WOOLPERT
ARCHITECTURE | ENGINEERING | GEOSPATIAL

Providing A Mile By Giving An Inch:

Sharing Data Required By The Permit

Columbia Stormwater Management
Partnering for clean waterways

Agenda

- Introduction
- Permit Requirements
  - Monitoring Site Selection
  - Station Descriptions
  - Monitoring Equipment
- Data Request
  - Initial Requests
  - Corrected Data
  - Real-Time
  - SHEF
- Benefits From Sharing
  - Added QC
  - Recognition

3 Takeaways

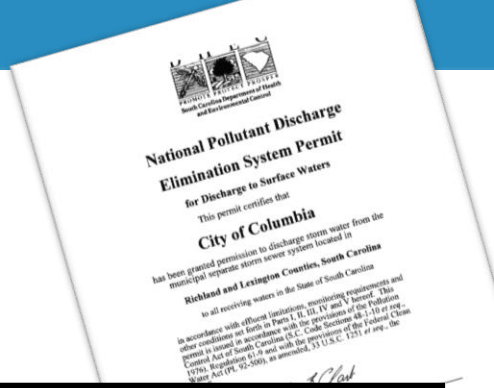
Monitoring equipment can be used for various purposes

Monitoring data is used by various State and Federal Agencies

Everyone benefits from water monitoring data

Columbia Permit Requirements

- Permit SCS790001
  - Monitor for pollutants of concern in impaired / TMDL watersheds
    - Outfall pipes, or
    - Ambient conditions, or
    - BMPs
- Gills Creek Total Maximum Daily Loads (TMDL) for fecal coliform and dissolved oxygen -2010



National Pollutant Discharge Elimination System Permit

for Discharge to Surface Waters

This permit certifies that

City of Columbia

has been granted permission to discharge storm water from the municipal separate storm sewer system located in

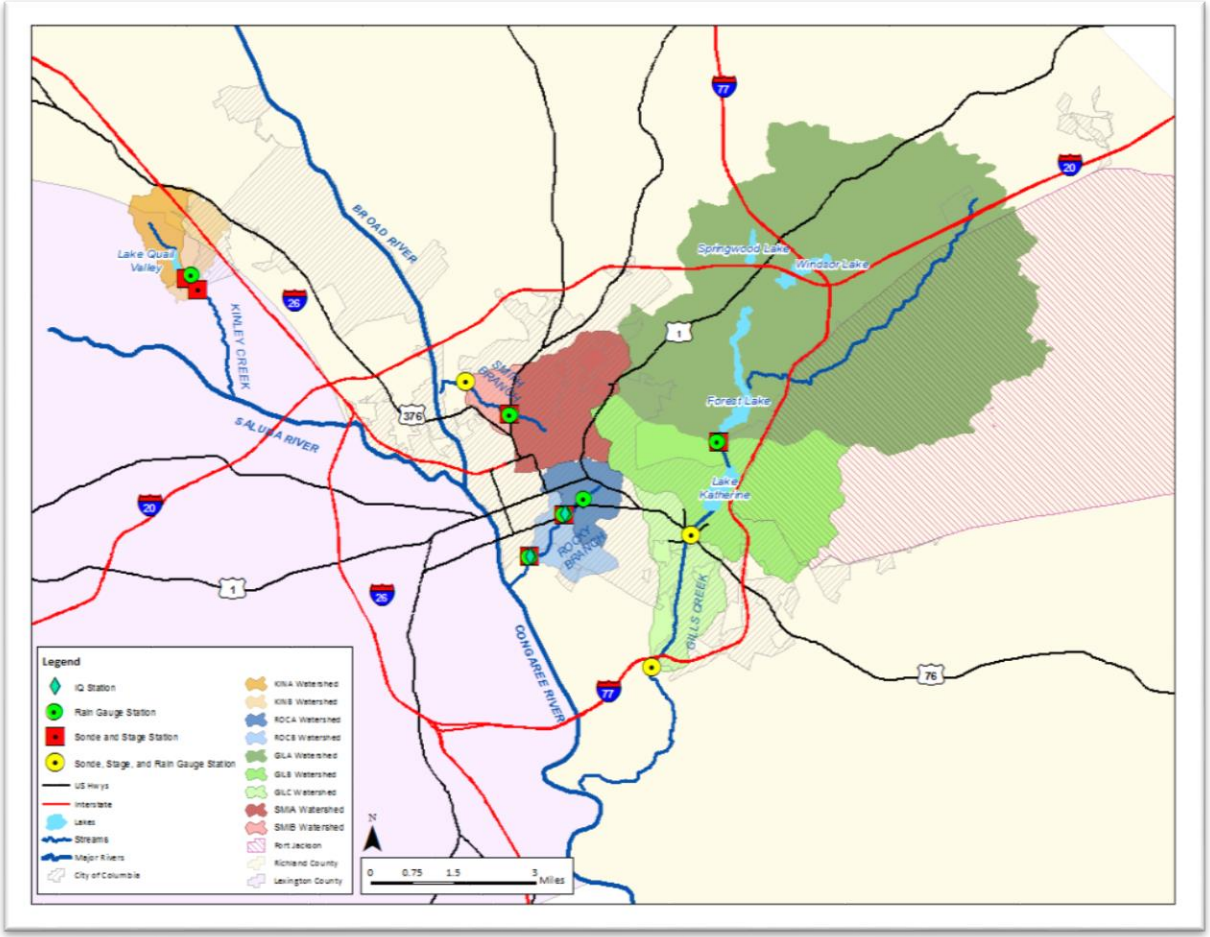
Richland and Lexington Counties, South Carolina

to all receiving waters in the State of South Carolina

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, III, IV and V hereof. This permit is issued in accordance with the provisions of the Pollution Control Act of South Carolina (S.C. Code Sections 48-1-10 et seq., Regulation 61-9 and with the provisions of the Federal Clean Water Act (PL 92-500), as amended, 33 U.S.C. 1251 et seq., the

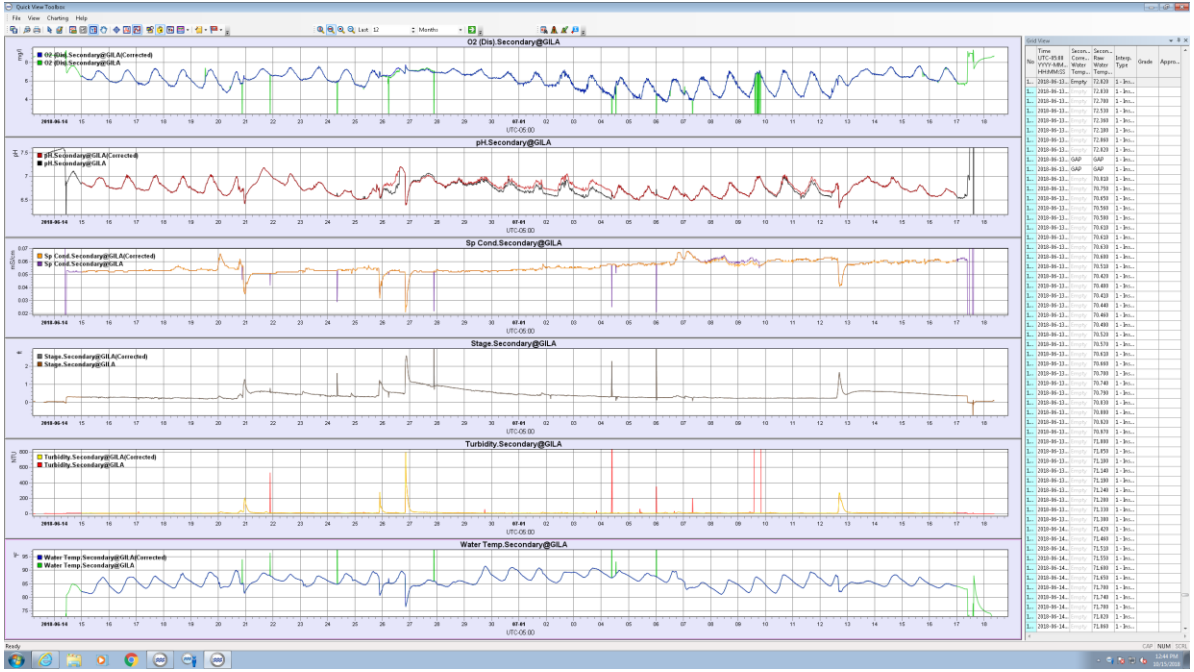
Phase (Year)	City Permit Contained Waterbodies	Basins	County	Station	Description	Use	Cause	Status	Name of TMDL	Approval Date
I	Gills Creek, Penn Branch, Wildcat Creek, Kilbourne Creek	Gills Creek	RICHLAND	GILA	CITY OF COLUMBIA MONITORING STATION @ FOREST DRIVE					
				C-001	GILLS CK AT BRDG ON US 76 (GARNERS FERRY ROAD)	REC	FC	TMDL - Not Supported	Gills Creek Watershed	11/5/2010
				GILB	CITY OF COLUMBIA MONITORING STATION @ GARNERS FERRY ROAD					
				GILC	CITY OF COLUMBIA MONITORING STATION @ BLUFF ROAD					
				C-017	GILLS CK AT SC 48 (BLUFF ROAD)	AL	DO	TMDL - Fully Supported	Gills Creek Watershed	11/5/2010
						REC	FC	TMDL - Not Supported		
II	Saluda River, Stoops Creek, Kinley Creek	SALUDA	LEXINGTON	KINA	CITY OF COLUMBIA MONITORING STATION @ LONGHORNS IN HARBISON					
				KINB	CITY OF COLUMBIA MONITORING STATION @ WOODS NEIGHBORHOOD DOWNSTREAM OF HARBISON					
				S-260	KINLEY CK AT S-32-36 (ST. ANDREWS RD) IN IRMO	AL	BIO	303(d)	-	-
						REC	FC	TMDL - Not Supported	Lower Saluda River and Tributaries	9/1/2004
III	Rocky Branch, Congaree River, Reeder Mill Branch	Congaree	RICHLAND	C-007F	CONGAREE RIVER @ ST HWY 378	FISH	HG	303(d)	-	-
			LEXINGTON	CSB-001L	CONGAREE RVR AT BLOSSOM ST (SALUDA RIVER)	REC	ECOLI	TMDL Under Development	Central Midlands / 3 Rivers	-
				CSB-001R	CONGAREE RVR AT BLOSSOM ST (BROAD RIVER)	REC	ECOLI	TMDL Under Development	Central Midlands / 3 Rivers	-
			RICHLAND	ROCA	CITY OF COLUMBIA MONITORING STATION @ MAXY GREGG PARK					
				ROCB	CITY OF COLUMBIA MONITORING STATION @ OLYMPIA AVENUE					
				C-007A	CONGAREE RIVER @ BARNEY JORDAN RAMP	FISH	HG	303(d)	-	-
				C-073	REEDER POINT BR AT SC 48	REC	ECOLI	303(d)	-	-
IV	Broad River Smith's Branch, Crane Creek, Nicholas Creek	BROAD	RICHLAND	B-316	CRANE CK AT S-40-43 UNDER I-20 - N COLA	AL	DO	303(d)	-	-
				B-280	SMITH BR AT N MAIN ST (US 21) IN COLA	REC	FC	TMDL - Not Supported	Lower Broad River Basin	9/11/2005
						AL	BIO	TMDL Under Development	Smith Branch	-
				SMIA	CITY OF COLUMBIA MONITORING STATION @North Main					
				SMIB	CITY OF COLUMBIA MONITORING STATION @ Mountain Drive					
				B-834	BROAD RIVER @ COLUMBIA DIVERSION CANAL	REC	FC	TMDL - Fully Supported	Lower Broad River Basin	9/11/2005
				B-337	BROAD RVR AT US 176 (BROAD RIVER RD) IN COLUMBIA	REC	FC	TMDL - Not Supported	Lower Broad River Basin	9/11/2005
		SALUDA	RICHLAND	B-080	BROAD RIVER DIVERSION CANAL AT COLA WATER PLANT	REC	ECOLI	TMDL Under Development	Central Midlands / 3 Rivers	-

Site Selection



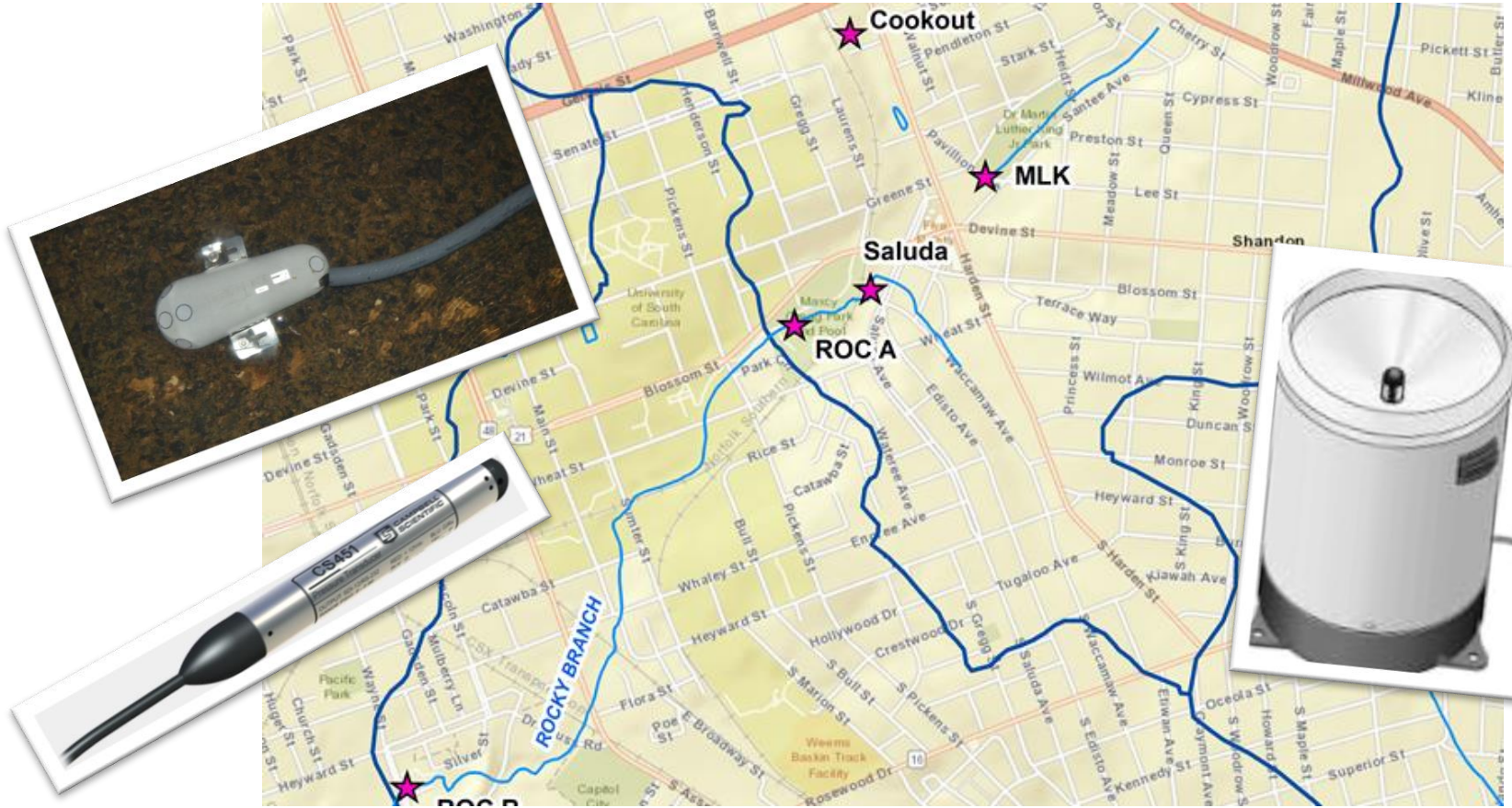
Data Being Collected

- Nine (9) Sites Monitoring: DO, pH, Temp, Sp. Cond, Turbidity
- Six (6) Sites monitoring with SonTek IQs
- The City first installed monitoring stations in 2013
- In 2017-2018, the City collected approximately 1.4 million data points from its continuous water quality monitoring program. This total does not include rainfall, stream stage, stream flow, and grab sample data
- **Need for data management!!!**



Monitoring Station Equipment

Monitoring Station Equipment



Data Requests

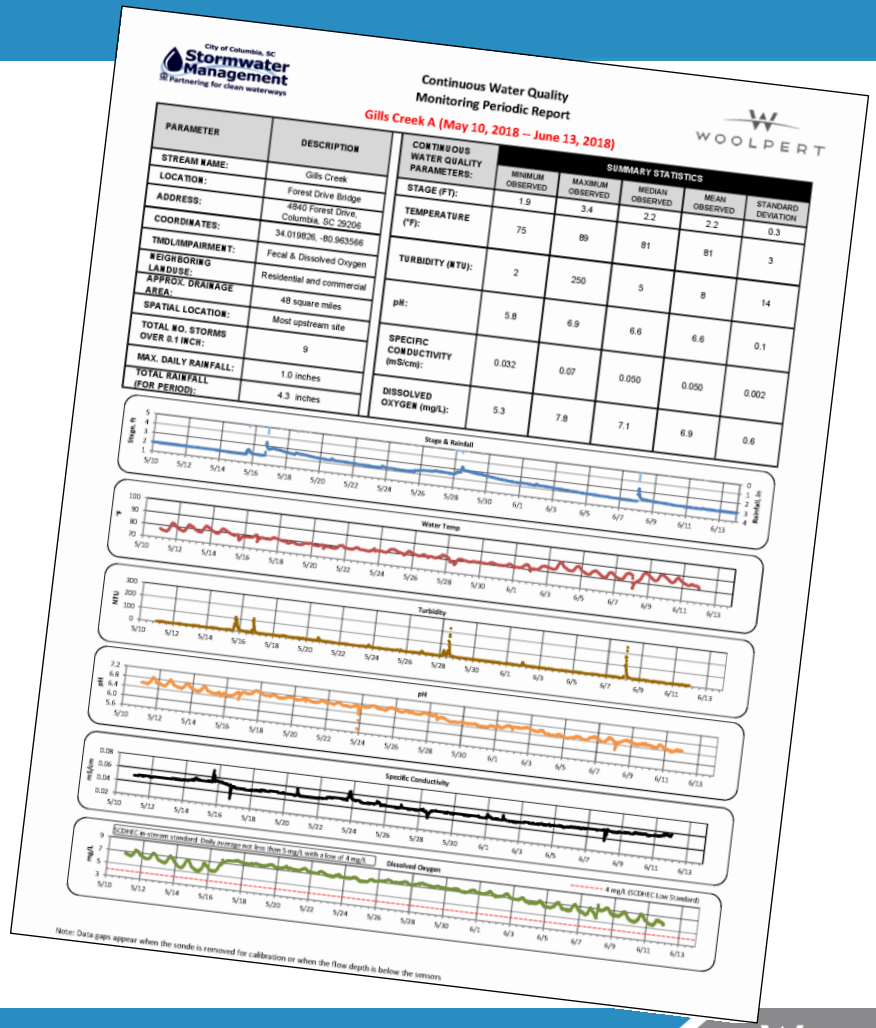
Initial Data Requests:

- Special Interest groups
- University Professors were requesting the City to provide additional information and out of scope items through an existing contract

1. The City provided monthly periodic reports
   - These summarized corrected data
   - Included rainfall and water quality data

2. Corrected Data

3. Access to the near- real time website – limited viewing



City of Columbia, SC Stormwater Management — Partnering for clean waterways

Continuous Water Quality Monitoring Periodic Report

Gills Creek A (May 10, 2018 – June 13, 2018)

WOOLPERT

PARAMETER	DESCRIPTION
STREAM NAME:	Gills Creek
LOCATION:	Forest Drive Bridge
ADDRESS:	4840 Forest Drive, Columbia, SC 29206
COORDINATES:	34.019826, -80.963566
TMDL/IMPAIRMENT:	Fecal & Dissolved Oxygen
NEIGHBORING LANDUSE:	Residential and commercial
APPROX. DRAINAGE AREA:	48 square miles
SPATIAL LOCATION:	Most upstream site
TOTAL NO. STORMS OVER 0.1 INCH:	9
MAX. DAILY RAINFALL:	1.0 inches
TOTAL RAINFALL (FOR PERIOD):	4.3 inches

CONTINUOUS WATER QUALITY PARAMETERS:	SUMMARY STATISTICS				
	MINIMUM OBSERVED	MAXIMUM OBSERVED	MEDIAN OBSERVED	MEAN OBSERVED	STANDARD DEVIATION
STAGE (FT):	1.9	3.4	2.2	2.2	0.3
TEMPERATURE (°F):	75	89	81	81	3
TURBIDITY (NTU):	2	250	5	8	14
pH:	5.8	6.9	6.6	6.6	0.1
SPECIFIC CONDUCTIVITY (mS/cm):	0.032	0.07	0.050	0.050	0.002
DISSOLVED OXYGEN (mg/L):	5.3	7.8	7.1	6.9	0.6

Note: Data gaps appear when the sonde is removed for calibration or when the flow depth is below the sensors.

Data Source

Server Database

Website Login

Access Restrictions

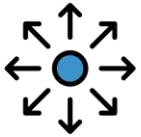
Data Import into AQUARIUS (management / DB)

QA/QC

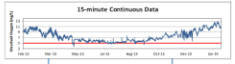
Perform Analysis

R, XL Stat, Matlab

Summary, Text, Conclusions

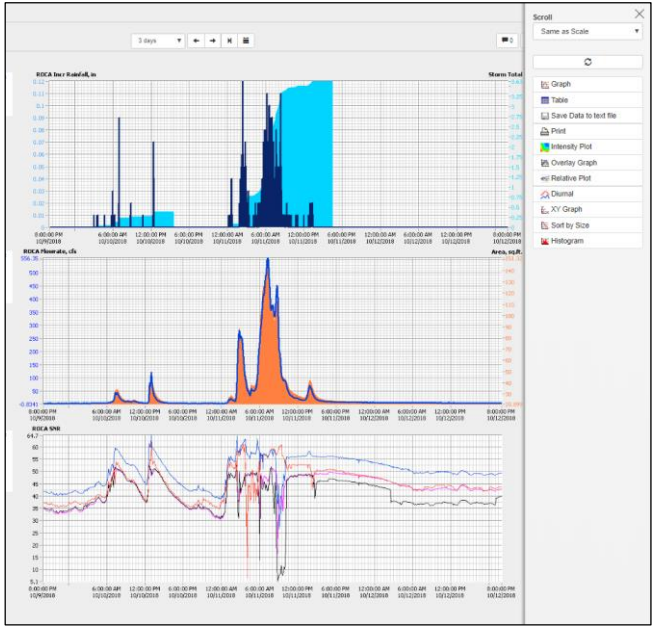


Final Corrected Dataset



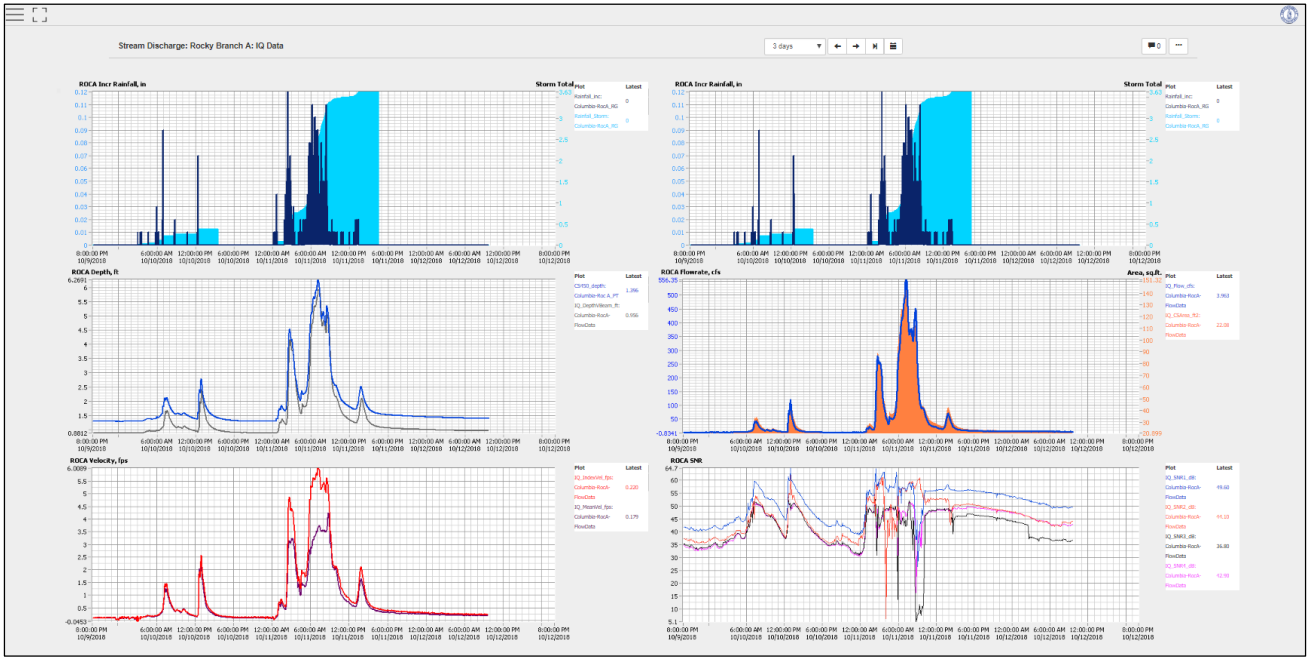
Client

Modelers

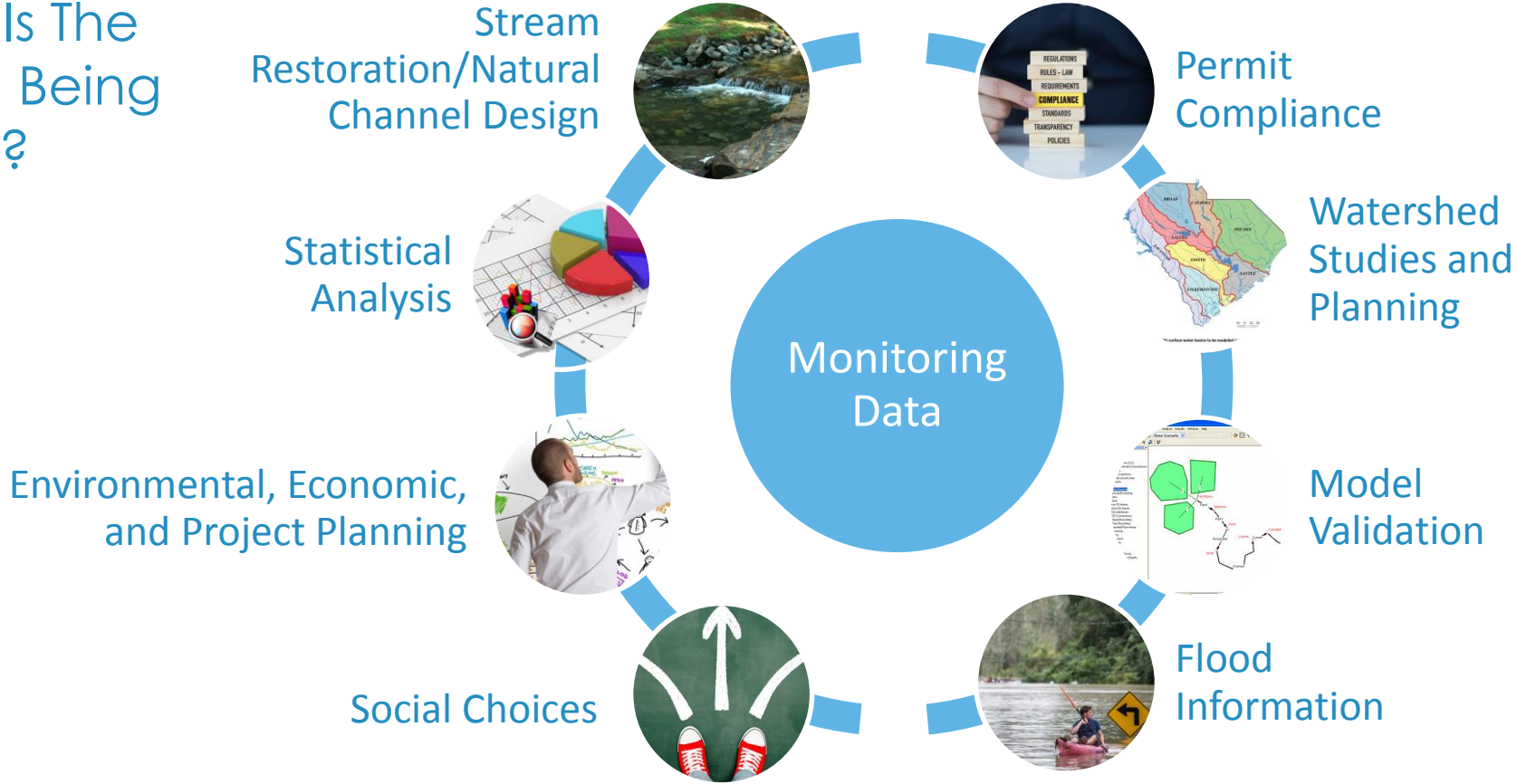


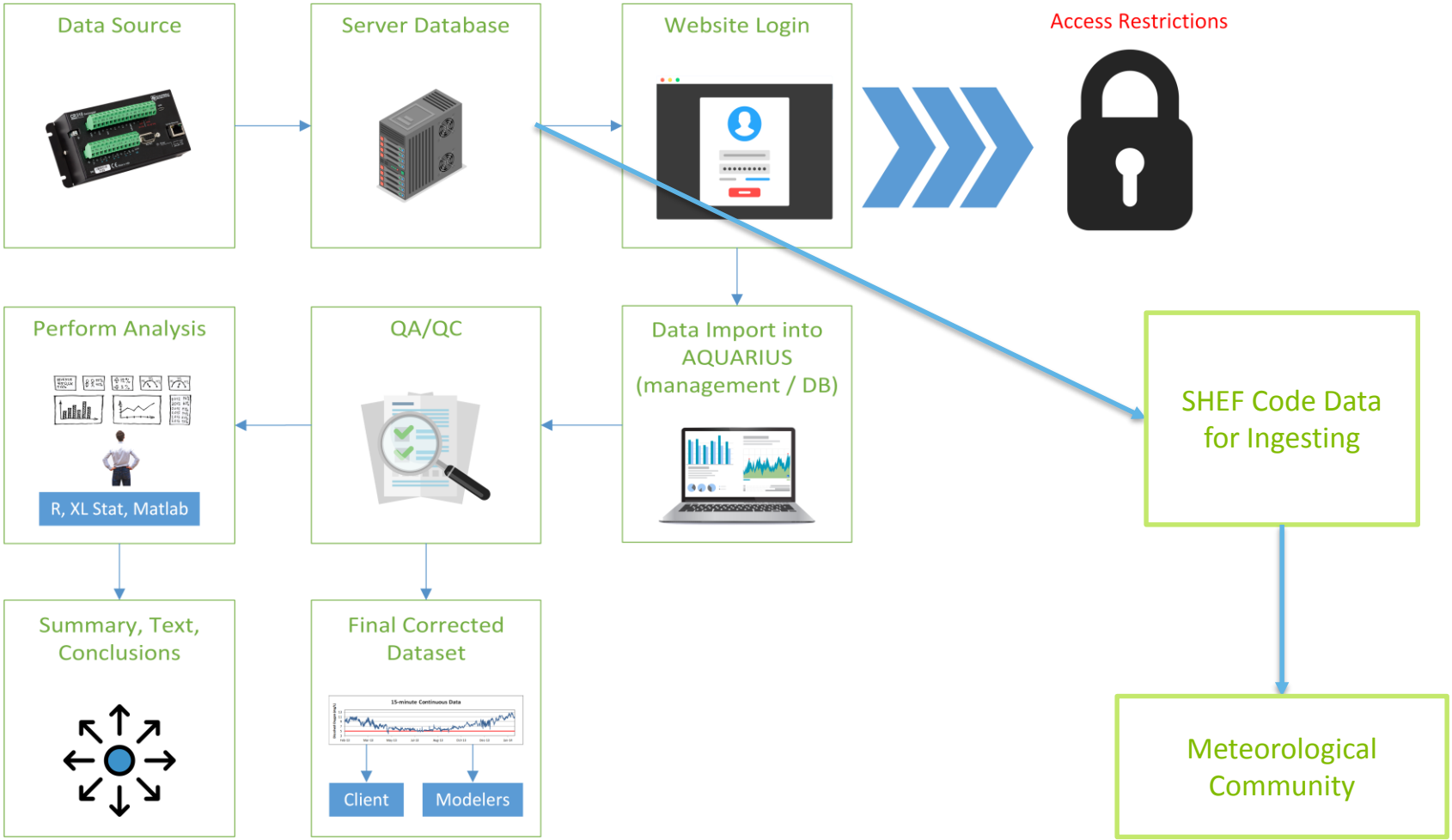
Restricted Access to Near Real-Time Data

- Allows for selected data to be displayed and viewed by the user
- The general public may be interested in the total rainfall in a 24 hour period, but the City is interested in the storm total and the maximum intensity



How Is The Data Being Used?




Data Source
Server Database
Website Login
Access Restrictions
Perform Analysis
R, XL Stat, Matlab
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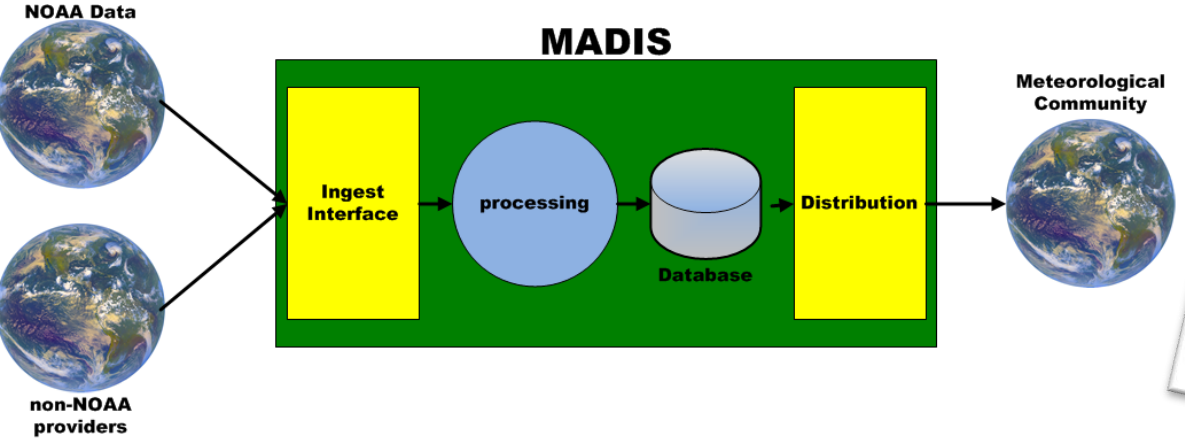
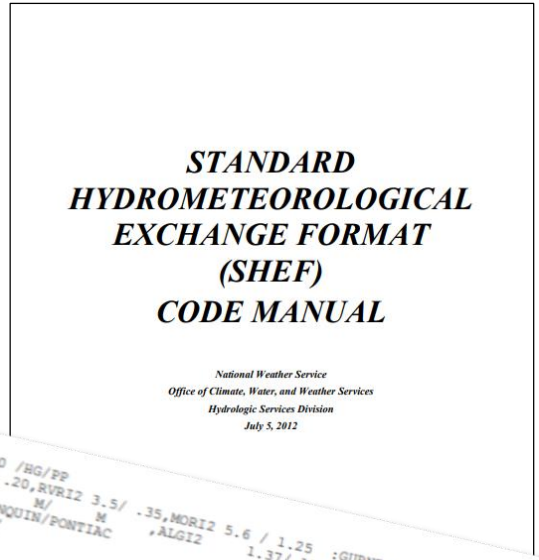
Data Import into AQUARIUS (management / DB)
SHEF Code Data for Ingesting
Summary, Text, Conclusions
Final Corrected Dataset
15-minute Continuous Data
Client
Modelers
Meteorological Community

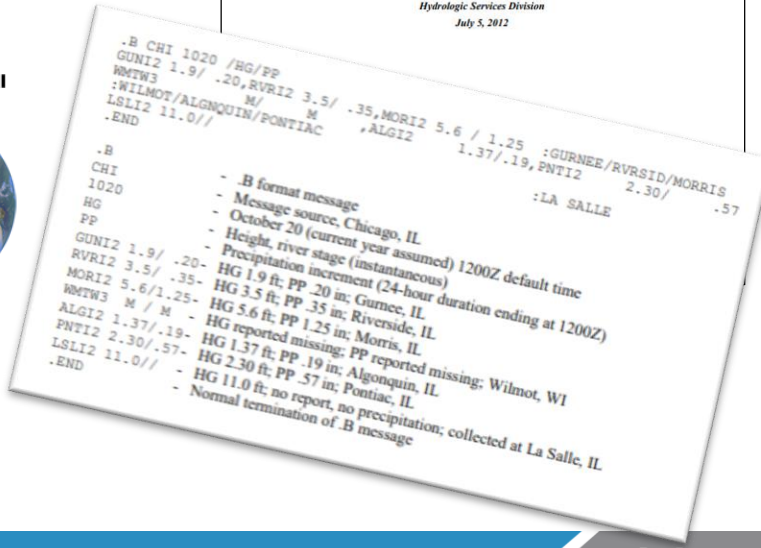
Lessons Learned

- SHEF coding to make data useful and standardized for multiple organizations
- V 1.4 of SDI-12 sensor specification will include SHEF code information for each value returned by the sensor




STANDARD HYDROMETEOROLOGICAL EXCHANGE FORMAT (SHEF) CODE MANUAL

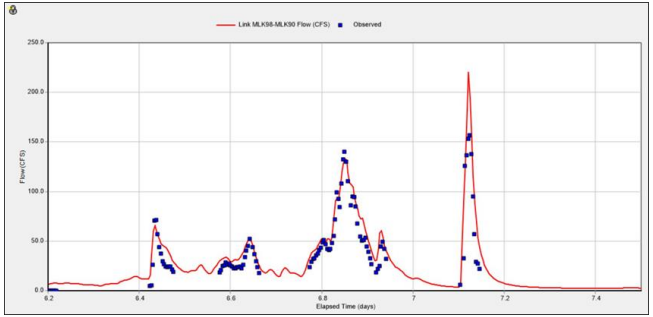
National Weather Service
Office of Climate, Water, and Weather Services
Hydrologic Services Division
July 5, 2012

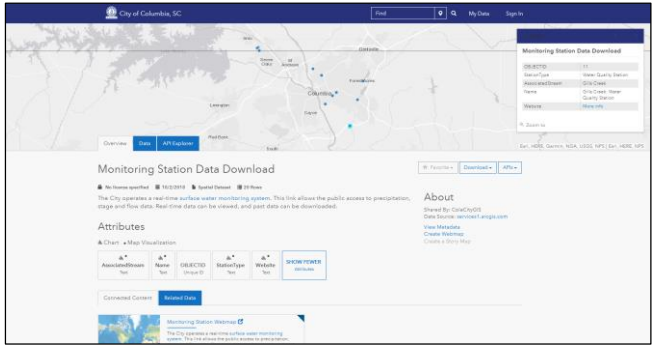

```
.B CHI 1020 /HG/PP
GUNI2 1.9/ .20,RVRI2 3.5/ .35,MORI2 5.6 / 1.25  :GURNEE/RVRSID/MORRIS
WMTW3          M/     M      ,ALGI2      1.37/.19,PNTI2      2.30/     .57
:WILMOT/ALGNQUIN/PONTIAC                                  :LA SALLE
LSLI2 11.0//
.END
```

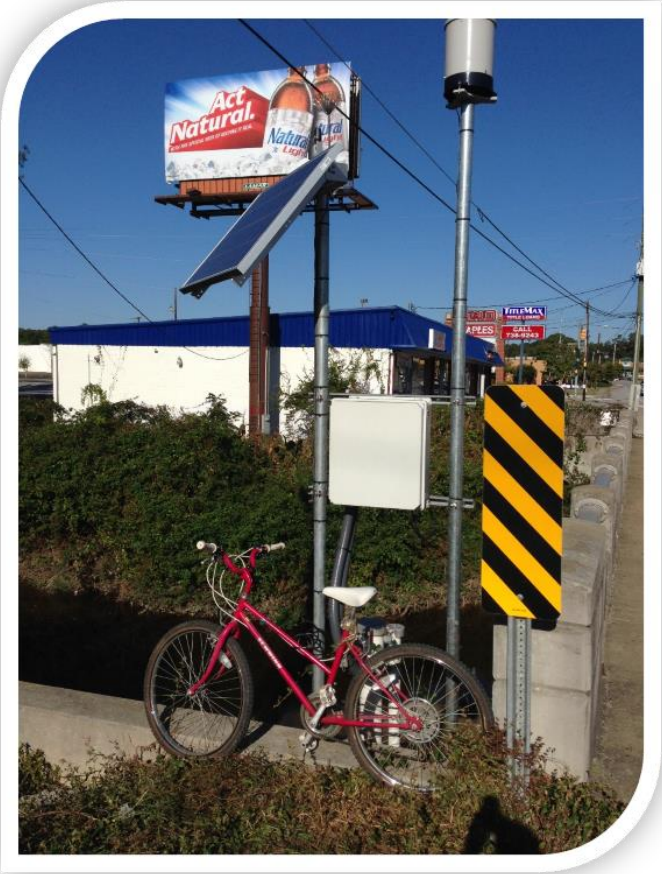
```
.B                 - .B format message
CHI                - Message source, Chicago, IL
1020               - October 20 (current year assumed) 1200Z default time
HG                 - Height, river stage (instantaneous)
PP                 - Precipitation increment (24-hour duration ending at 1200Z)
GUNI2 1.9/ .20-    HG 1.9 ft; PP .20 in; Gurnee, IL
RVRI2 3.5/ .35-    HG 3.5 ft; PP .35 in; Riverside, IL
MORI2 5.6/1.25-    HG 5.6 ft; PP 1.25 in; Morris, IL
WMTW3  M / M  -    HG reported missing; PP reported missing; Wilmot, WI
ALGI2 1.37/.19-    HG 1.37 ft; PP .19 in; Algonquin, IL
PNTI2 2.30/.57-    HG 2.30 ft; PP .57 in; Pontiac, IL
LSLI2 11.0//  -    HG 11.0 ft; no report, no precipitation; collected at La Salle, IL
.END               - Normal termination of .B message
```

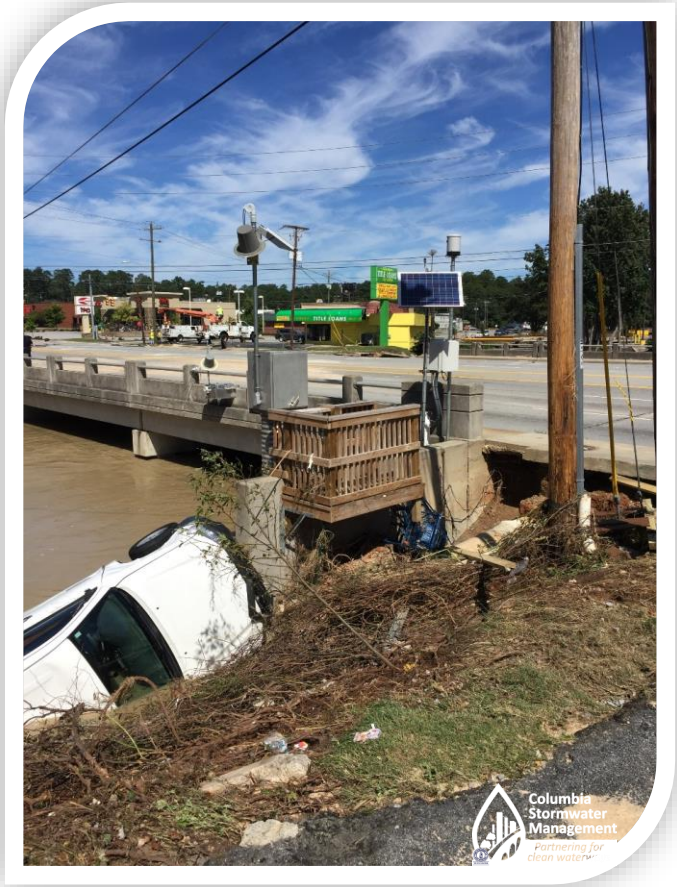
Benefits from Sharing

- Improves public recognition and public perspective of the stormwater/engineering department
- Help provide additional, faster data to the NWS
- Added quality control of the data
  - Multiple reviewers
- Aiding in undergraduate and graduate research
- Reliable source
  - The more people use the data, the easier the cost is justified to council members and others







Questions?

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