



Omaha Stream and Stormwater

TRACKING, CATEGORIZING, PRIORITIZING, AND IMPLEMENTING
STORMWATER CAPITAL IMPROVEMENTS

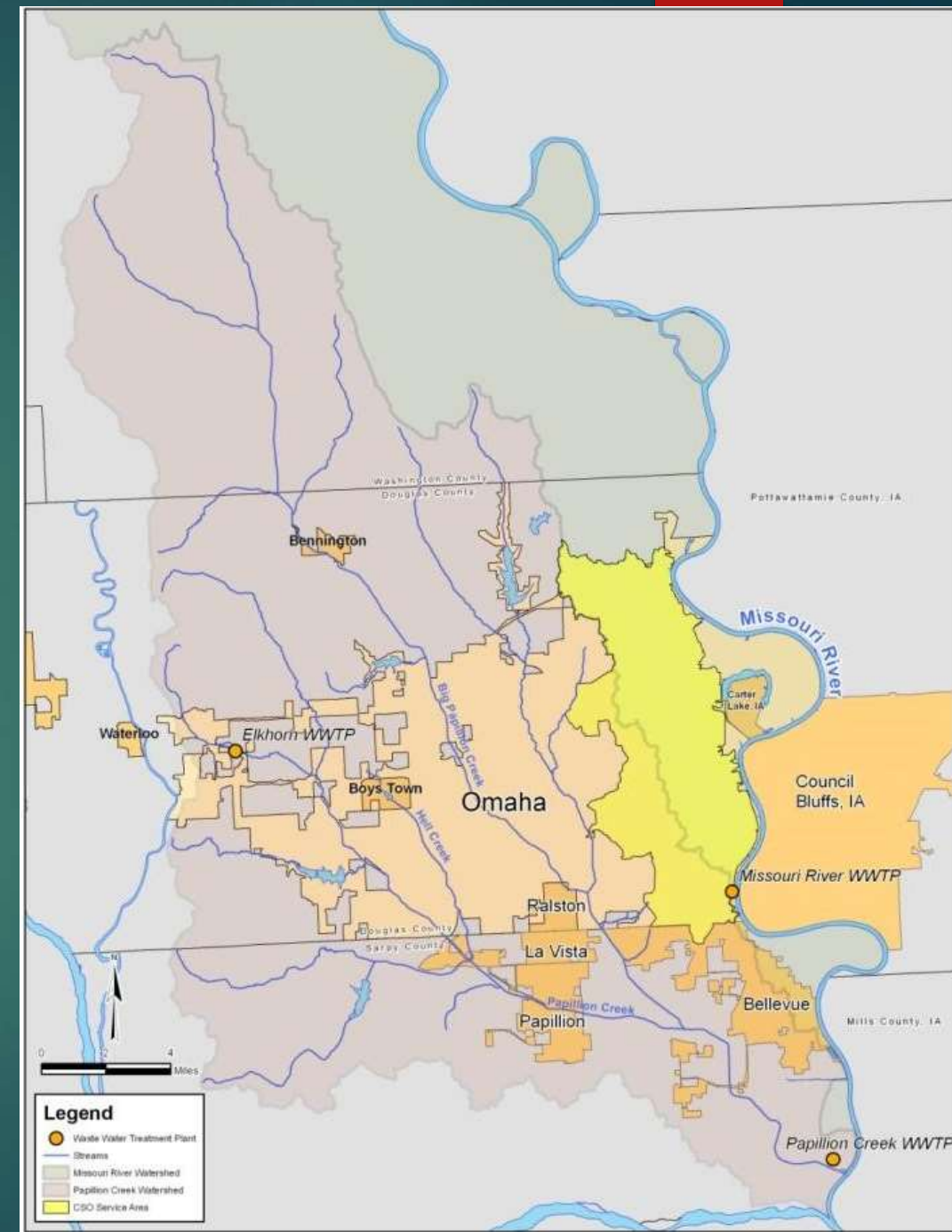
Omaha Stream and Stormwater

- ▶ Brief History
- ▶ Types of Issues
- ▶ Building a Stream and Stormwater Database
- ▶ Where We Are Today
- ▶ Looking Ahead
- ▶ An Ounce of Prevention
- ▶ Questions



Storm Drainage in Omaha

- ▶ City of Omaha has a varied system of storm sewer collection
 - ▶ Combined Sewer drainage system in Missouri River watershed
 - ▶ “Enclosed” creeks
 - ▶ Developed
 - ▶ Separate (MS4) System in Papillion Creek and Elkhorn Watersheds
 - ▶ Open Channels
 - ▶ Varied “maturity”
 - ▶ Developed and Developing



History of System Assessments

- ▶ Sewer System Requirements - 1952
 - ▶ “Many of the sewers in the present system were not designed for their present use. While they may have been adequate at the time they were constructed, the **increase in the amount of impervious surfaces** resulting from the paving of streets, sidewalks and construction of houses **has so increased the amount of runoff from rainfall that they are now too small.**”



History of System Assessments

► Open Channel and Storm Sewer Needs - 1983

► 30 Most Critical Channel Projects

► Estimated Construction cost over **\$41 Million** (1983 dollars)

► World Herald Article - March 9, 1996

► **\$130 Million** needed for open drainageways



I feel like we've been here before...

► Challenges

- Tracking Complaints
- Inspecting and evaluating consistently
- Spending limited funds wisely
- Prioritizing, ranking, and planning

► Opportunities

- Projects with multiple benefits
- Leveraging outside funding
- Sustainable and long-lasting solutions
- Maintaining and improving City's storm drainage system
- Protecting infrastructure and property
- Improving water quality, aquatic habitat, channel stability

Many Responsibilities: One Funding Source

- ▶ Channels, Streams, Drainageways
- ▶ Gravity Storm Sewer System:
 - ▶ Repair/Replacement of failures
 - ▶ Repair of Erosion
- ▶ Pumped Storm Sewer System
- ▶ Localized Flooding/Service Level
- ▶ Levee and Flood Protection



Challenges of Managing Streams

► Dynamic Equilibrium:

- Stream Slope
 - Stream Flow
 - Sediment Volume
 - Particle Size
- } Balance

► Things that upset the equilibrium

- Channel Straightening
- Urbanization
- Stream Crossings
- Channel Armoring or Point Repair
- Reservoirs





Channels, Streams, Drainageways

- ▶ How are we developing around our drainageways?

Channels, Streams, Drainageways

- Threat to infrastructure



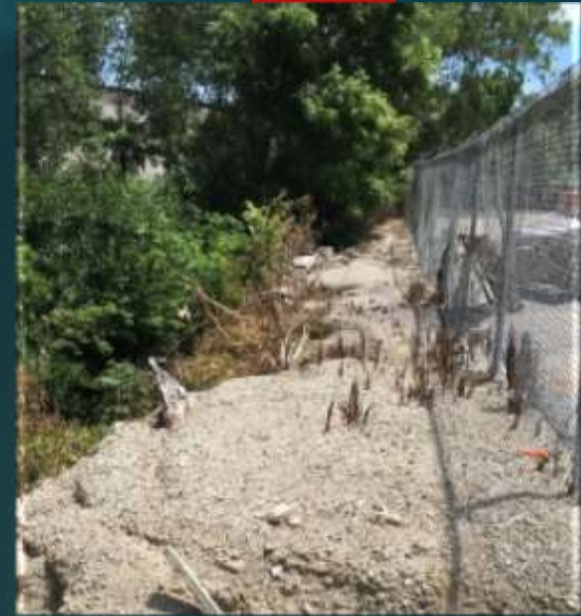
Channels, Streams, Drainageways

- Threat to infrastructure



Channels, Streams, Drainageways

- Threat to public and private property



Channels, Streams, Drainageways

- Safety



Channels, Streams, Drainageways

- ▶ Loss of aquatic habitat
- ▶ Water quality impairments



Storm Sewer Failures and Erosion

- ▶ Threat to public and private property
- ▶ Threat to infrastructure
- ▶ Safety of public & private residents
- ▶ Loss of working drainage system
- ▶ Small problems tend to grow



Flooding/Poor Drainage

- ▶ Threat to public and private property
- ▶ Safety of public and private residents



Stormwater Facilities (Pumping Stations and Force Mains)

- ▶ Asset management of critical stormwater infrastructure
 - ▶ Aging infrastructure
 - ▶ Life cycle replacements
- ▶ Areas where gravity storm drainage not possible (primarily near Missouri River)

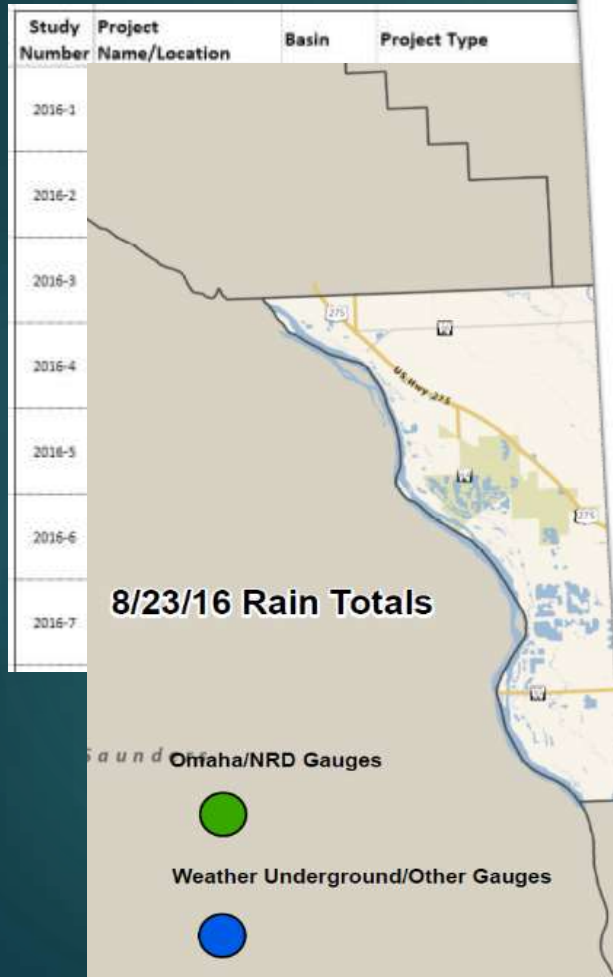


Levee Certification and Maintenance

- ▶ Maintenance, repair, replacement, and upgrades of Missouri River Levee and associated facilities
 - ▶ Relief Wells
 - ▶ Collector Pipes
 - ▶ Toe Drains
 - ▶ Pipe penetrations of levee
- ▶ Currently undertaking projects to achieve FEMA certification



Building a Stream and Stormwater Database



Papio-Missouri Draft Water Quality

3 May

Project

Project



Building a Stream and Stormwater Database

► Scoring System

► Two Categories

- Issues
- Infrastructure Risk

► Severity and Risk Ratings

► Scores

- Data can be analyzed and prioritized by category scores or total scores

ISSUE
Channel Downcutting
Bank / Widening
Incised Side Channel
Upland Swale / Gully Erosion
Little or No Buffer
Failed Grade Stabilization
Failed Bank Stabilization
Channel Sedimentation
In-Stream Obstruction
Scour at Pipe
Roadway Flooding
Other

SEVERITY
LOW
MEDIUM
HIGH

Issue Score

INFRASTRUCTURE RISK
Sanitary Sewer / Siphon
Storm Sewer
Utility
Culvert / Bridge
Building
Fence
Wall
Trail
Sidewalk
Parking Lot
Private Drives
Private Land Loss
Safety Concerns
Roadway
Other

RISK
LOW
MEDIUM
HIGH
IMMEDIATE THREAT

Infrastructure Score

Total Score = Issue Score + Infrastructure Score

Building a Stream and Stormwater Database

► Inspections

- City of Omaha Public Works Staff
 - Environmental Quality Control (EQC)
 - Design Division
- Field guides developed to enhance consistency
 - Inspector training



City of Omaha

Inspection Guide STREAM AND STORMWATER ISSUES



February 2018



City of Omaha

Inspection Guide STREAM AND STORMWATER INFRASTRUCTURE RISKS



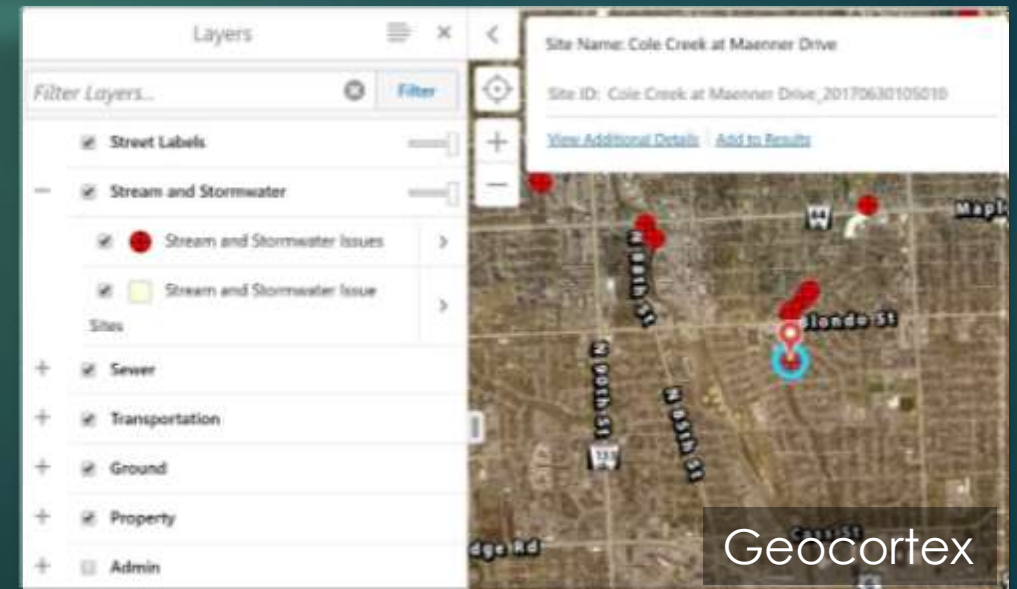
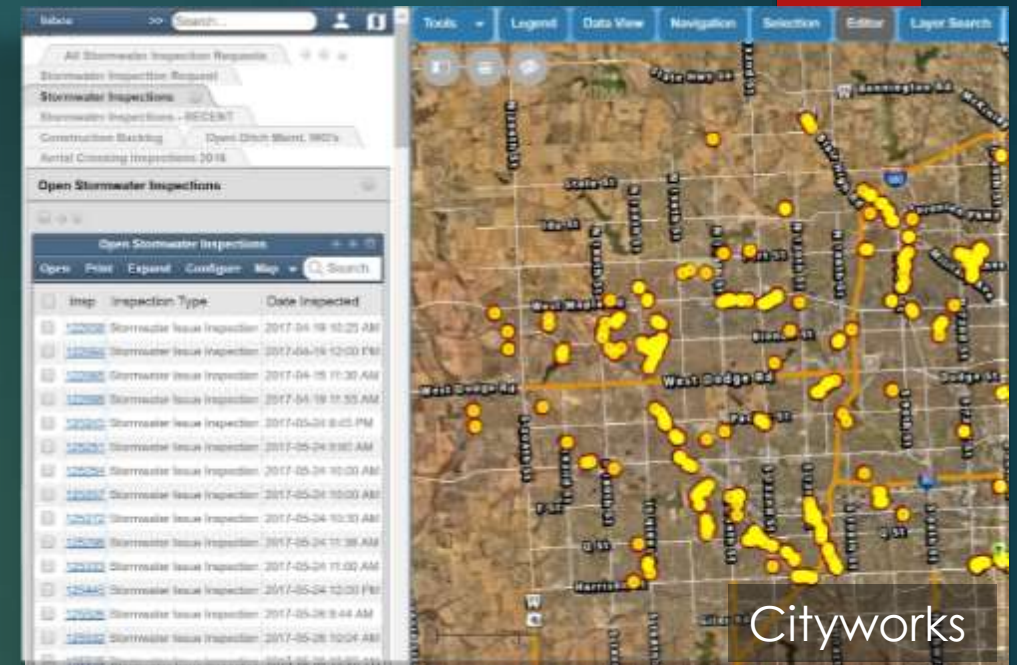
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Building a Stream and Stormwater Database

- ▶ Data Collection and Sharing
 - ▶ Cityworks and ESRI-based GIS platforms
 - ▶ ESRI's Collector App
 - ▶ Create site and point features
 - ▶ Cityworks
 - ▶ Requesting/assigning inspections
 - ▶ Completing inspections
- ▶ Geocortex
 - ▶ Display information to end-users in Public Works



Collector





2016



**CITY OF OMAHA
PUBLIC WORKS DEPARTMENT**

**STREAM & STORMWATER
INSPECTION # 128331**

Name: Cole Creek at Maenner Drive_20170630105010

Inspection Date: 06/27/2017

Inspected By: S.A.

LOCATION INFORMATION

Physical Access: Poor

Access Instructions: Access to site is fair via private property, construction access will be more difficult

INSPECTION RATINGS

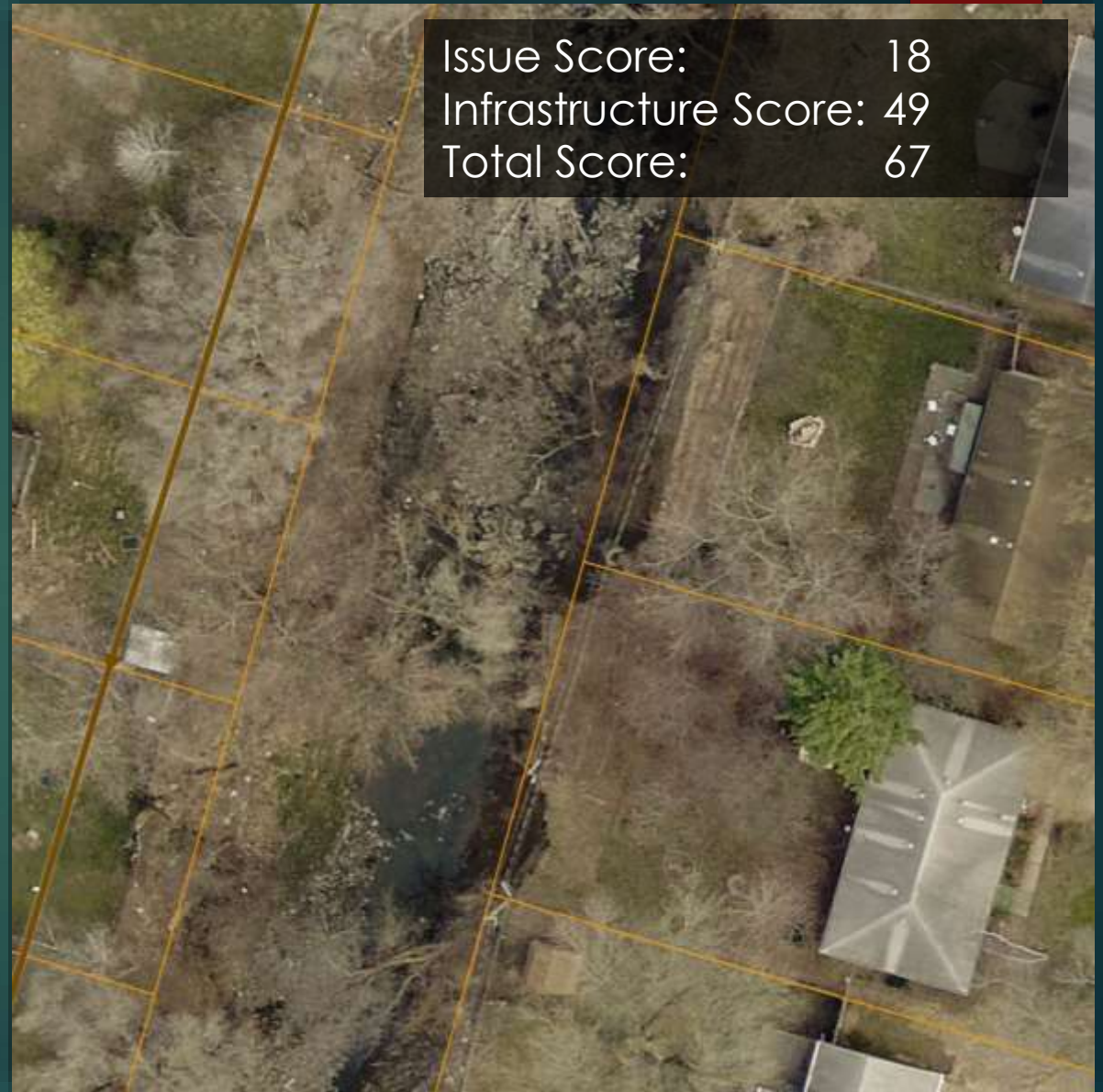
EROSION AND STORMWATER ISSUES

ISSUE	SEVERITY	COMMENTS
Bank Erosion / Widening	High	
In-Stream Obstruction	High	Upstream of 1722 Maenner there is broken concrete and the channel is braided flowing on the sides of the concrete

INFRASTRUCTURE RISK

ASSET	RISK	COMMENTS
Utility	Immediate Threat	OPPD pole is only about 1 foot from the edge of the bank on the southwest side of the property
Fence	Immediate Threat	The majority of the fence has already fallen in.
Safety Concerns	Medium	10-15 foot drop from backyard to the bottom of the channel. Vegetation is pushed over so high flows occur in the channel during rain events.
Private Land Loss	Medium	Homeowner states that she has lost 10-15 feet of property since buying the house in 2006. Rate has increased over the past couple of years.

Issue Score: 18
Infrastructure Score: 49
Total Score: 67

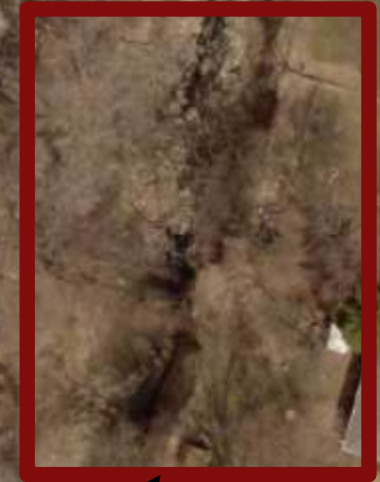
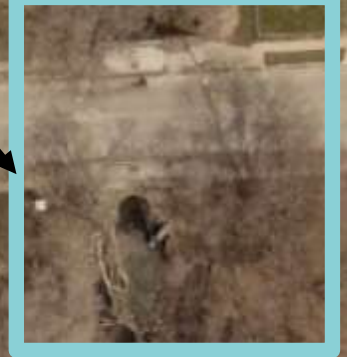


► Next Steps

- Rank Score(s)
- Assess Priority
- Action
 - Design
 - Emergency Repair
 - Study
 - Monitor
- Identify potential funding sources
- Identify opportunities to combine nearby projects



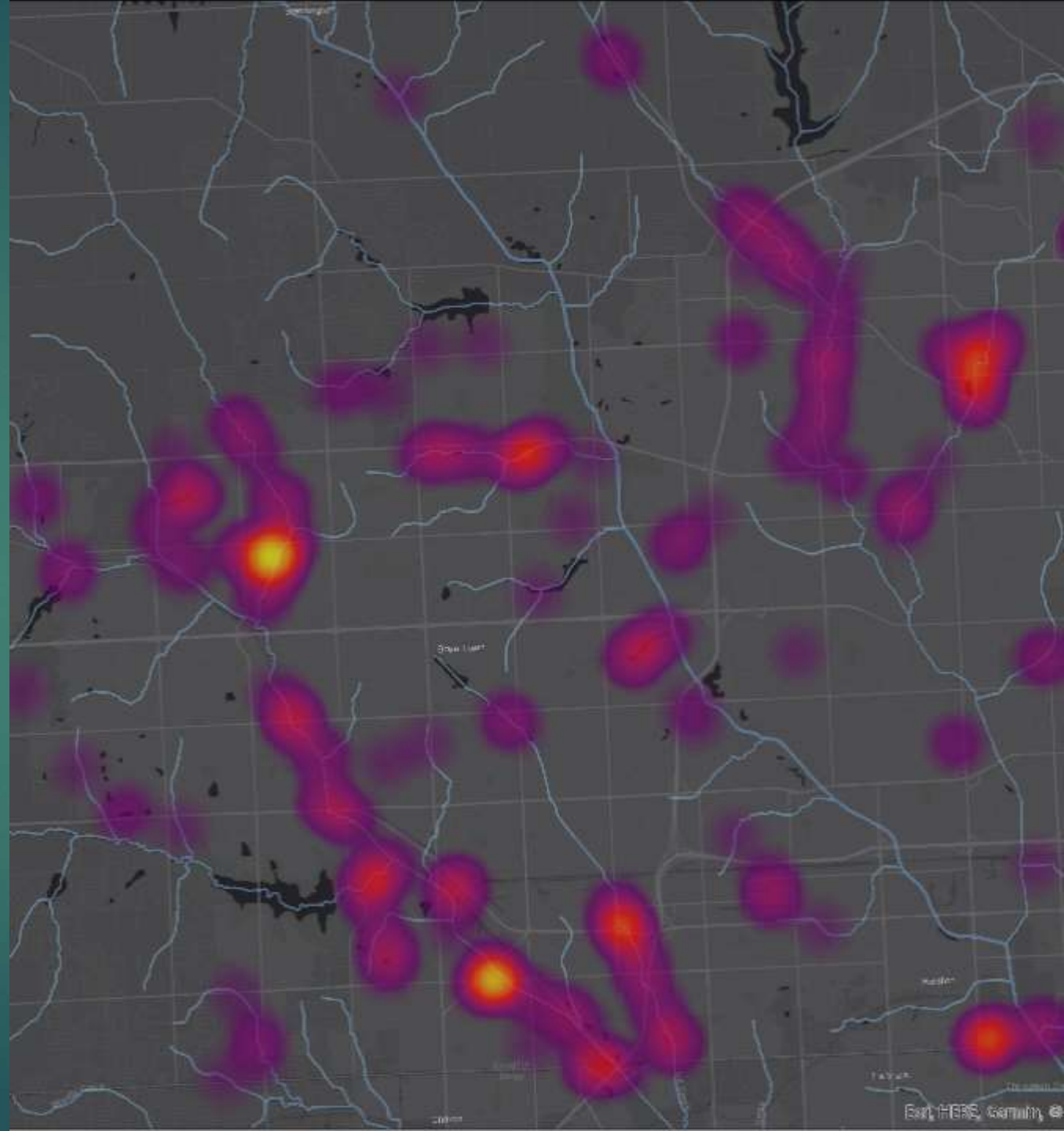
Future City Project



Potential Project Area

Where We Are Today

- ▶ Stream & Stormwater Issues Database
 - ▶ 178 Sites
 - ▶ 321 Issues
- ▶ How is this data being used?
 - ▶ Select projects for CIP
 - ▶ Inform decisions for grant applications
 - ▶ Data gathering for other projects



Current Projects, Priorities, High Ranking Issues

- ▶ Thomas Creek
 - ▶ Comprehensive study of 8,700 lineal feet of channel
 - ▶ 319 Funding received
 - ▶ P-MRNRD Cost Share under Urban Drainageway Program
 - ▶ Goals:
 - ▶ Provide channel stabilization
 - ▶ Protect critical infrastructure
 - ▶ Improve aquatic habitat
 - ▶ Private partnerships and public outreach



Current Projects, Priorities, High Ranking Issues

- ▶ Numerous failing storm sewers
 - ▶ Pipe deterioration
 - ▶ Many CMP pipes at end of service life



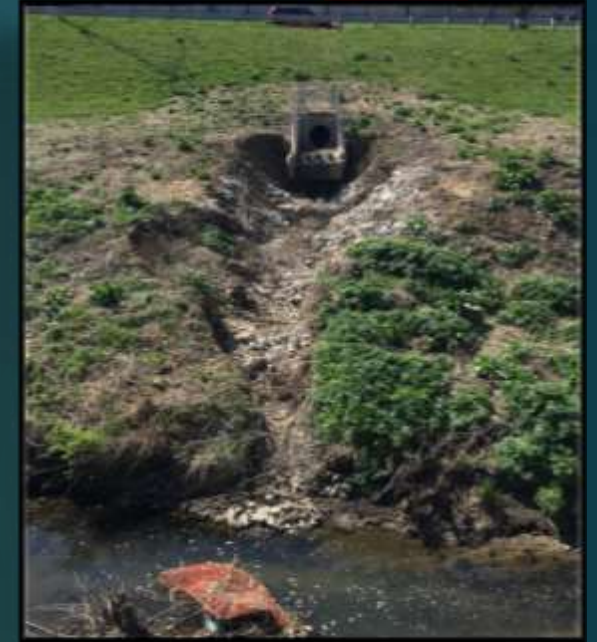
Current Projects, Priorities, High Ranking Issues

- ▶ Numerous failing storm sewers
 - ▶ Pipe deterioration
 - ▶ RCP spalling at flowline
 - ▶ Inferior materials
 - ▶ Failure of infrastructure on slopes



Current Projects, Priorities, High Ranking Issues

- ▶ Storm Sewer Outfalls
 - ▶ High above or long distance from drainageway



Current Projects, Priorities, High Ranking Issues

- ▶ Storm Sewer Outfalls
 - ▶ High above or long distance from drainageway
 - ▶ Headcuts eventually reach end of pipe
 - ▶ End of pipe fails, headcut accelerates damaging property, infrastructure, etc



Current Priorities: Missouri River Levee

► Background

- The relief well system for the Omaha Levee was **constructed in the early 1950's**
- Significant improvements and maintenance activities are required to bring it back to FEMA and USACE standards

► Current Status

- Bid initial Relief Well contract in June of 2018
- Bids exceeded Budget
- Redesign and prioritization of projects to fit budget
- Re-Bidding first phase in 2019
- Continued Improvement projects needed:
 - Levee penetration rehab
 - Relief well improvements

Next Steps and Goals

- ▶ Reactive to Proactive
 - ▶ Some Assets can be seen, others cannot
 - ▶ Use knowledge to guide inspection
 - ▶ Proactively re-inspect
 - ▶ Getting worse? Stable?
 - ▶ Do Projects at the Right Time
 - ▶ Identifying areas of flood risk



Better Designs Now = Fewer Problems in Future

- ▶ Preventing future problems through sustainable design approach
 - ▶ Urbanization effects are cumulative
 - ▶ Expect changes to drainageways, and **allow space!**
 - ▶ Sheet pile in channel today is flanked tomorrow
 - ▶ **Below channel** today is **In Channel** in 10 years



Effective Stormwater Management

- ▶ Post Construction Stormwater Management
 - ▶ Integral to site planning
 - ▶ Consider requirements from **project inception**
 - ▶ Set budgets and schedules appropriately
 - ▶ Look beyond immediate site – upstream and downstream
 - ▶ **Consider MAINTENANCE and ACCESS**



Thank You!

Questions?

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