

**23rd Annual
Nonpoint Source Conference
24 January 2012**



**City of Hoover
Cost Effective Tools for
MS4 Permit Compliance**

By:

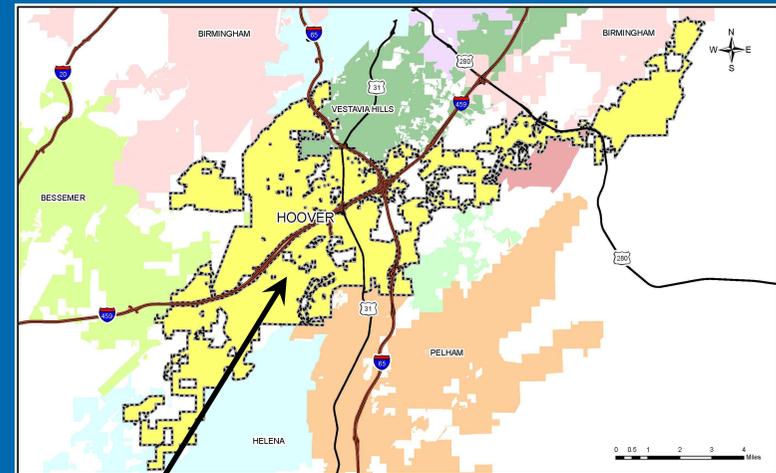
Dewayne Smith, P.E.
Hydro Engineering Solutions, LLC



**HYDRO
ENGINEERING
SOLUTIONS, LLC** 

City of Hoover

- Incorporated in 1967
- Size - 43.64 mi²
- 2000 Population – 73,000
- 2010 Population – 81,619
- Growth 11.81%
- 6th Largest City in Alabama



City of Hoover

- Phase I MS4 – NPDES Permit
- Limited Funding & Resources
- Corporate Limits
 - Comingled with other cities
 - Extend over a large area
 - Multiple Watersheds
- Water Quality Impacts
- Active Environmental Groups



MS4 Program Tools

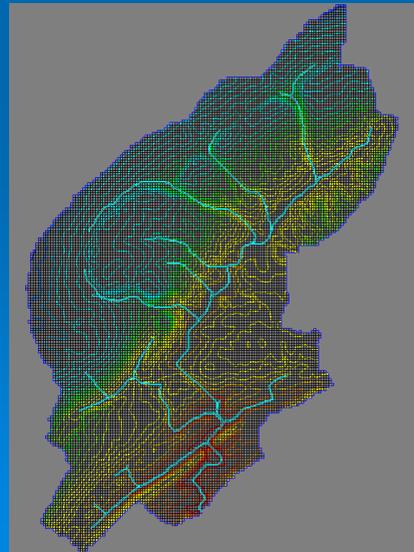
Rainfall Data



Water Quality Data



Watershed Modeling



MS4 Program Elements

- Construction Program
- Pesticide, Herbicide and Fertilizer
- New Development / Redevelopment
- Illicit Discharge
- Floodplain
- Monitoring



City of Hoover

Hoover Municipal Building
100 Municipal Drive
Hoover, Alabama 35216



Storm Water Management Program (SWMP) Plan

NPDES Permit No. ALS000001

September 2011

Prepared By:

HYDRO
ENGINEERING
SOLUTIONS, LLC 

2124 Moore's Mill Road ♦ Suite 120 ♦ Auburn, Alabama 36830

HYDRO
ENGINEERING
SOLUTIONS, LLC 



Rainfall Data





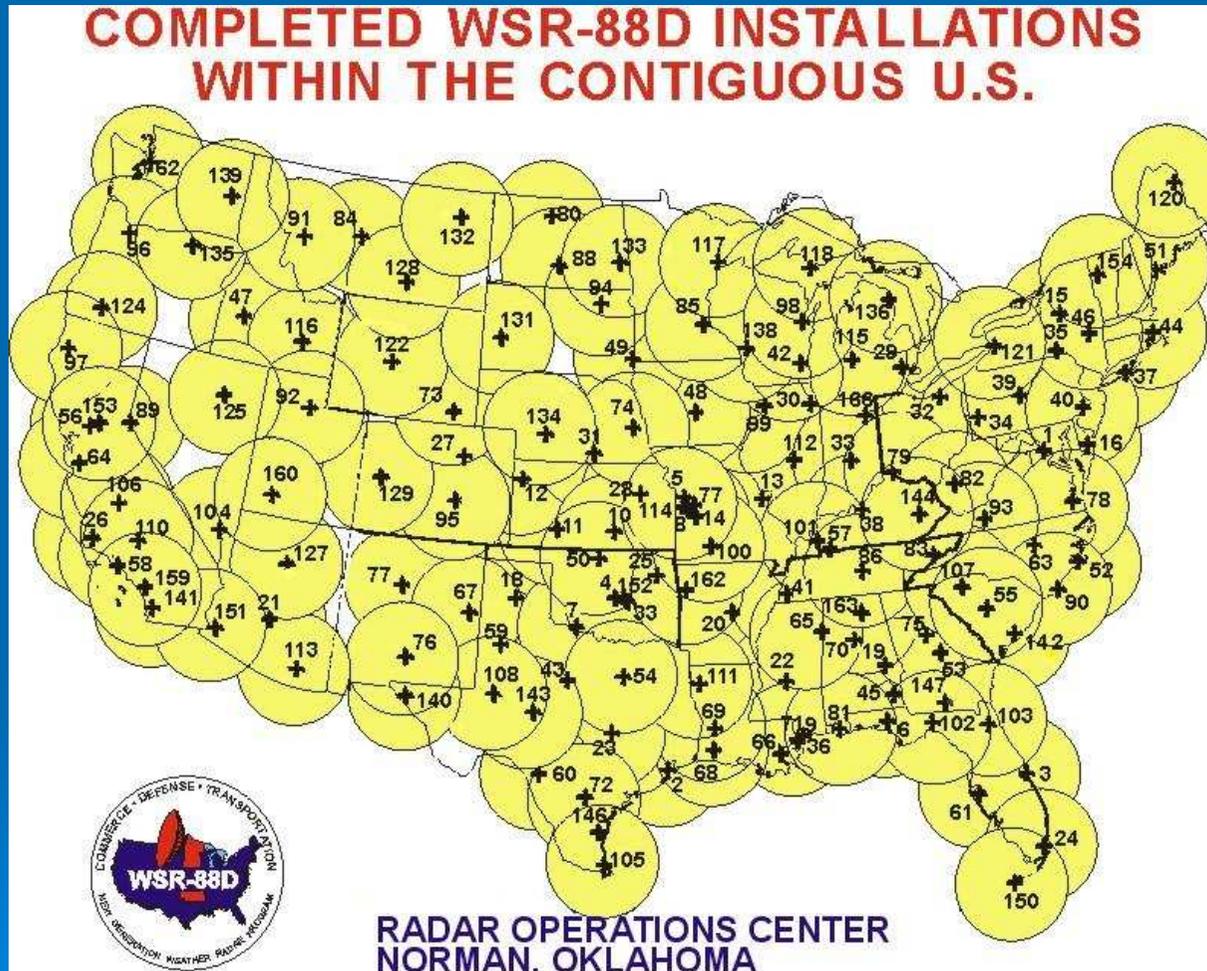
Rainfall Data

Proprietary software that leverages Doppler-based feeds to deliver precipitation measurements

- 5 minute intervals
- 24 hours/day – 7 days/week – 365 days/year
- Provides rainfall data for any location without installing equipment
- Quality controlled data
- Eliminates factors that degrade the reliability and accuracy of traditional gauge-based systems
- ADEM Approved Technology



Doppler Radar Coverage



RainWave Reports

Monthly Report

Alerts




Date: **Time:**

Project:

Site:

THIS SITE HAD MORE THAN .75 INCHES OF RAINFALL IN THE PAST 24 HOURS

City of Hoover
2020 Valleydale Rd.
Hoover, AL 35244



Hoover Monthly Rainfall Report		
	Upper	Lower
6/1/2010	0.93	0.17
6/2/2010	0.00	0.01
6/3/2010	0.00	0.00
6/4/2010	0.00	0.00
6/5/2010	0.06	0.04
6/6/2010	0.01	0.10
6/7/2010	0.00	0.00
6/8/2010	0.00	0.00
6/9/2010	0.00	0.00
6/10/2010	0.00	0.00
6/11/2010	0.00	0.00
6/12/2010	0.00	0.00
6/13/2010	0.00	0.00
6/14/2010	1.27	2.50
6/15/2010	0.59	0.93
6/16/2010	0.00	0.00
6/17/2010	0.00	0.06
6/18/2010	0.08	4.50
6/19/2010	0.52	0.61
6/20/2010	0.00	0.00
6/21/2010	0.00	0.00
6/22/2010	0.00	0.00
6/23/2010	0.00	0.00
6/24/2010	0.00	0.00
6/25/2010	0.03	0.05
6/26/2010	0.00	0.00
6/27/2010	0.00	0.00
6/28/2010	0.00	0.00
6/29/2010	0.06	0.24
6/30/2010	0.03	0.02
Total:	3.58	9.23

Daily Report

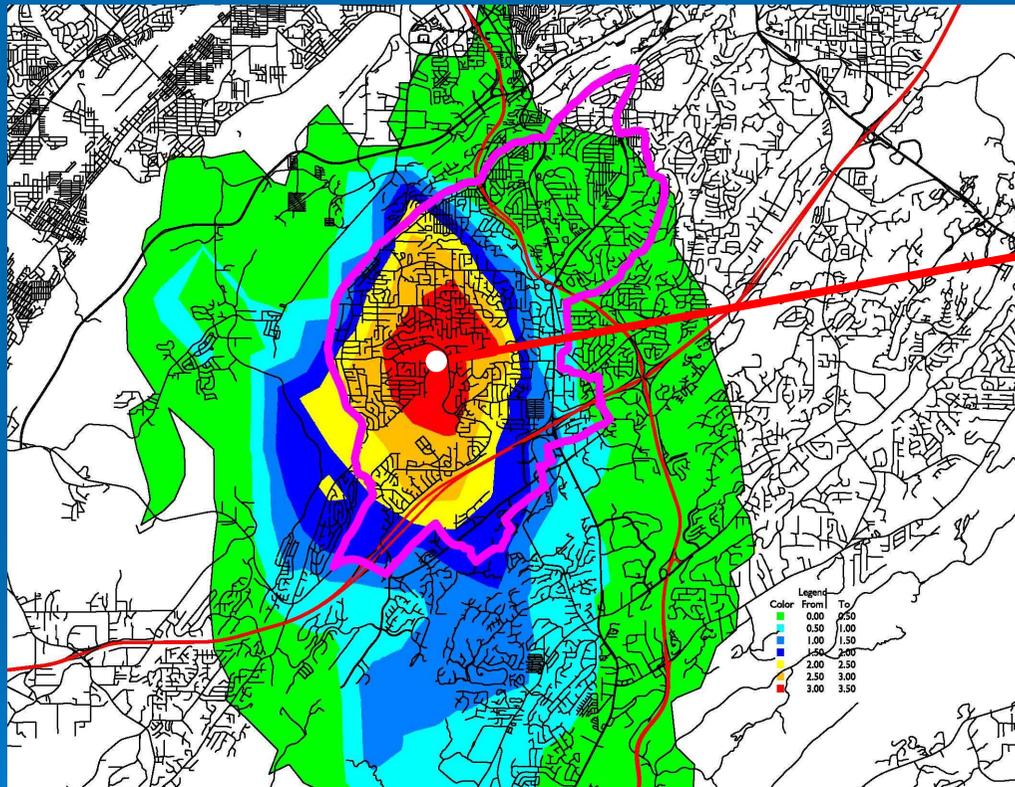
City of Hoover
2020 Valleydale Rd.
Hoover, AL 35244



Hoover Daily Rainfall Report		
	Upper	Lower
6/18/2010	0.08	4.50

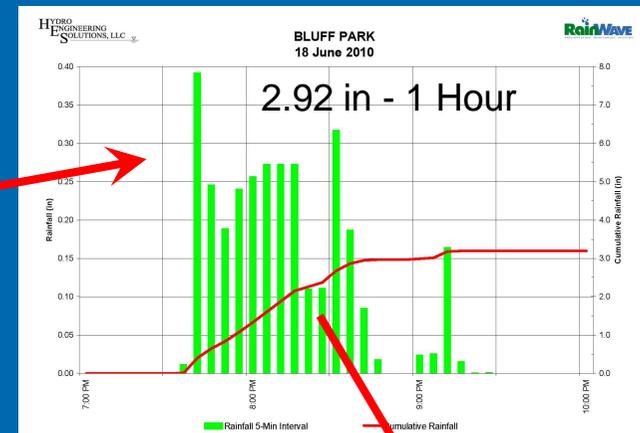


Storm Event Evaluation



18 June 2010 Storm Event

Hyetograph

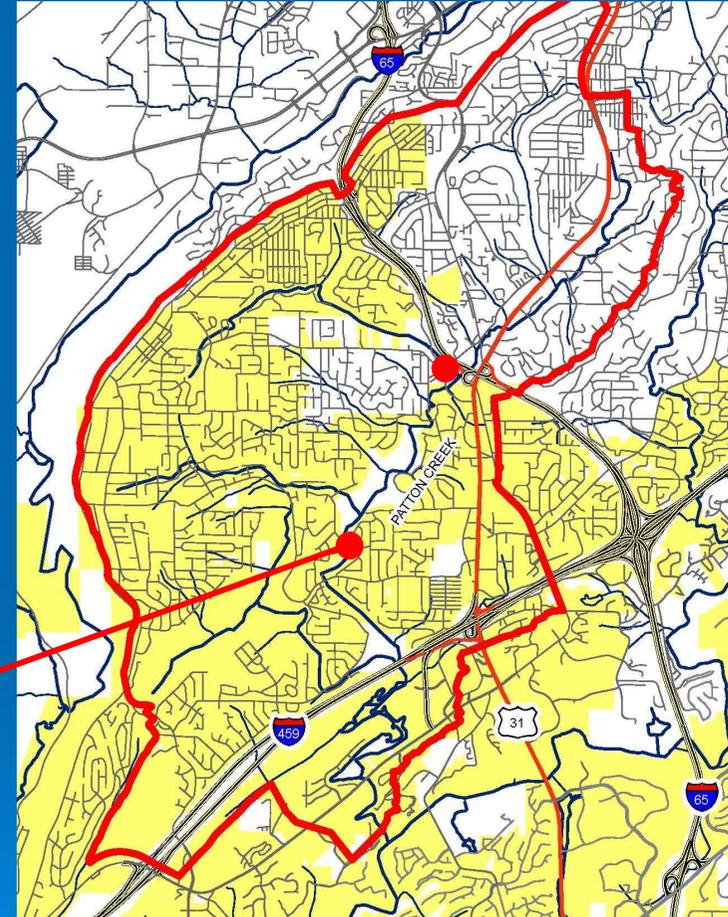


Technical Paper 40
25-Year, 1-Hour

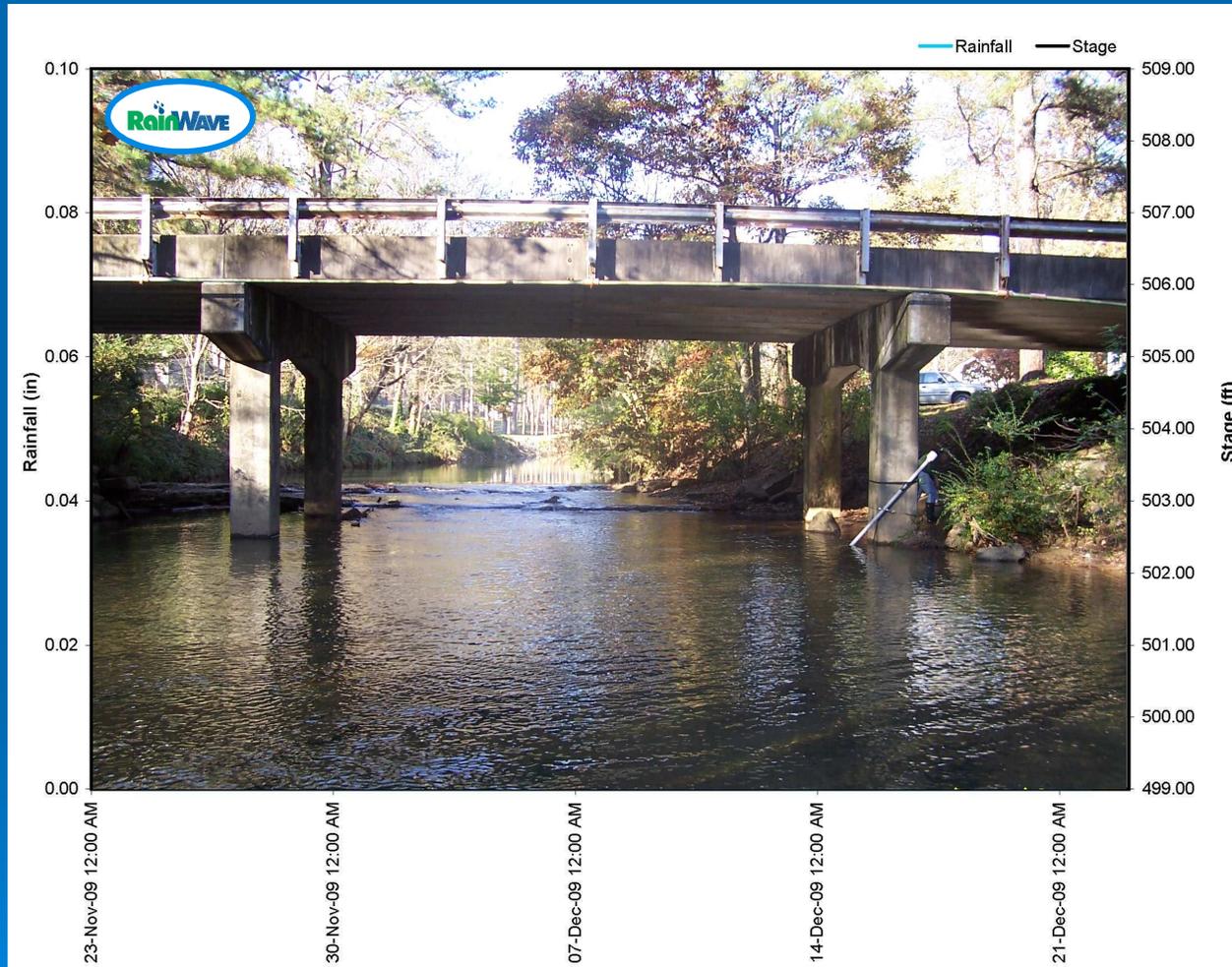


Level Data

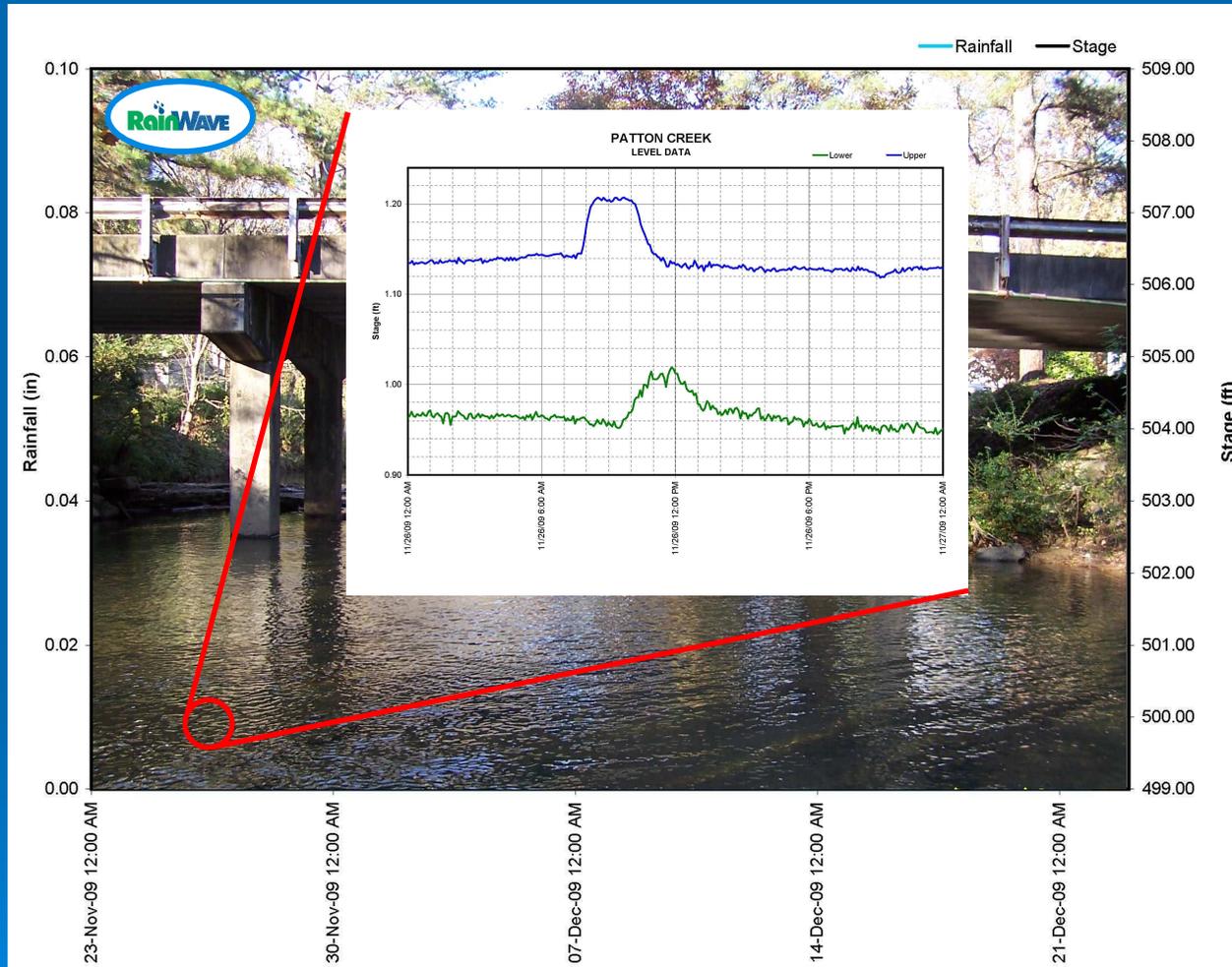
- Gauge
 - Level Logger
 - Locations



Level and Rainfall Data



Non Storm Water Discharge



Benefits

*“Better information to
make better decisions”*



provides:

- Watershed specific rainfall data
- Eliminates need of installing gauges
- E-mail alerts and documentation
- Rainfall data for watershed models
- Better use of limited staff and resources





Water Quality Data



Southland Drive



Kestwick Drive



Continuous Monitoring

In-Situ Troll 9500



Level
Dissolved Oxygen
Turbidity
Pressure
pH
ORP
Specific Conductance



Data Availability

Hi City of Hoover, [Log out](#)

Home [FAQ](#)

User Menu

- Project Configuration
- Location Map
- Project Photos
- File Downloads
- Settings
- Logout

Site List

- Southland Drive

Save your project notes here.

[Save]

Southland Drive

General **Status** Trend Overview Historic Data

General Site Info

Working with:



Upload Image (4MB Max)

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Southland Drive

General **Status** Trend Overview Historic Data

Site Status

Current Site Parameters as of: 12:34, 17 March 2011 [UTC-0] [\[Save List\]](#)

Name	Value	State	Alarm	Last Updated
Dissolved Oxygen	10.51 ppm	Normal	Normal	2011-03-17 11:45:00
Input Voltage	13.32 v	Normal	Normal	2011-03-17 00:45:00
Level	0.81 ft	Normal	Normal	2011-03-17 11:45:00
ORP	0.50 v	Normal	Normal	2011-03-17 11:45:00
Specific Conductance	210.40 uS/cm	Normal	Normal	2011-03-17 11:45:00
Temperature	14.31 °C	Normal	Normal	2011-03-17 11:45:00
Turbidity	17.18 NTU	Normal	Normal	2011-03-17 11:45:00
pH	7.89	Normal	Normal	2011-03-17 11:45:00

Dissolved Oxygen: 10.51 ppm

Input Voltage: 13.32 v

Level: 0.81 ft

Turbidity: 17.18 NTU

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Southland Drive

General **Status** Trend Overview Historic Data

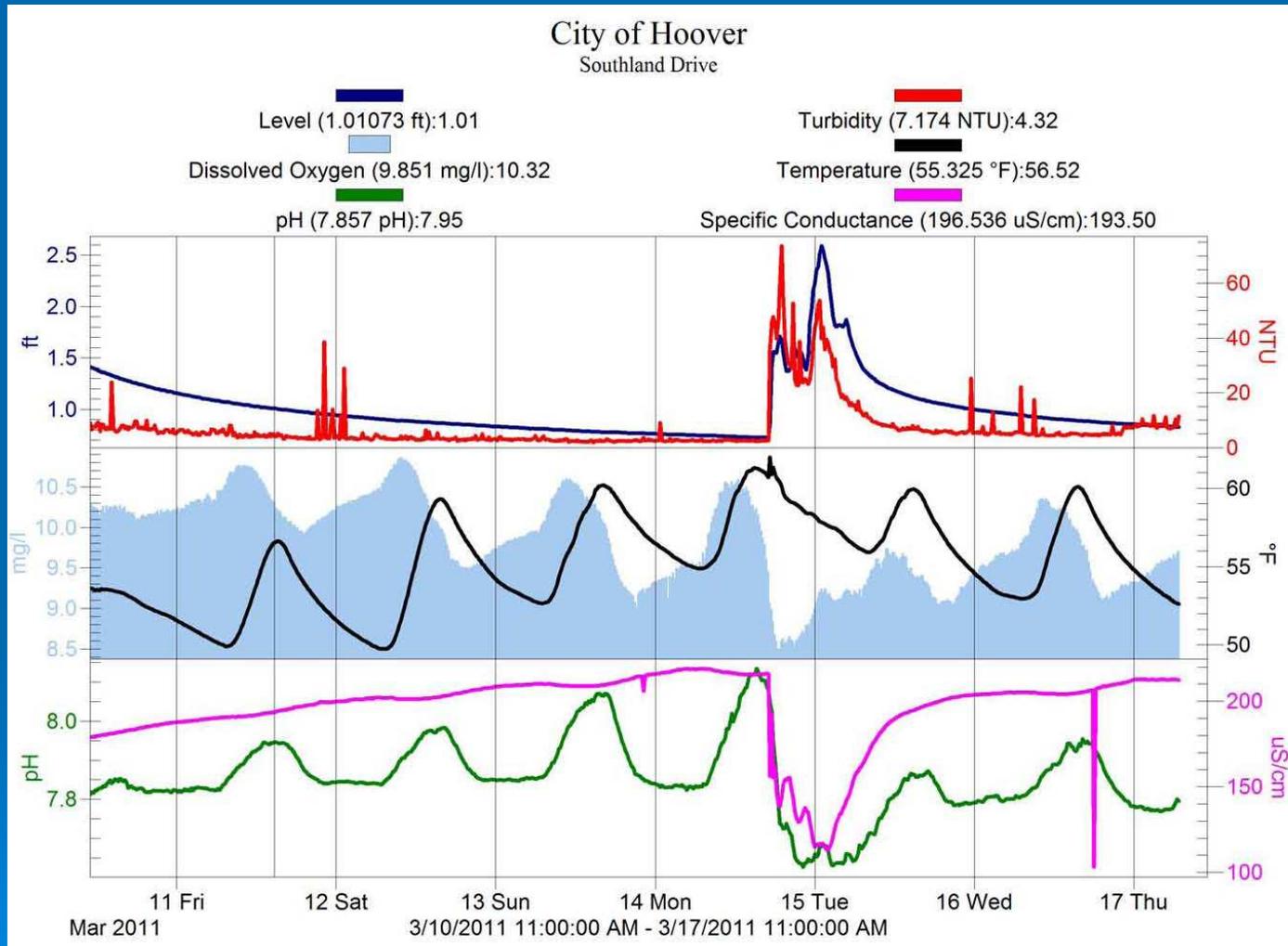
Trend Overview

Select Duration: 7 Days

● Dissolved Oxygen 10min AVG: Min: 8.5ppm Max: 10.87ppm 10 Mar 2011



Data Analysis



Storm Water Sampling

➤ Permit Requirements

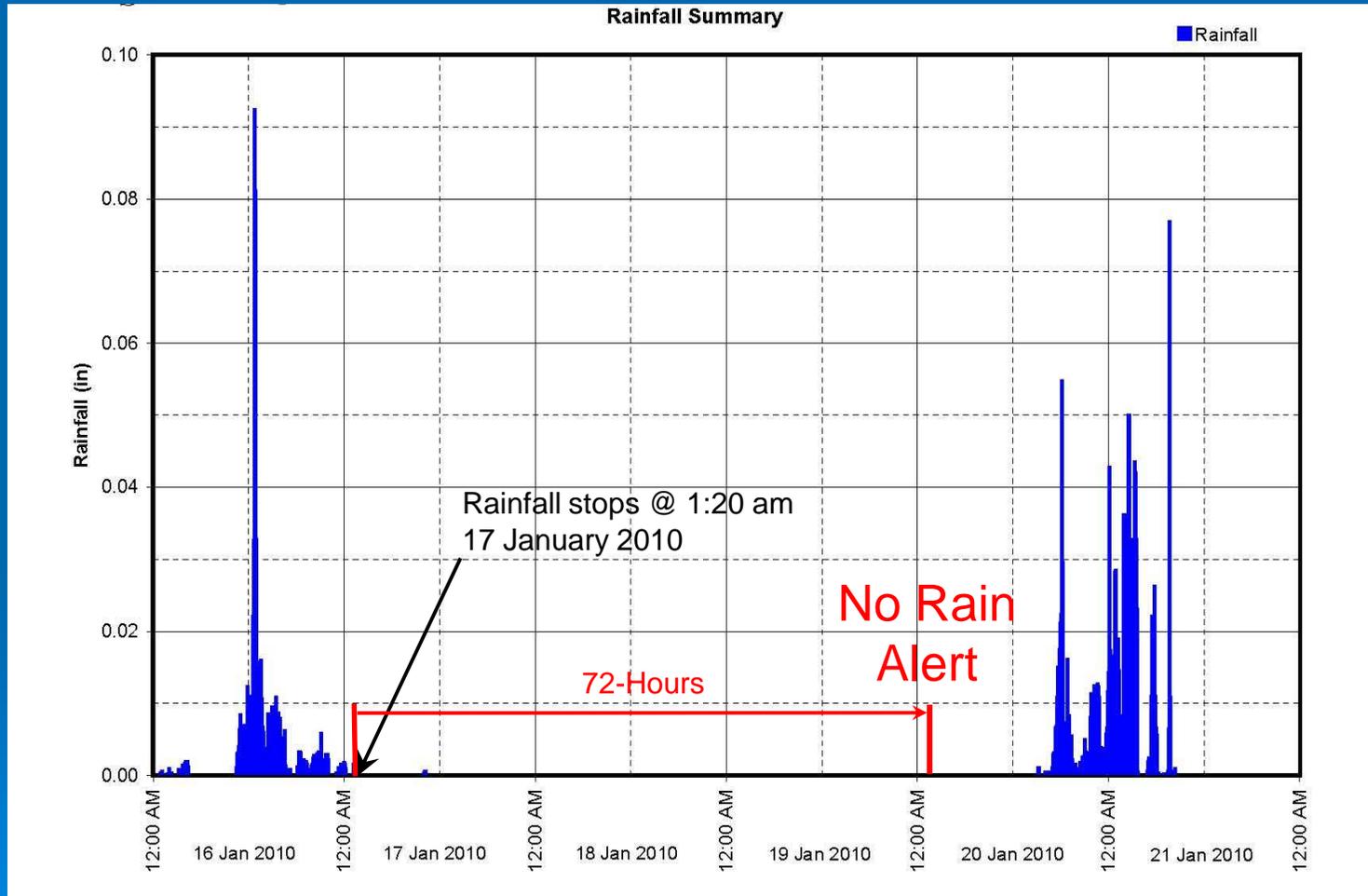
- 72-hours of Dry Weather
- Minimum of 0.10 inches of rain

➤ RainWave (First Flush)

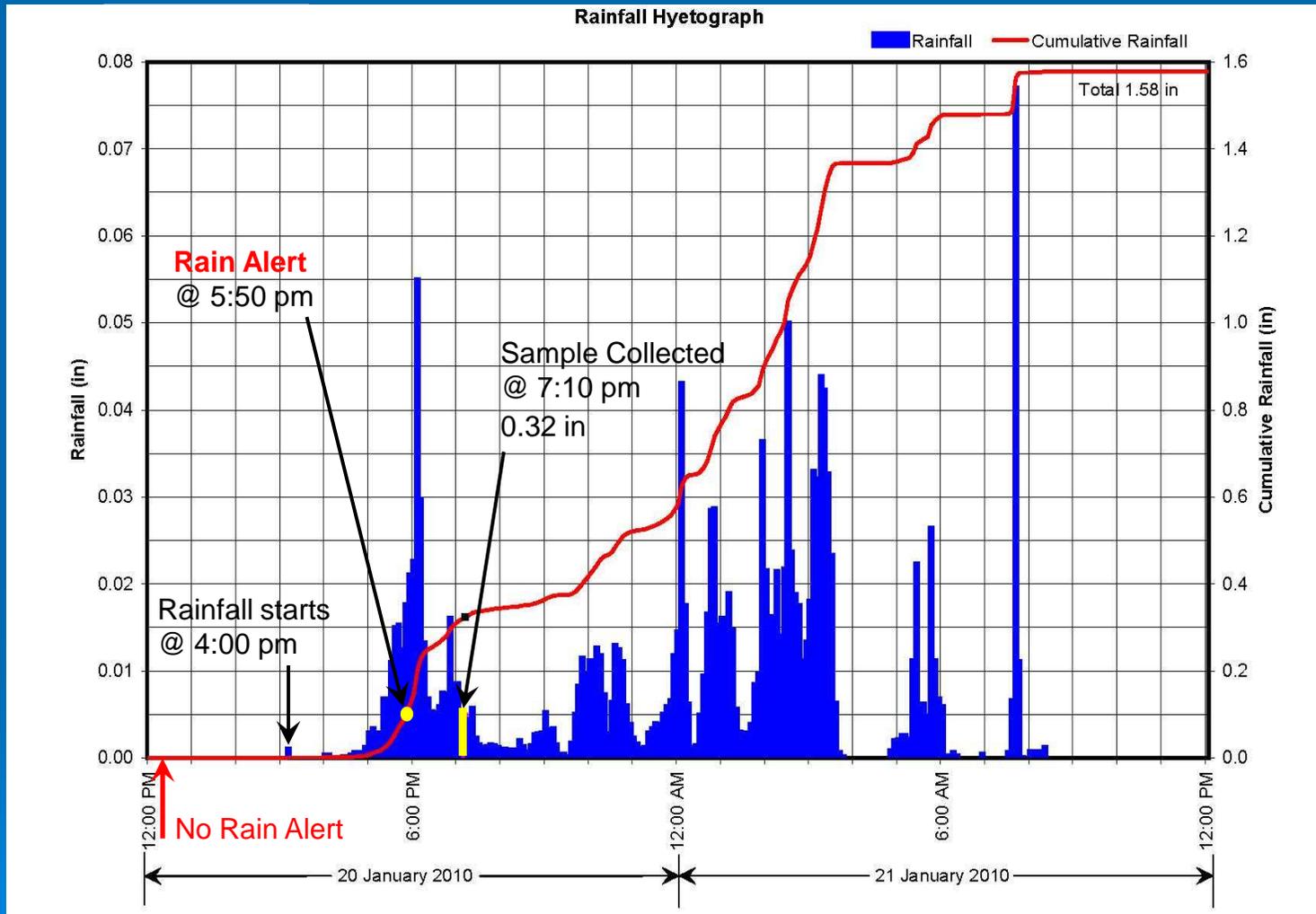
- No Rain Alert
- Rain Alert
 - Rainfall has started
 - Notification when rainfall exceeds approximately 0.10 inches
- Storm Event Documentation



No Rain Alert



Rain Alert



Benefits

*“Better information to
make better decisions”*

These tools provide:

- Real time water quality data
- Alerts to identify water quality concerns
- Data to evaluate water quality trends
- Information to identify and document manual sampling events
- Better use of limited staff and resources

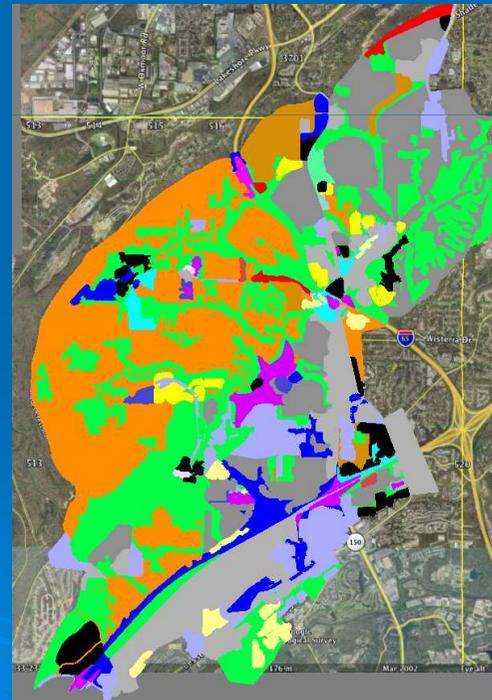




Watershed Modeling



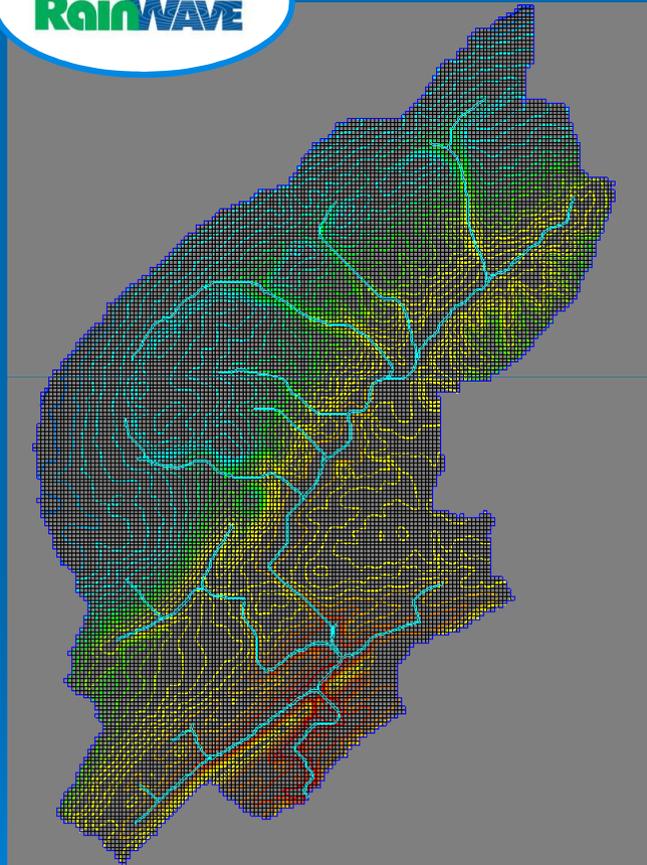
Soils Data



Land Use



GSSHA Model



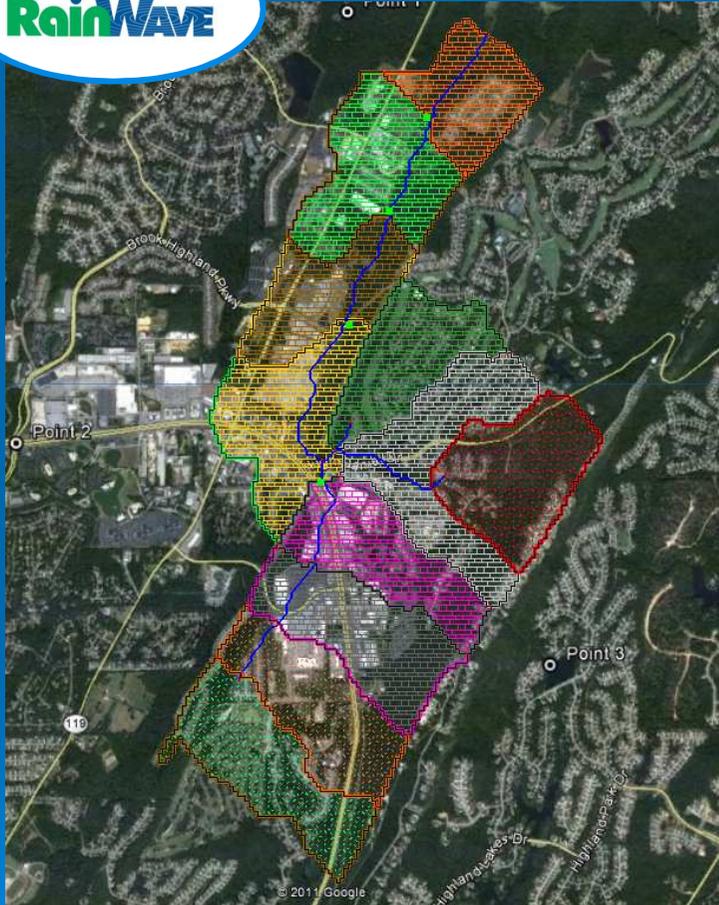
Gridded Surface Subsurface
Hydrologic Analysis
(GSSHA) Model

- 2D Overland Flow Model
- Water Quality Capabilities
- Input Data
 - Topography
 - Land Use
 - Soils
 - Rainfall



Automated Model

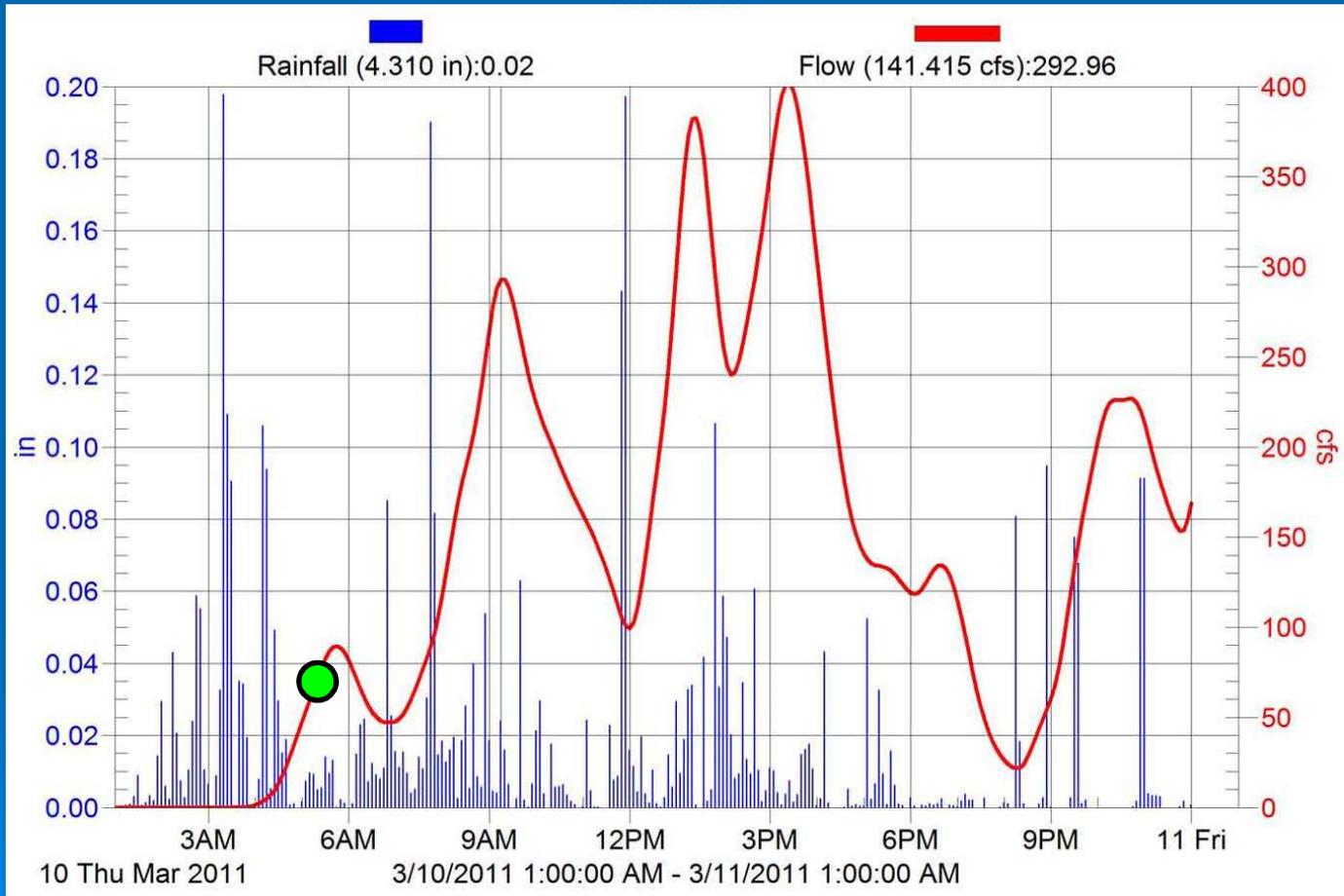
RainWAVE



- Watershed Specific
- Based on HEC-1 methodology
- Rainfall Data
- Estimates Daily Peak Discharges
- Generates Daily Hydrograph
- Determine Recurrence Interval

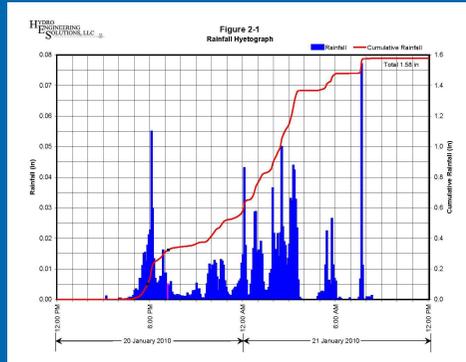


Storm Hydrograph

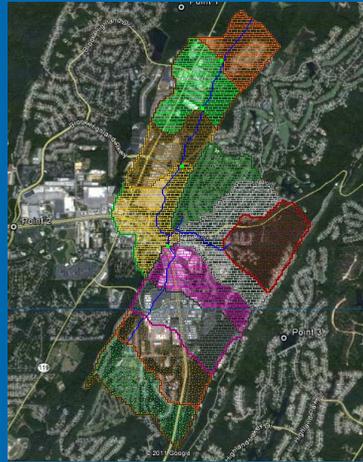


Pollutant Loads

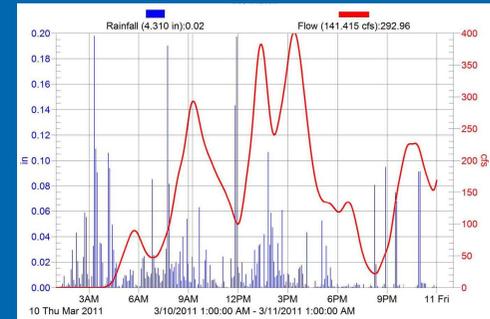
Rainfall Data



Watershed Model



Storm Hydrograph



Water Quality Data

GUARDIAN SYSTEMS, INC.
1108 Ashville Road
P.O. Box 190
Leeds, Alabama 35094

Telephone: 205/698-6647
Watts: 866/729-7211
Fax: 205/699-3882

Page: 1

Hydro Engineering Solutions
2124 Moore's Mill Road
Suite 120
Auburn, AL 36830
Attention: Mr. Dewayne Smith

Report Date: 1/28/10
Receive Date: 1/22/10
Receive Time: 09:00

Control No: 1001-00219 Sample # 002
Sampler: DS
Sample ID: 002A-24-RCP

Sample Date: 1/20/10
Sample Time: 7:20

PARAMETER	RESULTS	UNITS	ANAL. DATE	TIME	METHOD
pH	8.1	SI	LSC 1/22/10	10:00	150.1 (1)
Biological Oxygen Demand	2	mg/L	LSC 1/22/10	16:00	SM-5210B (2)
BOD, Initial Setup			LSC 1/22/10	14:00	
BOD, Final Read Back			LSC 1/22/10	14:00	
Solids, Total Suspended	1,470	mg/L	LSC 1/25/10	11:00	SM-2540D (2)

Approved by:

METHOD REFERENCES

(1) Standard Methods for the Examination of Water and Wastewater, 17th Edition, 1985, American Public Health Association, Inc., Washington, DC, 1985.
(2) Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992, American Public Health Association, Inc., Washington, DC, 1992.
(3) Test Methods for Estimating Stream Water Quality Chemical Method Field Kit, 3rd Edition, October 1999.
(4) 1997 ASTM Annual Book.
(5) Manual of Environmental Engineering, 2nd Edition, Part 4, Appendix A, Revised July 1995.
(6) Manual of Environmental Engineering, 2nd Edition, Part 4, Appendix A, Revised July 1995.
(7) English Conversion in Water Resources, 2nd Edition, Revised July 1991, August 1993.
(8) 1995 Manual of Analytical Methods, 4th Edition, May 1995.

Pollutant Loads

Outfall 001

BOD $2 \frac{\text{mg}}{\text{L}} \times \frac{3.7854 \text{ L}}{1 \text{ gal}} \times \frac{1}{453,592.40 \text{ mg}} \times \frac{\text{lb}}{\text{mg}} \times \frac{22,809.5 \text{ gal}}{1 \text{ day}} = 0.3807 \frac{\text{lb}}{\text{day}}$

TSS $10,120 \frac{\text{mg}}{\text{L}} \times \frac{3.7854 \text{ L}}{1 \text{ gal}} \times \frac{1}{453,592.40 \text{ mg}} \times \frac{\text{lb}}{\text{mg}} \times \frac{22,809.5 \text{ gal}}{1 \text{ day}} = 1,926.3849 \frac{\text{lb}}{\text{day}}$

AI $48.5 \frac{\text{mg}}{\text{L}} \times \frac{3.7854 \text{ L}}{1 \text{ gal}} \times \frac{1}{453,592.40 \text{ mg}} \times \frac{\text{lb}}{\text{mg}} \times \frac{22,809.5 \text{ gal}}{1 \text{ day}} = 9.2322 \frac{\text{lb}}{\text{day}}$



Benefits

*“Better information to
make better decisions”*

These tools provide:

- Better understanding of the watershed
- Identify pollution sources
- Better estimate of pollutant loadings
- Evaluate the effectiveness of BMPs
- Evaluate new BMPs to reduce pollution
- Helps the City effectively apply resources and funding to improve water quality



QUESTIONS

