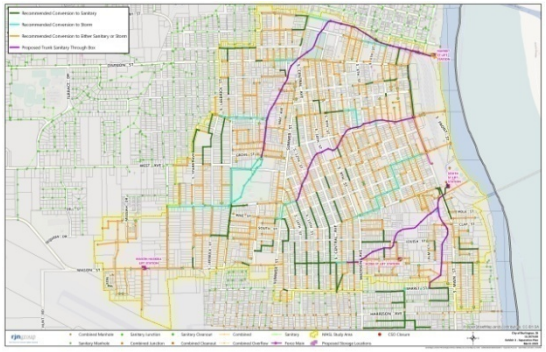
June 4, 2015



From Paper to the Cloud – Creating a Sewer GIS for Burlington, IA

Prepared By: Karol Giokas
and Dennis Gilbertson

rjngroup
40 years of collection system solutions

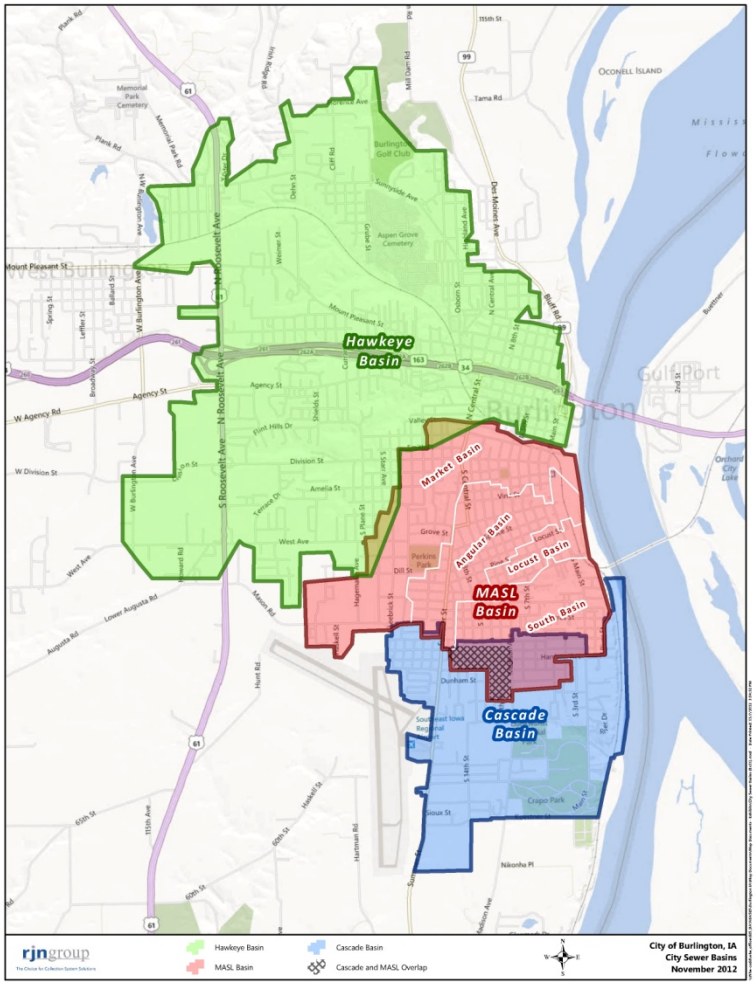
City of Burlington

Burlington, Iowa

- Des Moines County
- Mississippi River
- Founded 1837
- Population - 25,000
- ~15 Square Miles
- Combined Sewer System
  - ~ 9 square miles
- WWTP – 21 MGD

Burlington Regulatory History

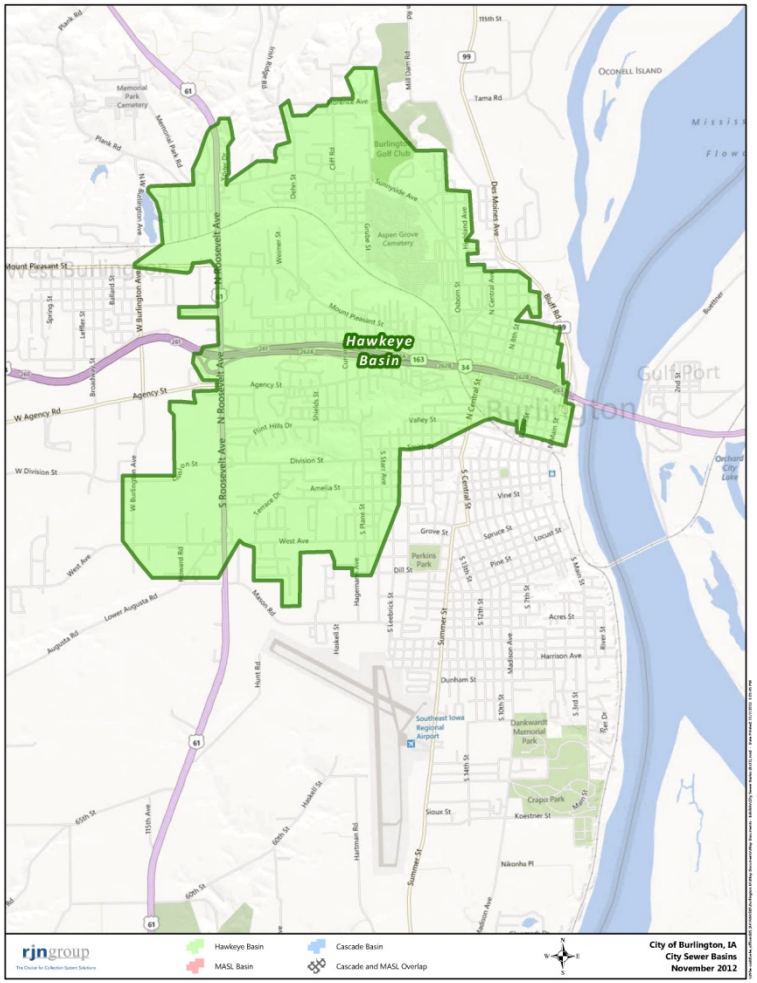
- CSO Discharges into Mississippi River
- IDNR consent order signed - 2007
- Separation Timeline for City Through 2028
- Phased approach
  - Hawkeye Area
  - Cascade Area
  - MASL Area



Hawkeye Drainage Area

- 5.6 Square miles
- 350,000 Linear Feet sewer
- 1,500 manholes

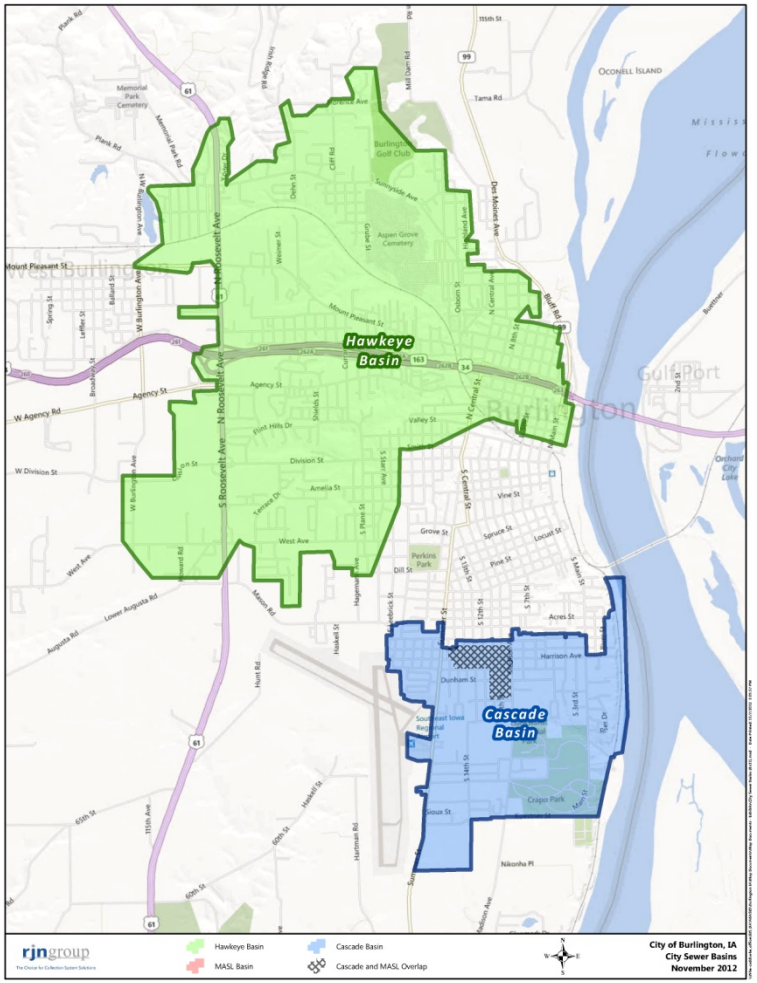
- Separation Complete in 2009
  - Constructed 2 Equalization Basins and new storm and new sanitary sewer



Cascade Drainage Area

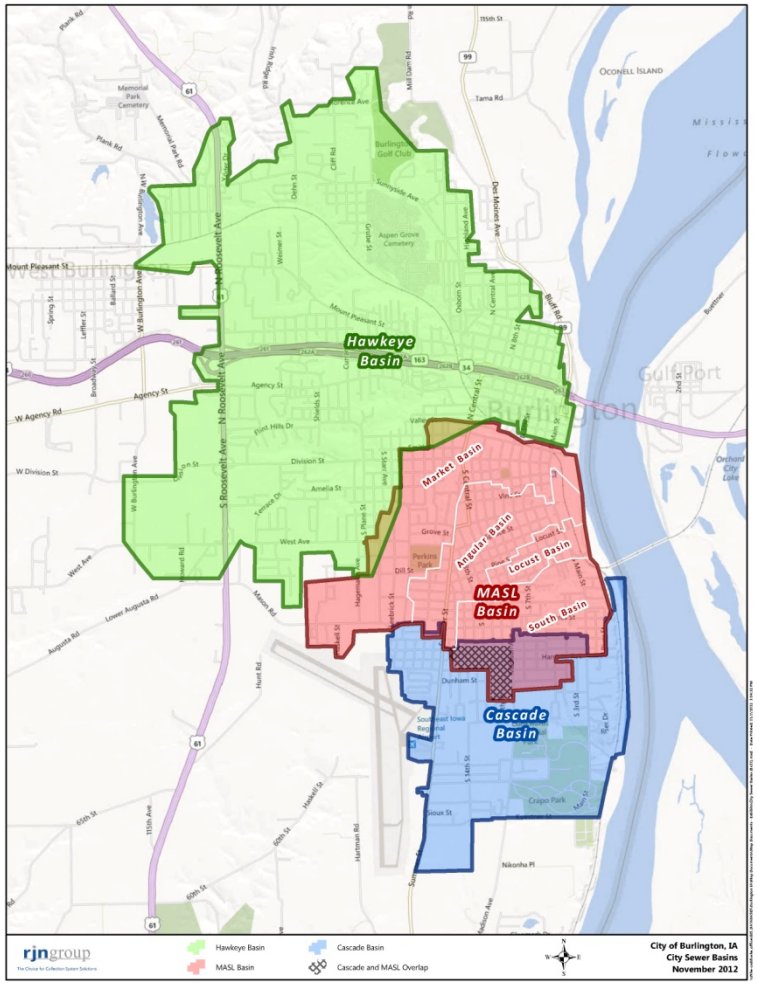
- 125,000 Linear Feet Sewer
- 430 Manholes
- 1.5 Square Miles
- Two CSO Points
- Valved CSO Outlets on Pressure Sewer

- Separation In Progress



Market/Angular/South/Locust (MASL) Drainage Area

- 200,000 Linear Feet Sewer
- 690 Manholes
- 2 Square Miles
- Four CSO points
  - Market St, Angular St, Locust St, South St
- Separation Not Started



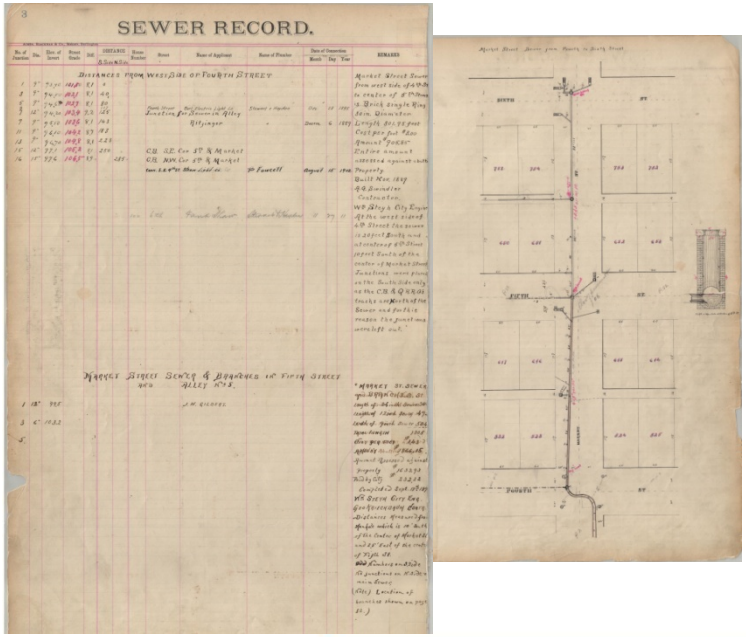
To Begin Separation

- Requires Good Asset Inventory
  - What do you have?
  - Where is it?
  - What condition is it in?
- Accessible
- Able to Drive Analyses

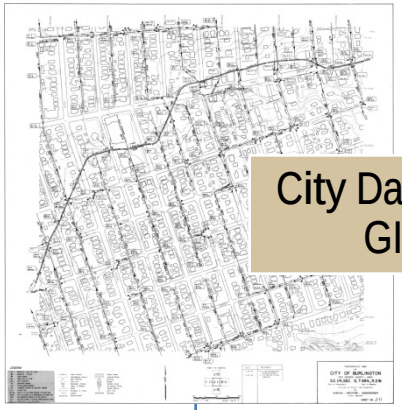
- GIS Services Provided by Des Moines County

City Sewer Data

- 19th Century Sewer Book
- Mylar atlas (1982)
- CAD format



Project Approach Summary



City Data into GIS

Field Data Collection and Verification

Link Lines and Points, Add Asset IDs, Diameters

Data Management / QA/QC / Map Updates

Asset Inventory in GIS

Initial CAD import into GIS

- Structures and Lines not Connected
- Flow Arrows not Correct
- No Asset IDs
- No Asset Information
  - Pipe diameters
  - Pipe material

Field Data Collection

- All Field Data Collected on Electronic Mobile Devices
- Synced Directly with GIS

- Confirm Location and Connectivity
- Document Condition

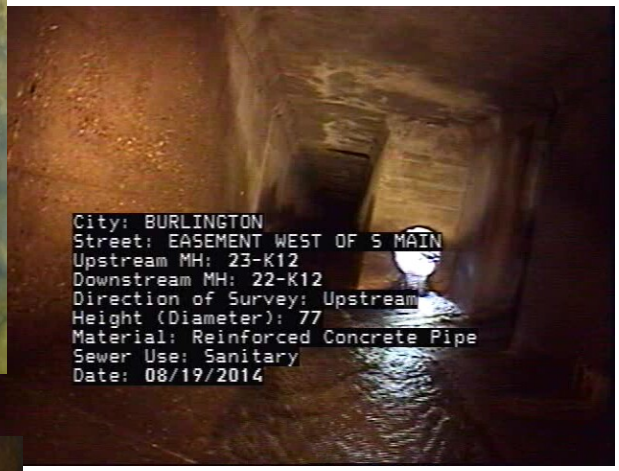
Manhole Inspection

Smoke Testing

Survey

Televising

UPSTREAM MH: 13-J10
DOWNSTREAM MH: 77-J11
FEET: 0401.1

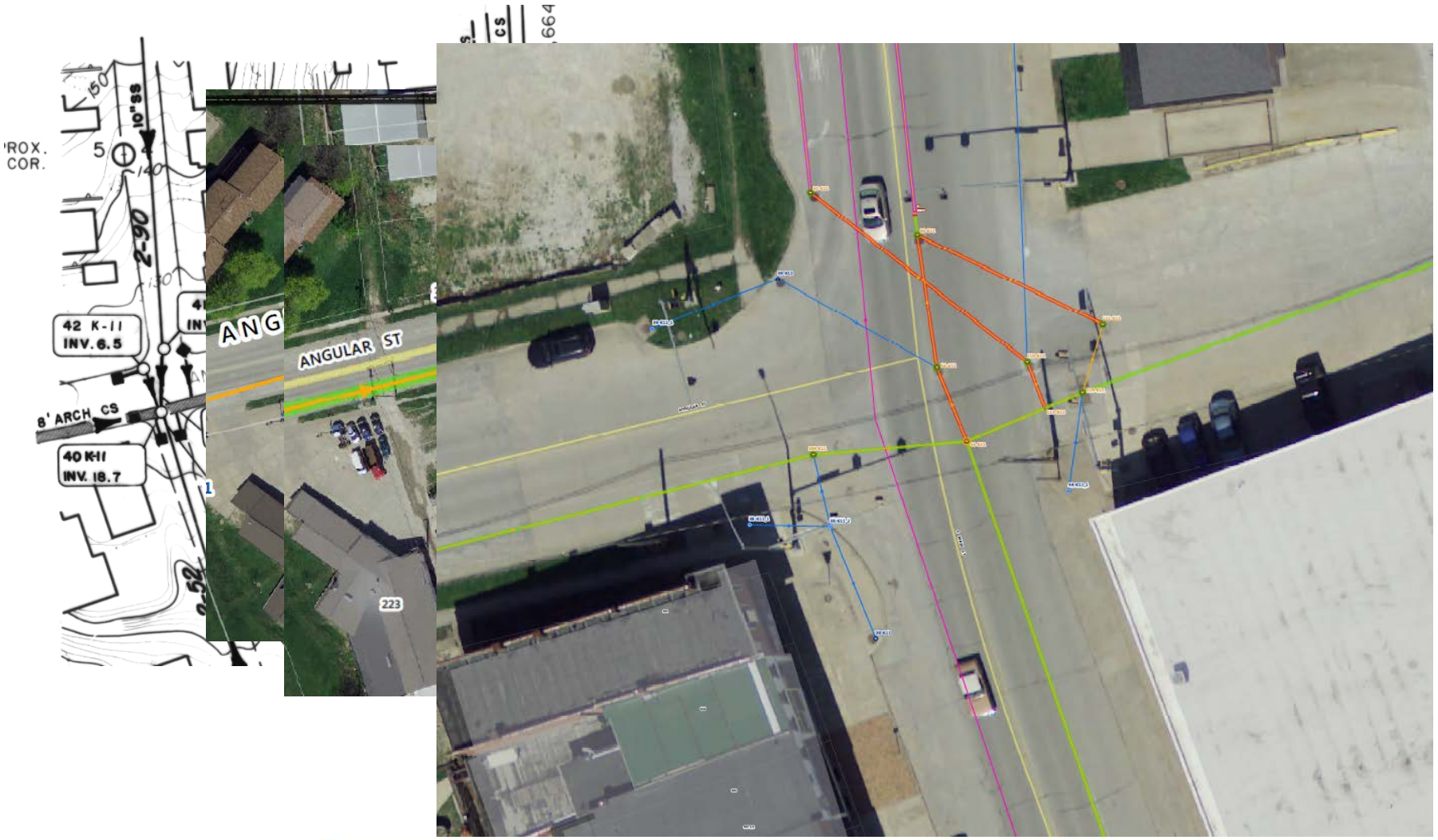

City: BURLINGTON
Street: EASEMENT WEST OF S MAIN
Upstream MH: 23-K12
Downstream MH: 22-K12
Direction of Survey: Upstream
Height (Diameter): 77
Material: Reinforced Concrete Pipe
Sewer Use: Sanitary
Date: 08/19/2014

UPSTREAM MH: 125-I10
DOWNSTREAM MH: 59-I11
FEET: 0140.1

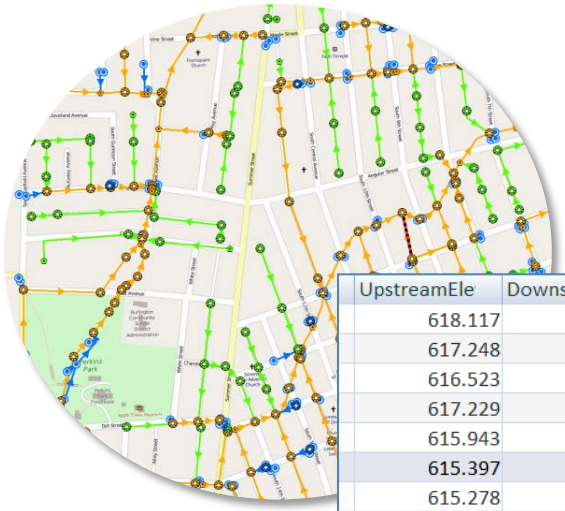
STREAM MH: 97-J11
WNSTREAM MH: 125-J11
ET: 0095.0

UPSTREAM MH: 43-I11
DOWNSTREAM MH: 71-I12
FEET: 0339.2

Map updates



Sharing Spatial Data



UpstreamEle	Downstream	UpstreamPip	UpstreamPip
618.117	617.248	8	Vitrifed Clay
617.248	616.523	8	Vitrifed Clay
616.523	615.278	8	Vitrifed Clay
617.229	615.943	8	Vitrifed Clay
615.943	615.397	8	Vitrifed Clay
615.397	614.543	8	Vitrifed Clay
615.278	615.427	10	Vitrifed Clay
615.427	614.543	10	Vitrifed Clay
614.543	613.45	12	Vitrifed Clay
614.962	615.165	12	Vitrifed Clay

ESRI GIS

- RJN Staff
- City of Burlington

ArcGIS Online

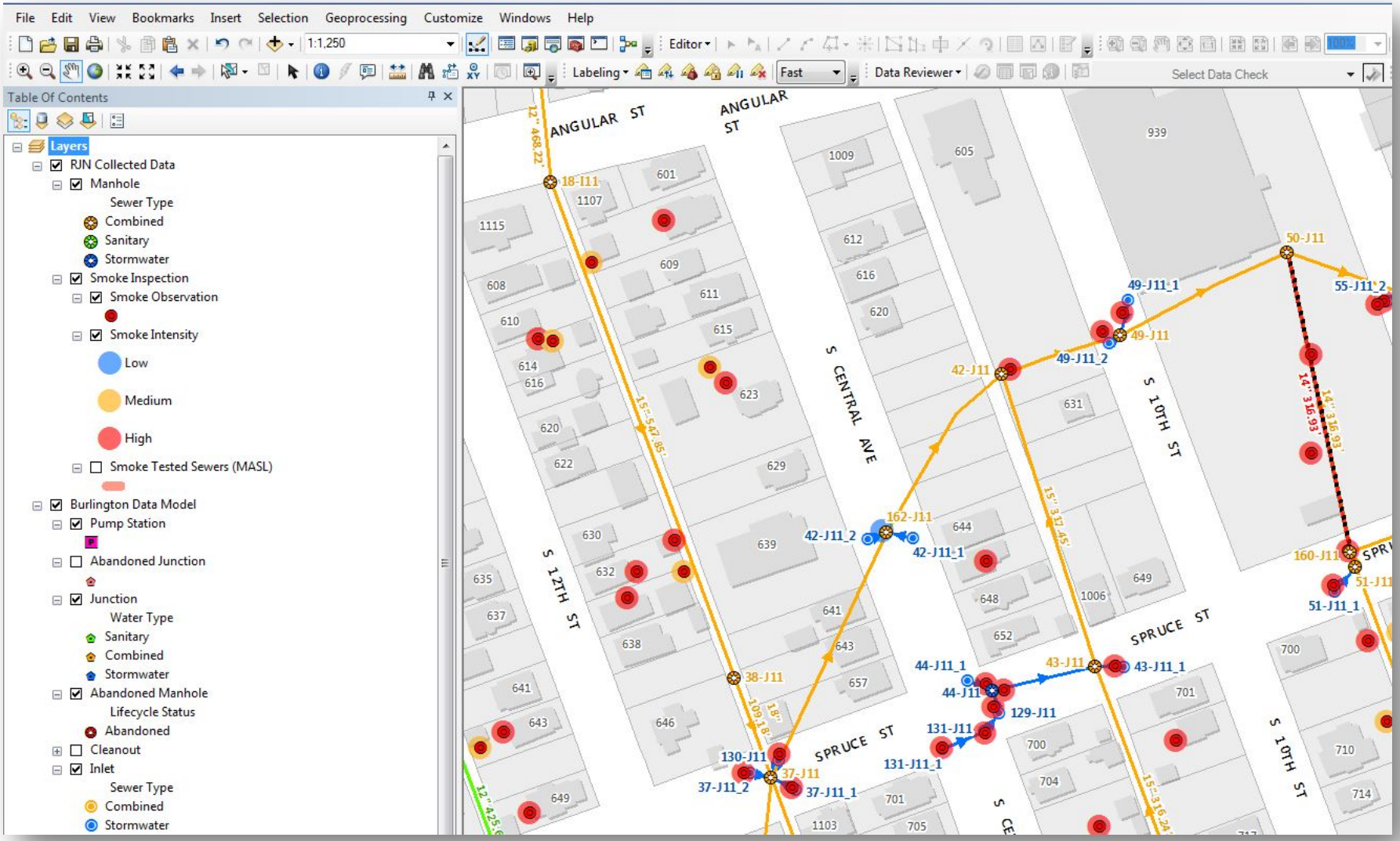
- Map Services
- Internet Browsers or Mobile Applications

RJN Online

- Web Based Application to view Flow Monitoring and SSES Data
- Does Not Require Existing GIS

RJN Online version 1.0

- Burlington's Access to Spatial Data
- Live Data Over the Internet
- Immediate Use of Assets with GIS Software
- Project Management
- Communication with RJN Group


File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:1,250
Editor
Labeling
Fast
Data Reviewer
Select Data Check
Table Of Contents
Layers
RJN Collected Data
Manhole
Sewer Type
Combined
Sanitary
Stormwater
Smoke Inspection
Smoke Observation
Smoke Intensity
Low
Medium
High
Smoke Tested Sewers (MASL)
Burlington Data Model
Pump Station
Abandoned Junction
Junction
Water Type
Sanitary
Combined
Stormwater
Abandoned Manhole
Lifecycle Status
Abandoned
Cleanout
Inlet
Sewer Type
Combined
Stormwater
ANGULAR ST
S CENTRAL AVE
S 12TH ST
S 10TH ST
SPRUCE ST
18-I11
38-J11
37-J11
37-J11_1
37-J11_2
130-J11
131-J11
131-J11_1
129-J11
44-J11
44-J11_1
43-J11
43-J11_1
42-J11
42-J11_1
42-J11_2
162-J11
49-J11
49-J11_1
49-J11_2
50-J11
55-J11_2
160-J11
51-J11
51-J11_1

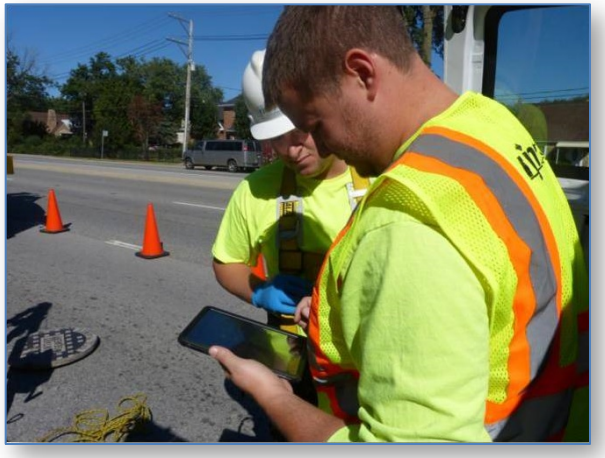
ArcGIS Online

- Software As A Service (SAAS)
- Easy To Use, Yet Powerful GIS
- Portable and Reliable
- It’s Live and Timely
- Developed and Maintained by ESRI
- Secure and Encrypted
- Hosted in the “Cloud”

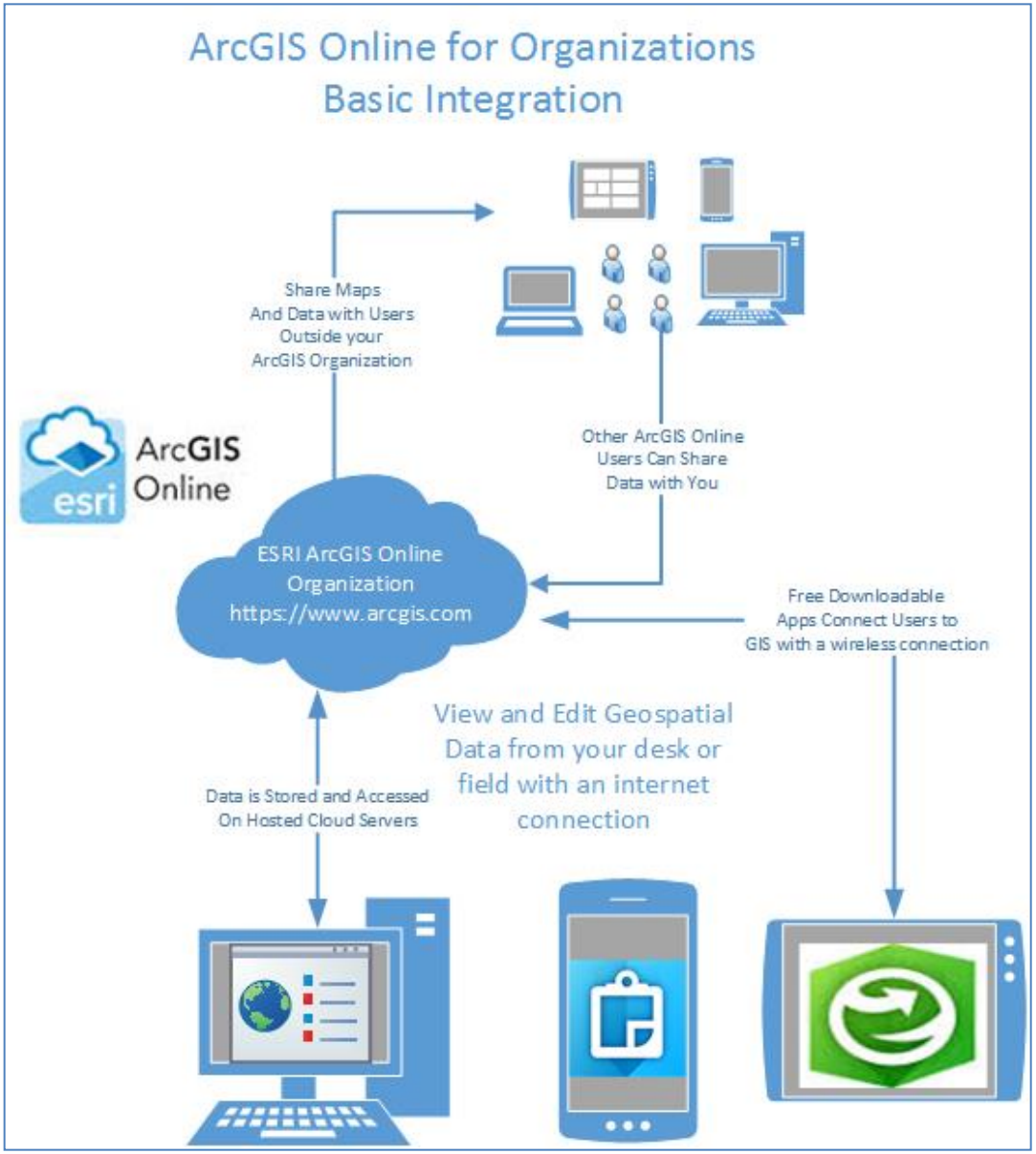
ArcGIS Online Demonstration

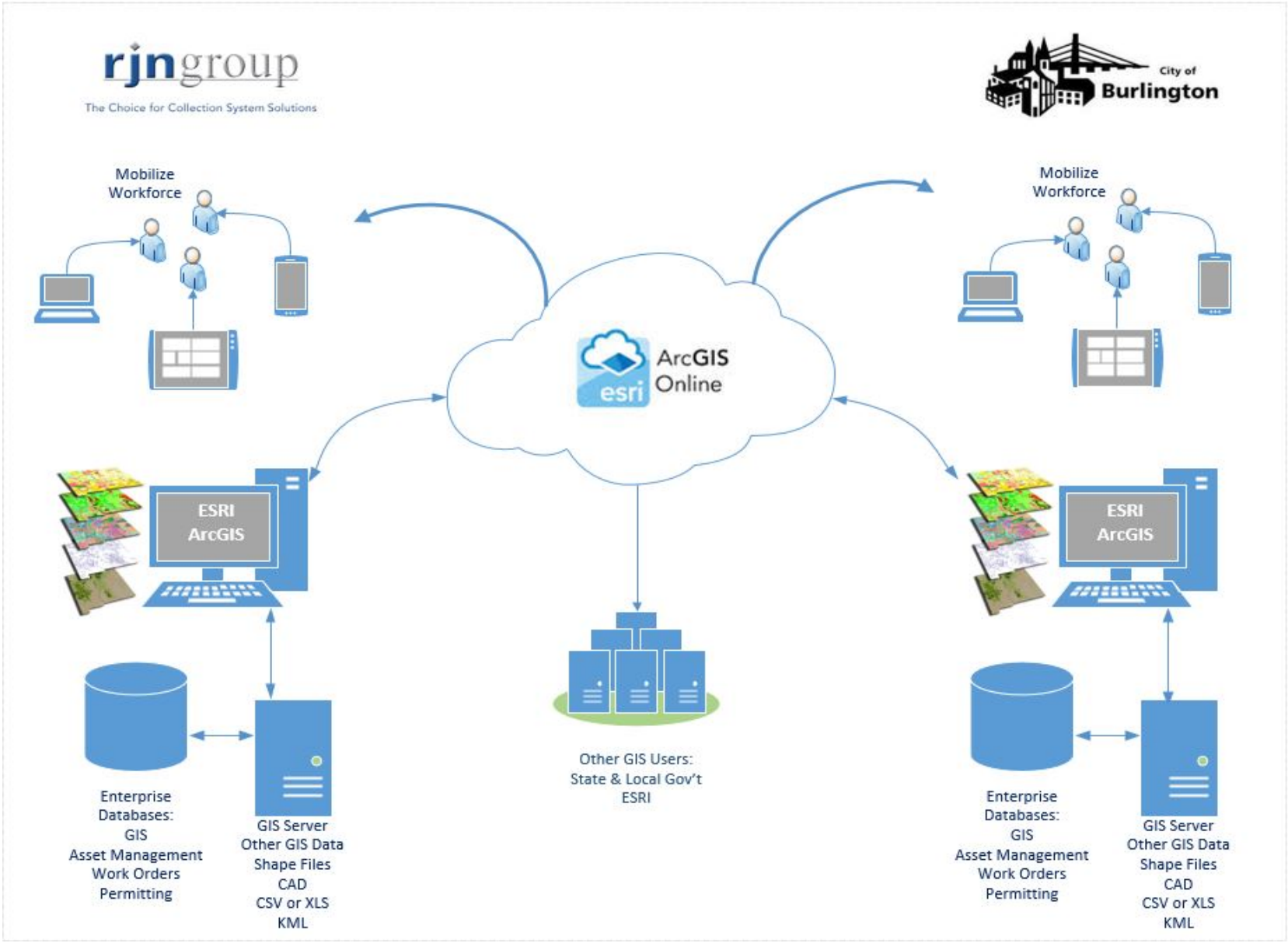
MOBILE

- Your GIS in the Field
- Free ESRI Apps
- Connects Directly to ArcGIS Online
- Create or Edit Spatial Data



Mobile Demonstration


ArcGIS Online for Organizations
Basic Integration
Share Maps
And Data with Users
Outside your
ArcGIS Organization
Other ArcGIS Online
Users Can Share
Data with You
ArcGIS
Online
esri
ESRI ArcGIS Online
Organization
https://www.arcgis.com
Free Downloadable
Apps Connect Users to
GIS with a wireless connection
View and Edit Geospatial
Data from your desk or
field with an internet
connection
Data is Stored and Accessed
On Hosted Cloud Servers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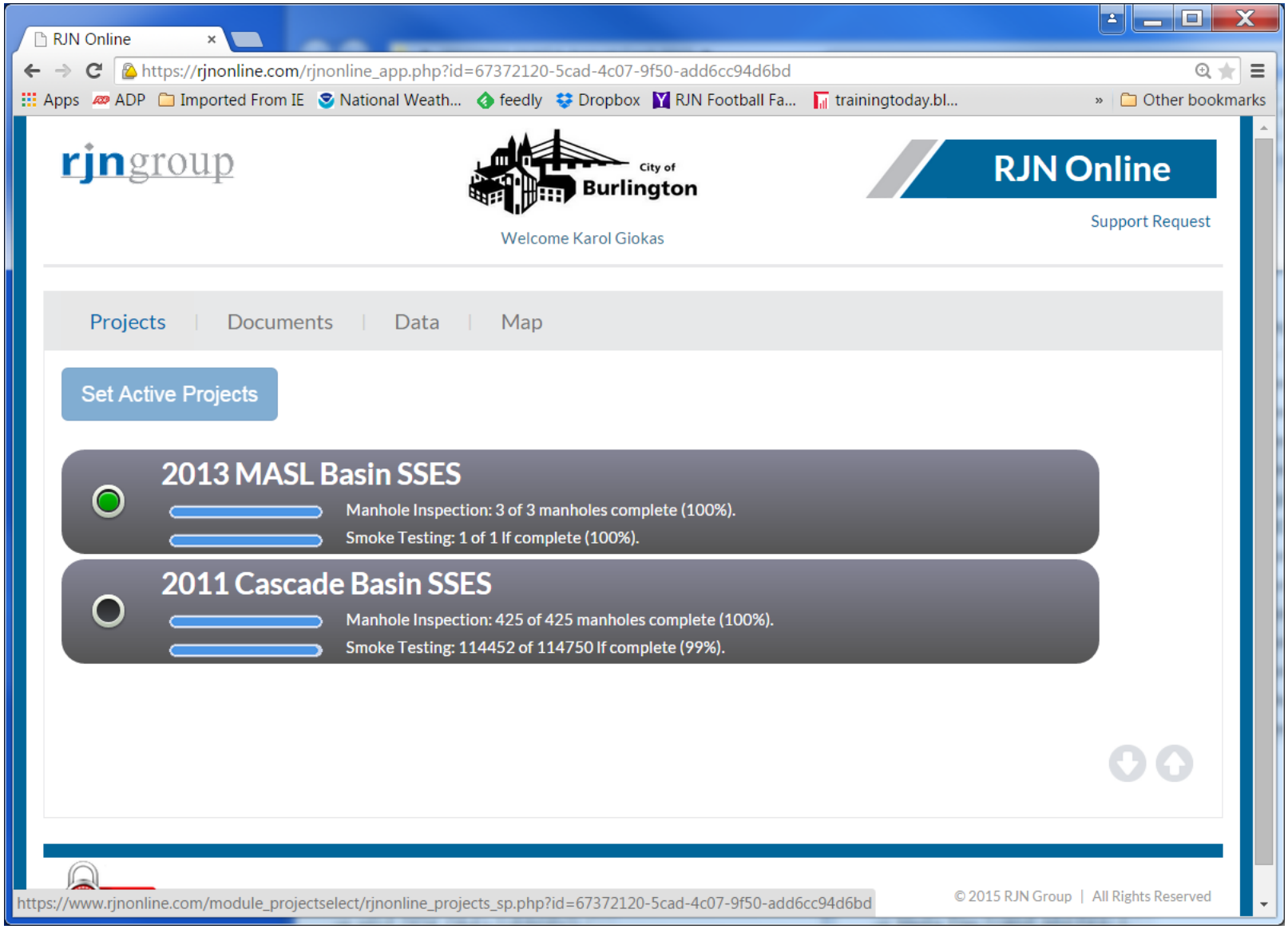
The Choice for Collection System Solutions
City of Burlington
Mobilize Workforce
Mobilize Workforce
ArcGIS Online
esri
ESRI ArcGIS
ESRI ArcGIS
Enterprise Databases:
GIS
Asset Management
Work Orders
Permitting
GIS Server
Other GIS Data
Shape Files
CAD
CSV or XLS
KML
Other GIS Users:
State & Local Gov't
ESRI
Enterprise Databases:
GIS
Asset Management
Work Orders
Permitting
GIS Server
Other GIS Data
Shape Files
CAD
CSV or XLS
KML

What If No GIS?

- Ways to Access the Data with No GIS
- RJN Online


RJN Online
https://rjnonline.com/rjnonline_app.php?id=67372120-5cad-4c07-9f50-add6cc94d6bd
Apps
ADP
Imported From IE
National Weath...
feedly
Dropbox
RJN Football Fa...
trainingtoday.bl...
Other bookmarks
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City of Burlington
RJN Online
Support Request
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Projects
Documents
Data
Map
Set Active Projects
2013 MASL Basin SSES
Manhole Inspection: 3 of 3 manholes complete (100%).
Smoke Testing: 1 of 1 lf complete (100%).
2011 Cascade Basin SSES
Manhole Inspection: 425 of 425 manholes complete (100%).
Smoke Testing: 114452 of 114750 lf complete (99%).
https://www.rjnonline.com/module_projectselect/rjnonline_projects_sp.php?id=67372120-5cad-4c07-9f50-add6cc94d6bd
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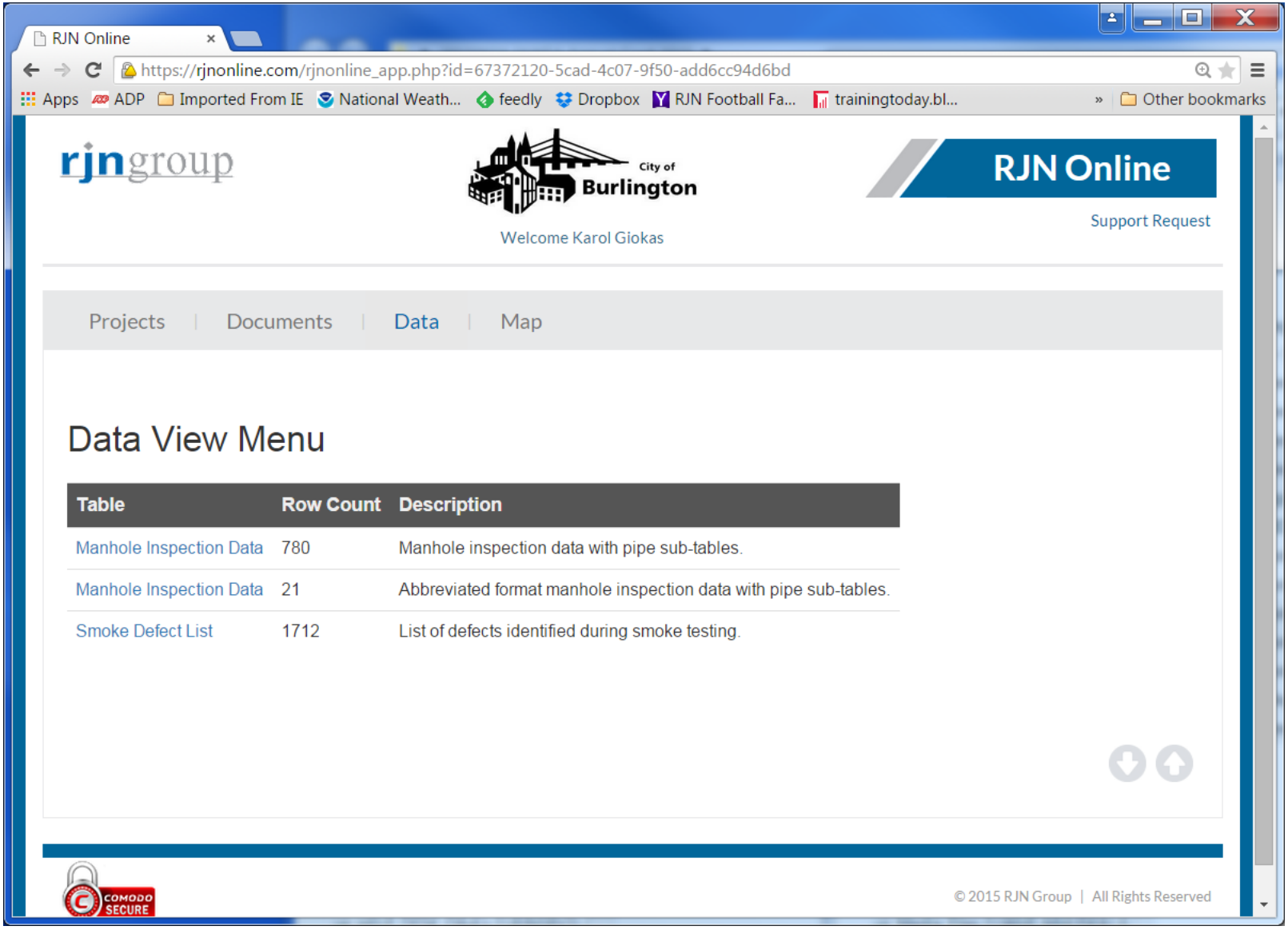
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https://rjnonline.com/rjnonline_app.php?id=67372120-5cad-4c07-9f50-add6cc94d6bd
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feedly
Dropbox
RJN Football Fa...
trainingtoday.bl...
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Documents
Data
Map
Data View Menu
Table
Row Count
Description
Manhole Inspection Data
780
Manhole inspection data with pipe sub-tables.
Manhole Inspection Data
21
Abbreviated format manhole inspection data with pipe sub-tables.
Smoke Defect List
1712
List of defects identified during smoke testing.
COMODO SECURE
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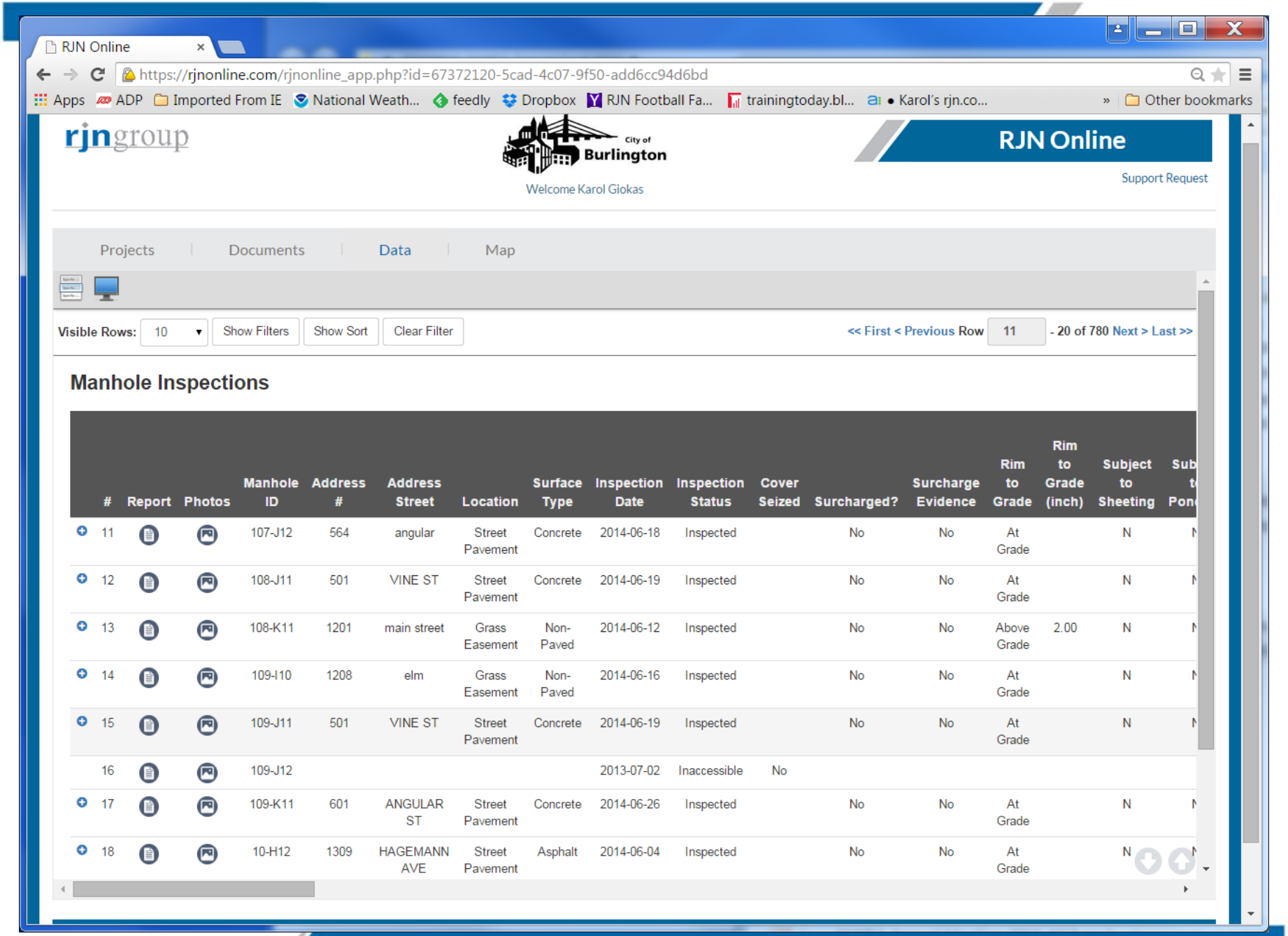
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https://rjnonline.com/rjnonline_app.php?id=67372120-5cad-4c07-9f50-add6cc94d6bd
Apps ADP Imported From IE National Weath... feedly Dropbox RJN Football Fa... trainingtoday.bl... Karol's rjn.co... Other bookmarks
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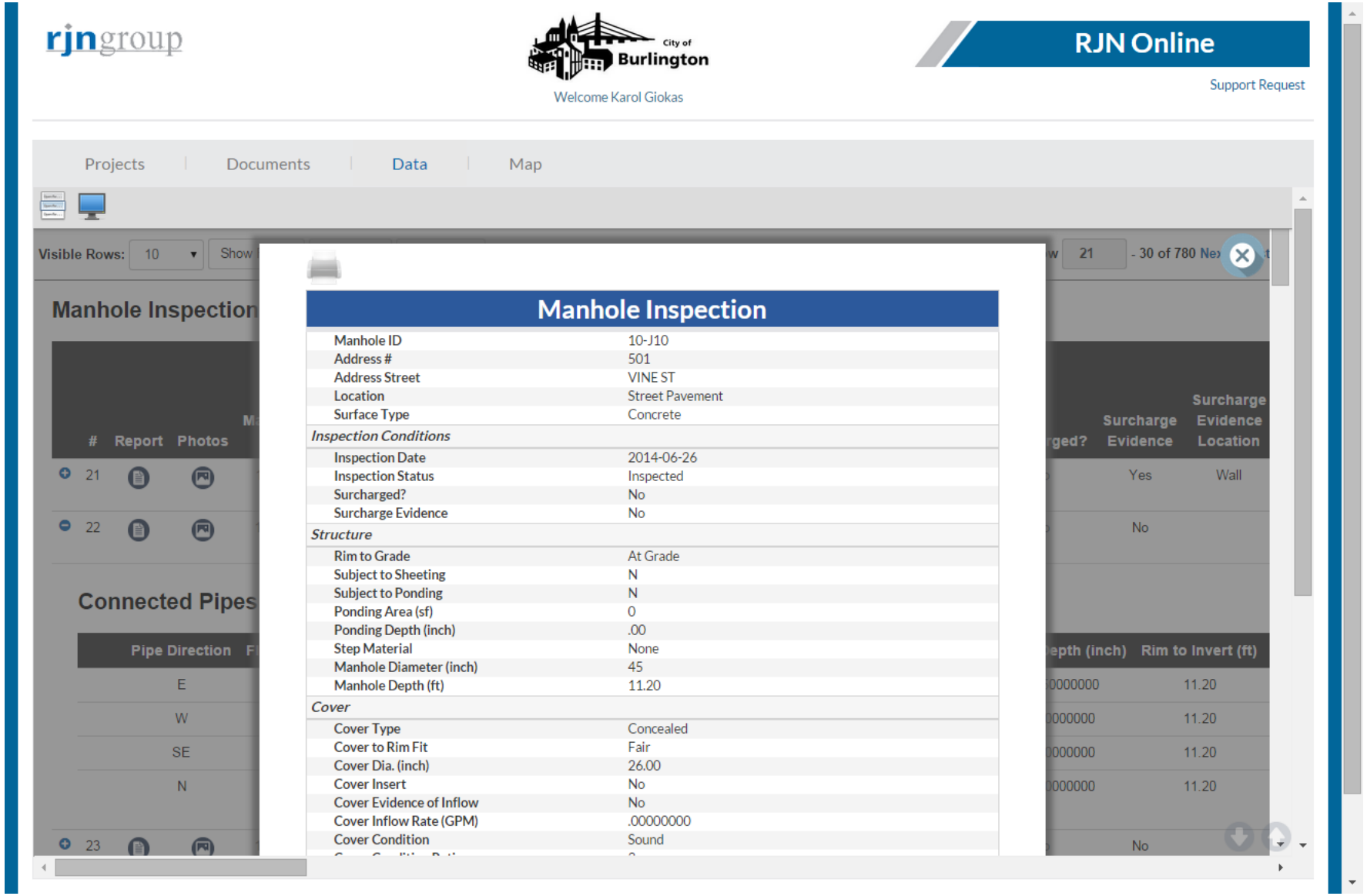
RJN Online
Welcome Karol Giokas
Support Request
Projects Documents Data Map
Visible Rows: 10 Show Filters Show Sort Clear Filter
<< First < Previous Row 11 - 20 of 780 Next > Last >>
Manhole Inspections
Report Photos Manhole ID Address # Address Street Location Surface Type Inspection Date Inspection Status Cover Seized Surcharged? Surcharge Evidence Rim to Grade Rim to Grade (inch) Subject to Sheeting Sub
11 107-J12 564 angular Street Pavement Concrete 2014-06-18 Inspected No No At Grade N
12 108-J11 501 VINE ST Street Pavement Concrete 2014-06-19 Inspected No No At Grade N
13 108-K11 1201 main street Grass Easement Non-Paved 2014-06-12 Inspected No No Above Grade 2.00 N
14 109-I10 1208 elm Grass Easement Non-Paved 2014-06-16 Inspected No No At Grade N
15 109-J11 501 VINE ST Street Pavement Concrete 2014-06-19 Inspected No No At Grade N
16 109-J12 2013-07-02 Inaccessible No
17 109-K11 601 ANGULAR ST Street Pavement Concrete 2014-06-26 Inspected No No At Grade N
18 10-H12 1309 HAGEMANN AVE Street Pavement Asphalt 2014-06-04 Inspected No No At Grade N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Projects
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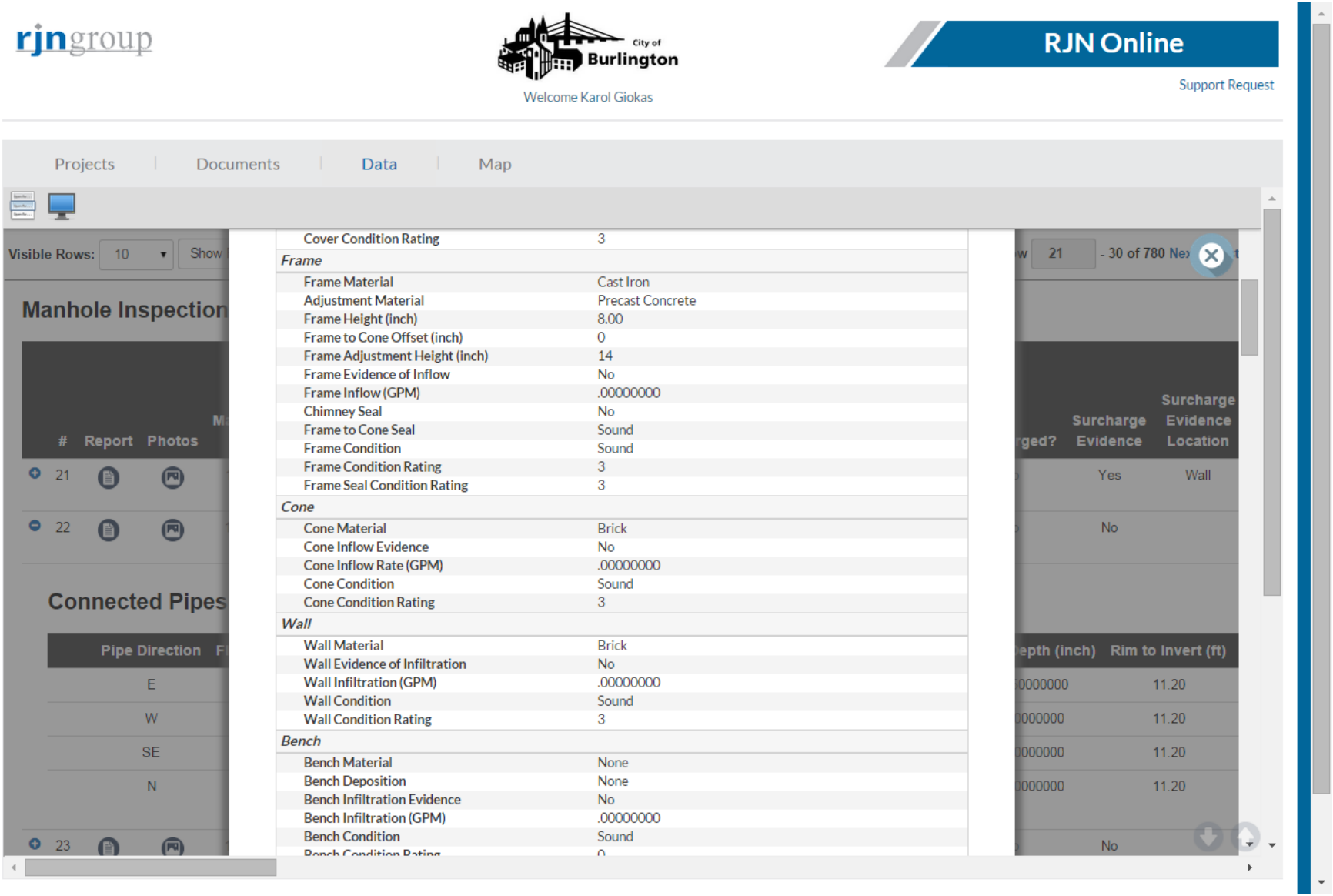
Map
Visible Rows: 10
Show
21
- 30 of 780
Manhole Inspection
Report Photos
21
22
Connected Pipes
Pipe Direction
E
W
SE
N
23
Surcharge Evidence
Surcharge Evidence Location
Yes
Wall
No
Rim to Invert (ft)
11.20
11.20
11.20
11.20
No
Manhole Inspection
Manhole ID 10-J10
Address # 501
Address Street VINE ST
Location Street Pavement
Surface Type Concrete
Inspection Conditions
Inspection Date 2014-06-26
Inspection Status Inspected
Surcharged? No
Surcharge Evidence No
Structure
Rim to Grade At Grade
Subject to Sheeting N
Subject to Ponding N
Ponding Area (sf) 0
Ponding Depth (inch) .00
Step Material None
Manhole Diameter (inch) 45
Manhole Depth (ft) 11.20
Cover
Cover Type Concealed
Cover to Rim Fit Fair
Cover Dia. (inch) 26.00
Cover Insert No
Cover Evidence of Inflow No
Cover Inflow Rate (GPM) .00000000
Cover Condition Sound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Visible Rows: 10
Show
Manhole Inspection
Report Photos
21
22
23
Connected Pipes
Pipe Direction
E
W
SE
N
Cover Condition Rating 3
Frame
Frame Material Cast Iron
Adjustment Material Precast Concrete
Frame Height (inch) 8.00
Frame to Cone Offset (inch) 0
Frame Adjustment Height (inch) 14
Frame Evidence of Inflow No
Frame Inflow (GPM) .00000000
Chimney Seal No
Frame to Cone Seal Sound
Frame Condition Sound
Frame Condition Rating 3
Frame Seal Condition Rating 3
Cone
Cone Material Brick
Cone Inflow Evidence No
Cone Inflow Rate (GPM) .00000000
Cone Condition Sound
Cone Condition Rating 3
Wall
Wall Material Brick
Wall Evidence of Infiltration No
Wall Infiltration (GPM) .00000000
Wall Condition Sound
Wall Condition Rating 3
Bench
Bench Material None
Bench Deposition None
Bench Infiltration Evidence No
Bench Infiltration (GPM) .00000000
Bench Condition Sound
21 - 30 of 780
Surcharge Evidence
Surcharge Evidence Location
Yes
Wall
No
Rim to Invert (ft)
11.20
11.20
11.20
11.20
No

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Projects | Documents | Data | Map

Visible Rows: 10 Show

Manhole Inspection

#	Report	Photos
21		
22		

Connected Pipes

Pipe Direction
E
W
SE
N
23

Trough	
Trough Material	Brick
Trough Deposition	None
Trough Infiltration Evidence	No
Trough Infiltration Rate (GPM)	.00000000
Trough Condition	Sound
Trough Condition Rating	3
Pipe Seals	
Pipe Seal Infiltration Evidence	No
Pipe Seal Infiltration Rate (GP	.00000000
Pipe Seal Condition	Sound
Pipe Seal Condition Rating	3
Photo Description	Cover

Photo Description	Topside

21 - 30 of 780 Ne

ged?	Surcharge Evidence	Surcharge Evidence Location
	Yes	Wall
	No	
	No	

epth (inch)	Rim to Invert (ft)
0000000	11.20
0000000	11.20
0000000	11.20
0000000	11.20

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Manhole Inspection

#	Report	Photos
21		
22		

Connected Pipes

Pipe Direction
E
W
SE
N
23

Photo Description Topside

Photo Description Frame

21 - 30 of 780 Next

Surcharge Evidence	Surcharge Evidence Location
Yes	Wall
No	
No	

Rim to Invert (ft)
11.20
11.20
11.20
11.20

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Visible Rows: 10 Show

Manhole Inspection

#	Report	Photos
21		
22		

Connected Pipes

Pipe Direction
E
W
SE
N
23

Photo Description	Area

Connected Pipe

Pipe Direction	E
Flow Direction	Out
Connected Manhole	141-J11
Pipe Shape	Circular
Pipe Width (inch)	21.000
Pipe Height (inch)	21.000
Pipe Material	VCP
Flow Depth (inch)	1.50000000
Rim to Invert (ft)	11.20
Rim to Drop-Invert (ft)	.00
Photo Description	Up-Pipe

21 - 30 of 780 Ne

Surcharge Evidence	Surcharge Evidence Location	Rim to Invert (ft)
Yes	Wall	11.20
No		11.20
		11.20
		11.20
No		

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Manhole Inspection

#	Report	Photos
21		
22		

Connected Pipes

Pipe Direction
E
W
SE
N
23

Connected Pipe

Pipe Direction	E
Flow Direction	Out
Connected Manhole	141-J11
Pipe Shape	Circular
Pipe Width (inch)	21.000
Pipe Height (inch)	21.000
Pipe Material	VCP
Flow Depth (inch)	1.50000000
Rim to Invert (ft)	11.20
Rim to Drop-Invert (ft)	.00
Photo Description	Up-Pipe

Connected Pipe

Pipe Direction	W

21 - 30 of 780 Ne

Surcharge Evidence	Surcharge Evidence Location
Yes	Wall
No	

epth (inch)	Rim to Invert (ft)
0000000	11.20
0000000	11.20
0000000	11.20
0000000	11.20
	No

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Visible Rows: 10 Show

Manhole Inspection

#	Report	Photos
21		
22		

Connected Pipes

Pipe Direction
E
W
SE
N
23

Connected Pipe

Pipe Direction	W
Flow Direction	In
Connected Manhole	153-J11
Pipe Shape	Circular
Pipe Width (inch)	18.000
Pipe Height (inch)	18.000
Pipe Material	VCP
Flow Depth (inch)	.20000000
Rim to Invert (ft)	11.20
Rim to Drop-Invert (ft)	.00
Photo Description	Up-Pipe

Connected Pipe

21 - 30 of 780 Ne

Surcharge	Surcharge Evidence Location
Yes	Wall
No	
No	

epth (inch)	Rim to Invert (ft)
0000000	11.20
0000000	11.20
0000000	11.20
0000000	11.20

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Projects | Documents | Data | Map

Visible Rows: 10 Show

Manhole Inspection

#	Report	Photos
21		
22		

Connected Pipes

Pipe Direction
E
W
SE
N
23

21 - 30 of 780 Next

Surcharge Evidence	Surcharge Evidence Location
Yes	Wall
No	

Depth (inch)	Rim to Invert (ft)
0000000	11.20
0000000	11.20
0000000	11.20
0000000	11.20
	No

Connected Pipe

Pipe Direction	SE
Flow Direction	In
Connected Manhole	unknown
Pipe Shape	Circular
Pipe Width (inch)	9.000
Pipe Height (inch)	9.000
Pipe Material	VCP
Flow Depth (inch)	.10000000
Rim to Invert (ft)	11.20
Rim to Drop-Invert (ft)	.00
Photo Description	Up-Pipe

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Support Request

Projects | Documents | Data | Map

Visible Rows: 10 Show

Manhole Inspection

#	Report	Photos
21		
22		
23		

Connected Pipes

Pipe Direction
E
W
SE
N

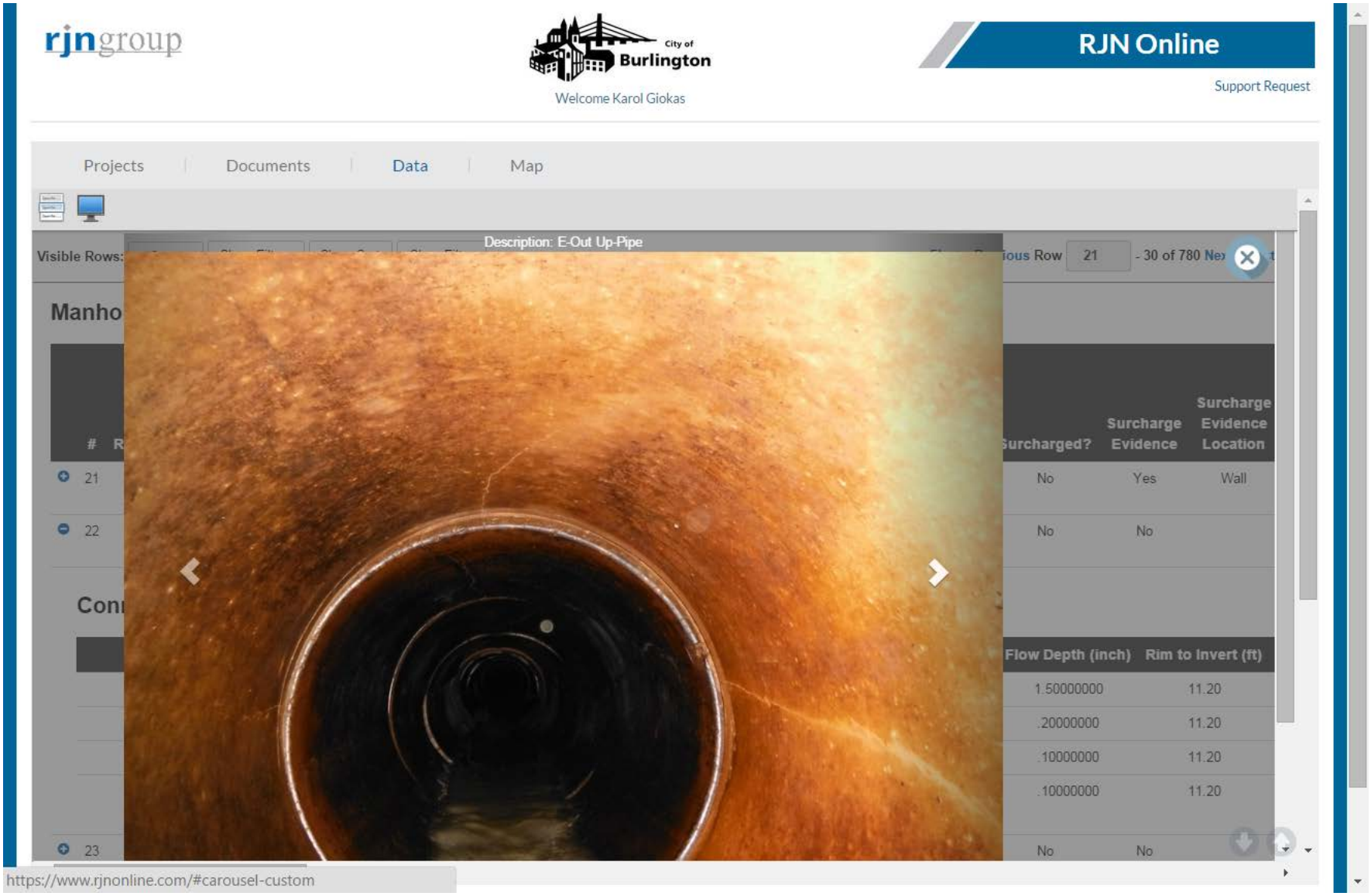
21 - 30 of 780 Next

Surcharge Evidence	Surcharge Evidence Location
Yes	Wall
No	
No	

epth (inch)	Rim to Invert (ft)
0000000	11.20
0000000	11.20
0000000	11.20
0000000	11.20

Connected Pipe

Pipe Direction	N
Flow Direction	In
Connected Manhole	unknown
Pipe Shape	Circular
Pipe Width (inch)	12.000
Pipe Height (inch)	12.000
Pipe Material	VCP
Flow Depth (inch)	.10000000
Rim to Invert (ft)	11.20
Rim to Drop-Invert (ft)	.00
Photo Description	Up-Pipe


rjngroup
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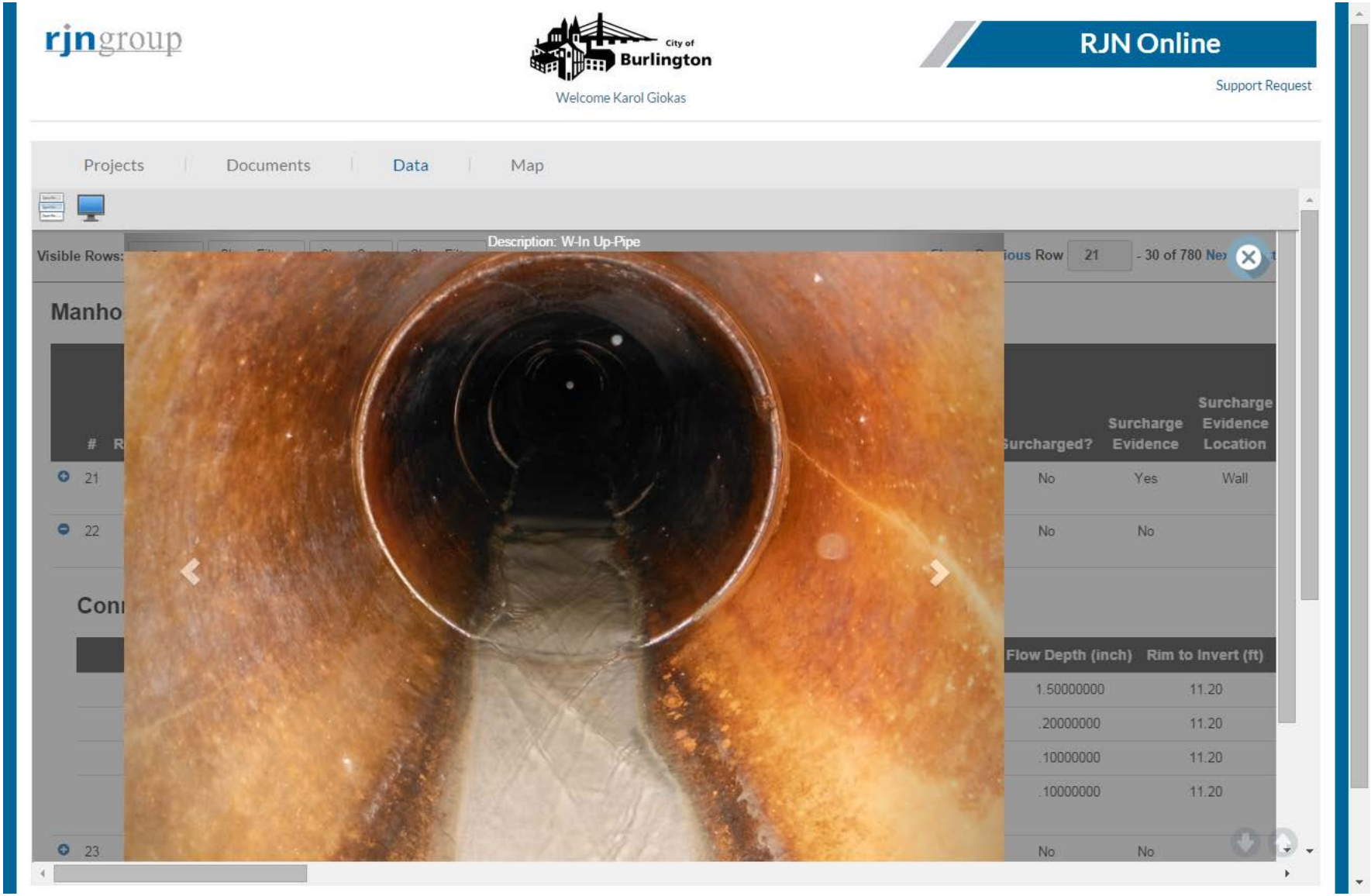
RJN Online
Support Request
Projects
Documents
Data
Map
Description: E-Out Up-Pipe
Visible Rows:
Row 21
- 30 of 780
Manho
Surcharged?
Surcharge Evidence
Surcharge Evidence Location
21
No
Yes
Wall
22
No
No
Flow Depth (inch)
Rim to Invert (ft)
1.50000000
11.20
.20000000
11.20
.10000000
11.20
.10000000
11.20
23
No
No
https://www.rjnonline.com/#carousel-custom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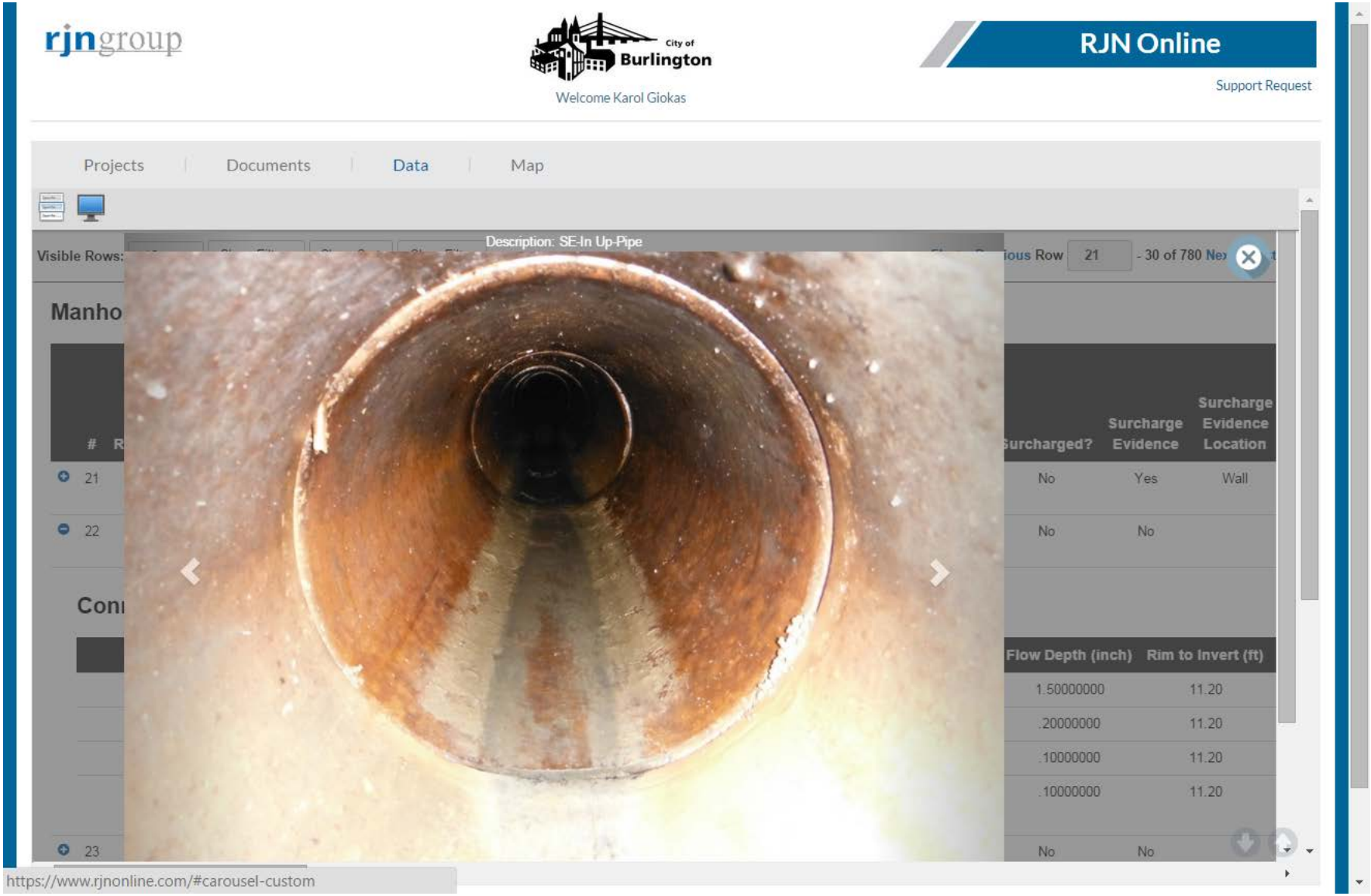
Map
Description: W-In Up-Pipe
Visible Rows:
ious Row 21 - 30 of 780 Nex
Manho
R
Surcharged?
Surcharge Evidence
Surcharge Evidence Location
21 No Yes Wall
22 No No
Conn
Flow Depth (inch)
Rim to Invert (ft)
1.50000000 11.20
.20000000 11.20
.10000000 11.20
.10000000 11.20
23 No No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Map
Description: SE-In Up-Pipe
Visible Rows:
ious Row 21 - 30 of 780 Nex
Manho
R
Surcharged?
Surcharge Evidence
Surcharge Evidence Location
21 No Yes Wall
22 No No
Conn
Flow Depth (inch)
Rim to Invert (ft)
1.50000000 11.20
.20000000 11.20
.10000000 11.20
.10000000 11.20
23 No No
https://www.rjnonline.com/#carousel-custom

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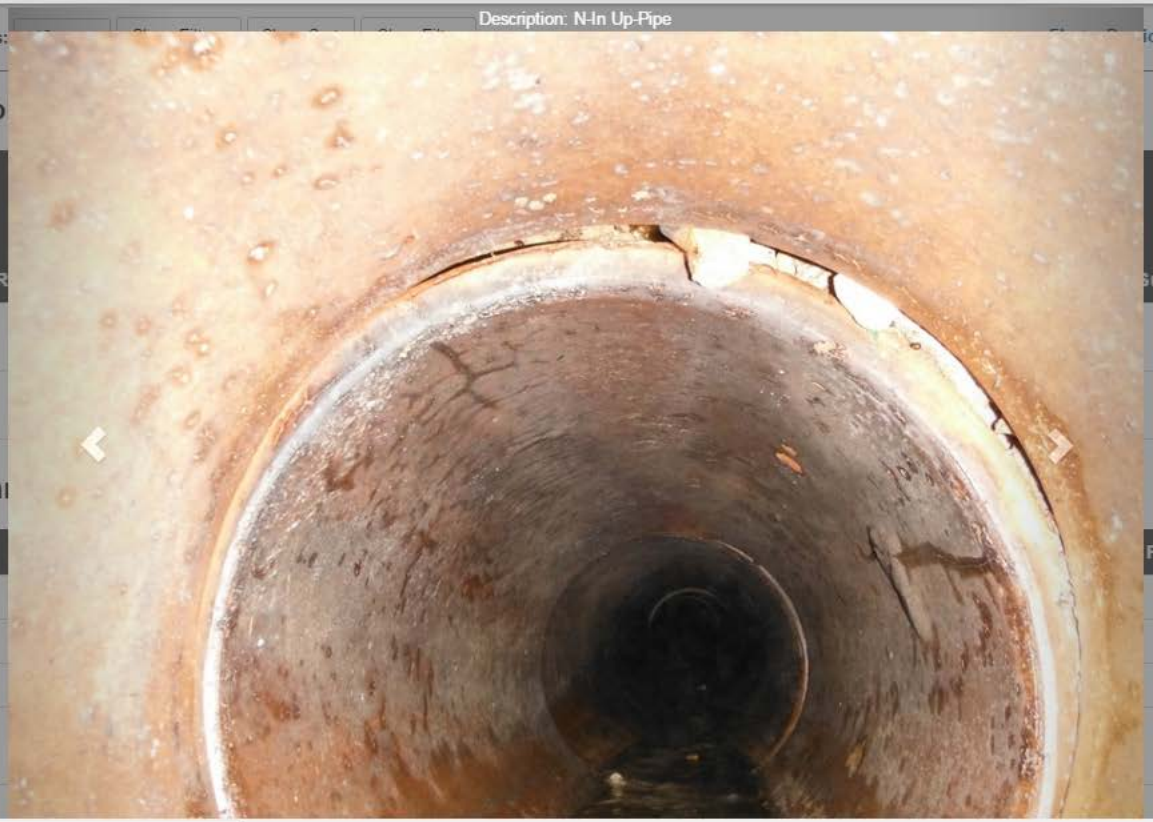

Visible Rows: ious Row 21 - 30 of 780 Nex

Manho

#	Surcharged?	Surcharge Evidence	Surcharge Evidence Location
21	No	Yes	Wall
22	No	No	

Conn

Flow Depth (inch)	Rim to Invert (ft)
1.50000000	11.20
.20000000	11.20
.10000000	11.20
.10000000	11.20

23	No	No	

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Visible Rows:

ious Row 21 - 30 of 780 Nex

Manho

#	Surcharged?	Surcharge Evidence	Surcharge Evidence Location
21	No	Yes	Wall
22	No	No	
23	No	No	

Con

Flow Depth (inch)	Rim to Invert (ft)
1.50000000	11.20
.20000000	11.20
.10000000	11.20
.10000000	11.20

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Visible Rows: ... ious Row 21 - 30 of 780 Nex

Manho

#	R	Surcharged?	Surcharge Evidence	Surcharge Evidence Location
21		No	Yes	Wall
22		No	No	

Conn

Flow Depth (inch)	Rim to Invert (ft)
1.50000000	11.20
.20000000	11.20
.10000000	11.20
.10000000	11.20

23		No	No

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Visible Rows: ... ious Row 21 - 30 of 780 Nex

Manho

#	R	Surcharged?	Surcharge Evidence	Surcharge Evidence Location
21		No	Yes	Wall
22		No	No	

Conn

Flow Depth (inch)	Rim to Invert (ft)
1.50000000	11.20
.20000000	11.20
.10000000	11.20
.10000000	11.20

23		No	No

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Visible Rows:

ious Row 21 - 30 of 780 Nex

Manho

#	R	Surcharged?	Surcharge Evidence	Surcharge Evidence Location
21		No	Yes	Wall
22		No	No	
23		No	No	

Con

Flow Depth (inch)	Rim to Invert (ft)
1.50000000	11.20
.20000000	11.20
.10000000	11.20
.10000000	11.20

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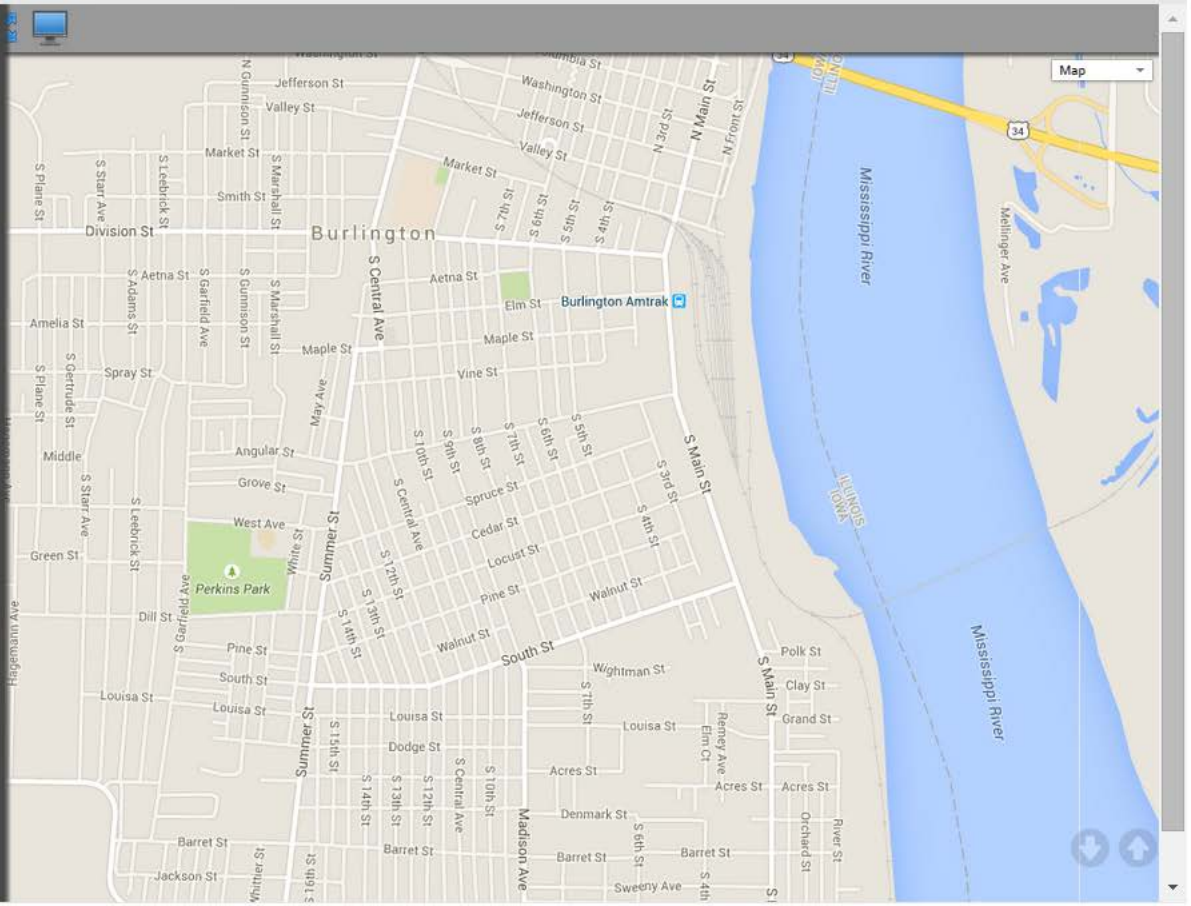
Toggle Layers

- Site Locations
- Smoke Defects
- Manhole Inspection



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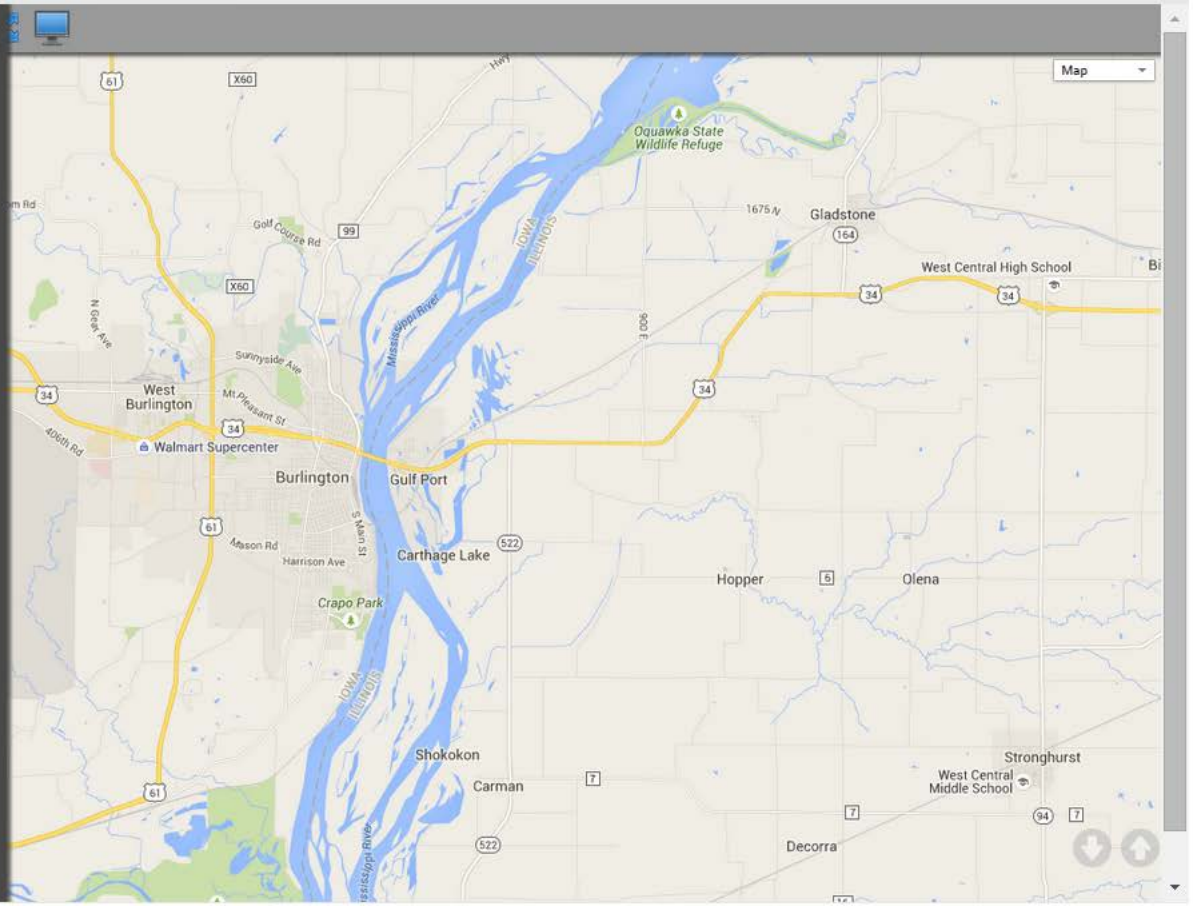
Toggle Layers

- Site Locations
- Smoke Defects
- Manhole Inspection



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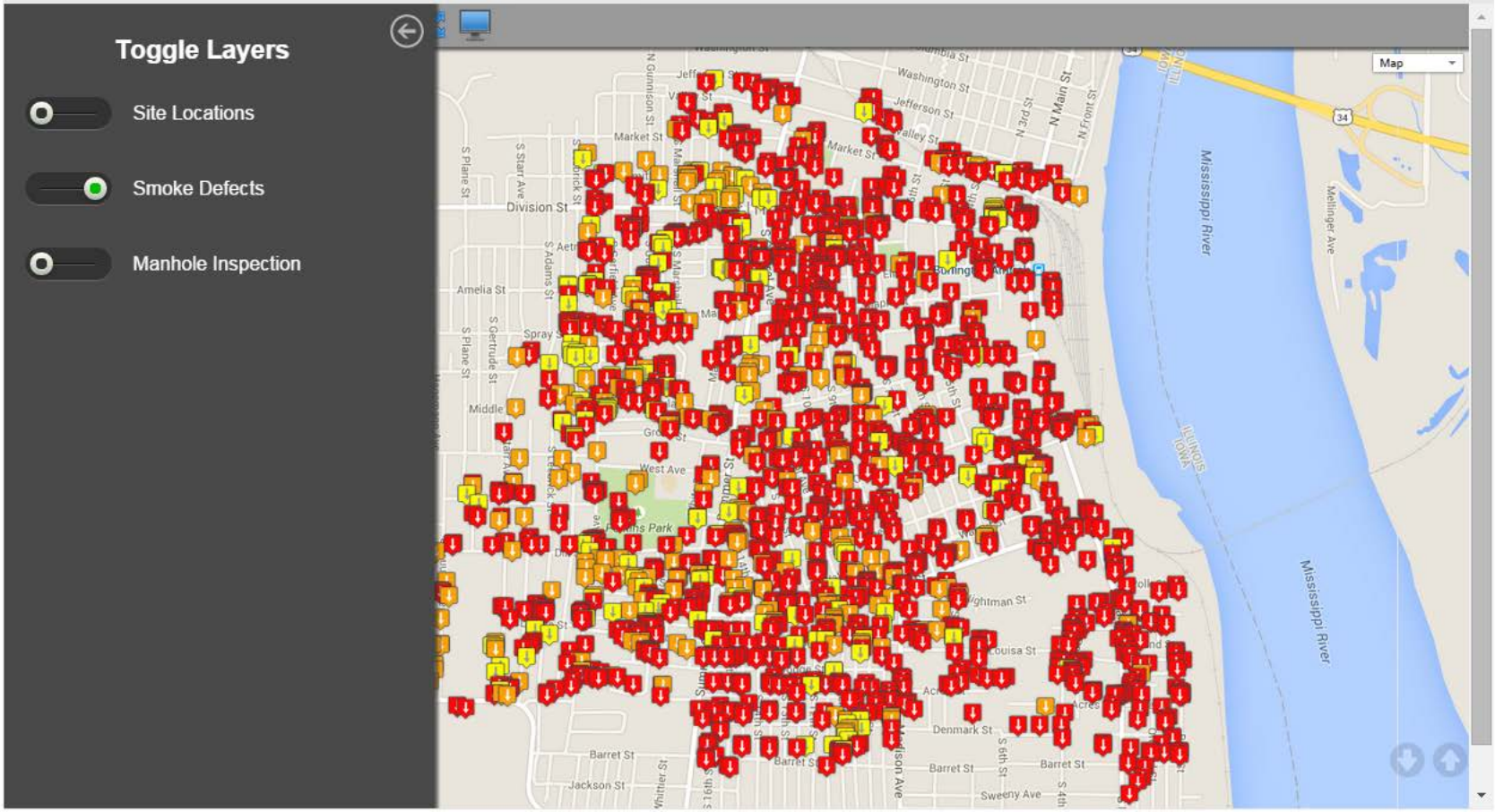

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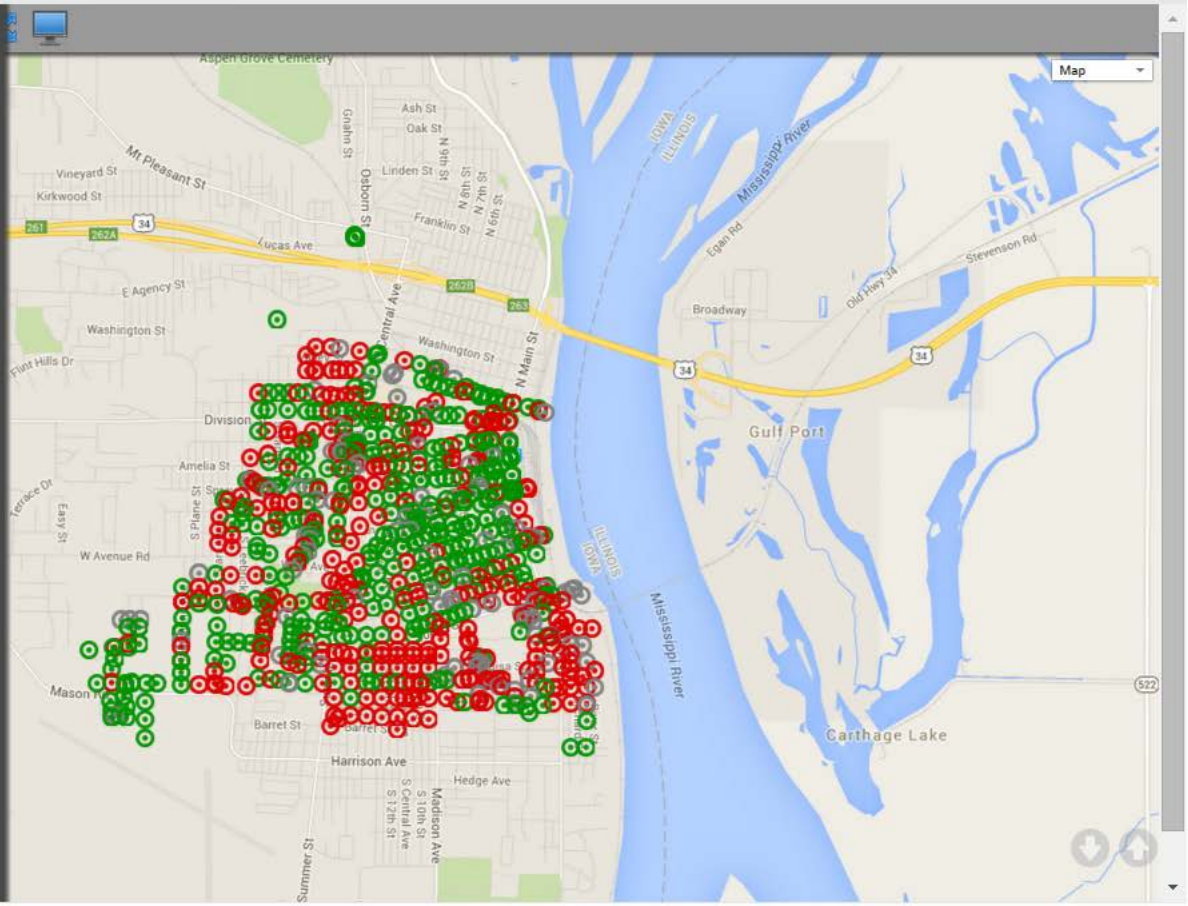
Toggle Layers

- Site Locations
- Smoke Defects
- Manhole Inspection



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Toggle Layers

- Site Locations
- Smoke Defects
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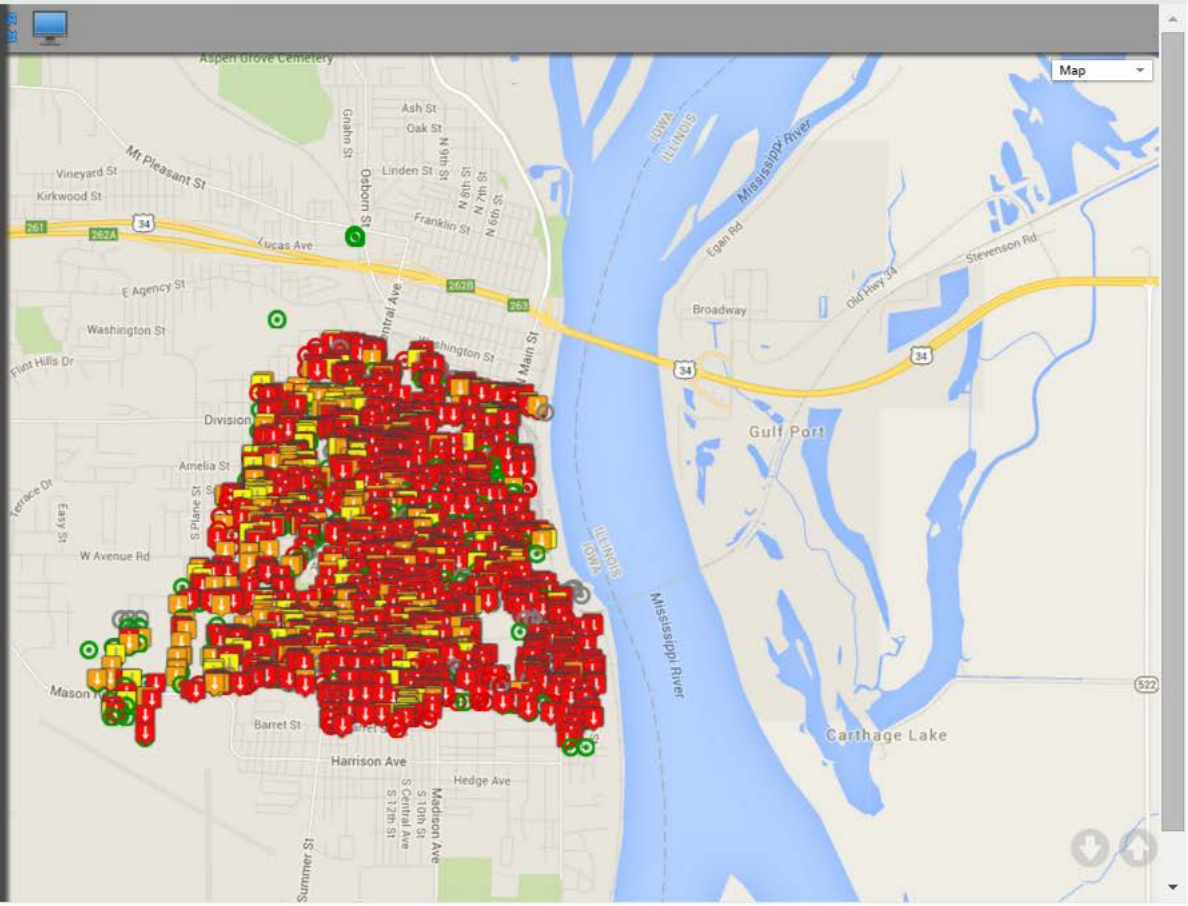

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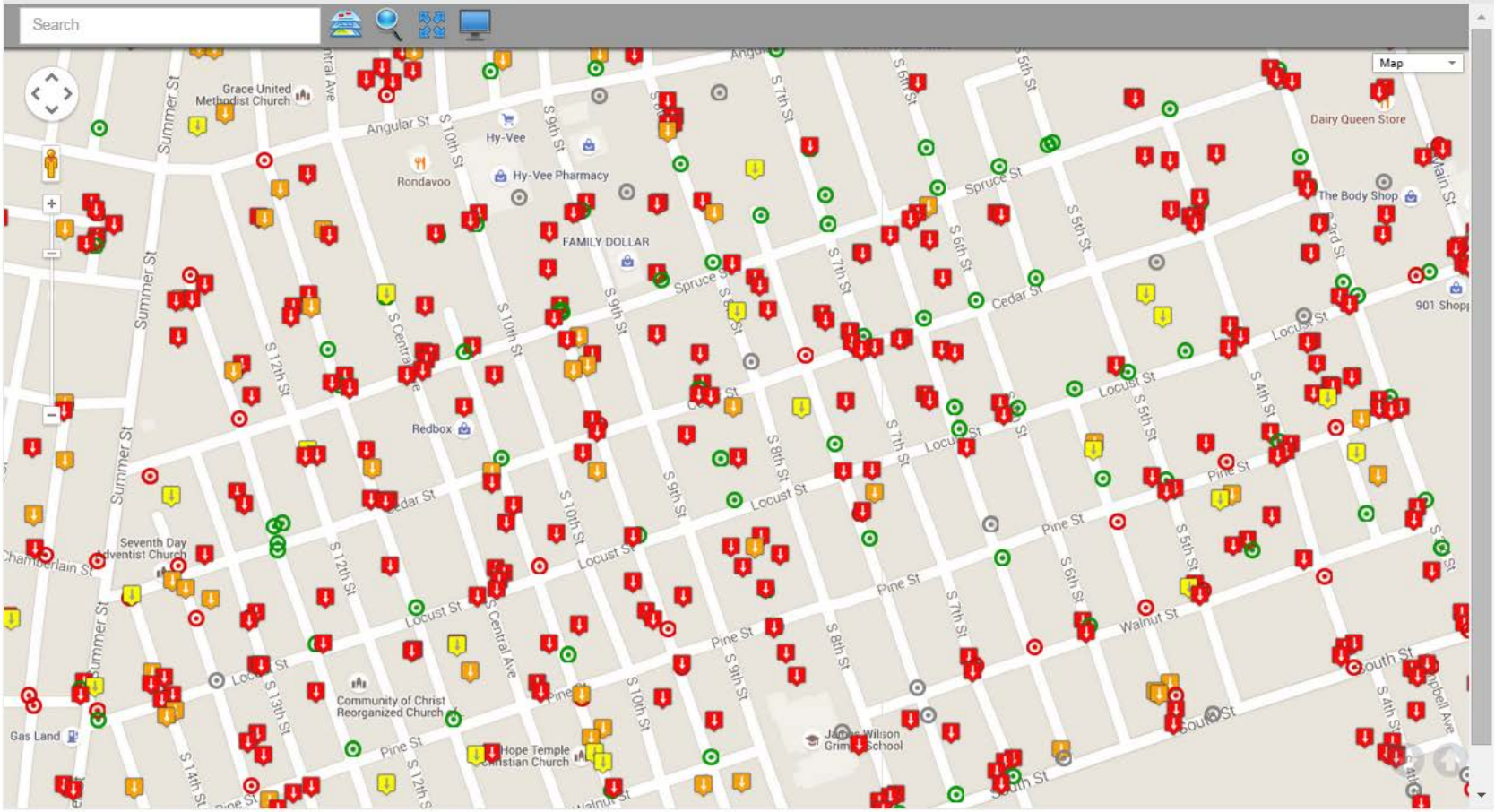

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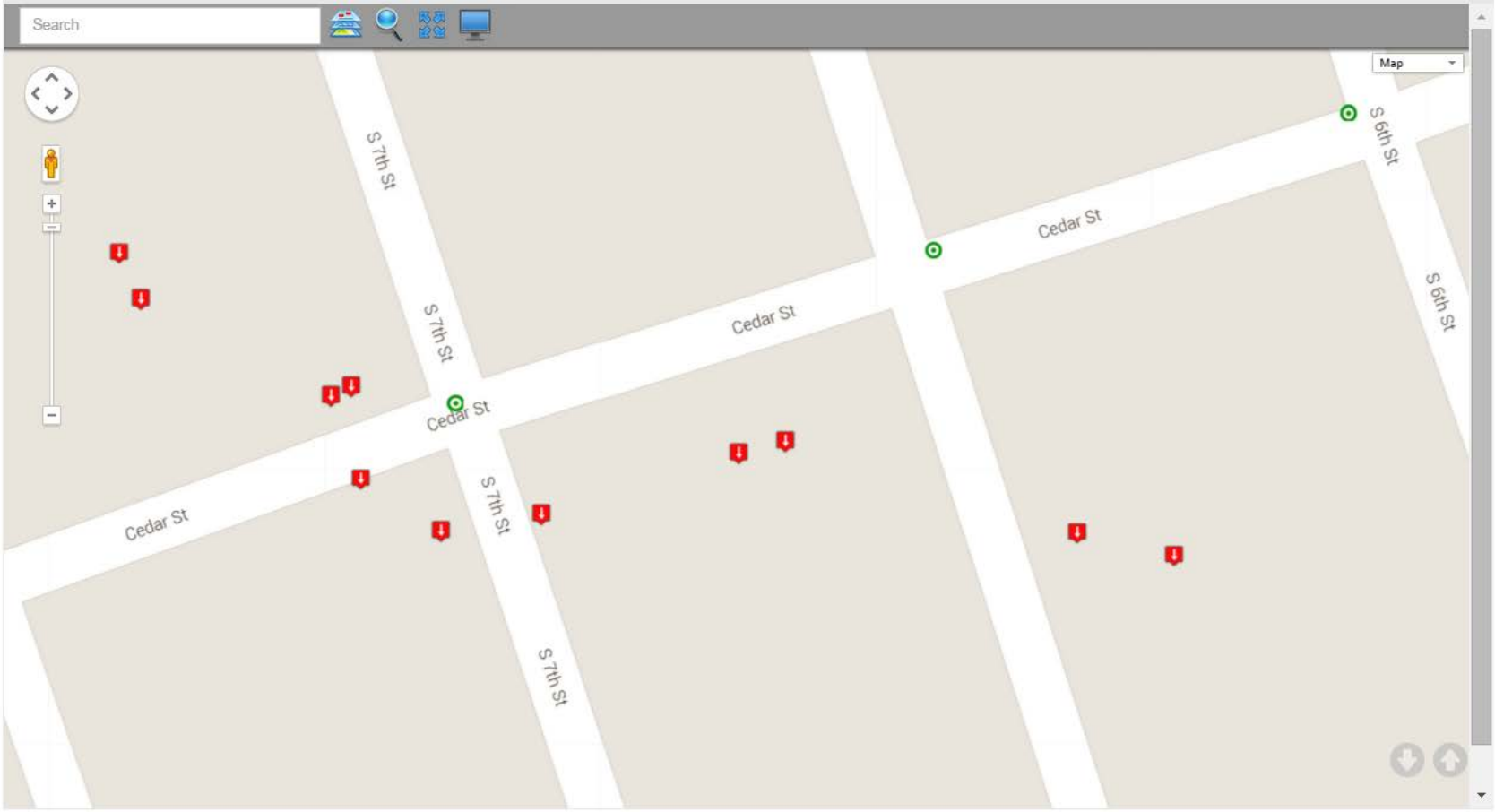

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Search

Map

Storm Inlet
Address: 800 S 7TH ST
Smoke Intensity: High
Report

Cedar St
Cedar St
Cedar St
S 6th St
S 6th St
S 7th St
S 7th St

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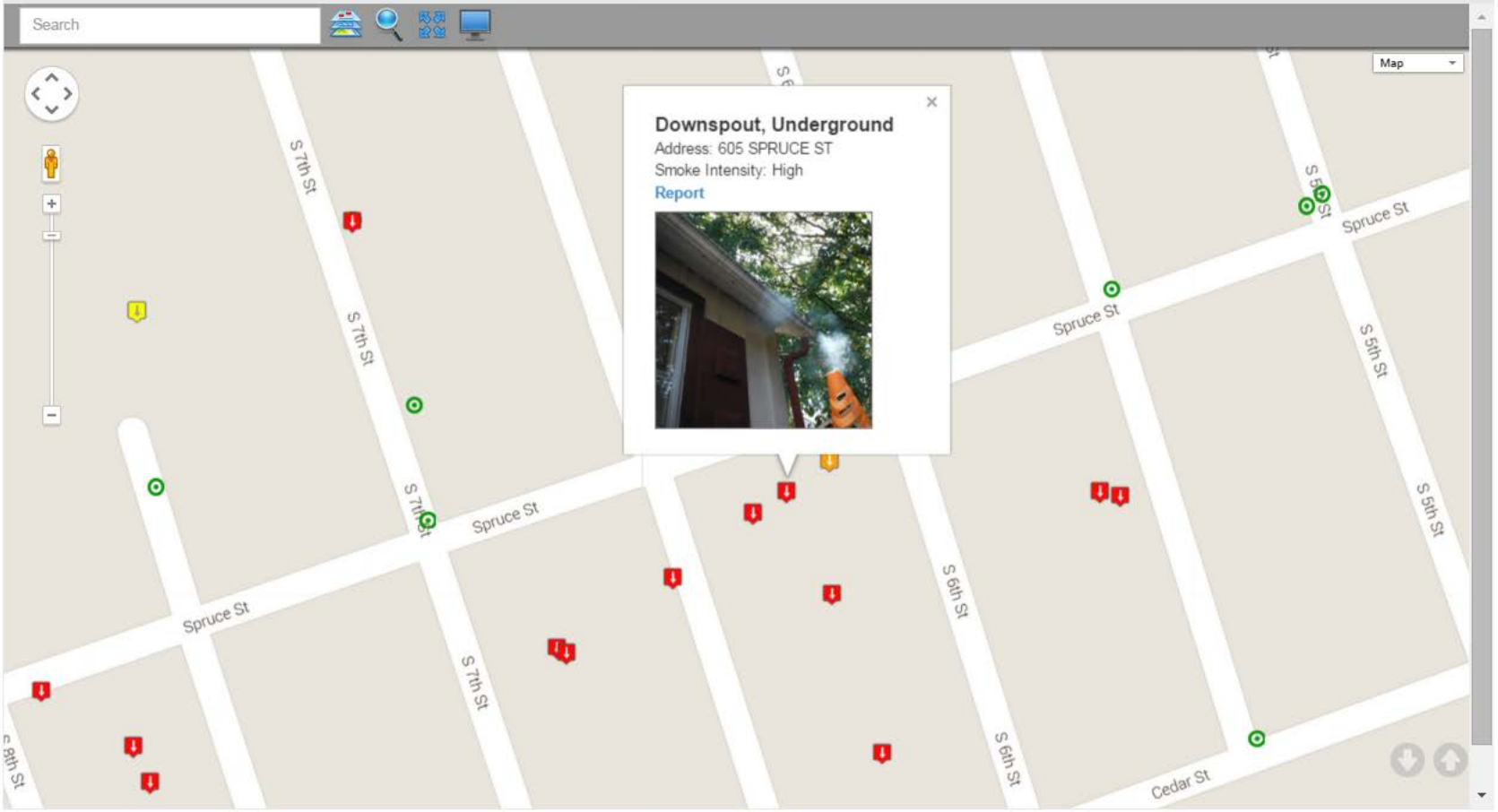

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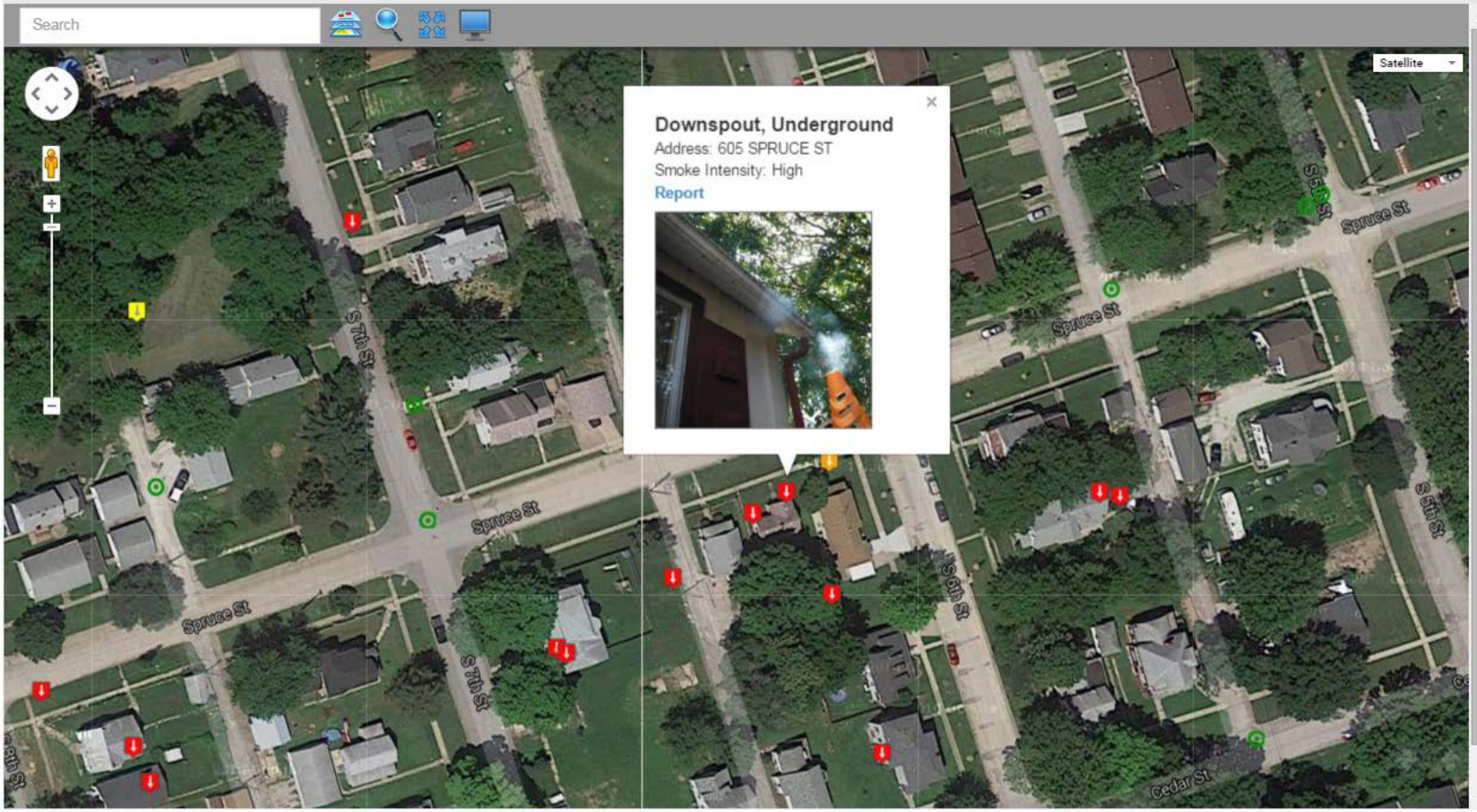
Search



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Search

Smoke Testing Observation

Address Number	605
Address Street	SPRUCE ST
Inspection Date	2013-08-28
Defect Description	Downspout, Underground
Public / Private Sector	Private
Smoke Intensity	High
Photo Description	Defect

Photo Description	Defect

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Search

Photo Description Defect

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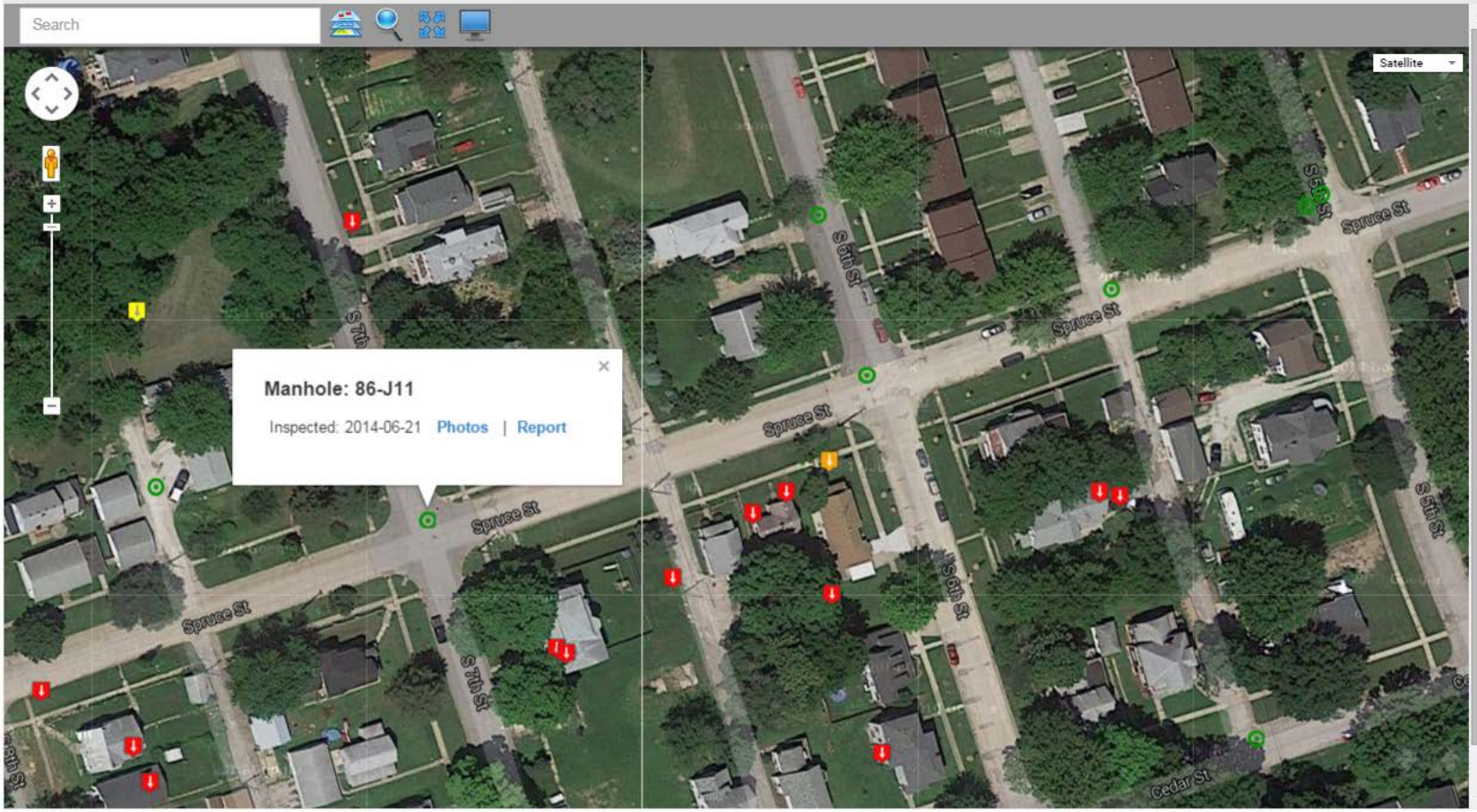

Benefits of Asset Inventory

- Feeds System Analyses
  - Hydraulic model
- Facilitates System Maintenance
- Works with Work Order Management Systems
- CIP Planning
- Meets Regulatory Requirements
  - IDNR, EPA, CMOM, LTCP

QUESTIONS?

Karol Giokas - kgiokas@rjnmail.com

Dennis Gilbertson - dgilbertson@rjnmail.com

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40 years of collection system solutions

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