

WATER-M

Water Advocacy Tool for Equitable Resource Management

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Belinda Sturm, Co-PI; Dietrich Earnhart, Co-PI

Karina Schoengold & Jatin Talreja, Key Collaborators



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KU INSTITUTE FOR
POLICY &
SOCIAL RESEARCH
The University of Kansas

Project Leadership

Introduction



William Duncan
Principal Investigator (PI)
Institute for Policy & Social Research



Karina Schoengold
Key Collaborator
UNL - Agricultural Economics



Belinda Sturm
Co-PI
Kansas EPSCoR Office



Jatin Talreja
Key Collaborator
Viaanix Inc.



Dietrich Earnhart
Co-PI
Center for Environmental Policy



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Problem

"If we don't change our behaviors... there will be no Ogallala Aquifer for us to use. **There'll be nothing.** There will be no agriculture. There will be no communities. There will be no hospitals, no schools, no towns."

- *Connie Owen, Director of Kansas Water Office*

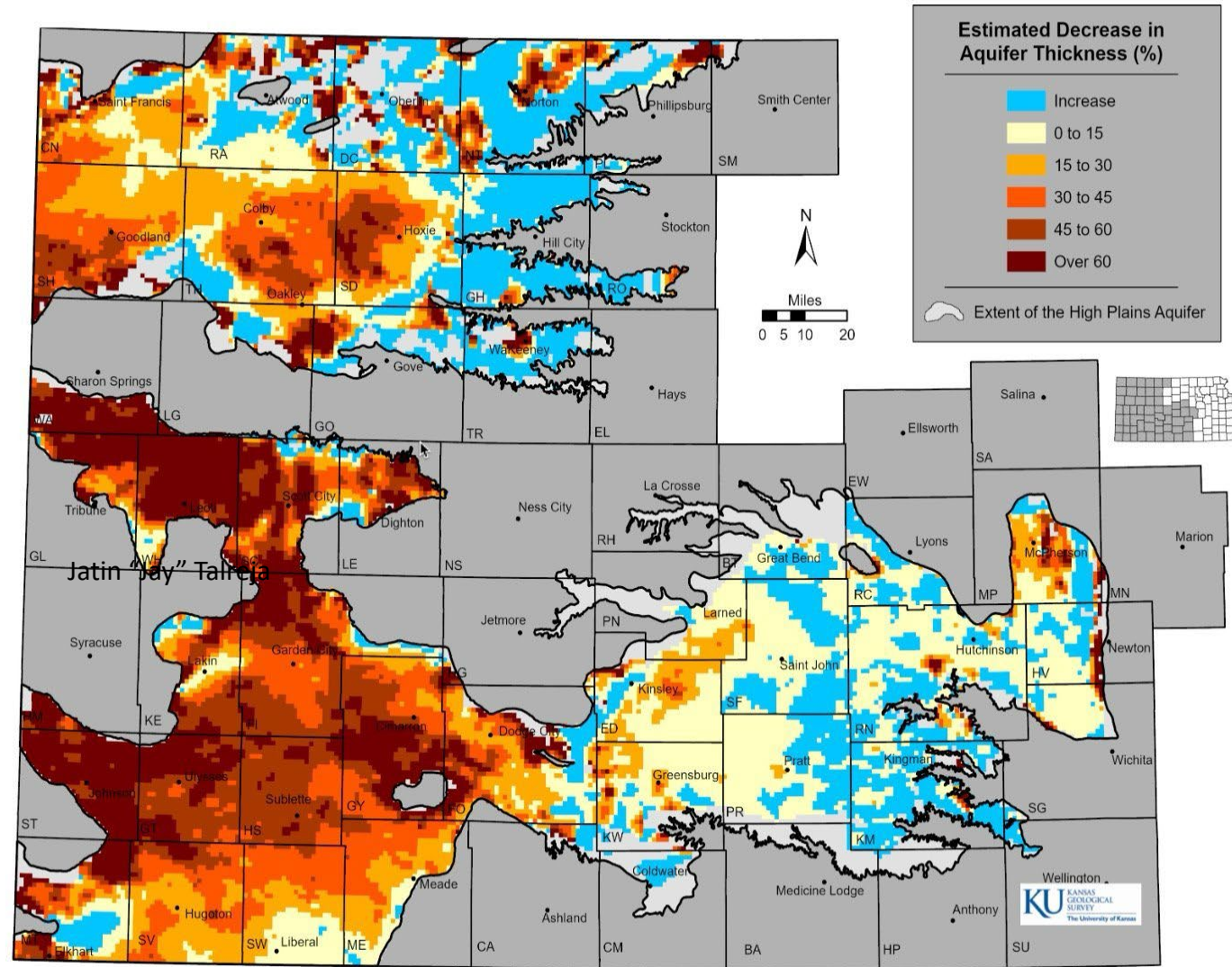
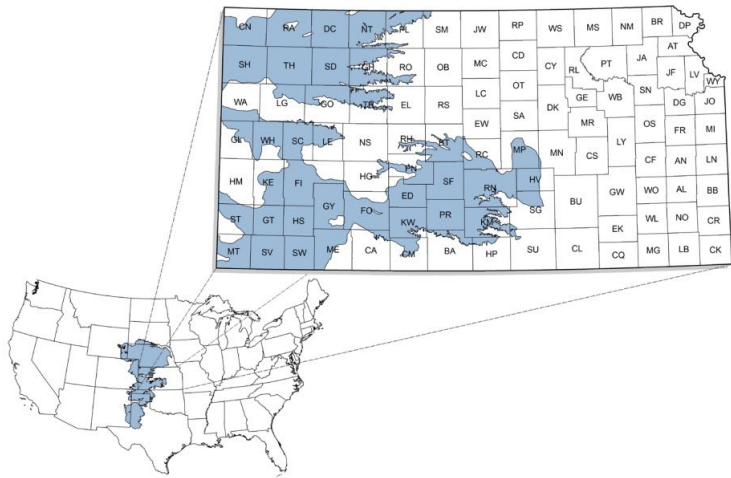
Water use

is not sustainable

and not equitable.

Problem

Percent change in aquifer thickness for the Ogallala Aquifer in Kansas



Jatin "Jay" Taneja

Figures from Kansas Geological Survey

Convergent Partners

City Water Officials	Water officials at cities drawing water from wells
Irrigators	Agricultural producers/farmers with active water rights
State Agency Staff	Staff making regulatory and policy decisions about water



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Key Lessons: User Guided

Feedback-informed Phase II Application

Based on focus groups, interviews, and surveys of 150 individuals, we learned that we need to:

1. Build public and private dashboards
2. Appropriate location for LoRaWAN gateways
3. Specific water quality characteristics

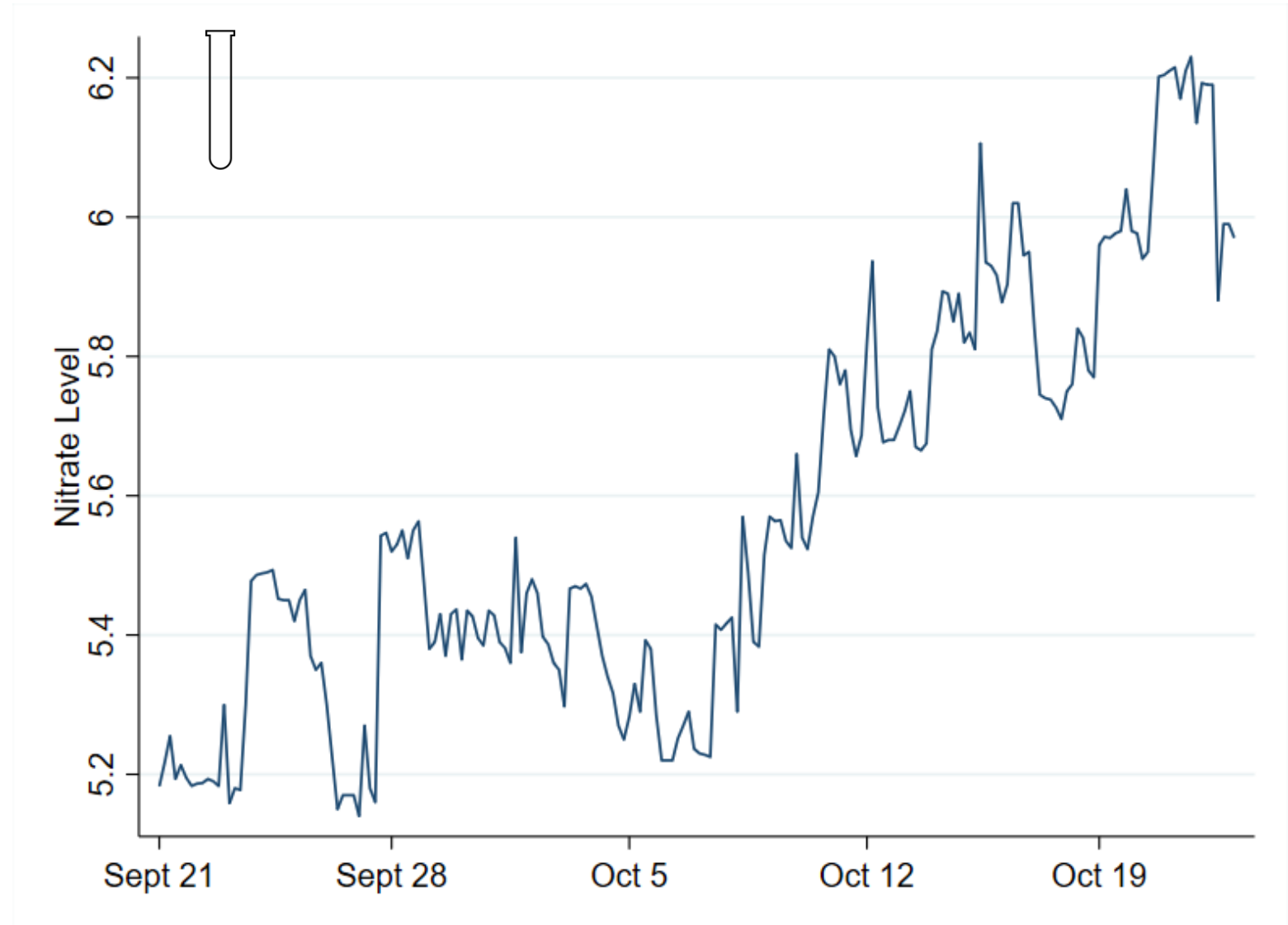


Team members Dietrich Earnhart, Co-PI, and Bruce Fritz, Viaanix Inc., meet with Fred Jones, Water Resource Manager in Garden City, KS.

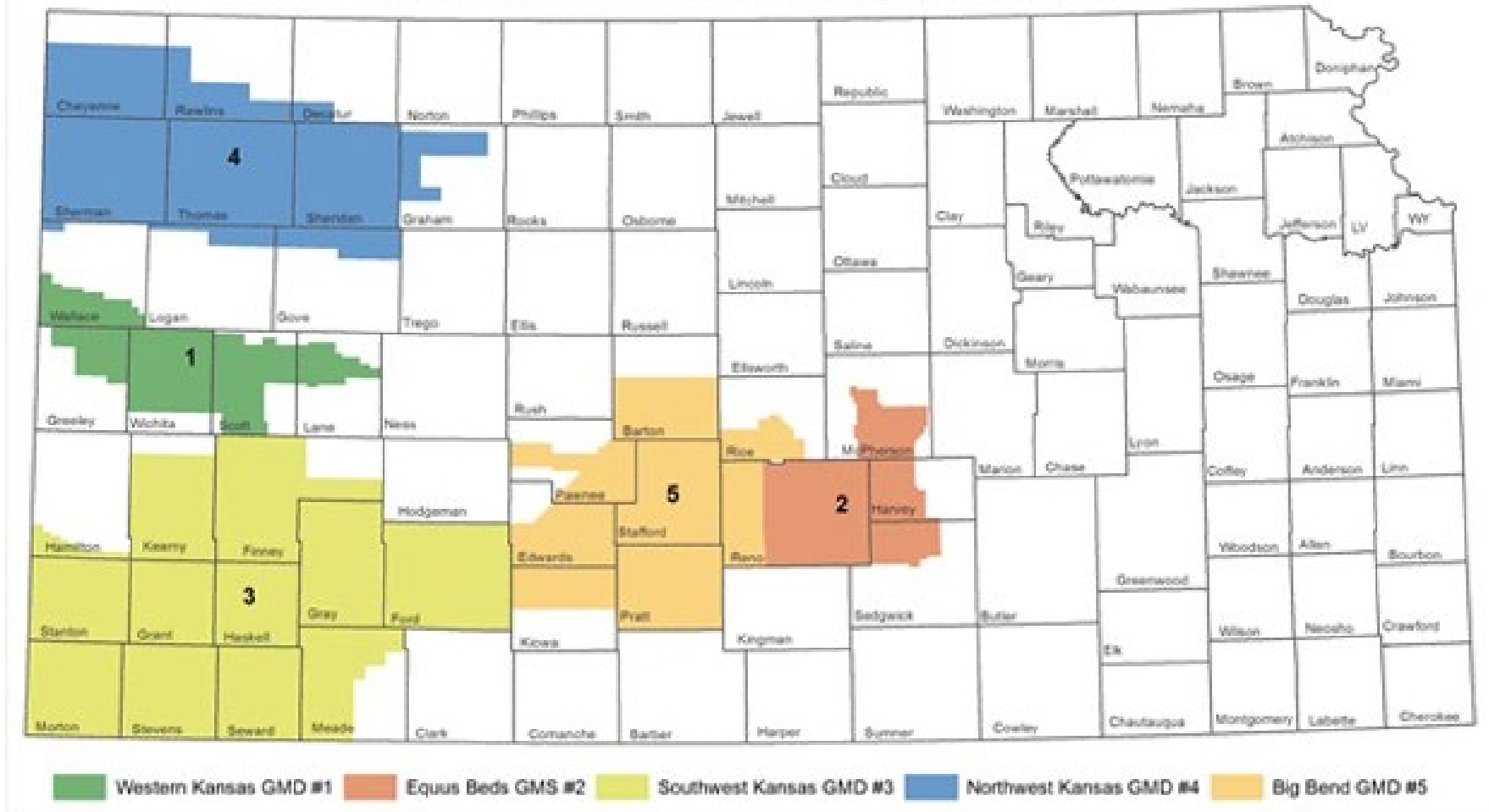
Solution: Use Inspired

The private dashboards in Kansas show the water quality and water quantity data taken from sensors installed in wells collaborating with cities and farmers.

Dodge City, Kansas

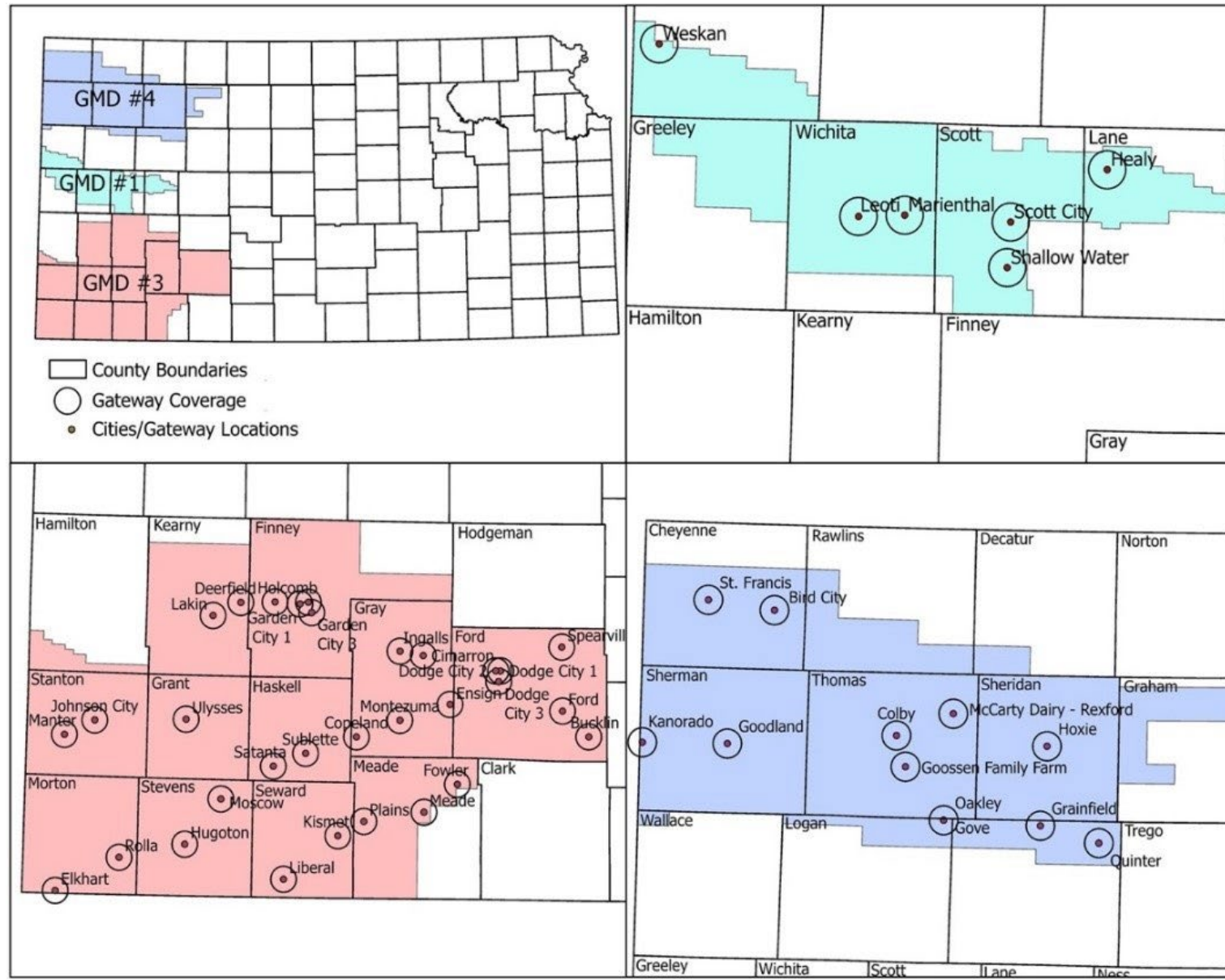


Groundwater Management Districts in Kansas



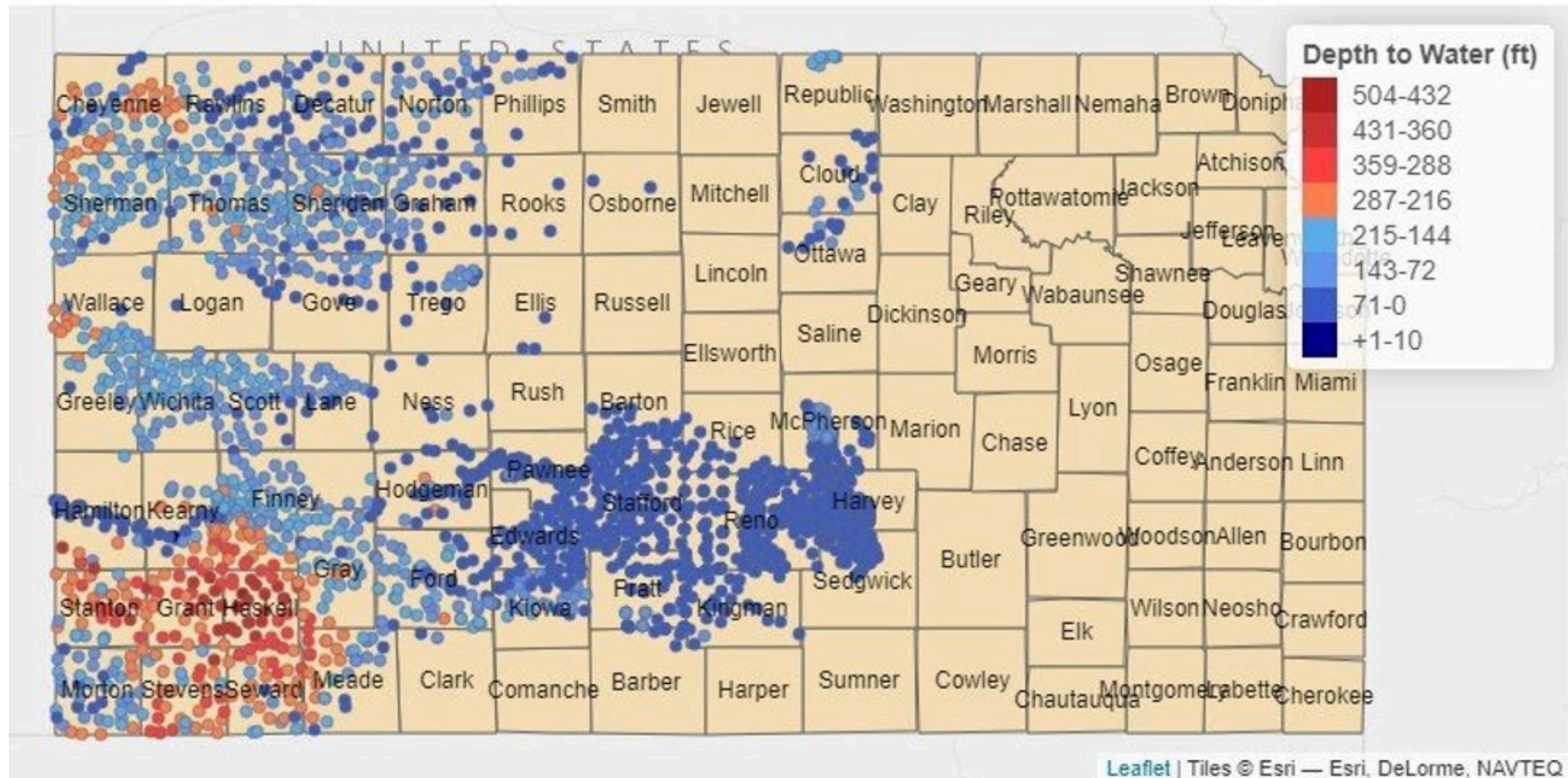
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Location of GMDs with Kansas and Gateway Locations within each GMD

Solution: Use Inspired



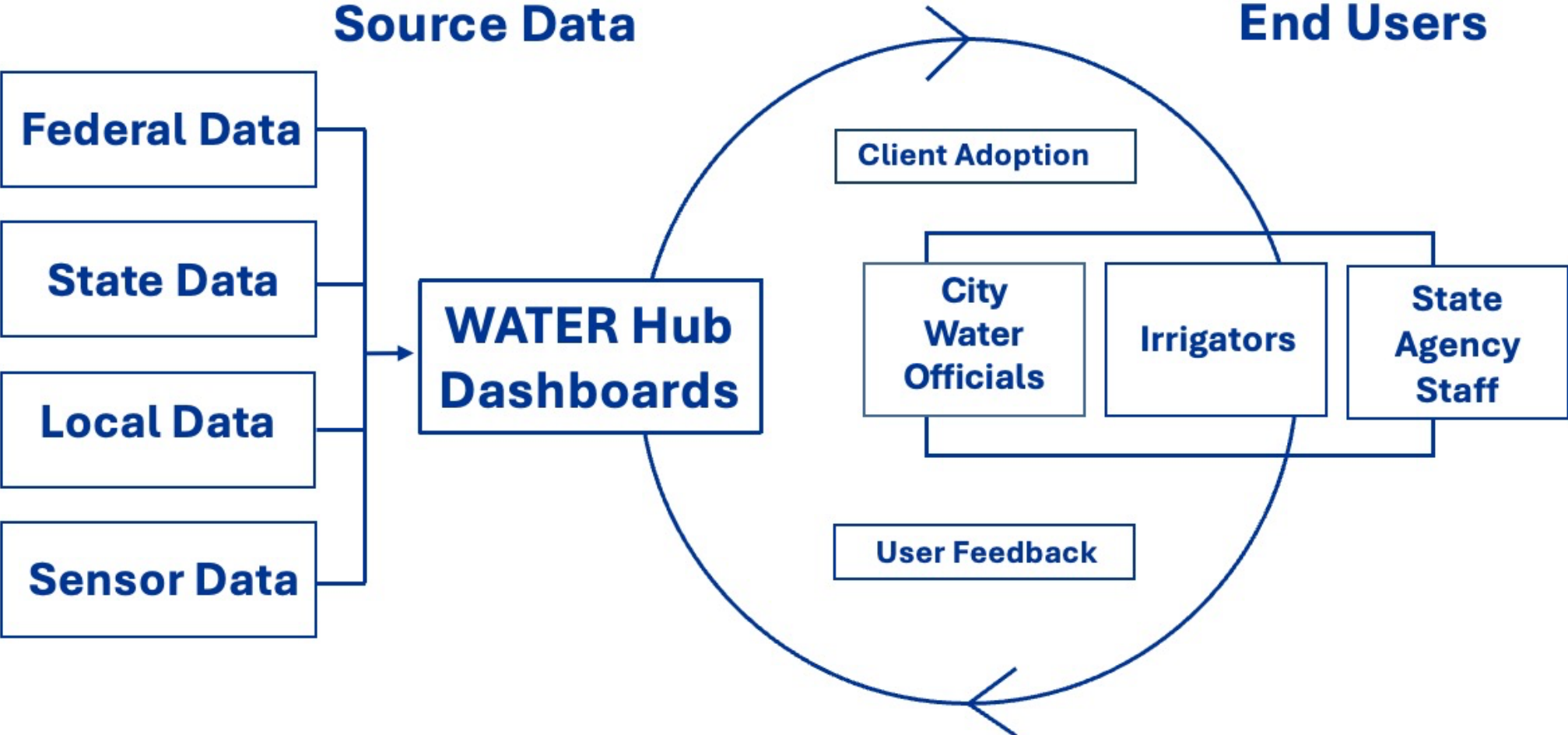
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The public-facing Kansas dashboard prototype shows the locations of wells in the Kansas Geological Survey database.



Intellectual Merit: Convergent Research

Phase II



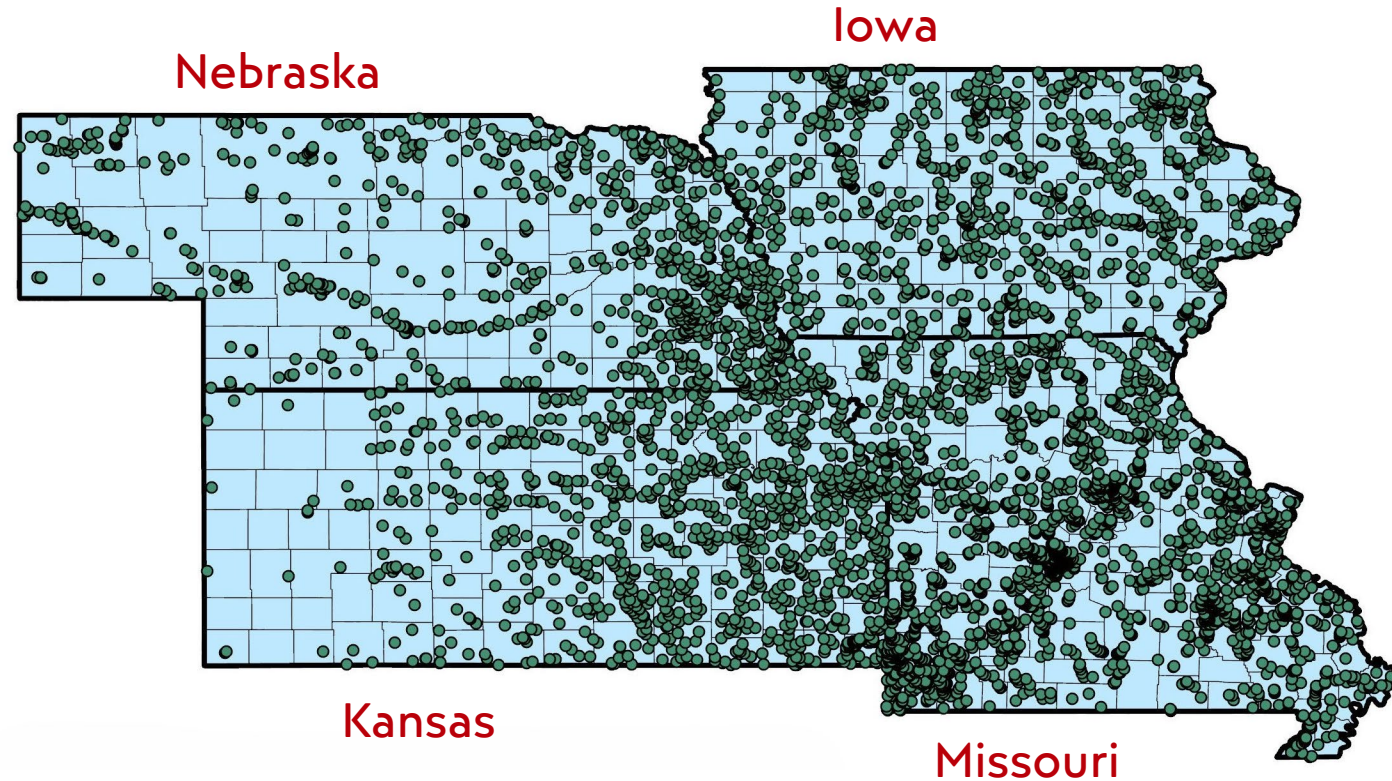
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Minimum Viable Product (MVP)

Phase II

A key feature of our MVP is the integration of data across sources, including data federal, state, local, and sensor-based sources.



Data in this figure come from the Water Quality Portal, range between 2006 and 2023, and includes tests for any characteristics state agencies submitted to the EPA.



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Sustainability

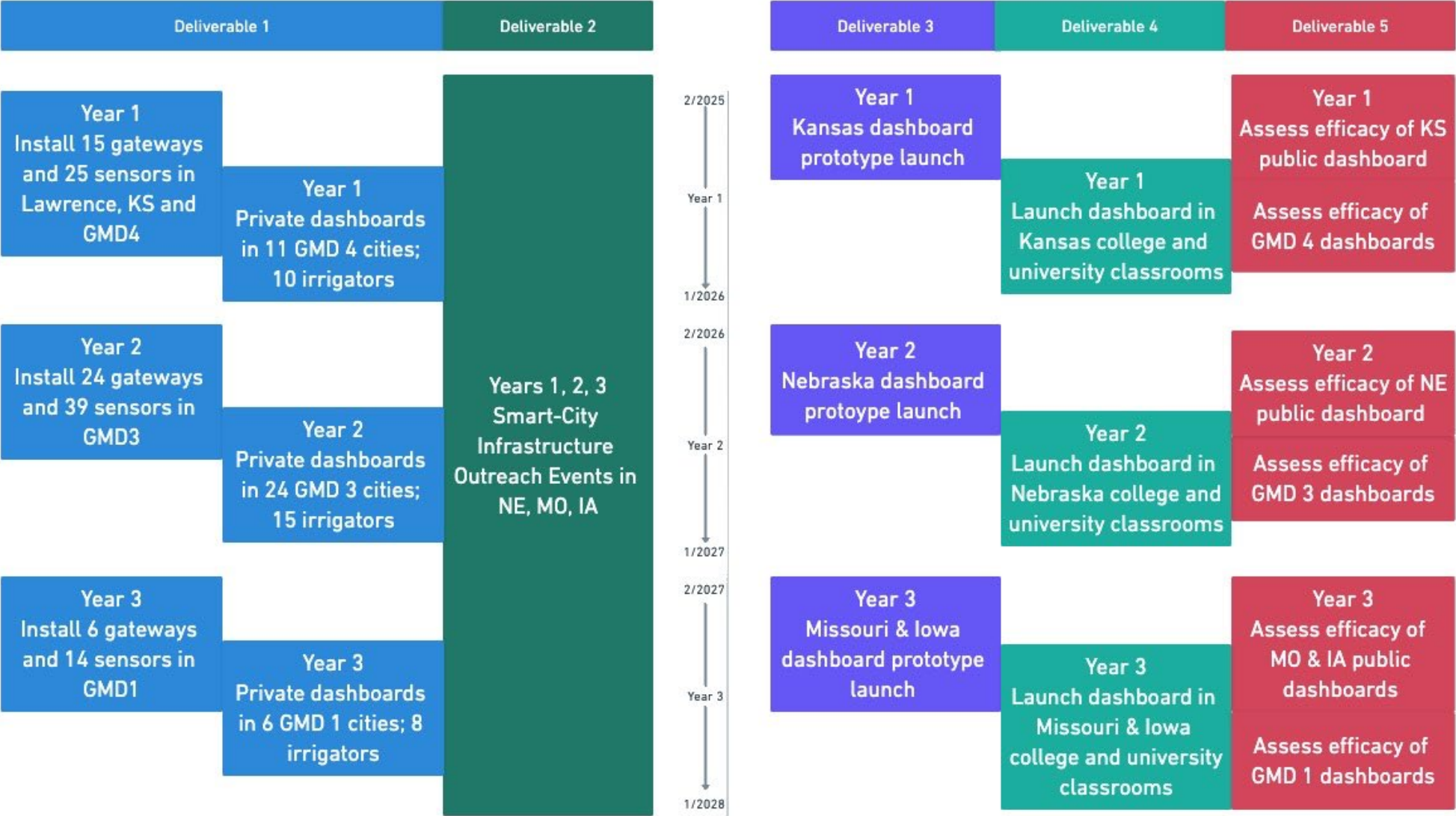
- Hire a **business development officer**
- Implement WATER Hub business development plan
 - Private sensor-based dashboards are sustained through **commercial contracts** with end user (irrigators and municipal governments).
 - Public-facing dashboards are sustained through **data services contracts with state agencies.**
- Manage Intellectual Property with **IP Plan**



Private Dashboards	Public Dashboards
1. Expand installation of gateways and sensors and build private dashboards.	3. Deploy public-facing dashboards in KS, NE, MO, and IA.
2. Smart-city infrastructure outreach in NE, MO, and IA.	4. Partner with college faculty to use data tools in curriculum.
5. Assess efficacy of data tools.	



Project Milestones



Broader Impacts – Collaborator Networks

Phase II

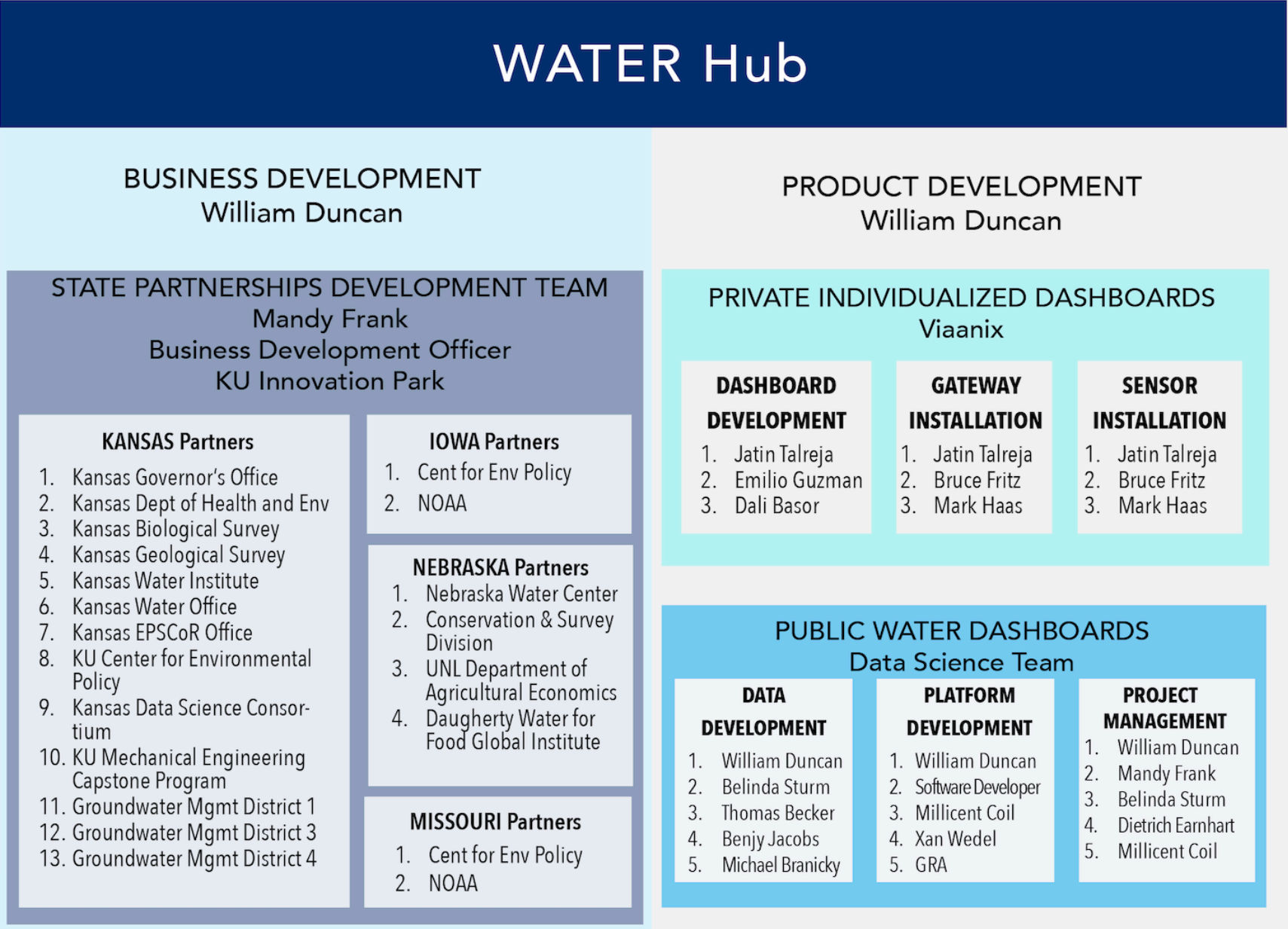
- **Kansas Governor's Office**
- **Advancing Research & Innovation in the STEM Education (ARISE)**
- **Center for Environmental Policy**
- **Daugherty Water for Food Global Institute**
- **Institute for Policy & Social Research**
- **Kansas Biological Survey**
- **Kansas Data Science Consortium**
- **Kansas Department of Health and Environment**
- **Kansas Geological Survey**
- **Kansas Water Institute**

- **Kansas Groundwater Management Districts (GMDs) 1, 3 and 4**
- **Kansas NSF EPSCoR**
- **Kansas Water Office**
- **National Oceanic and Atmospheric Administration**
- **Nebraska Conservation and Survey Division**
- **Nebraska Water Center**
- **University of Kansas, School of Engineering**
- **University of Nebraska-Lincoln Agriculture Economics**
- **Viaanix Inc.**



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Broader Impacts – Collaborator Networks

Phase II

- **National Science Foundation Phase II Convergence Accelerator**
 - \$5 million
 - Due October, 2024
 - Geography: KS, NE, IA, MO
 - Waiting on decision
- **Bureau of Reclamation – Applied Science Grant**
 - \$600,000
 - Tentatively due in February, 2025
 - Geography: KS
 - Looking for collaborators

- **Foundation for Food and Agriculture Research**
 - \$500,000
 - Rolling application deadline in 2025
 - Geography: KS
 - Looking for collaborators
- **National Science Foundation EPSCoR RII – FEC**
 - \$6 million
 - Due January 2026
 - Geography: KS, NE, IA
 - Looking for collaborators



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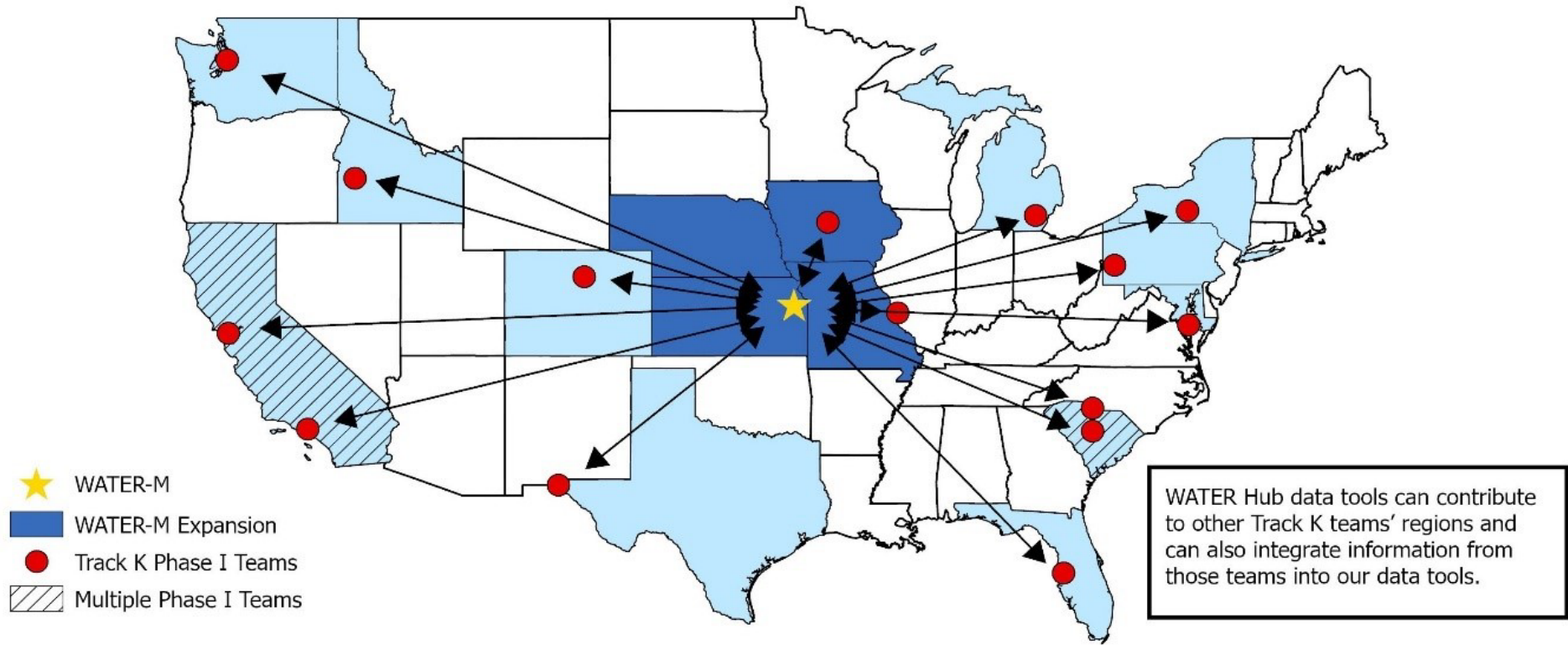
Track K Success

"Because water needs are complex, there isn't a one-size-fits-all solution."

-Douglas Maughan, Head of NSF Convergence Accelerator program

We will **integrate products** from other Track K projects to inform our work and **share the tools** we develop.

Track Alignment between WATER Hub and Track K Teams



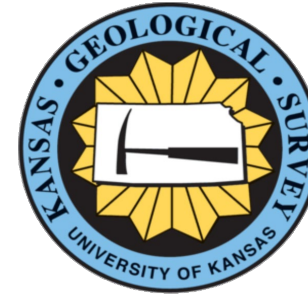
Thank you! Questions?



THE DAUGHERTY
WATER
for **FOOD**
GLOBAL INSTITUTE



Institute of Agriculture and Natural Resources
AGRICULTURAL ECONOMICS



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Missouri](#)



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Arkansas River, Western Kansas



Intellectual Property Plan

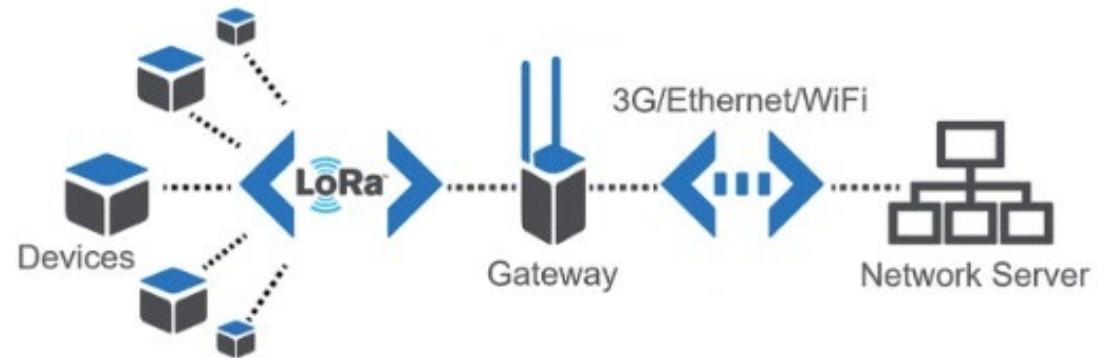
	Private Sector – Viaanix	Academia – KU	State Agencies and Local Municipalities
Background IP	Owns	Owns	Will contribute through datasets
Foreground IP	Will develop through private dashboards	Will develop through public dashboards	–

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More about Viannix



Mark Haas, Viaanix Inc., climbing water tower to install LoRaWAN gateway in Dodge City, KS.



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Installation of Gateways & Sensors

	Expense	Hours or Units	Rate	Totals
Gateways	Equipment	Y1: 15; Y2: 24; Y3: 6	\$6,500	\$292,500
	Install/Deploy	Y1: 330; Y2: 500; Y3: 180	\$60-\$65/hr	\$62,200
	Specialized Installation equip.	34 gateways	\$13,000/each	\$442,000
	Total Gateway Costs			\$796,700
Sensors	Equipment	Y1: 30; Y2: 49; Y3: 12	WQU = \$5,640; WQT = \$7,000; WDT = \$1,835	\$410,795
	Install/Deploy	Y1: 360; Y2: 560; Y3: 200	\$60-\$65/hr	\$68,800
	Assembly/ Calibration	Y1: 15; Y2: 24; Y3: 2	35 hours/sensor @ \$60/hr	\$86,100
	Total Sensor Costs			\$565,695
Travel	Y1: \$15,730; Y2: \$19,082; Y3: \$11,632		\$2,903/trip	\$46,444
Management	Y1: 580; Y2: 660; Y3: 825		\$60-\$65/hr	\$108,100
Dashboard	Y1: \$66,300; Y2: \$76,700; Y3: \$28,600		\$65/hr	\$171,600
	Total Project Costs			\$1,688,539



Challenges & Risks

- Continuing to meet end-user needs in an evolving water equity environment (Challenge)
- Navigating political landscape of water governance within project states (Challenge)
- Managing fiscal sustainability beyond the lifecycle of the Phase II Convergence Accelerator (Risk)



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Why this work now?

- Since 2022 and for the first time in 15 years, the **Kansas Governor's Office has fully funded the Kansas Water Plan.**
- **Agriculture is one of Kansas' top 10 industries,** making up 7 percent of gross state product and accounting for 85 percent of its freshwater use.
- **The path forward balances the use of water for life and for livelihoods.** Convergent teams bringing together the varied expertise needed to forge a sustainable future are urgently needed to deliver solutions to large water users.



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End-user needs

Interviews, surveys, and focus groups conducted with 150 end users to understand where information would inform their decision points.

City Water Officials	Irrigators	State Agency Staff
“We need to assess the reliability of our water supply from both a quality and a quantity perspective.”	“We need integrated data about our water use, crop yields, and state conservation programs.”	“We need a way to evaluate the effectiveness of our state agency programs in relation to the state water plan.”



Dashboard Value

Individual Dashboards

Cities and farmers are willing to pay for high-frequency and impactful information that is integrated into their operations. Viaanix is a successful company with commercial relationships maintaining sensors, gateways, and dashboards for clients.

Public Dashboard

State and regional agencies are willing to pay for data services contracts. The Institute for Policy and Social research has a long history of this work including contracts for data work on the state water plan, economic impact studies for state programs, and in-depth research on proprietary state data.



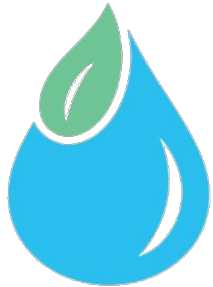
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Expansion in Nebraska

Nebraska Water
Center



Conservation and
Survey Division



Daugherty Water
for Food Institute

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for **FOOD**
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UNL Agricultural
Economics



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Expansion in Iowa and Missouri



CENTER FOR ENVIRONMENTAL
POLICY



NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION



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Objective Assessment

- Interviews – assess decision points where data can inform action
- Focus Groups – assess dashboard design for effective use
- Surveys – collect feedback from users while they incorporate the dashboards into their daily decision making



Track Success

- [AI Copilot for Rural Water Quality](#), led by Delta Bravo Artificial Intelligence, Inc.
- [Equity in Water Information for Community Capacity Building](#), led by Boise State University
- [Electrokinetic Water Purification System for Point-of-Use Applications](#), led by Iowa State University.
- [Mapping the Nation's Wetlands for Equitable Water Quality, Monitoring, Conservation, and Policy Development](#), led by University of Washington.
- [Measuring and Mitigating Land Management Impacts on In-Stream Water Quality with Sensor-Informed Data Fusion and Community-Led, Climate Financed Riparian Restoration](#), led by Virridity, Inc.
- [Passive Samplers for Equitable Monitoring of Drinking Water Quality](#), led by Washington University, St Louis.



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Intellectual Merit

*Water Information
Storage and Retrieval
Database (WIZARD)
run by the Kansas
Geological Survey*

WIZARD Water Well Levels Database

Enter values for any or all parameters			
Public Land Survey System: Township: <input type="text" value="Any Township"/> Range: <input type="text" value="Any Range"/> Range Direction: <input type="text" value="E or W"/> Section: <input type="text" value="Any Section"/>			
Lat/Long Box (NAD 83): North Latitude <input type="text"/> West Longitude East Longitude <input type="text"/> <input type="text"/> South Latitude <input type="text"/>	County Name: <input type="text" value="Any County"/> Allen Anderson Atchison Barber Barton Bourbon Brown	GMD Number: <input type="text" value="Any GMD"/> Western Kansas GMD #1 Equus Beds GMD #2 Southwest Kansas GMD #3 State: <input type="text" value="Kansas"/>	Water Level Date Range: mm/dd/yyyy format or leave blank for all records Start Date: <input type="text"/> End Date: <input type="text"/>
USGS_ID: Single Entry: <input type="text"/> Load From file: <input type="button" value="Choose File"/> No file chosen Examples on Loading Files	KGS Local Well Number: Single Entry: <input type="text"/> Load From file: <input type="button" value="Choose File"/> No file chosen Examples on Loading Files		
Restrict search to wells WITH water levels?: <input checked="" type="checkbox"/>			
<input type="button" value="Select Wells"/>			



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Broader Impacts

- Mechanical Engineering Capstone
- Kansas Data Science Consortium
- Enhanced data capabilities within our partners
- Greater data availability



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