

olsson

MAP

11

F:\2019\2501-3000\019-2879\40-Design\GIS\20-01-17_WTRS_GMP\Update_LandUse.mxd User: mmorton



PROJECT: 019-2879	Sources: CPNRD: Certified Irrigated Acres, Sub-irrigated Acres NDNR: NRD Boundaries USGS: National Hydrography Dataset, Digital Elevation Model U.S. Census Bureau: Roads, County Boundaries
DRAWN BY: MKM	
DATE: May 19, 2022	

051020

Miles

1 in = 10 miles

N

SUB-IRRIGATED AND CERTIFIED IRRIGATED ACRES

Central Platte NRD

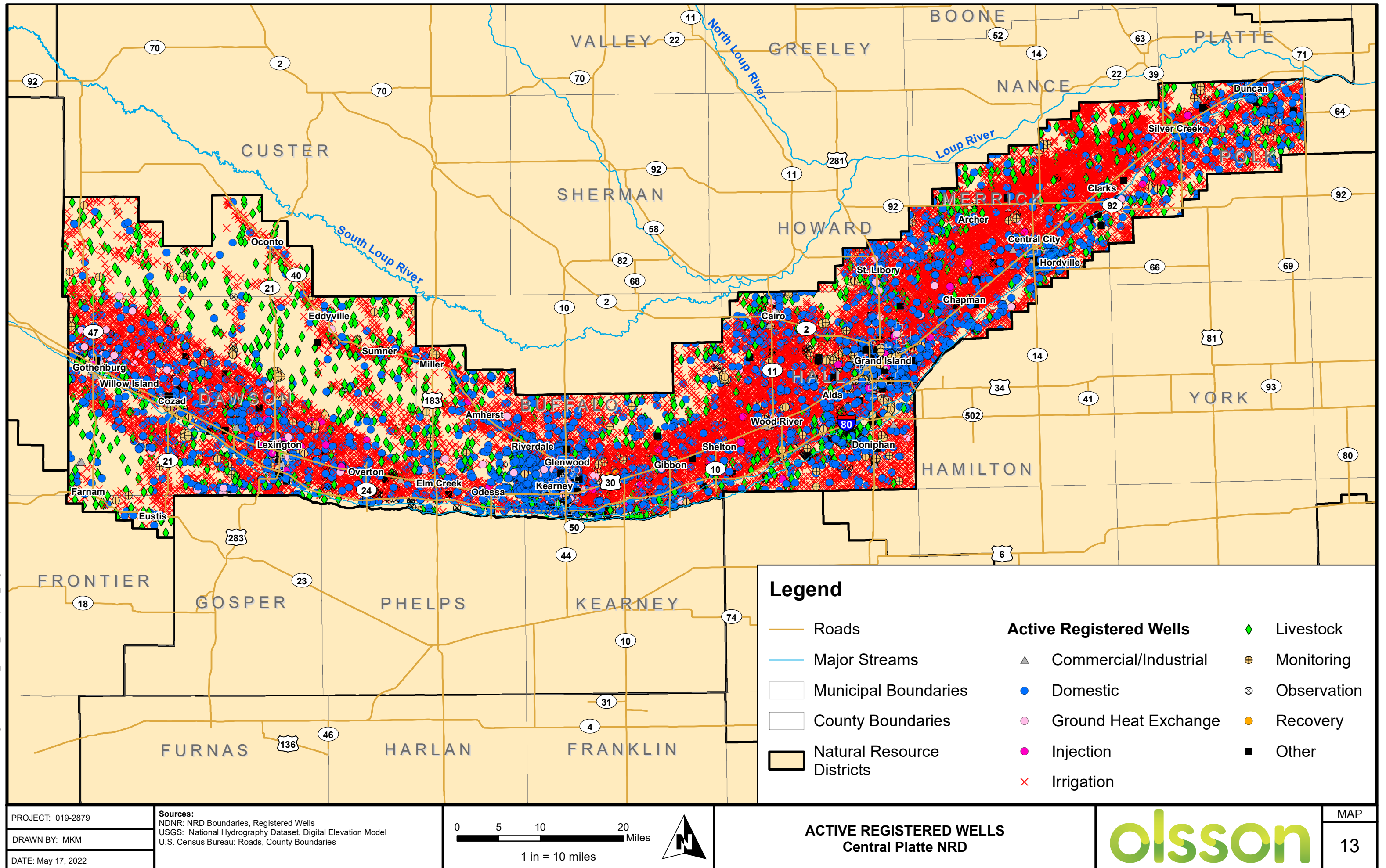
olsson

MAP

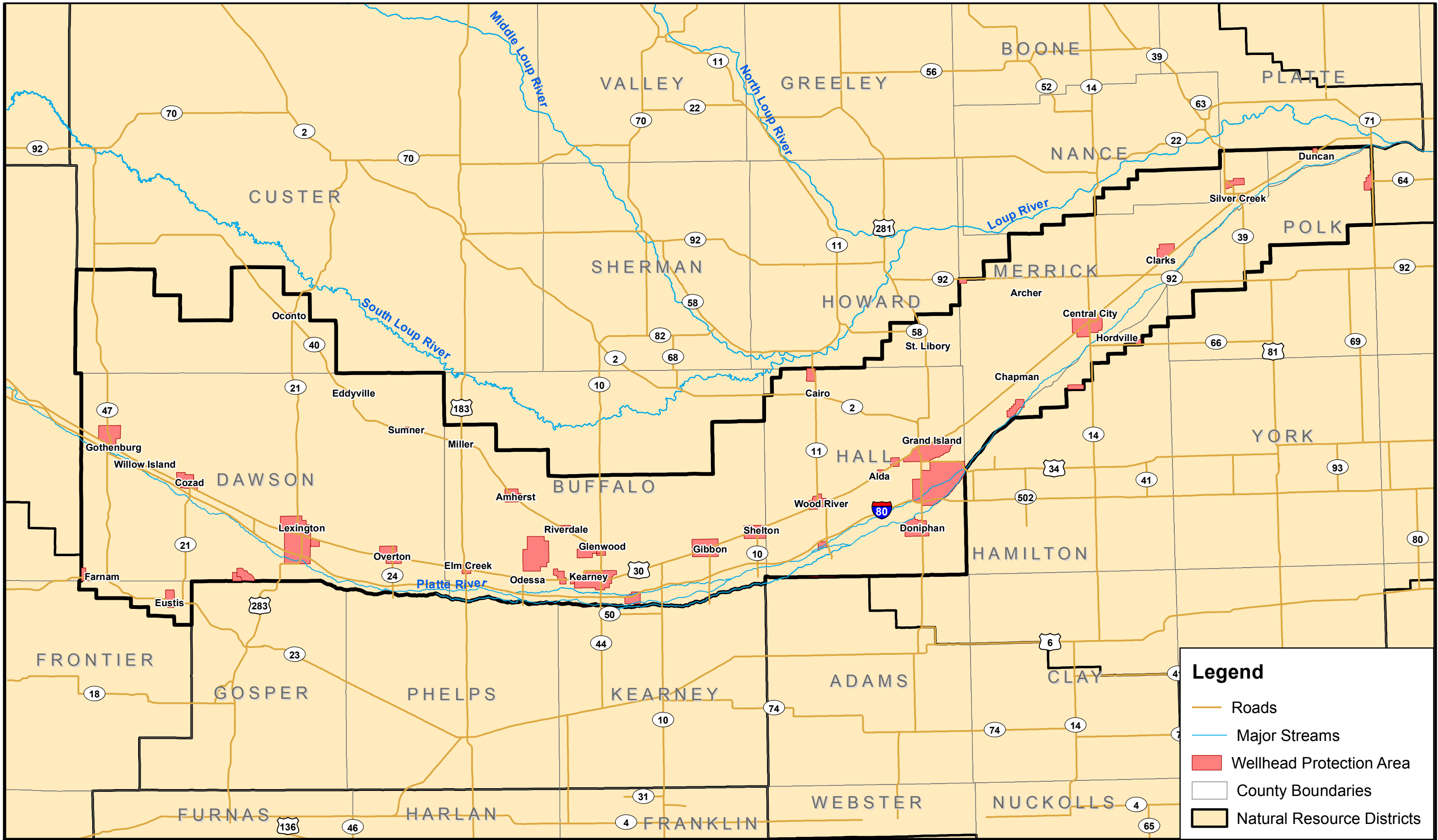
12

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F:\2019\2501-3000\019-2879\40-Design\GIS\20-01-17_WTRS_GMP\Update_RegWells.mxd User: mmorton



F:\2019\2501-3000\019-2879\40-Design\GIS\22-11-29_VTRS_GMPUpdate_WellheadProtection.mxd User: mmorton



Legend

- Roads
- Major Streams
- Wellhead Protection Area
- County Boundaries
- Natural Resource Districts

PROJECT: 019-2879

DRAWN BY: MKM

DATE: November 29, 2022

Sources:

NDEE: Wellhead Protection Areas

NDNR: NRD Boundaries

USGS: National Hydrography Dataset

U.S. Census Bureau: Roads, County Boundaries

051020Miles

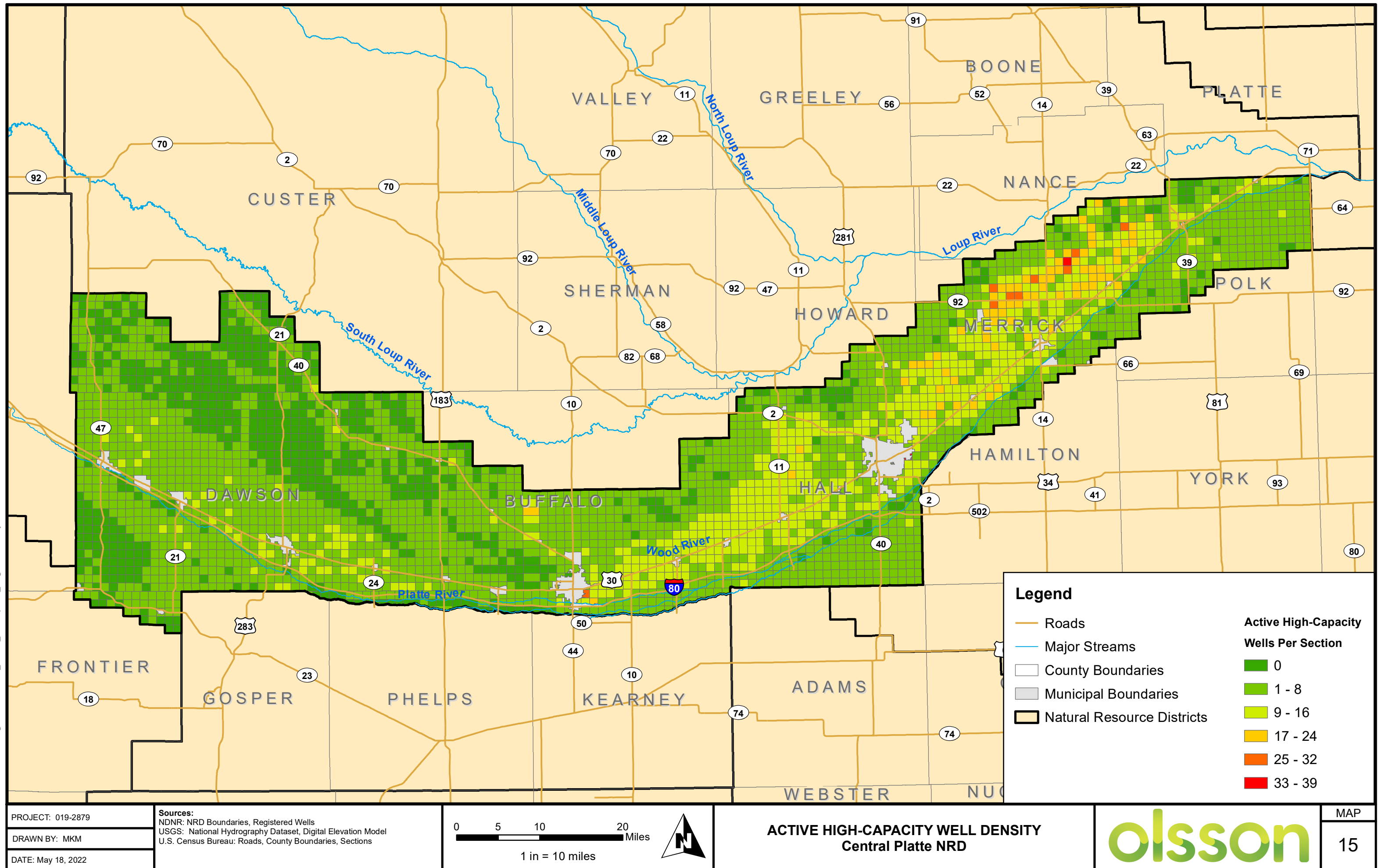
1 in = 10 miles

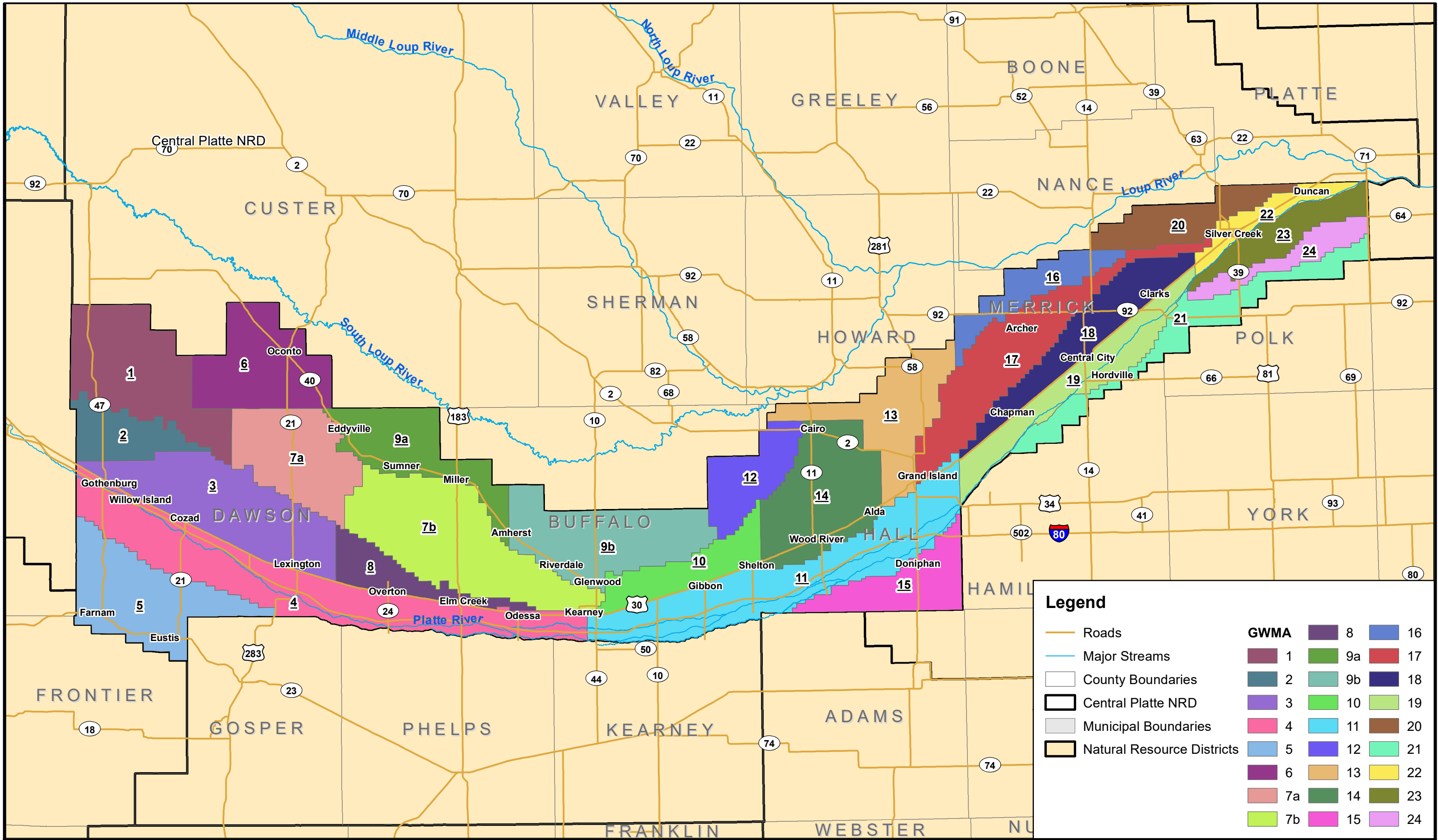
WELLHEAD PROTECTION AREAS

Central Platte NRD

MAP14

F:\2019\2501-3000\019-2879\40-Design\GIS\20-01-17_WTRS_GMPUpdate_RegWellsDensity.mxd User: bstams





Legend

- Roads
- Major Streams
- County Boundaries
- Central Platte NRD
- Municipal Boundaries
- Natural Resource Districts

GWMA	
1	8
2	9a
3	9b
4	10
5	11
6	12
7a	13
7b	14
15	16
17	18
19	20
21	22
23	24

F:\2019\2501-3000\019-2879\40-Design\GIS\22-05-19_GMPUpdate_GWMA.s.mxd User: mmorton

NOTE:

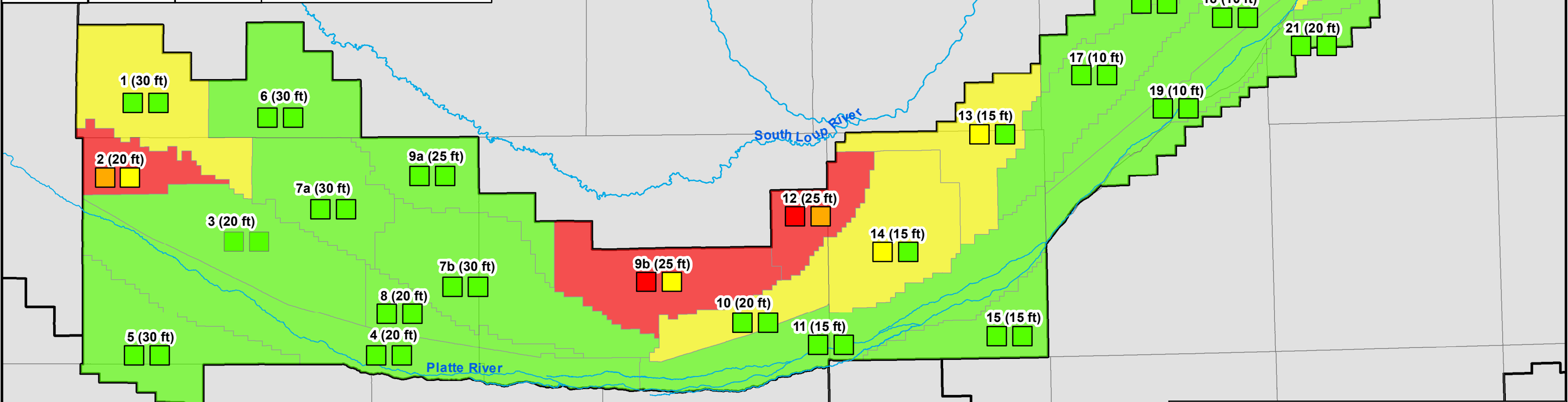
Groundwater Management Area Number

Maximum Acceptable Decline Depth

Phase 2 Likelihood

Phase 3 Likelihood

Phase 4 Likelihood



NOTE:

Colors represent the likelihood of each GWMA reaching the maximum acceptable decline within 50 years. The color of the GWMA represents the baseline ("do nothing") scenario. The phase 2 trigger is 25% of the maximum acceptable decline (MAD), phase 3 is 50% of the MAD, and phase 4 is 75% of the MAD. Regulations at each phase trigger are further described in the groundwater management plan.

Legend

- Major Streams
 - Phase Squares
 - County Boundaries
 - Municipal Boundaries
 - Natural Resources Districts
 - County Boundaries
- Reach Phase Trigger?
- Unlikely
 - Somewhat Likely
 - Likely
 - Very Likely

PROJECT: 019-2879

DRAWN BY: ELB

DATE: May 17, 2022

Sources:
CPNRD: GWMA Boundaries
NDNR: NRD Boundaries
USGS: National Hydrography Dataset
U.S. Census Bureau: County Boundaries

0 5 10 20 Miles

1 in = 10 miles



Likelihood of Reaching Phase Triggers -
Baseline Scenario
Central Platte NRD

olsson

MAP

17

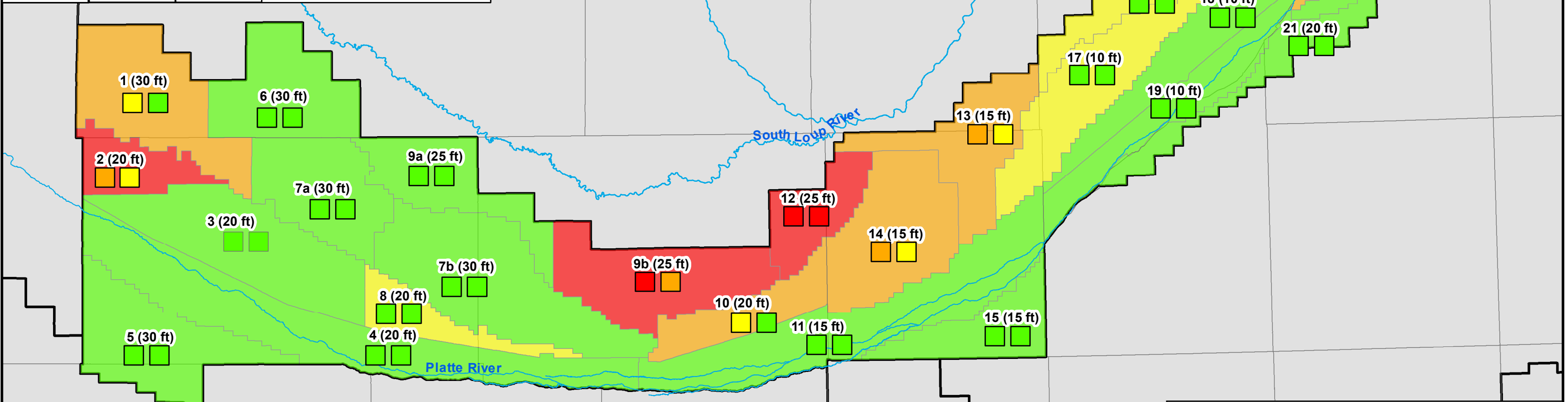
F:\2019\2501-3000\019-2879\40-Design\GIS\21-08-09_GMPUpdate_Baseline\Phases.mxd User: ebowman

NOTES:

Groundwater Management Area Number

Maximum Acceptable Decline Depth

Phase 2 Likelihood	Phase 3 Likelihood	Phase 4 Likelihood
-----------------------	-----------------------	-----------------------



NOTE:

Colors represent the likelihood of each GWMA reaching the phase triggers within 50 years under a scenario with 10% more pumping than the baseline. The phase 2 trigger is 25% of the maximum acceptable decline (MAD), phase 3 is 50% of the MAD, and phase 4 is 75% of the MAD. Regulations at each phase trigger are further described in the groundwater management plan.

Legend

Major Streams

Phase Squares

Municipal Boundaries

County Boundaries

Natural Resources Districts

County Boundaries

Reach Phase Trigger?

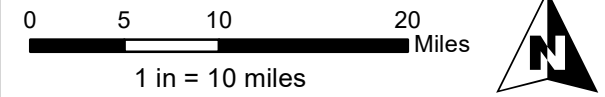
Unlikely

Somewhat Likely

Likely

Very Likely

PROJECT: 019-2879	Sources: CPNRD: GWMA Boundaries NDNR: NRD Boundaries USGS: National Hydrography Dataset U.S. Census Bureau: County Boundaries
DRAWN BY: ELB	
DATE: May 17, 2022	



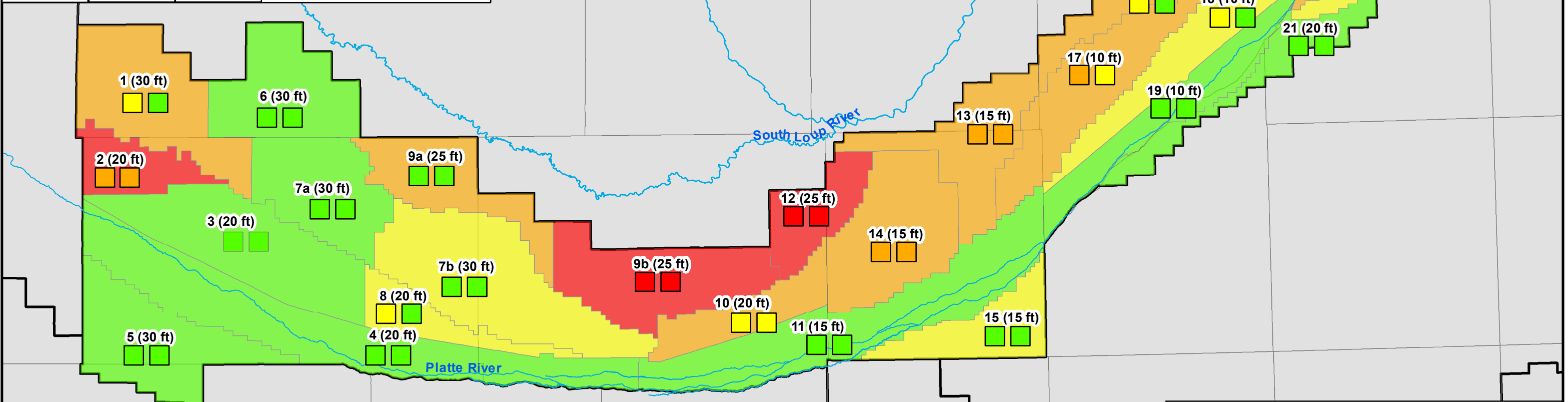
Likelihood of Reaching Phase Triggers -
Moderate Increase Scenario (1)
Central Platte NRD

NOTES:

Groundwater Management Area Number

Maximum Acceptable Decline Depth

Phase 2 Likelihood	Phase 3 Likelihood	Phase 4 Likelihood
-----------------------	-----------------------	-----------------------



NOTE:

Colors represent the likelihood of each GWMA reaching the phase triggers within 50 years under a scenario with 20% more pumping than the baseline. The phase 2 trigger is 25% of the maximum acceptable decline (MAD), phase 3 is 50% of the MAD, and phase 4 is 75% of the MAD. Regulations at each phase trigger are further described in the groundwater management plan.

Legend

Major Streams

Phase Squares

Municipal Boundaries

County Boundaries

Natural Resources Districts

County Boundaries

Reach Phase Trigger?

Unlikely

Somewhat Likely

Likely

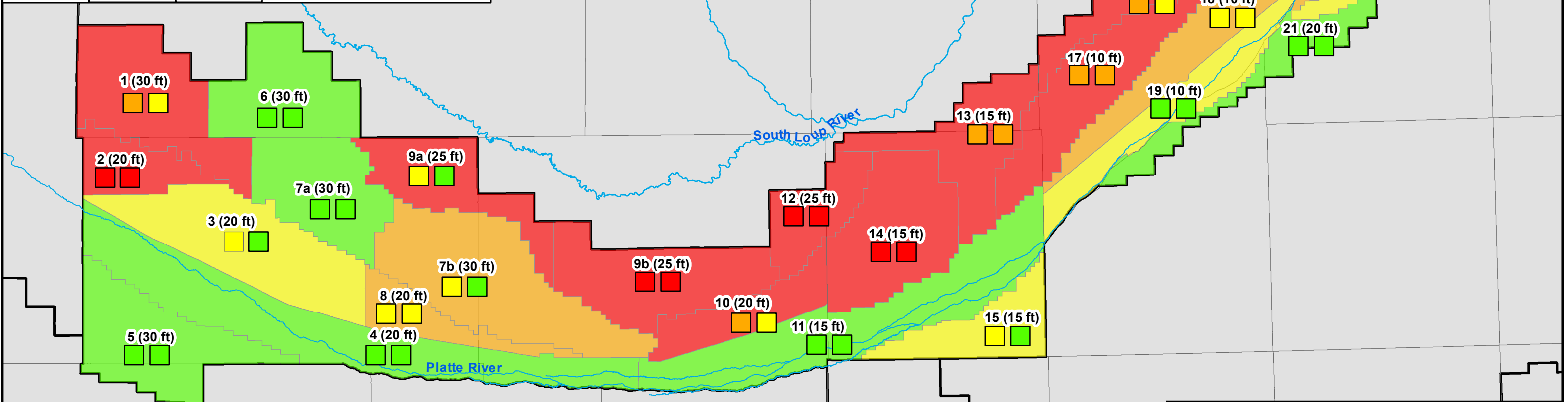
Very Likely

NOTES:

Groundwater Management Area Number

Maximum Acceptable Decline Depth

Phase 2 Likelihood	Phase 3 Likelihood	Phase 4 Likelihood
-----------------------	-----------------------	-----------------------



NOTE:

Colors represent the likelihood of each GWMA reaching the phase triggers within 50 years under a scenario with 30% more pumping than the baseline. The phase 2 trigger is 25% of the maximum acceptable decline (MAD), phase 3 is 50% of the MAD, and phase 4 is 75% of the MAD. Regulations at each phase trigger are further described in the groundwater management plan.

Legend

Major Streams

Phase Squares

Municipal Boundaries

County Boundaries

Natural Resources Districts

County Boundaries

Reach Phase Trigger?

Unlikely

Somewhat Likely

Likely

Very Likely

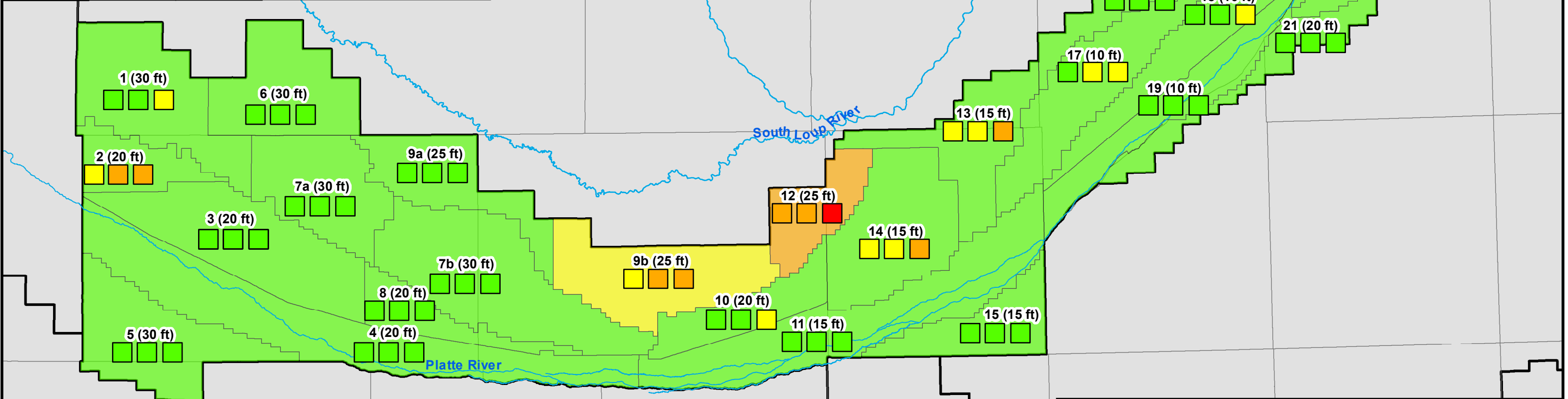
NOTE:

Groundwater Management Area Number

Maximum Acceptable Decline Depth

Baseline Scenario

Scenario 1	Scenario 2	Scenario 3
+10% pumping	+20% pumping	+30% pumping



NOTE:

Colors represent the likelihood of each GWMA reaching the maximum acceptable decline within 50 years. The color of the GWMA represents the baseline ("do nothing") scenario. The first, second, and third box represent the likelihood under a 10%, 20%, and 30% more pumping scenario, respectively.

Legend

— Major Streams	Reach Max. Acceptable Decline (MAD)?
■ PhaseSquares	■ Unlikely
□ County Boundaries	■ Somewhat Likely
□ Municipal Boundaries	■ Likely
□ Natural Resources Districts	■ Very Likely
□ County Boundaries	

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