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Data Driven Management for Digital Capital Projects

2017 Engineering and Construction Conference
June 26-28, 2017

Agenda

Module / Topic
Industry Challenges and Trends
Analytics in the Water Industry
Analytics for Construction Management
Success Stories
Benefits
Q&A

Industry challenges and trends

Reporting challenges

Typical industry reporting and metrics can limit management's effectiveness in delivering projects as planned

MANAGEMENT REPORTS

Corporate Management

Executive

- Executive Summary Reports
- Executive Project Reports
- Key Performance Indicators

Functional Leaders

Summary Reports

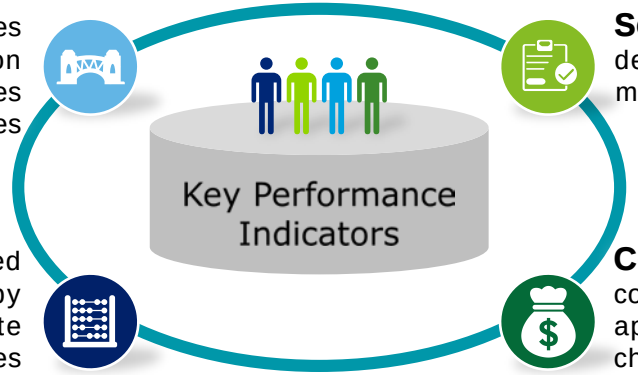
- Project Summary Reports
- Anticipated Cost Reports

Project Support Teams

Detailed Project Reports

- Anticipated Cost Reports
- Payment Detail Reports
- General Ledger Reports

KPIs



QUALITY: Includes requests for information (RFIs), design changes and critical issues

SCOPE: Includes delivery and delivery metrics

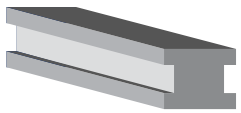
TIME: Includes earned value, percent complete by discipline, percent complete by phase and milestones

COST: Includes contingency usage, approved and pending change orders, forecast costs and cash flow

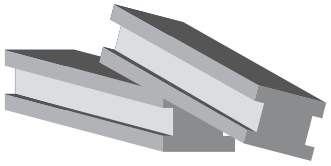
Management challenges (cont.)

Businesses are unable to quickly find deep insights across their portfolio, reducing on-time and on-budget performance

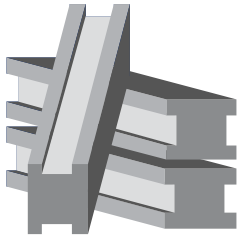
Repetitive Reporting: Multiple data calls at various time periods leads to discrepancies



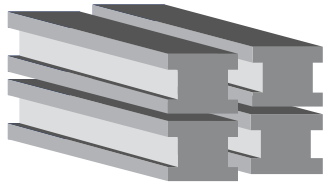
Largely paper based: intensive industry creates volumes of disparate, unstructured data



Multiple data systems: data are housed in a variety of disparate systems

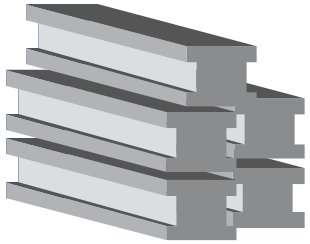


Lack of system connectivity: the systems do not communicate with each other, resulting in redundant entry and risk of errors



Increasing demand for transparency: project owners are often separated from data by multiple degrees of stakeholders

Unprioritized and unorganized: Owners are unable to find deep insights in their data across their portfolio and instead rely on subjective criteria



Technology challenges

Why has technology adoption remained a hurdle for the industry?

19th

"The construction industry is last in IT spending compared to 19 other industries."[1]

3.3

"The average construction professional uses **3.3 software applications daily** and, on average, only 1.7 of those applications integrate"

67%

"67% of Construction project management professionals are tracking and reporting performance via **manual processes or spreadsheets.**" [2]

70%

"70% of the construction industry is spending 1% or less of its annual sales volume on IT.

40%

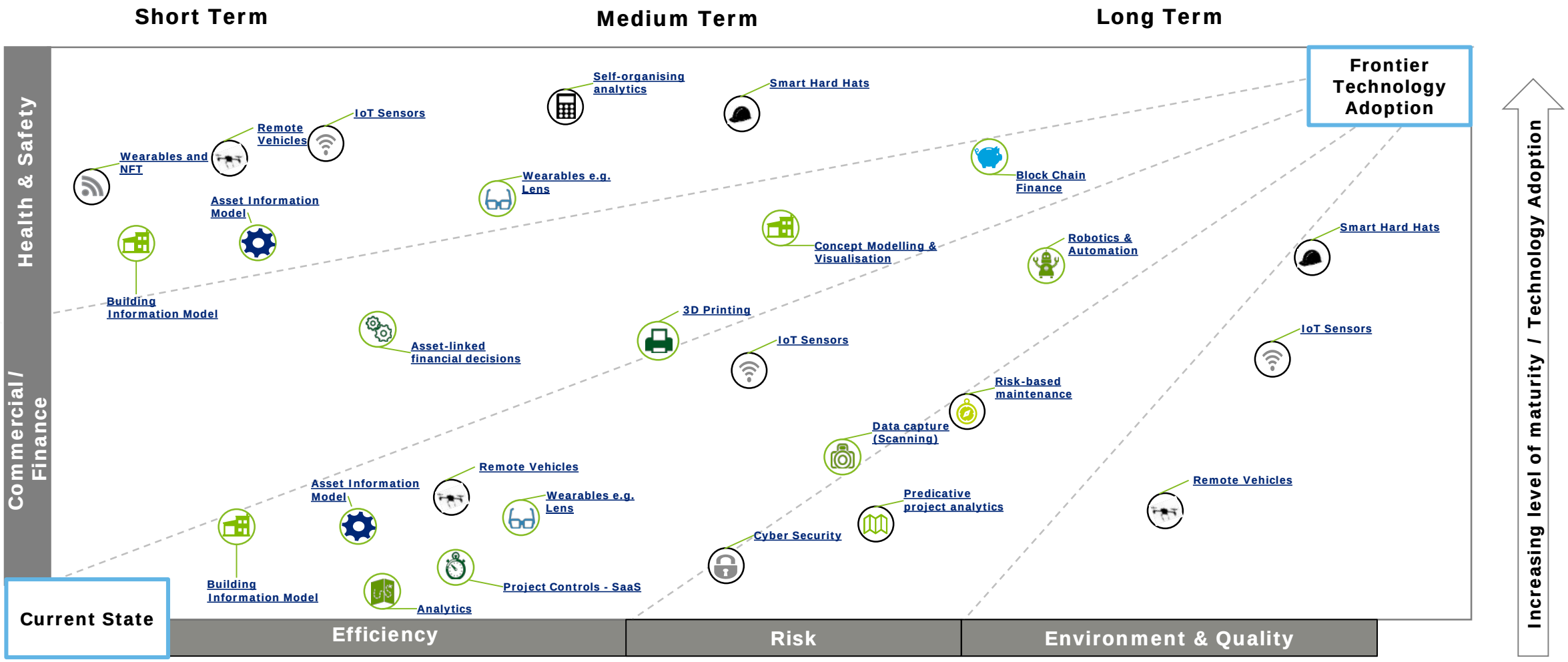
"40% of companies with revenues over $200 million **do not have a dedicated IT department.**" [2]

1) IT Metrics Key Data 2017: Executive Summary

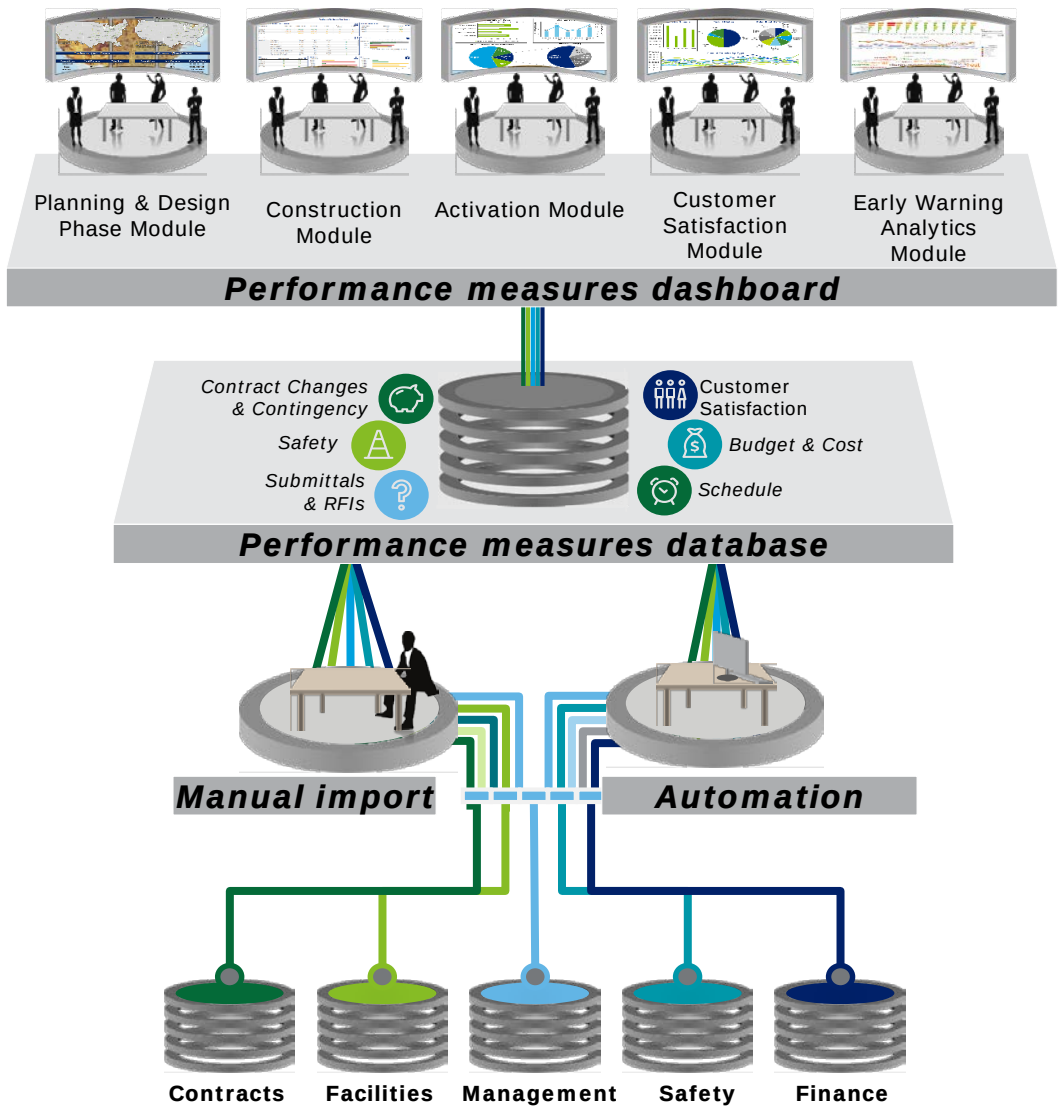
2) "The 5th Annual Construction Technology Report," JB Knowledge

Technology Horizon

Whether directly or indirectly, advancements in technology offer new opportunities for increased productivity, transparency, and management.



Construction analytics framework



Construction analytics provides easy and efficient reporting on key performance measures at the contract, project, and portfolio level.

A database platform is used to sort, analyse, and align the incoming data to enable consistency from the various sources.

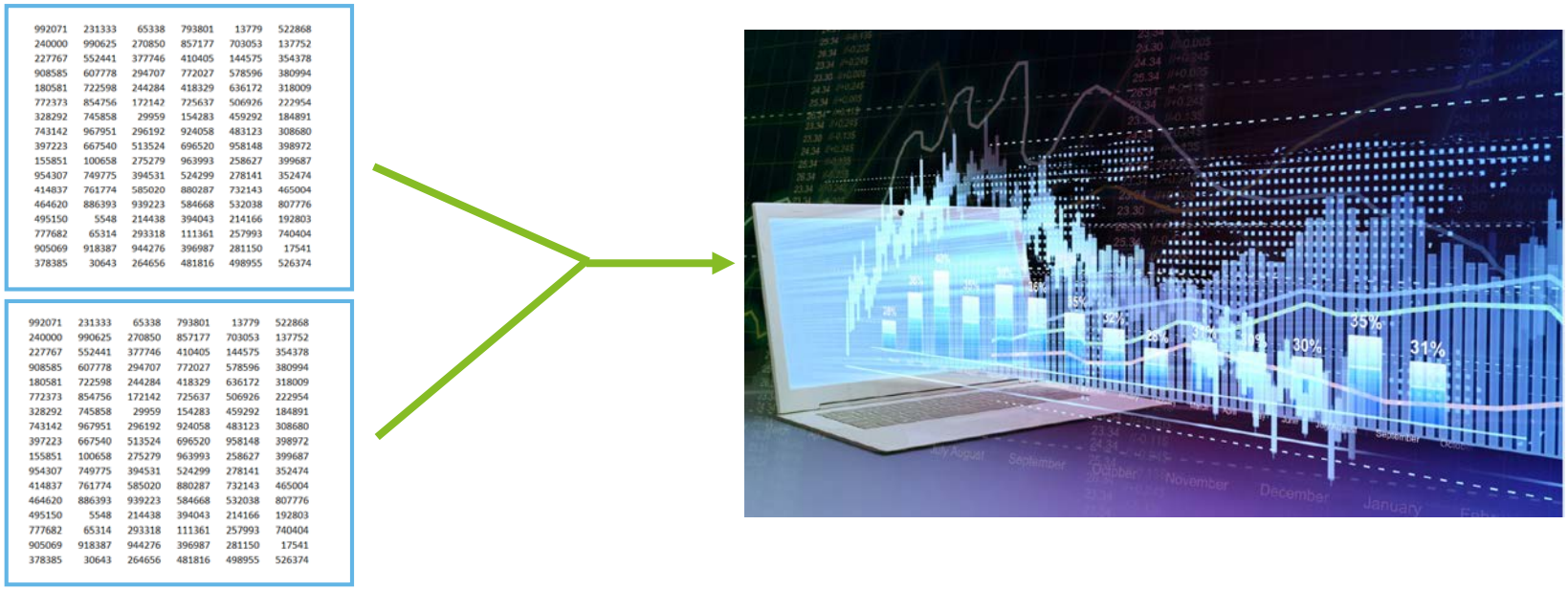
Data is collected and processed—initially manually - and later automatically as source data improves.

Important construction data typically resides in various systems and tools, including paper based processes.

Analytics in the water industry

Applying Analytics to the Water Industry

- Analytics and Big Data are everywhere
- Immense impact across industries
- Water sector is data rich but information poor
- Apply and demystify for water



From Dirty Data to Clean Water Insights

- Process starts with data preparation
- Majority of time spent cleaning data
- Dirty data is incomplete, inconsistent, or not continuous
- Fallacy that you need pristine data before applying analytics
- How dirty data yields insights

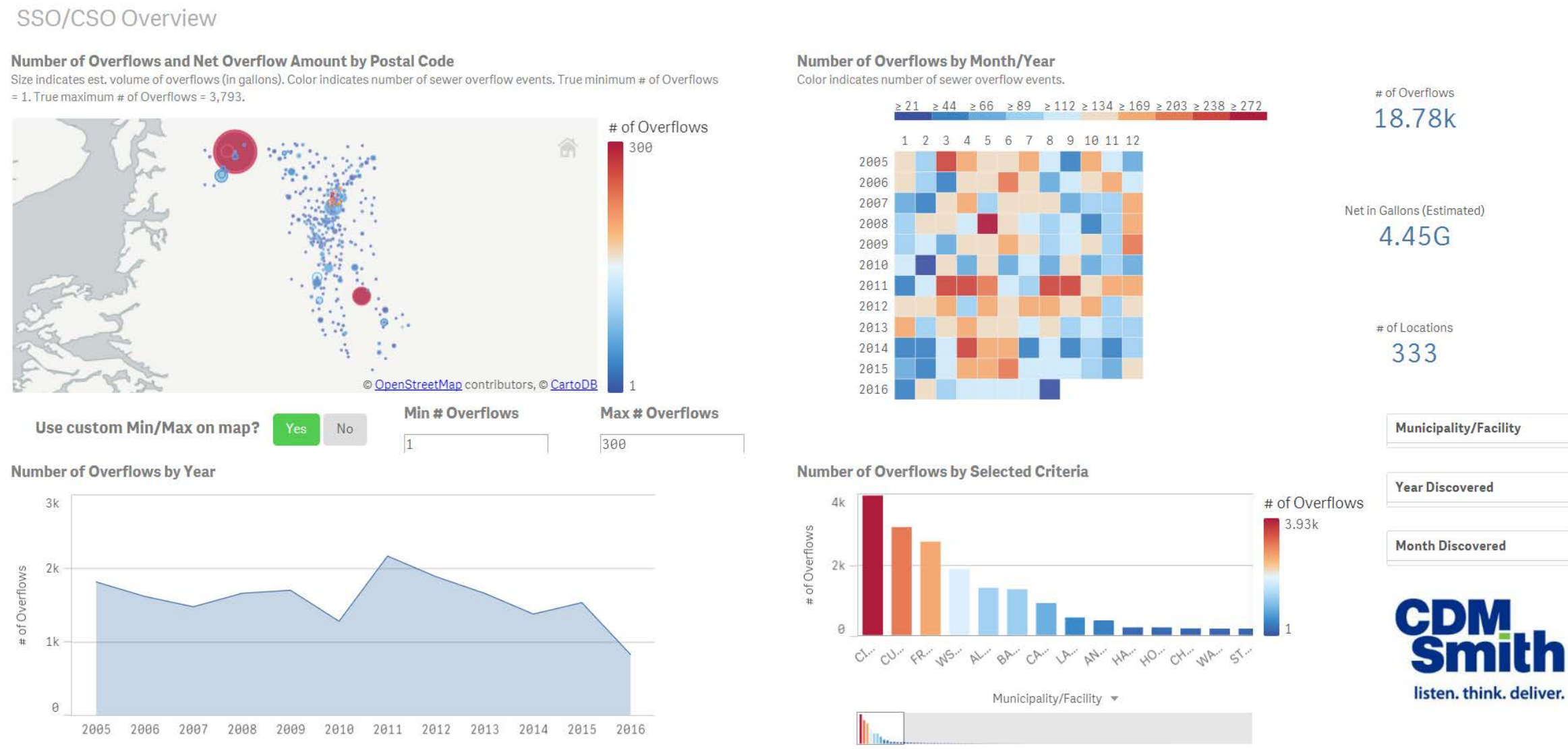
Fallacy →

Demonstration Data Set

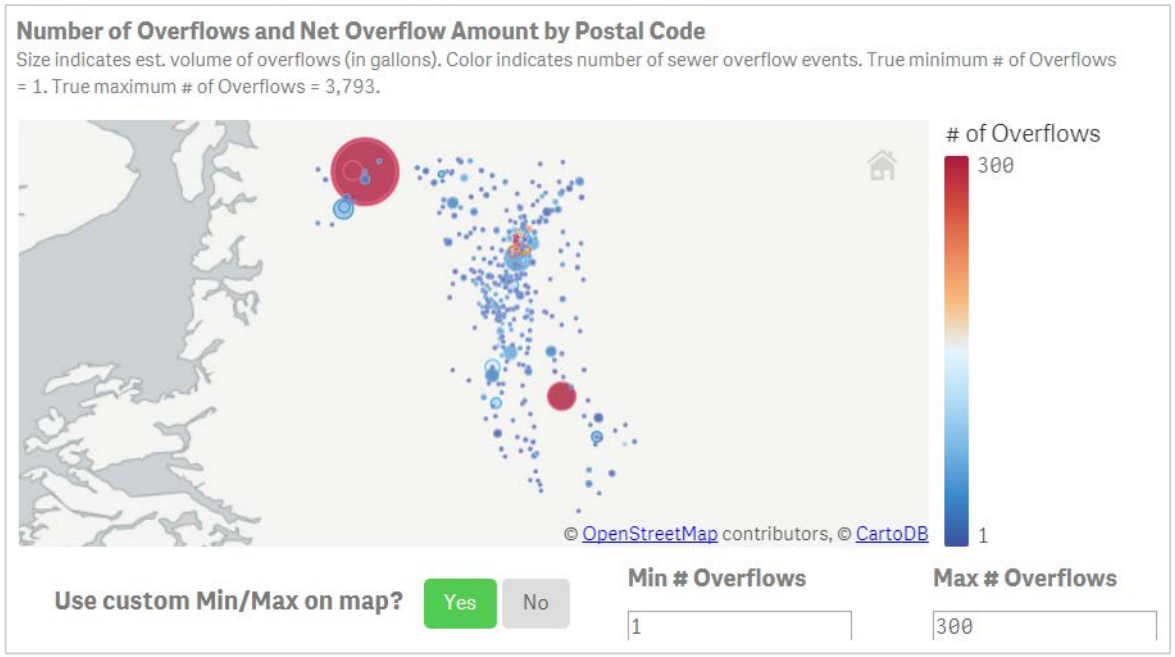
Sanitary and combined sewer overflows

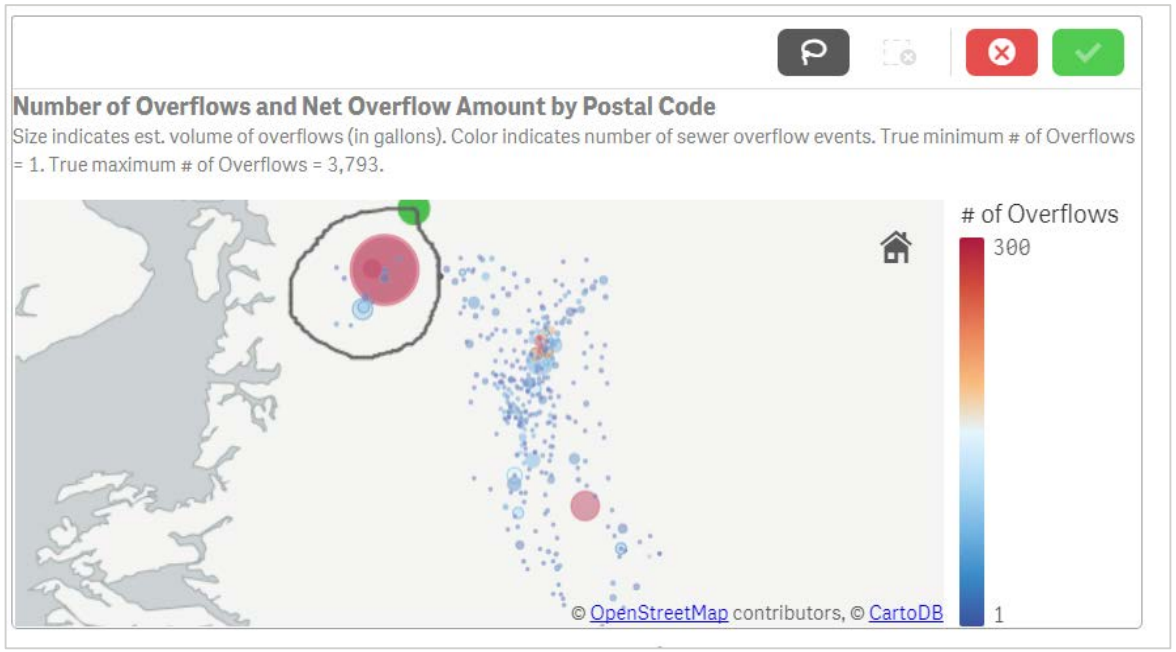
- Self reported overflows – 1 state, 10 years, 20K events
- First analysis on dirty data to understand major causes
- Minor data cleanup
- Conclusions were so strong, we needed to anonymize the data!

Demonstration



Demonstration





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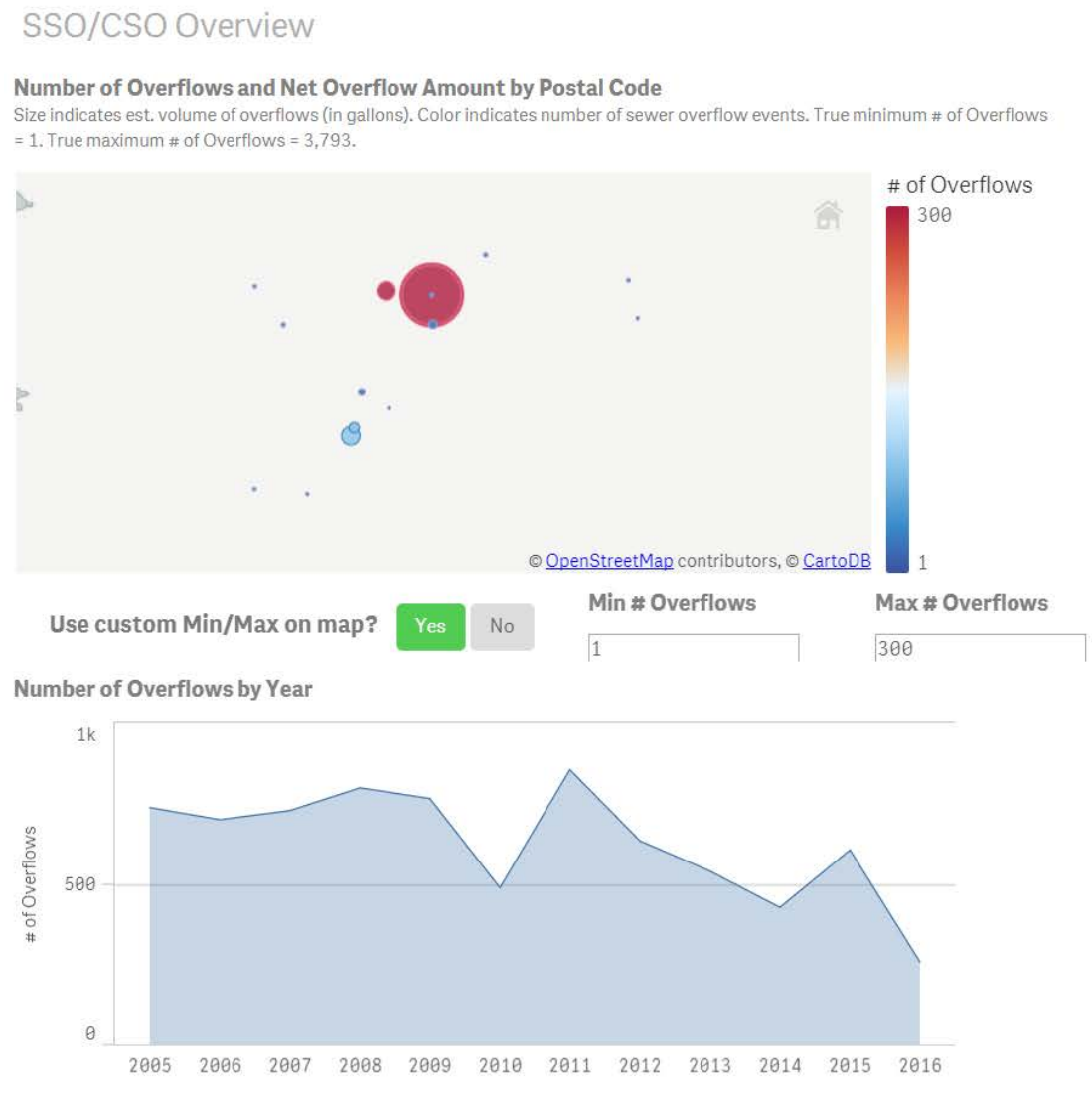

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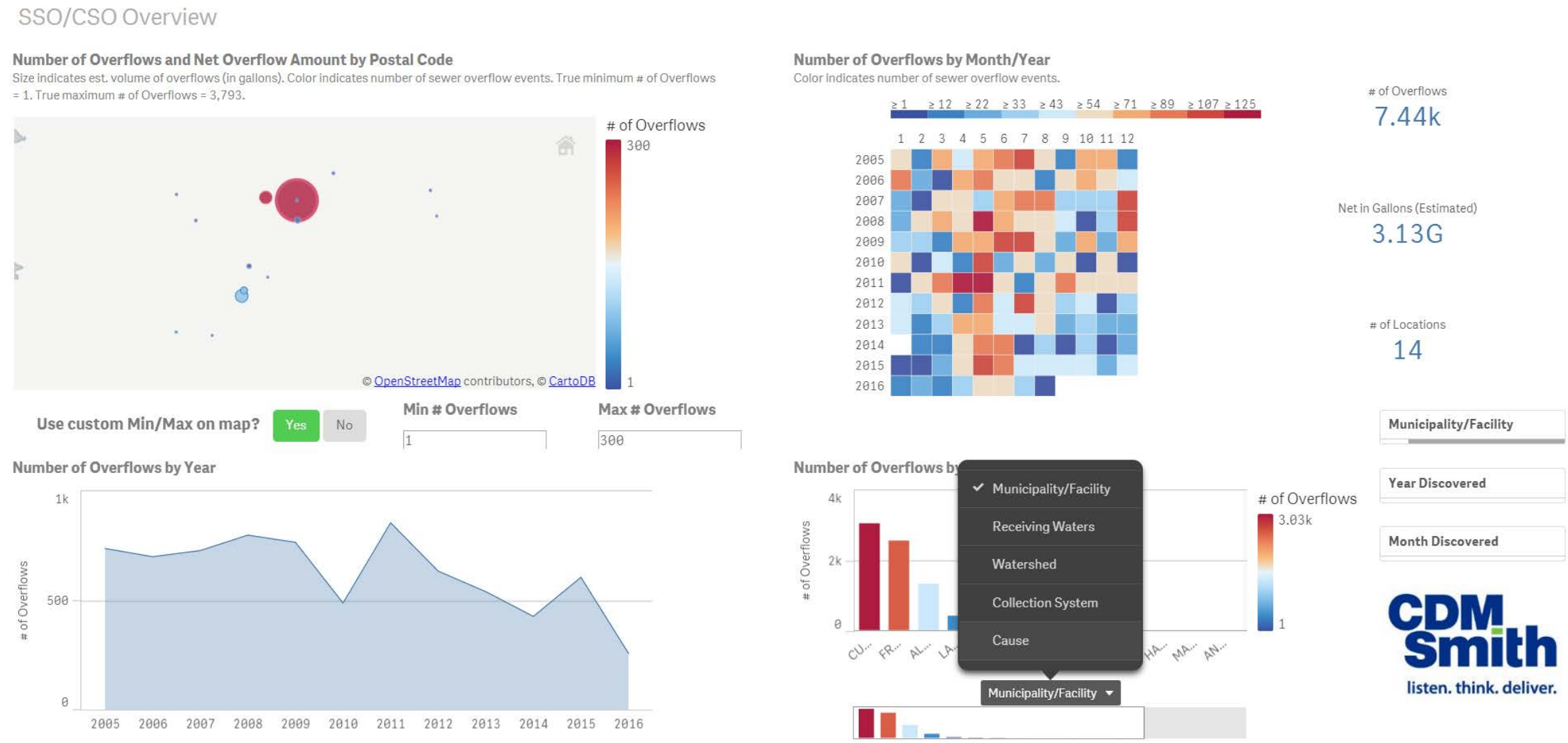

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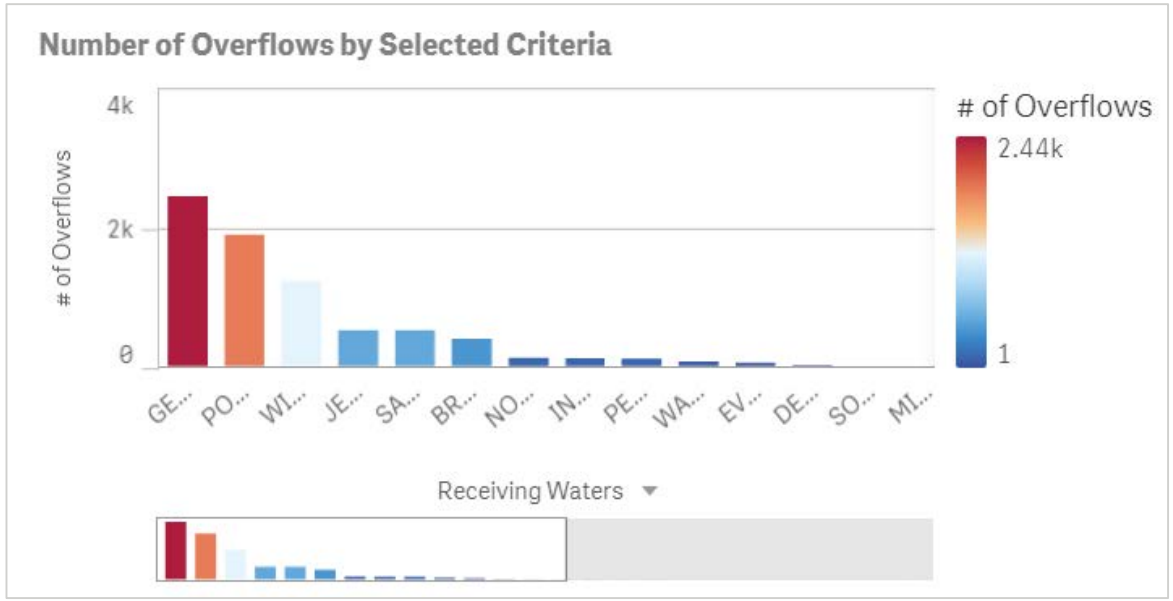

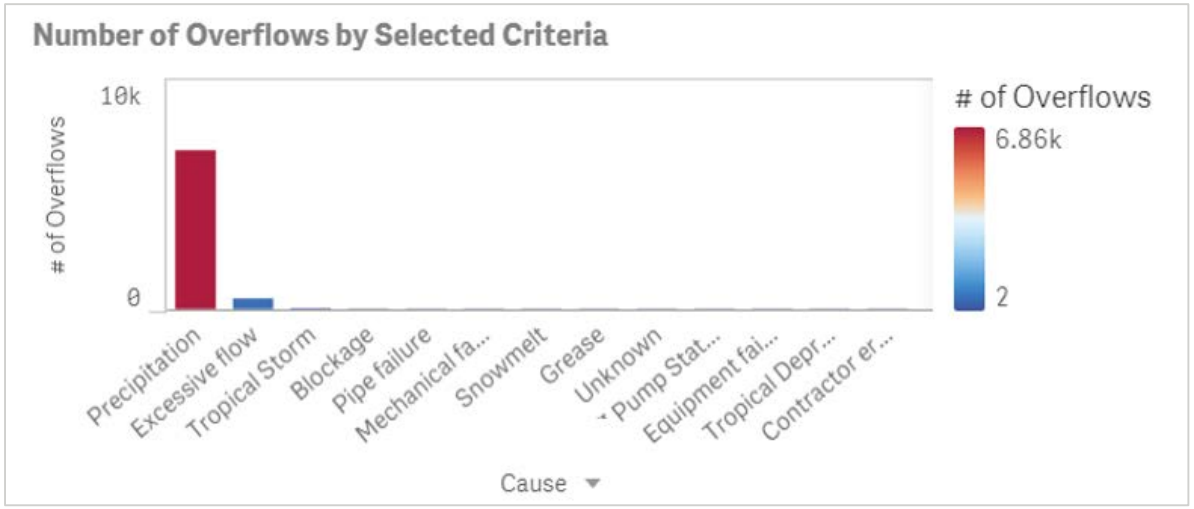

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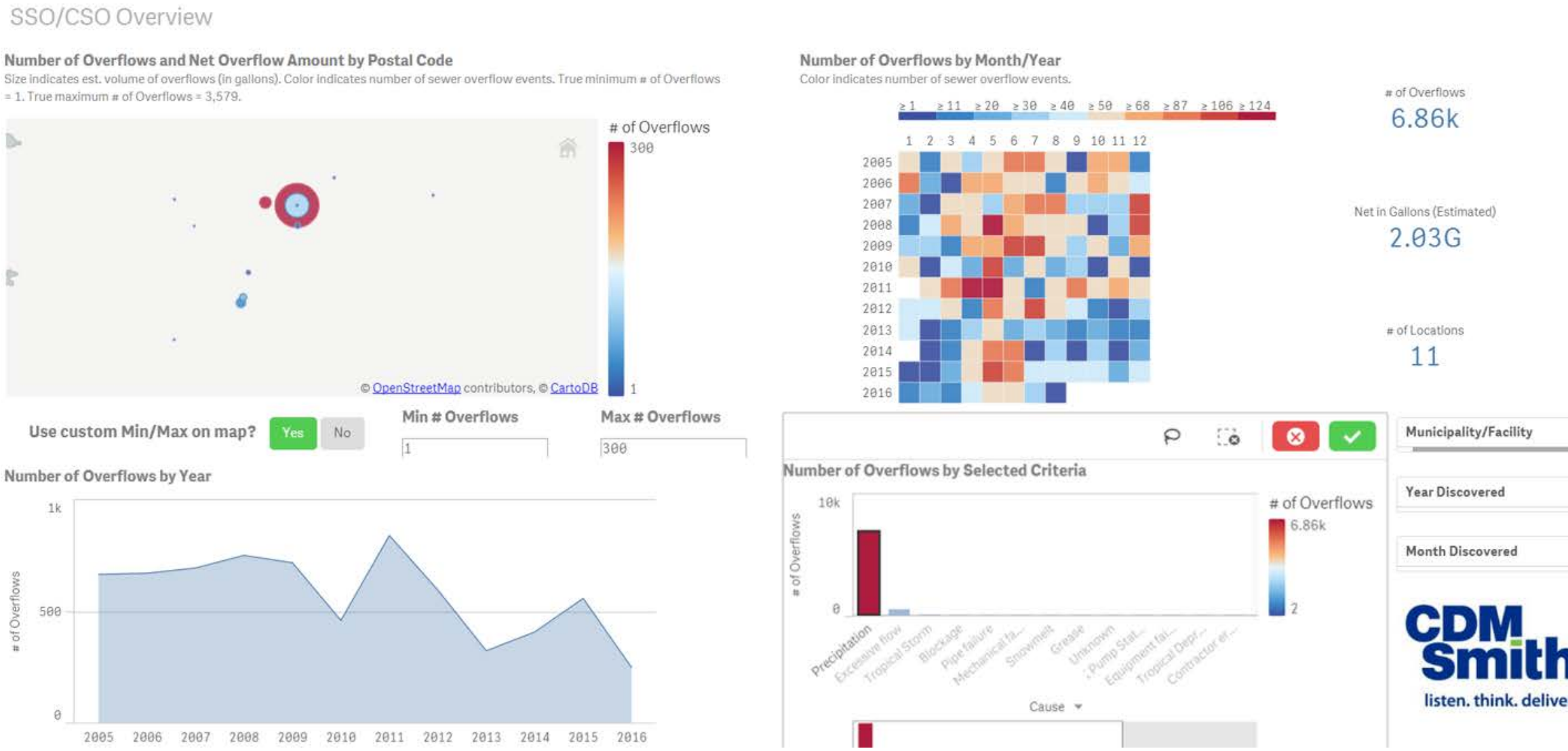

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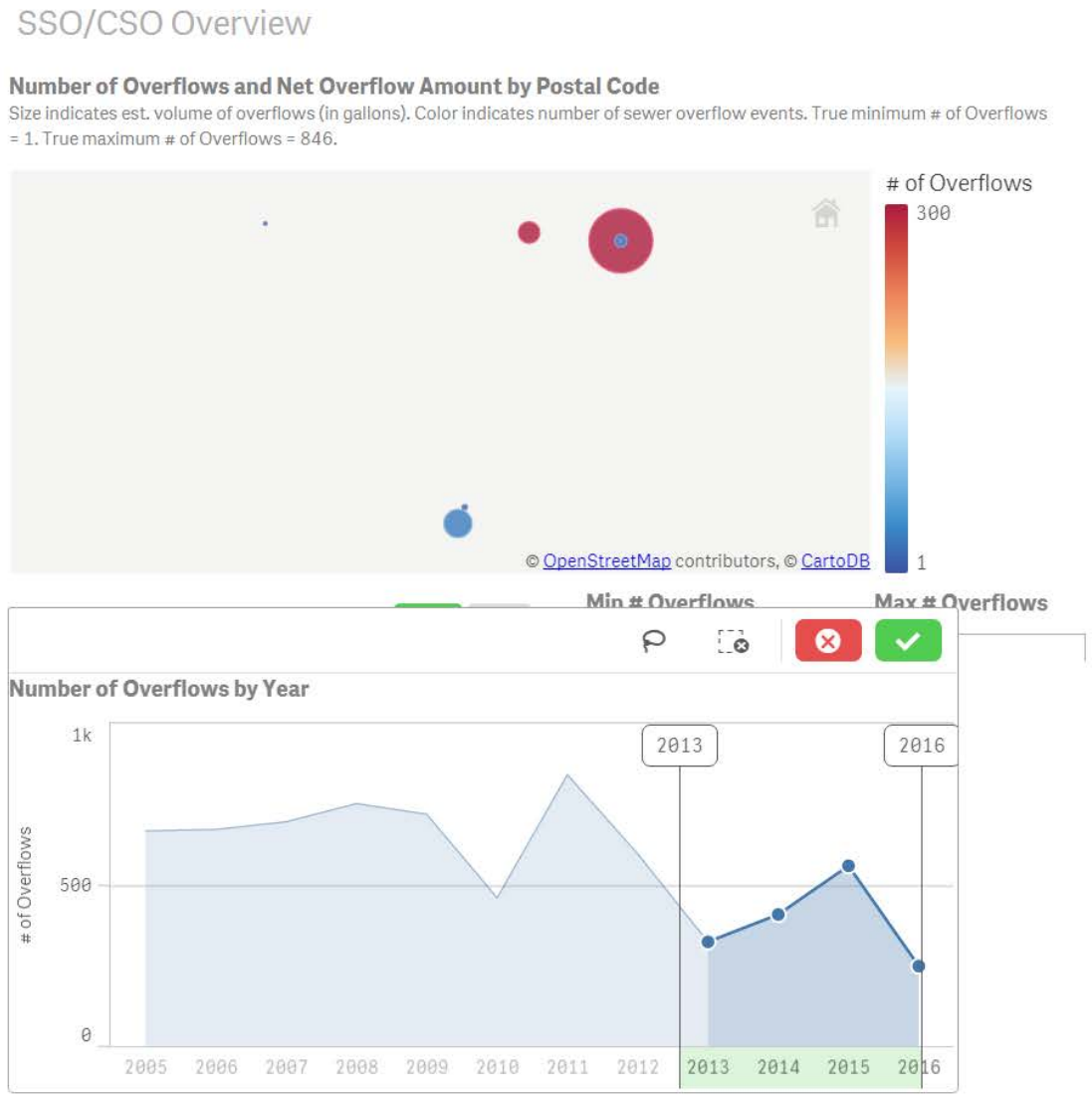

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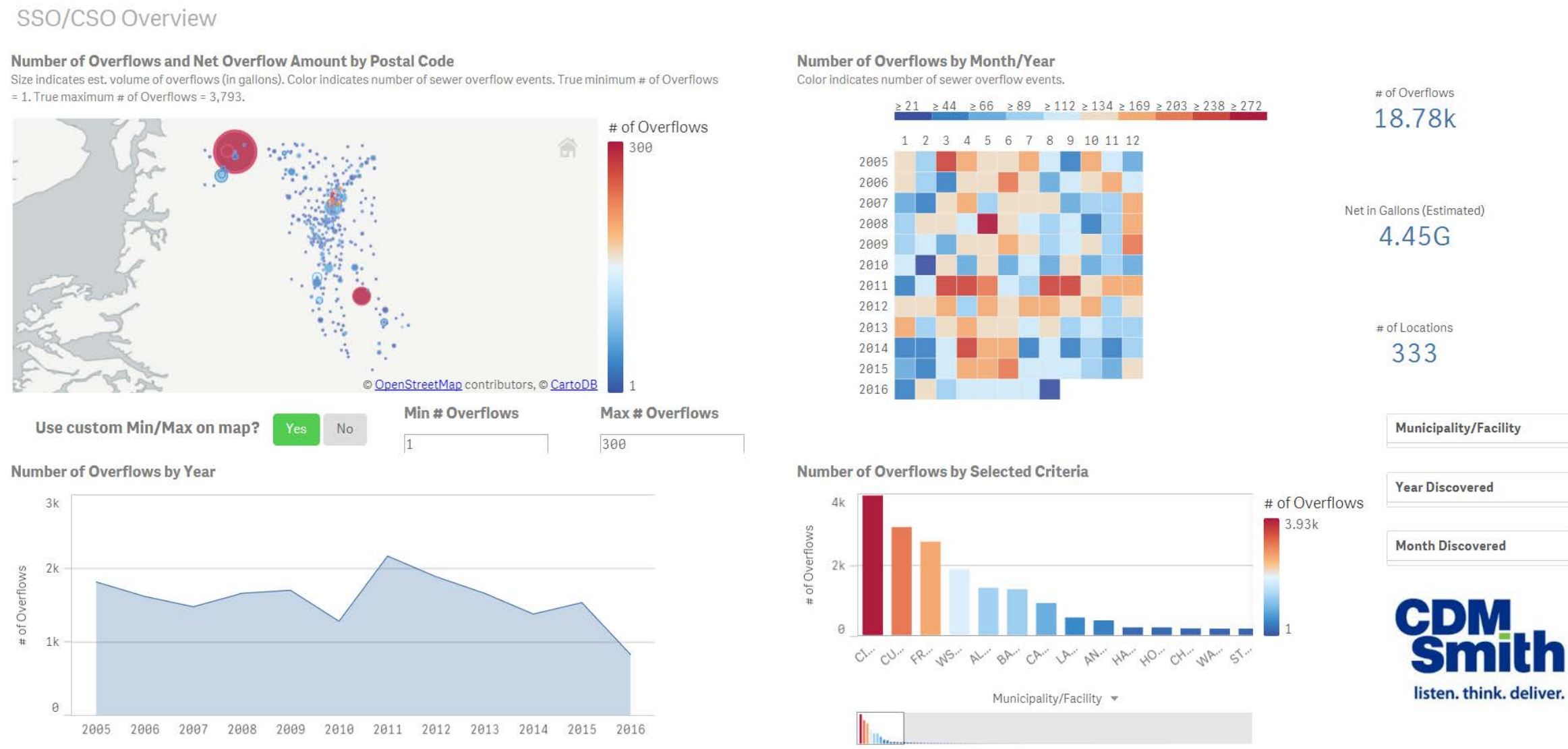

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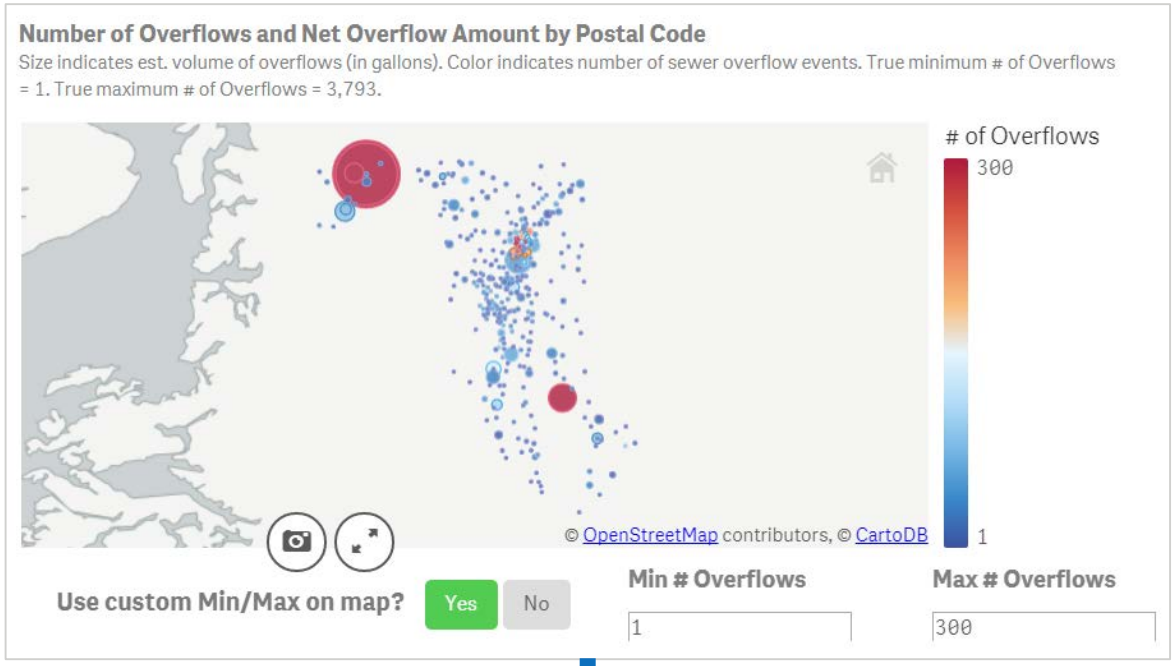

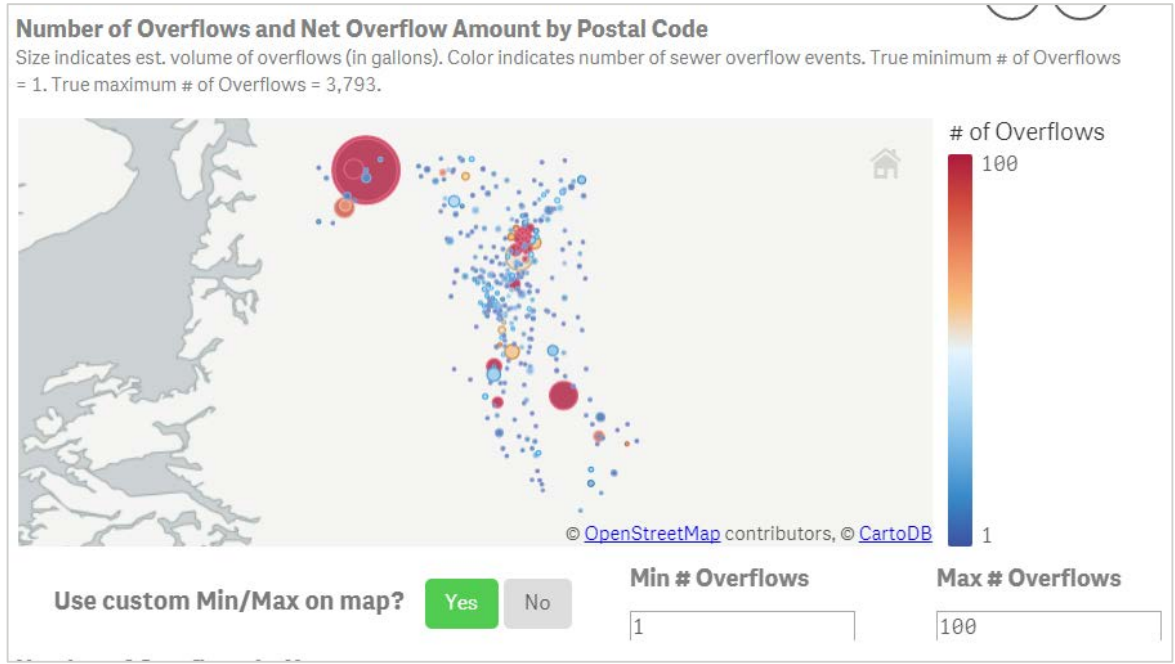

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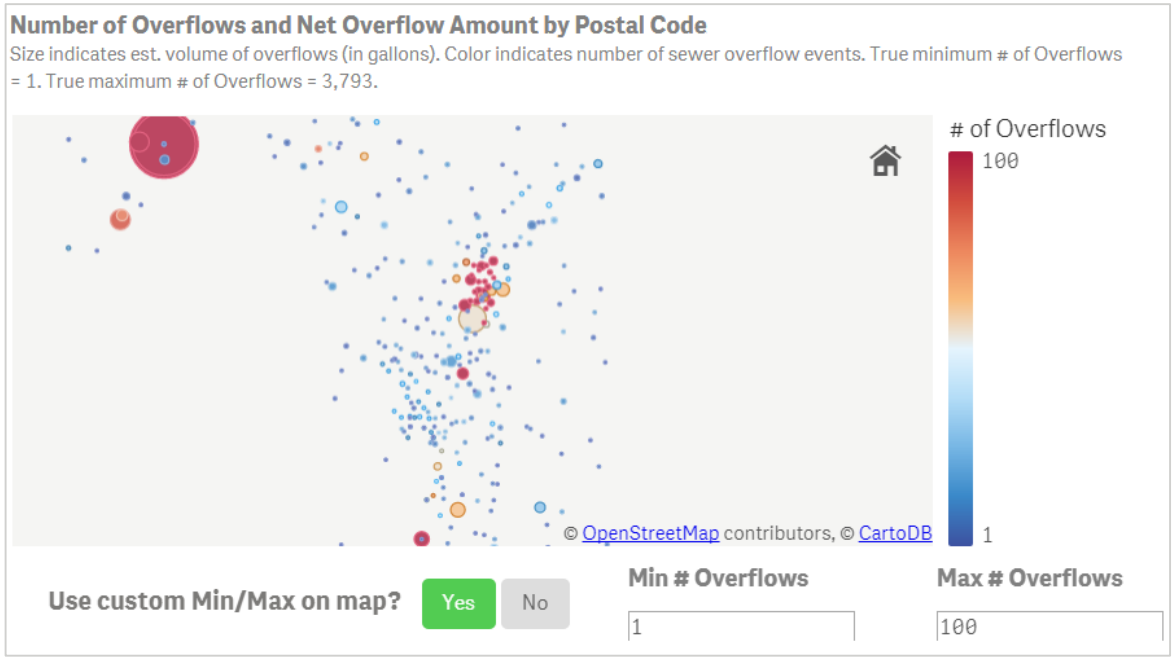

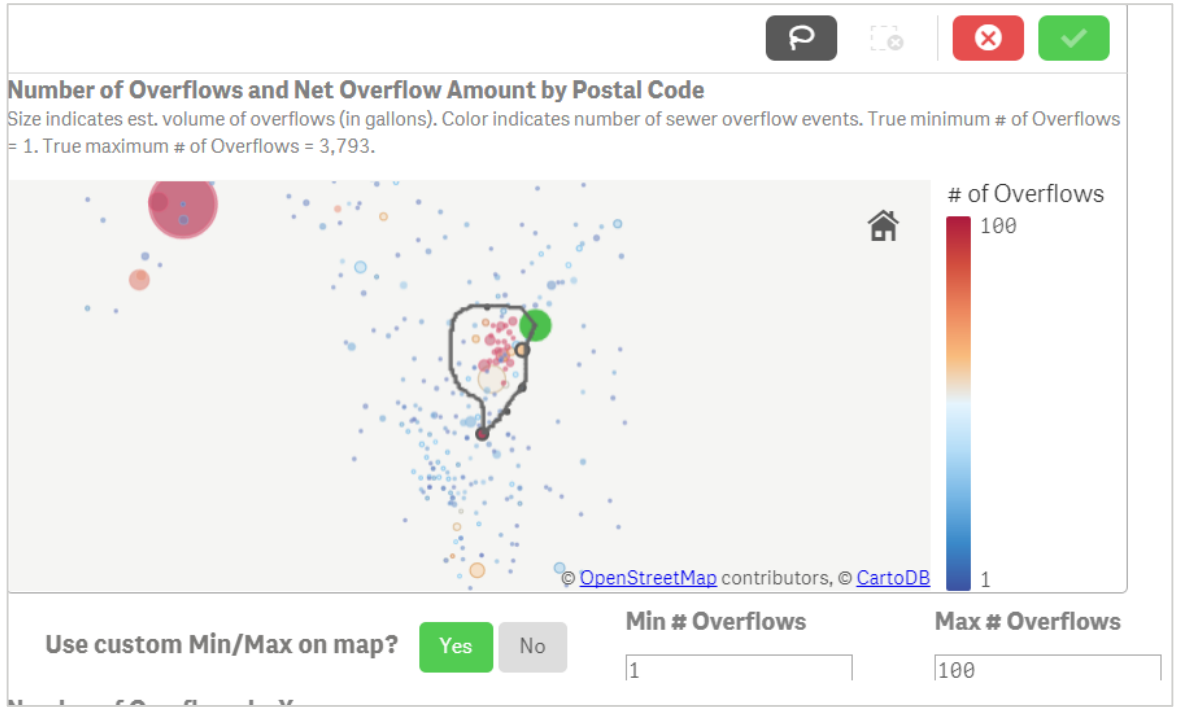

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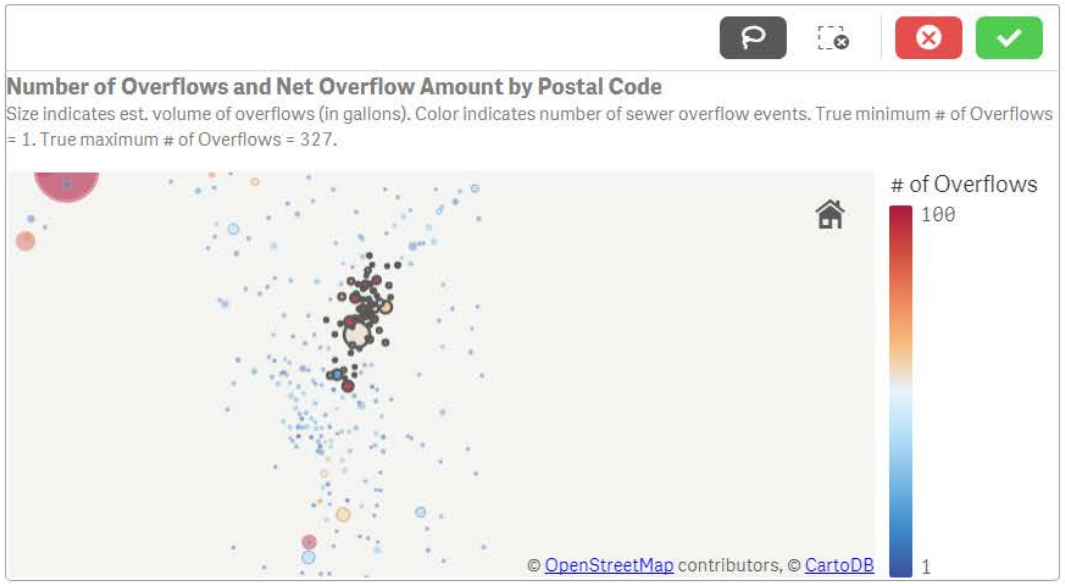
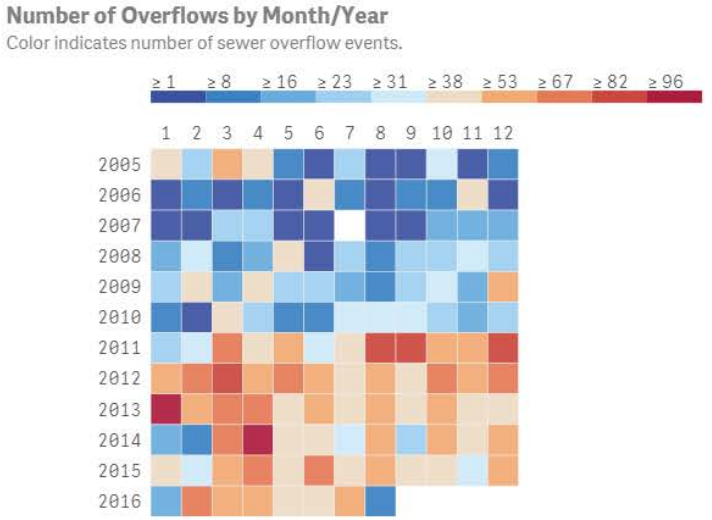




# of Overflows
5.28k

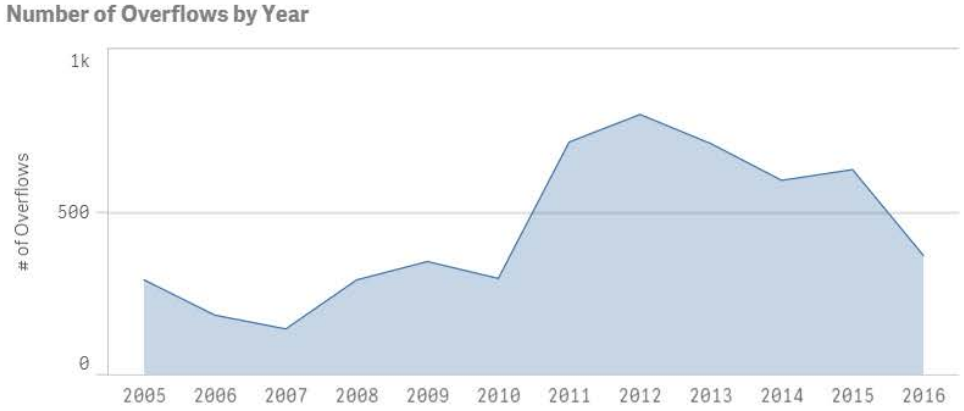
Net in Gallons (Estimated)
464.1M

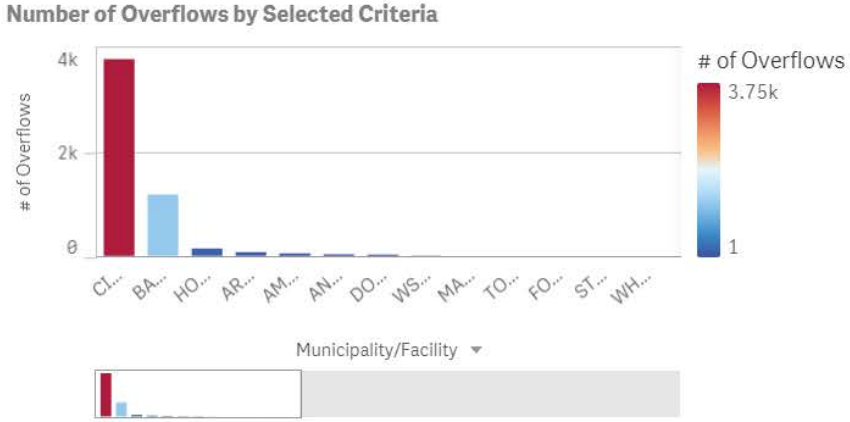
# of Locations
58

Use custom Min/Max on map? Yes No

Min # Overflows
1

Max # Overflows
100





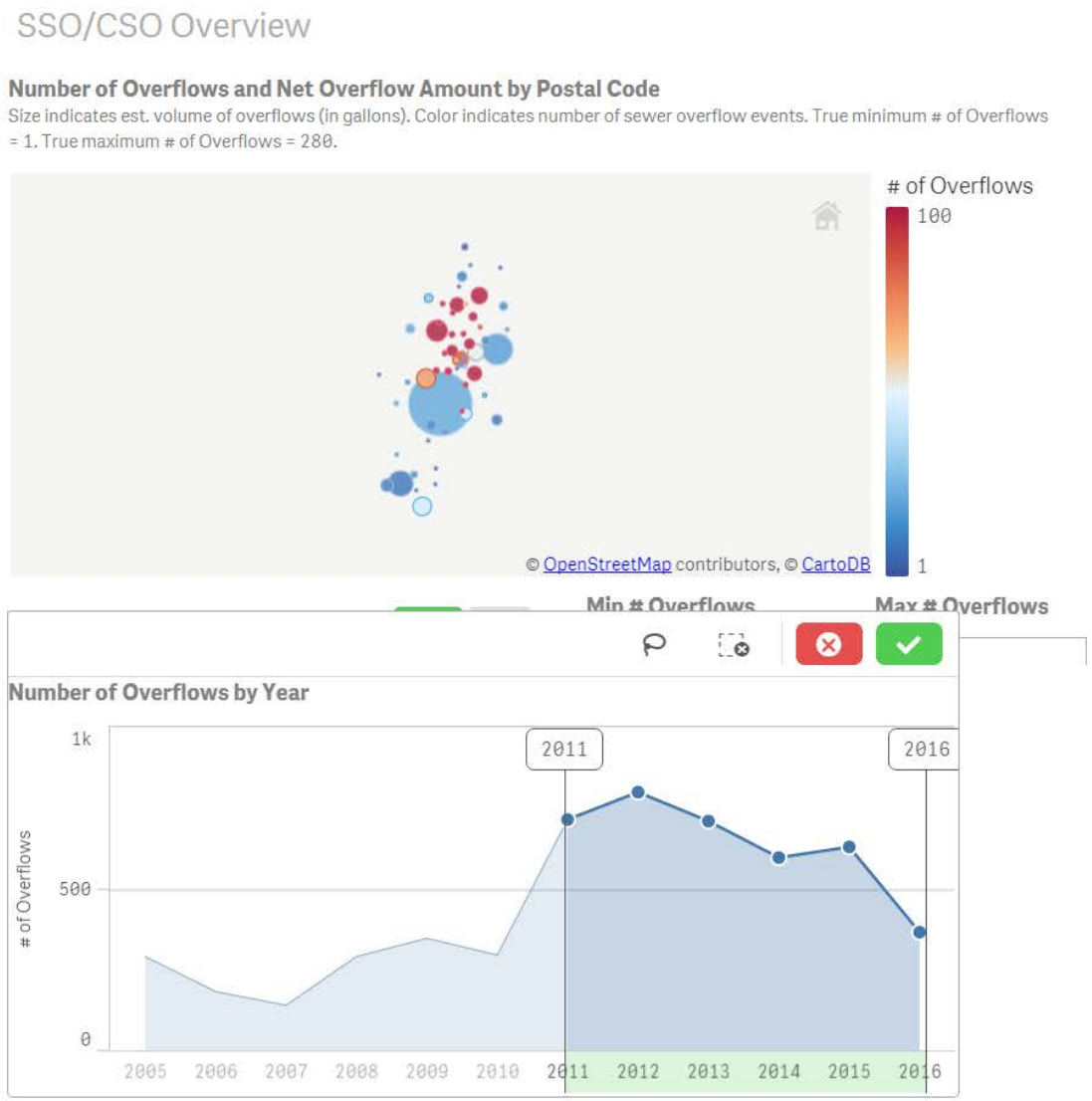
Municipality/Facility

Year Discovered

Month Discovered

CDM Smith
listen. think. deliver.

Demonstration



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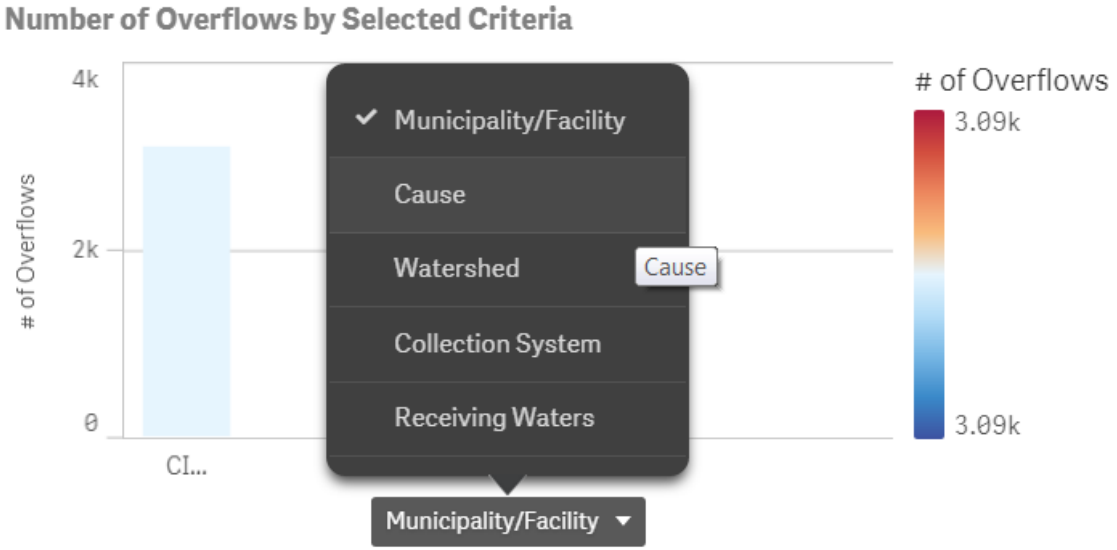

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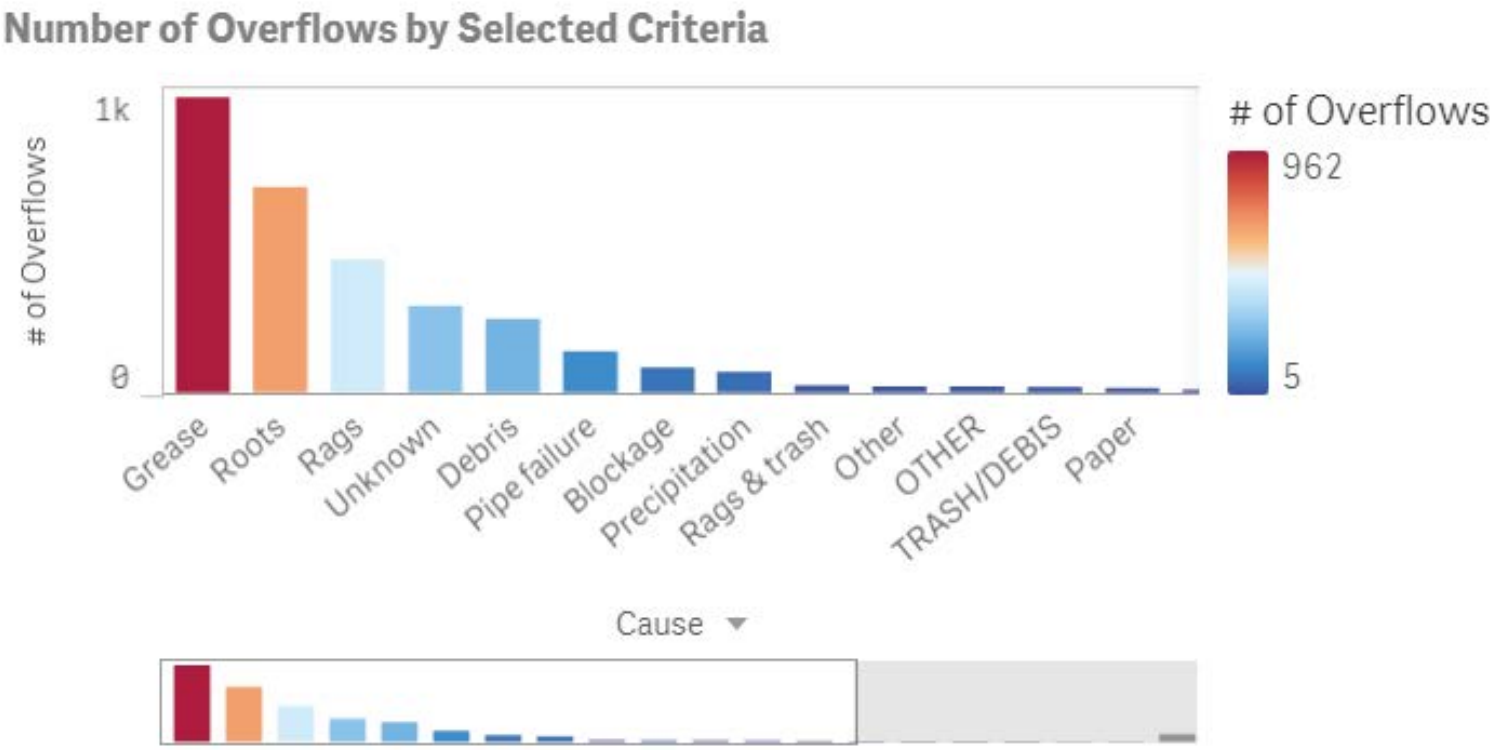

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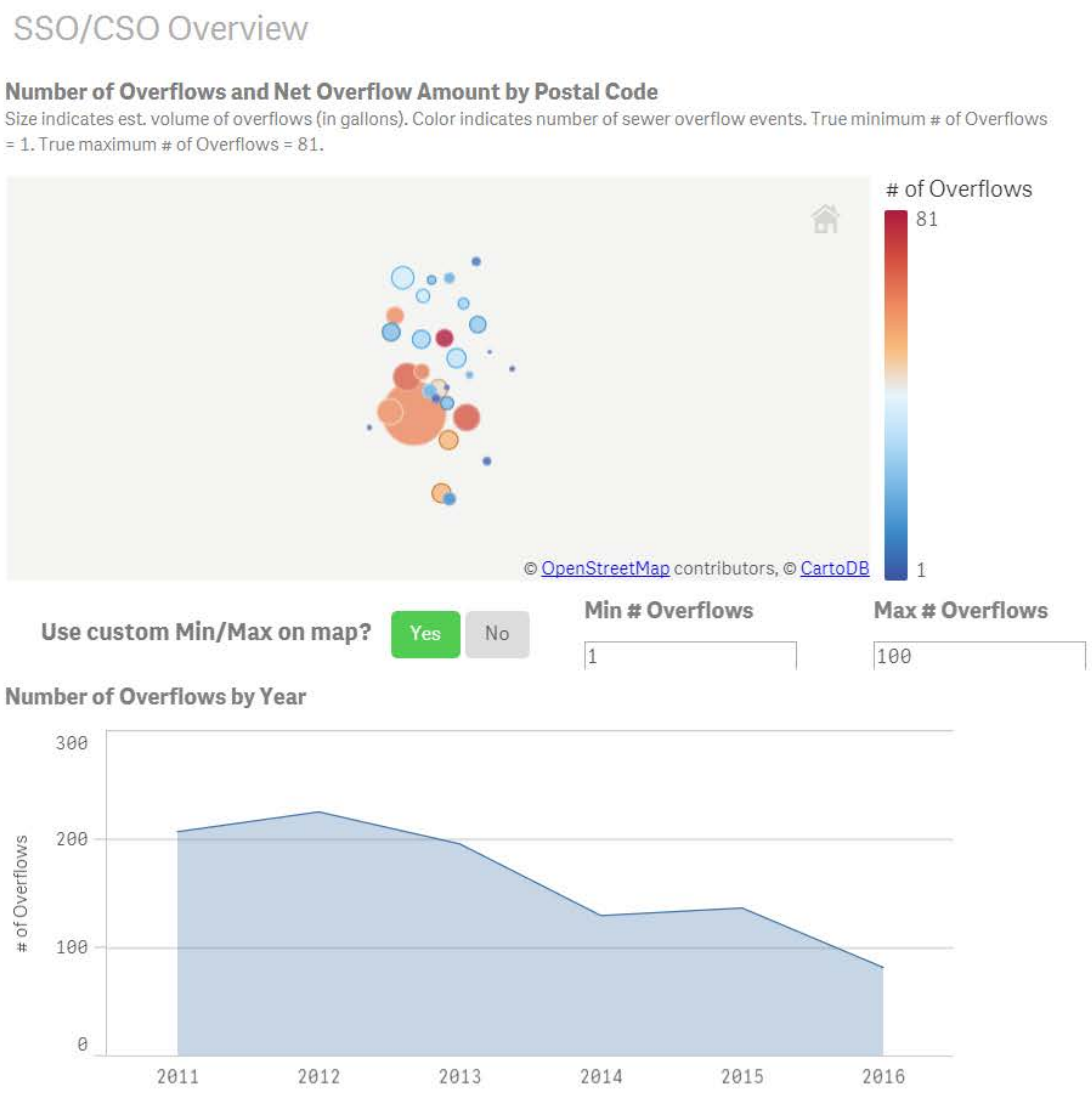

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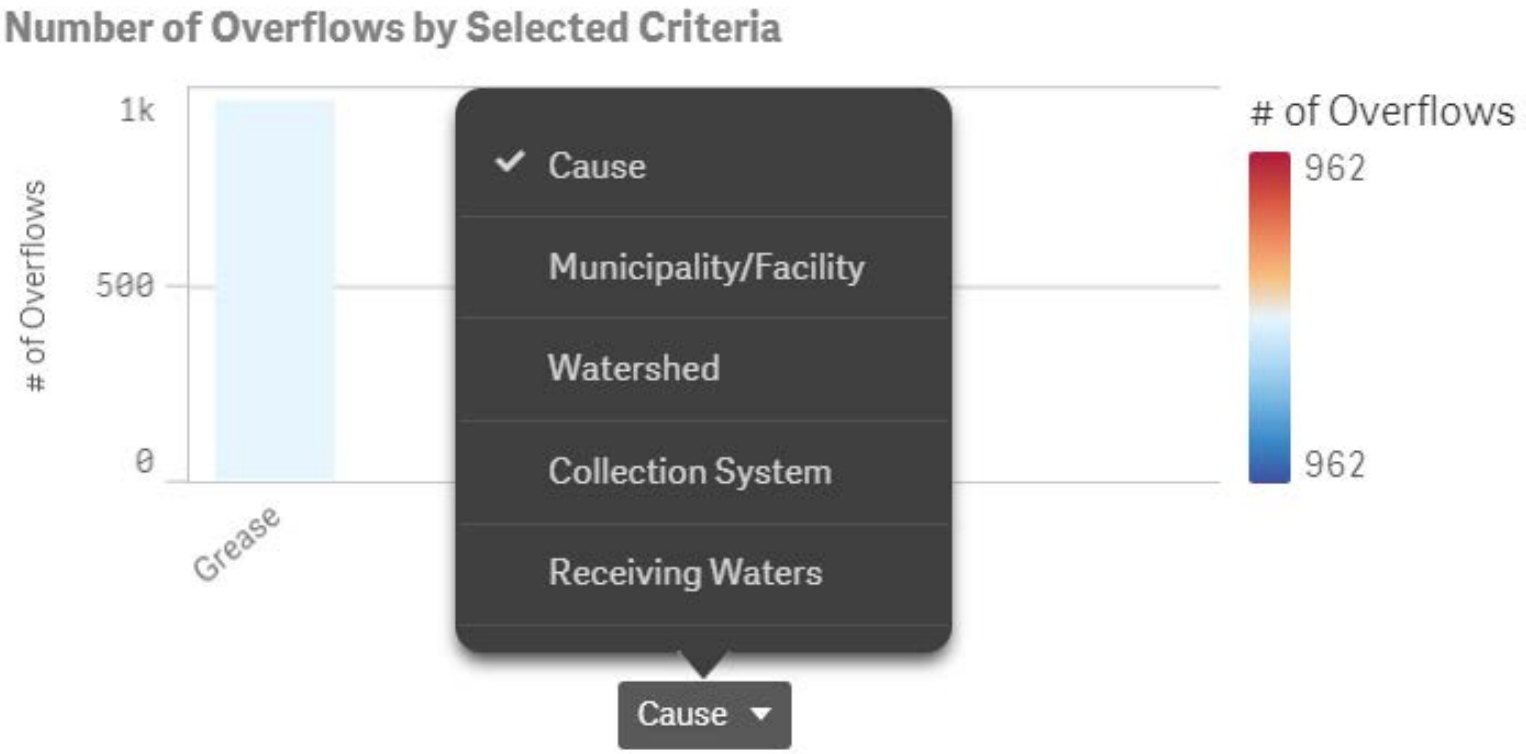

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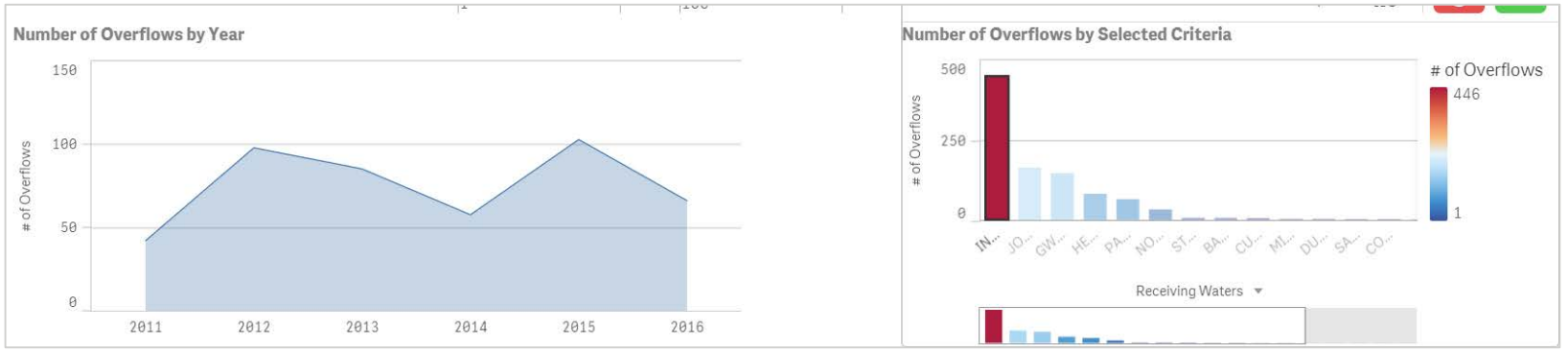
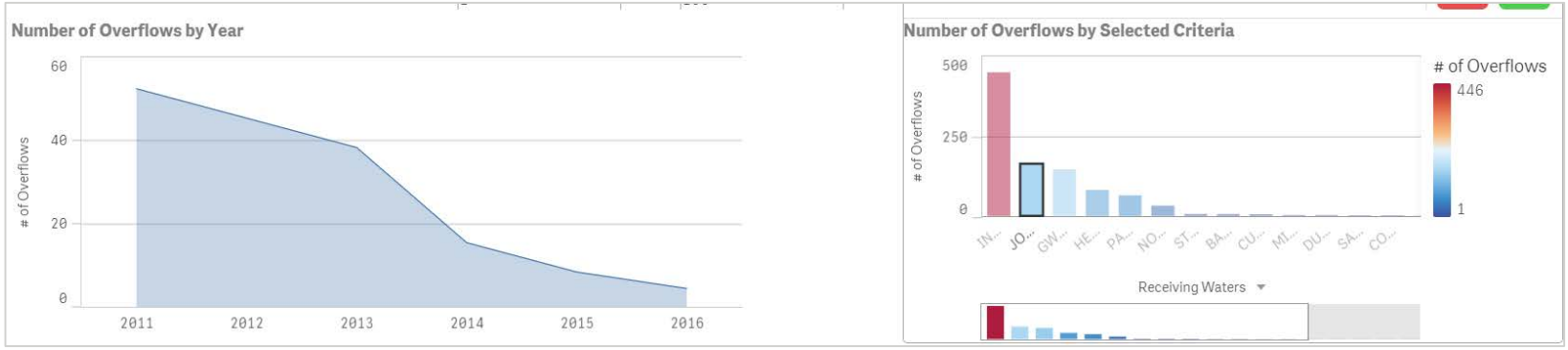
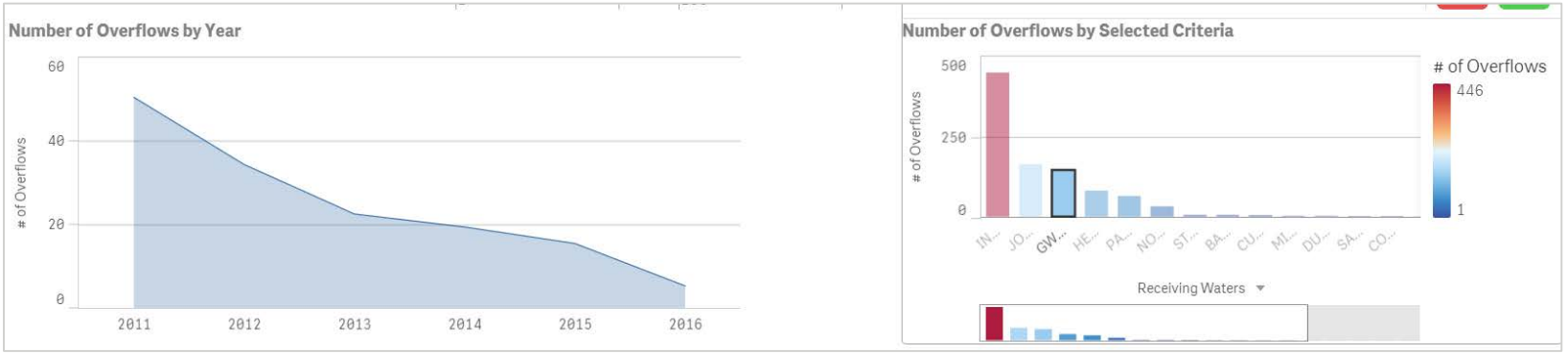
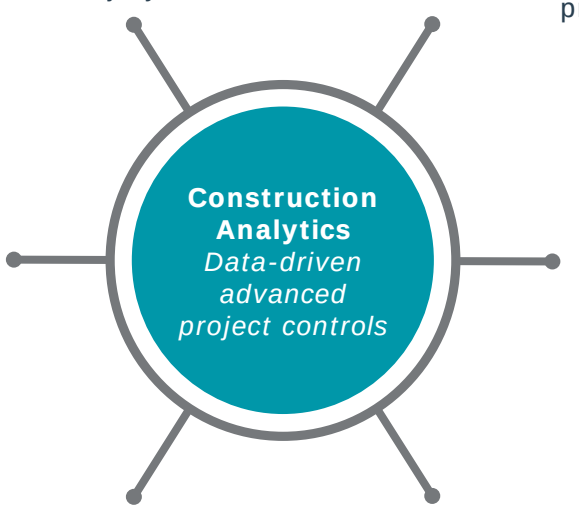






Analytics for construction management

Construction analytics sample visuals



Health and Safety

Breaking through internal and external data silos and applying proven data mining methods to identify people and processes with the highest risk for critical injury

Cost Management

Using analytics to drive real-time, interactive reporting and predictive insights related to project cost performance and forecasting to prevent overruns

Schedule Management

Integrating disparate data sources and applying analytics to proactively anticipate and resolve productivity and resourcing issues to avoid delays

Risk Management

Exploiting structured and unstructured data to provide early indicators of issues and risks, and implement timely interventions

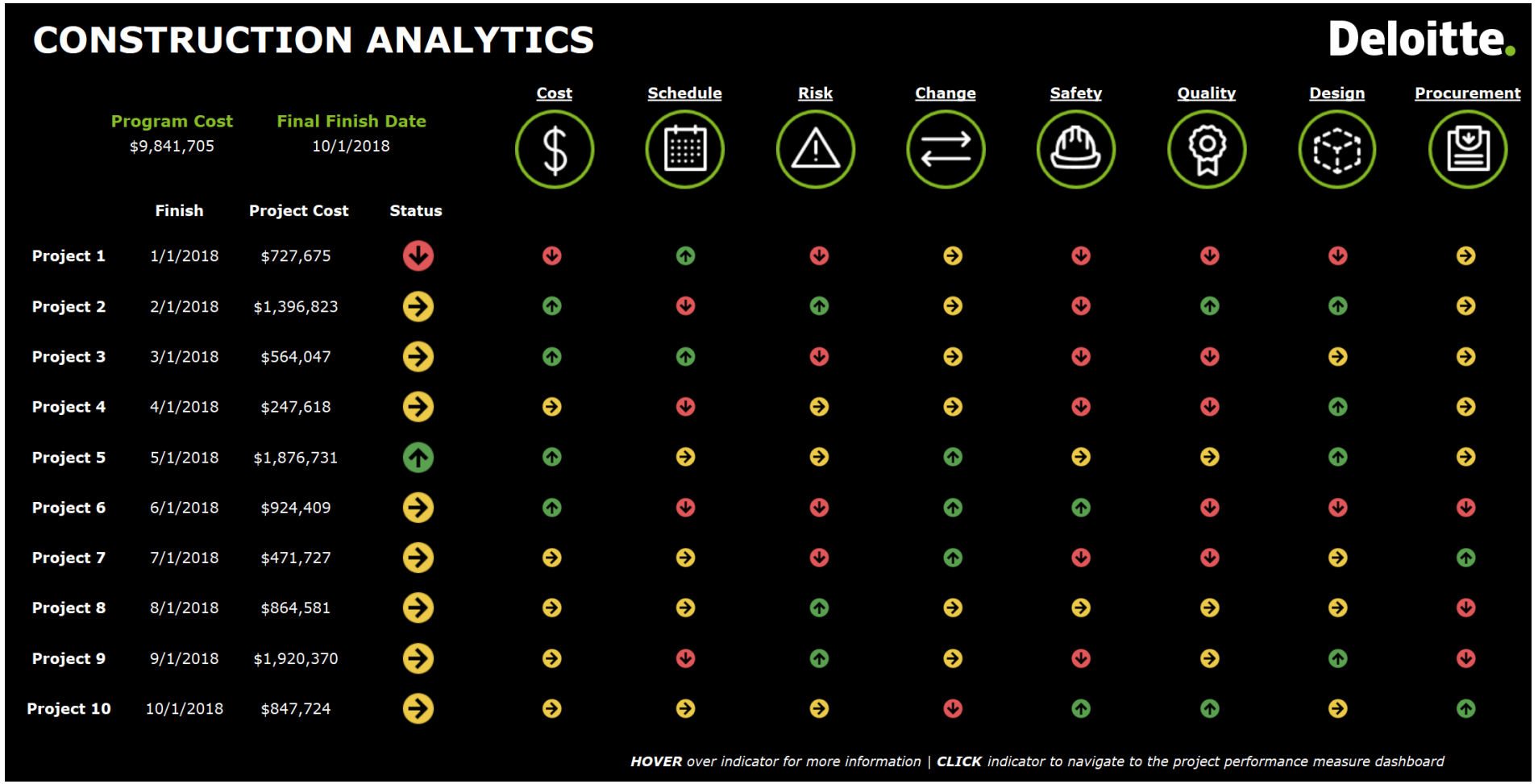
Change Management

Delivering comprehensive reporting on the source and impact of project changes, and implementing controls to avoid unnecessary costs and delays

Contract and Payment Management

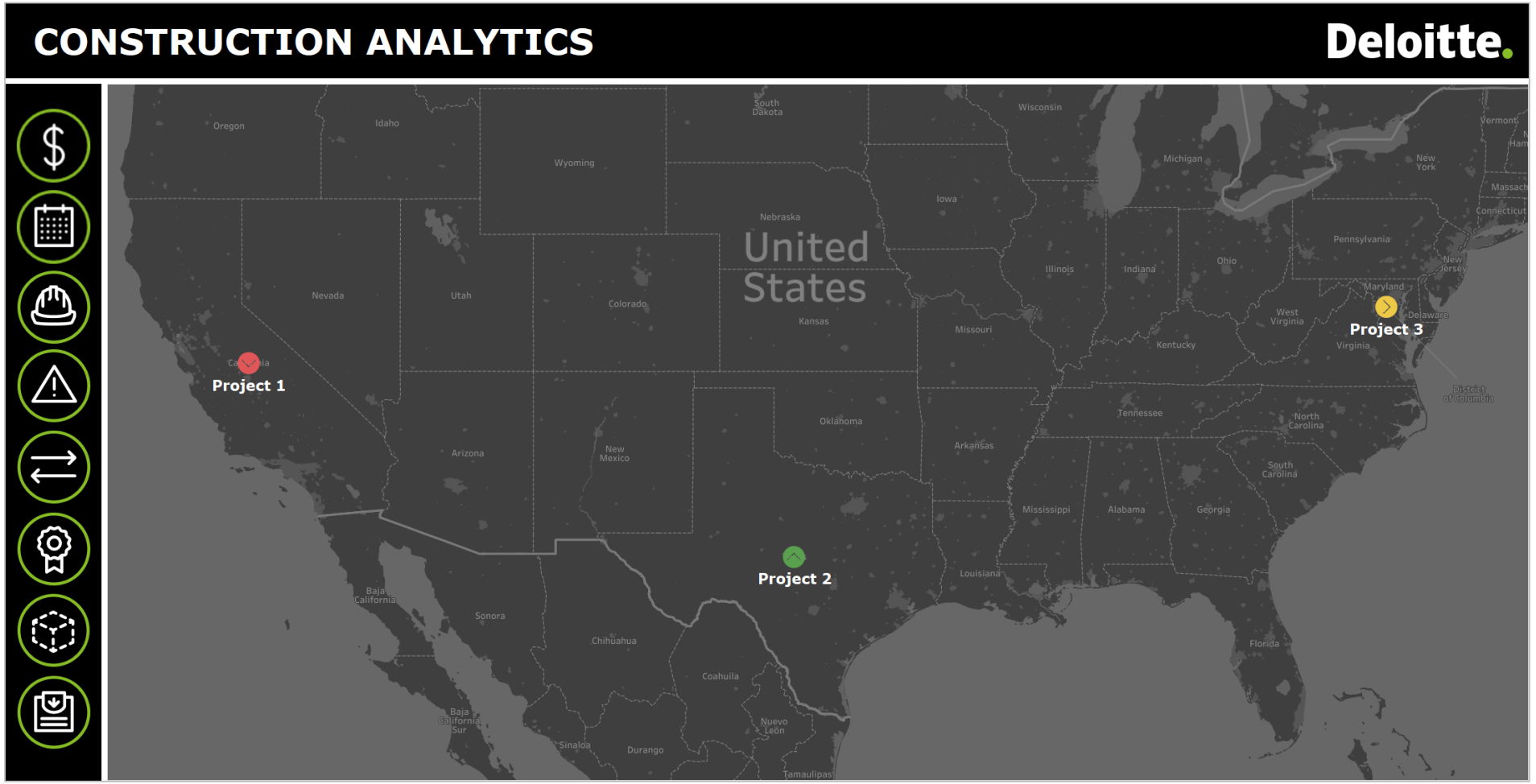
Embedding analytics in contract and payment management to resolve billing issues and inaccuracies prior to payment and enhancing vendor performance management

Construction Analytics Sample Visuals



Note: Values included in the dashboard images are notional and for demo purposes only.

Construction analytics sample visuals



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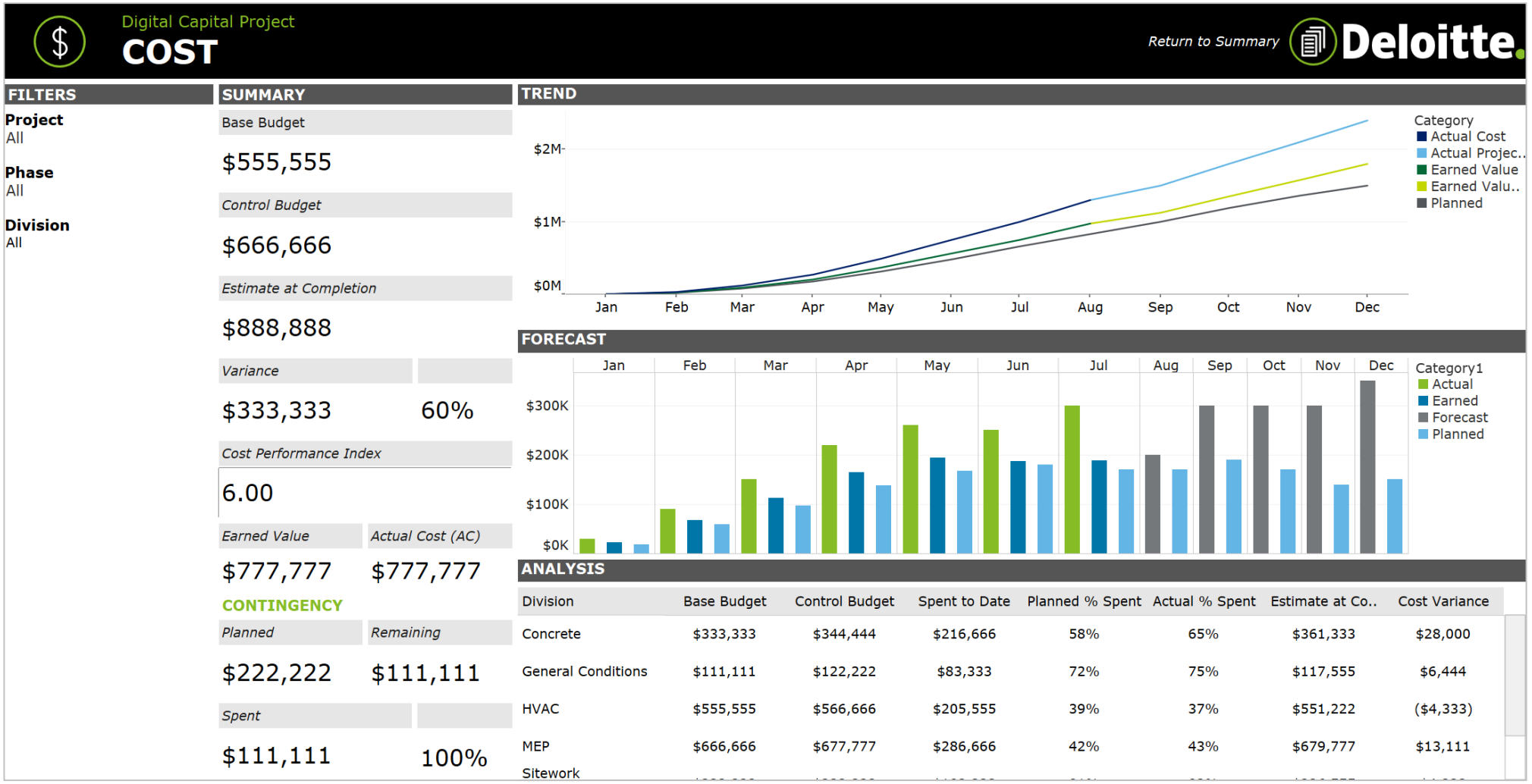

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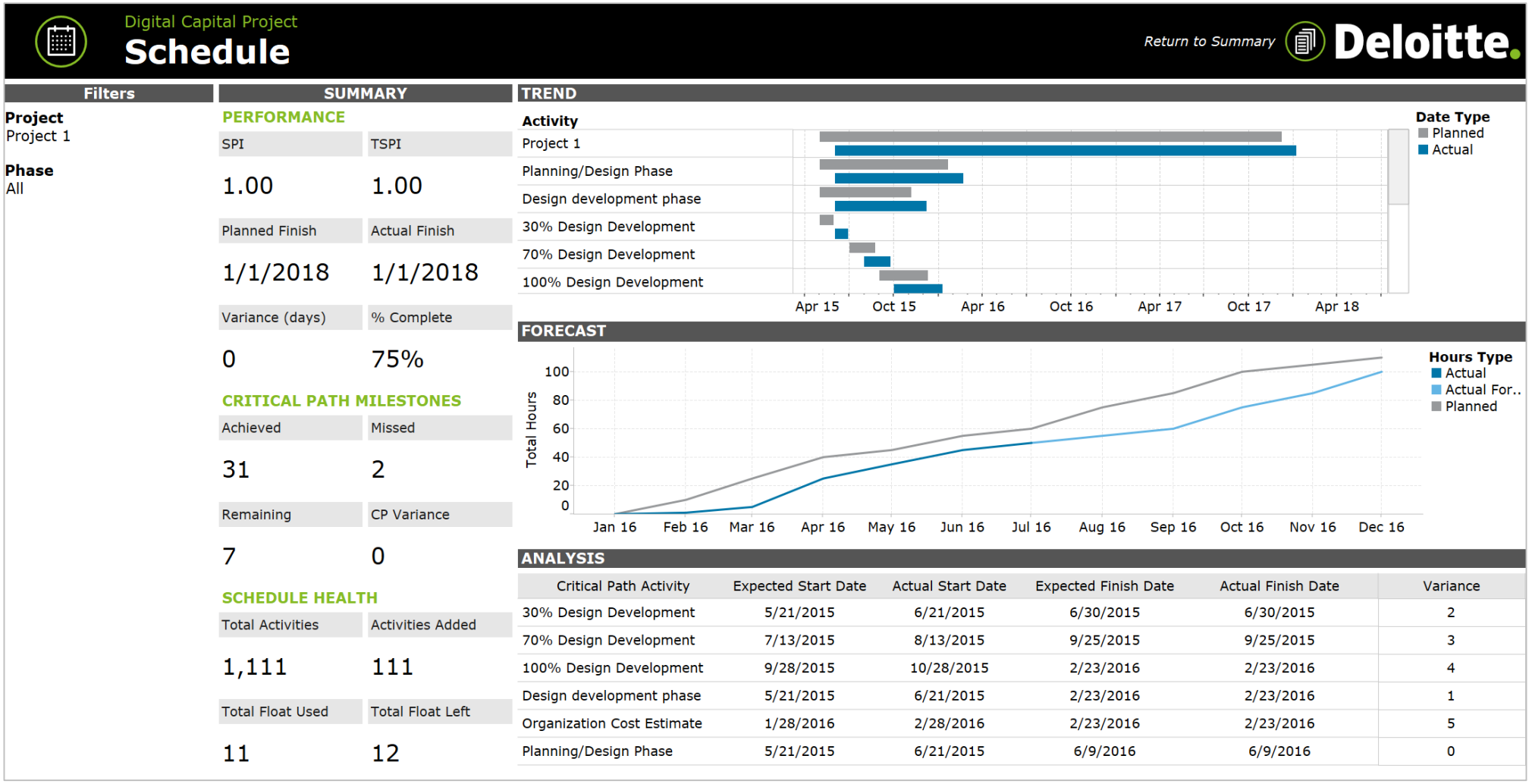

Critical Path Activity	Expected Start Date	Actual Start Date	Expected Finish Date	Actual Finish Date	Variance
30% Design Development	5/21/2015	6/21/2015	6/30/2015	6/30/2015	2
70% Design Development	7/13/2015	8/13/2015	9/25/2015	9/25/2015	3
100% Design Development	9/28/2015	10/28/2015	2/23/2016	2/23/2016	4
Design development phase	5/21/2015	6/21/2015	2/23/2016	2/23/2016	1
Organization Cost Estimate	1/28/2016	2/28/2016	2/23/2016	2/23/2016	5
Planning/Design Phase	5/21/2015	6/21/2015	6/9/2016	6/9/2016	0

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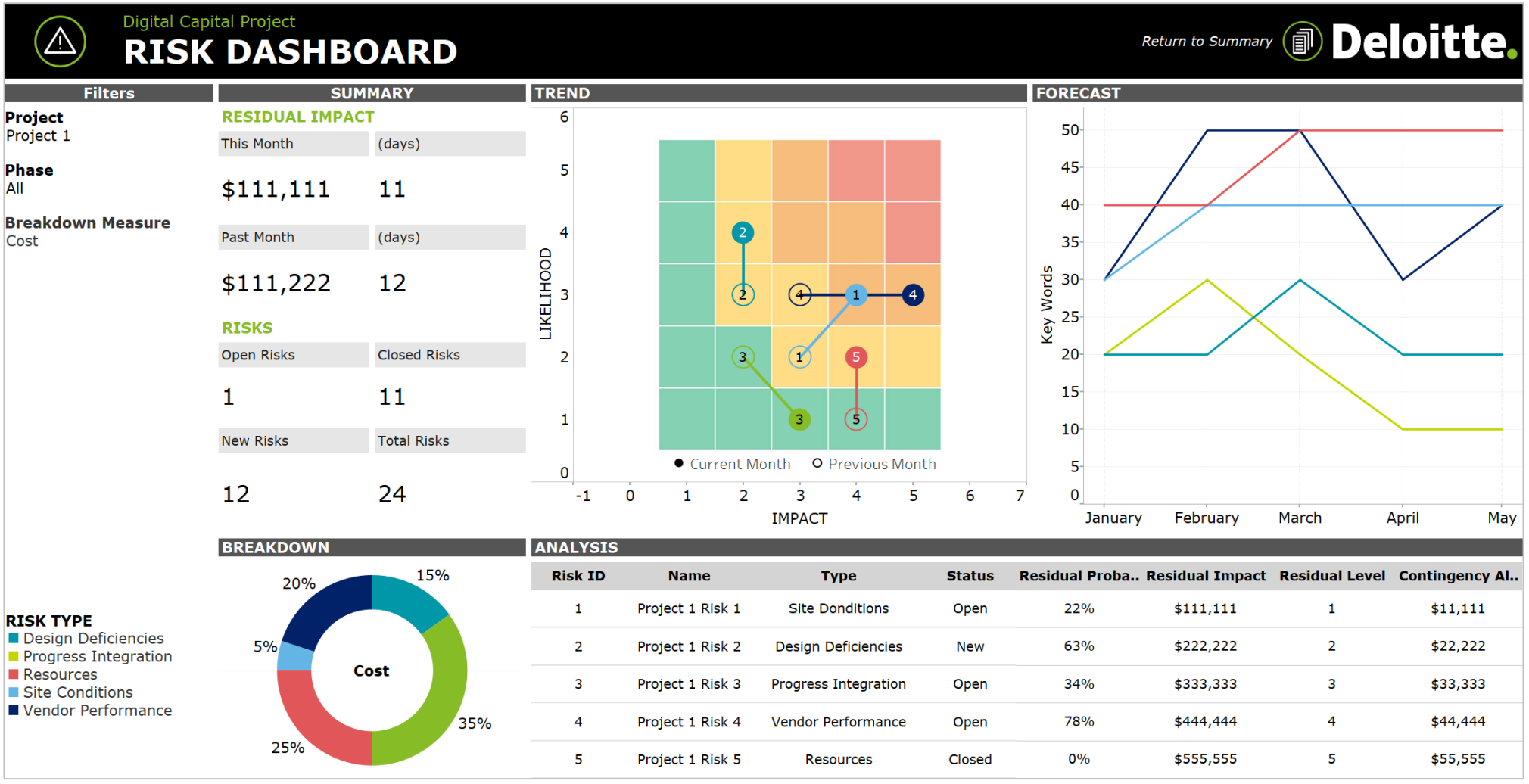
Construction Analytics Sample Visuals



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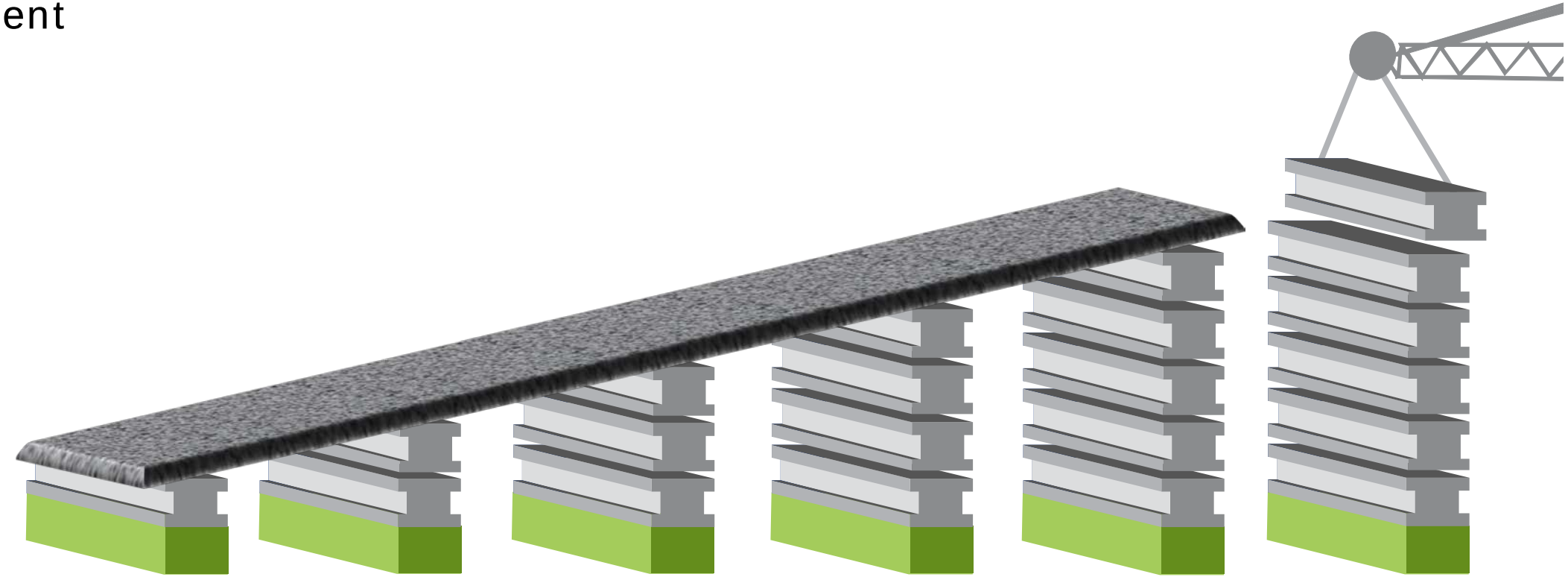
Success Stories

Benefits

Construction analytics can help clients enhance project delivery and portfolio management



Minimized data calls

Using the dashboard tool, data calls will be minimized and consistent reports will be generated directly from the tool

Paper to digital

The tool is able to collect, read, and analyze the paper-based reports to input the information into the database

Automation

The database is able to automatically import data from all of the various systems currently housing it

Aggregation

The tool is able to aggregate both structured and unstructured data collected from the disparate systems

Visualization

Transferring hard data and numbers into useful and concise visuals, promoting efficiency, insight, and effectiveness

Portfolio-Wide Insights

The tool enhances transparency for project owners, producing reliable and insightful metrics to analyze their full portfolio of projects

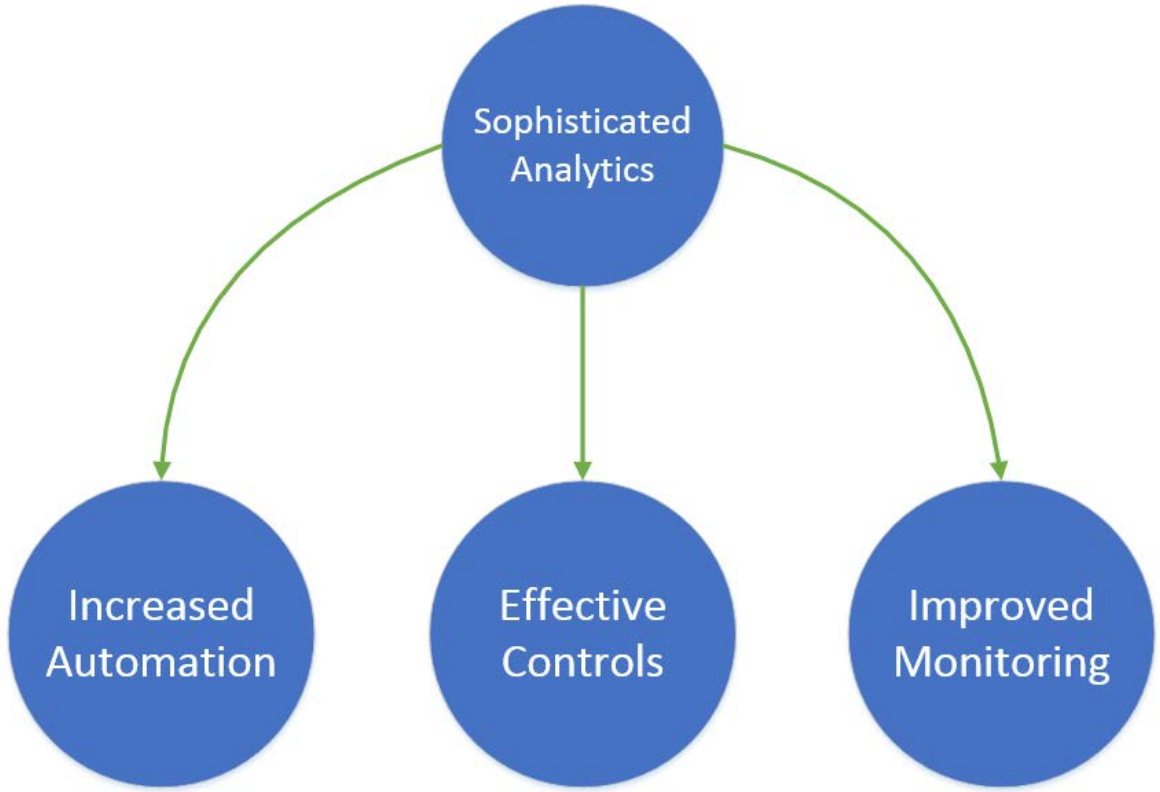
Tangible benefits for your operation

- Prioritize capital investment and public education programs
- Optimize current systems and processes
- Improve asset management
- Predict demand

Tangible benefits for your operation (cont.)

"The savings from monitoring, automation, and control are staggering and have the potential to save in the region of
$320 billion from 2016 to 2020 in an array of utility water and wastewater capital and operational spending."

- Global Water Intelligence, 2016



Q&A

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