

Optimizing Performance

of Existing Stormwater Infrastructure Through Real Time Control Retrofits: A Minnesota Demonstration Site

Project Team:

David Roman, PE, CFM, CPESC

David Richardson, PE, PG

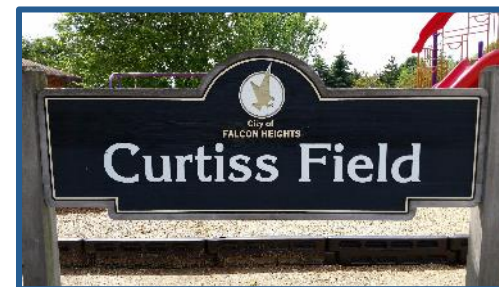
Scott Landers, PE, CPESC



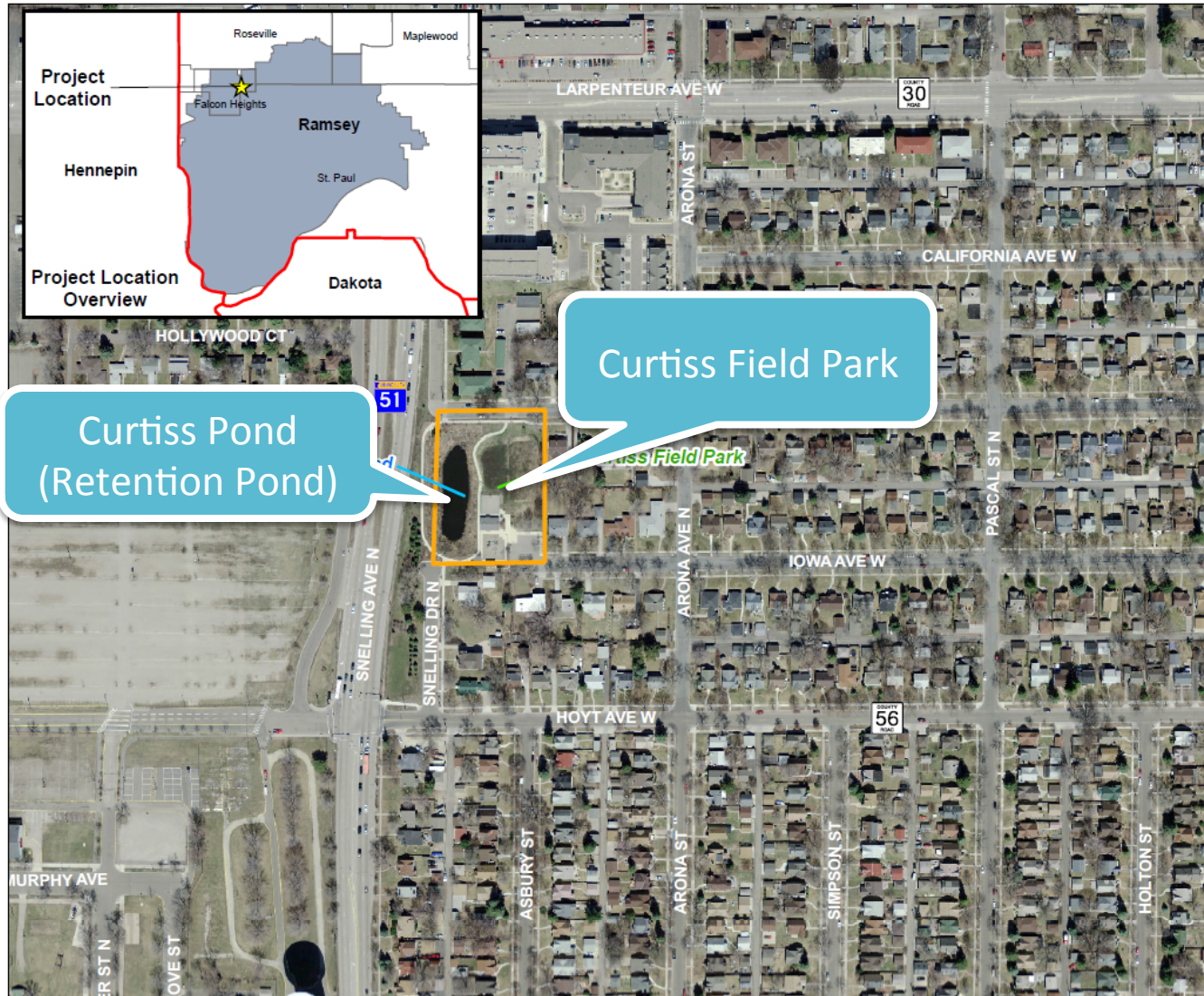
Project Partners & Collaborators:



Presented at:



Background



*Figure courtesy of Feasibility Study Report prepared by Houston Engineering, Inc. (2013)

Background



Capitol Region Watershed District Curtiss Pond



- Falcon Heights Catch Basins
- Subwatersheds
- St. Paul Storm Sewer Pipes
- ★ Falcon Heights Storm Sewer Manholes
- Falcon Heights Storm Sewer Pipes
- ← Drainage Area Outlets

Drainage Area	Area (in Acres)
DA 1	22
DA 2	3.4
DA 3	1.0
DA 4	7.2
DA 5	0.3
DA 6	0.8
DA 7	3.6



0 125 250 500 Feet

Source: MN DOT, City of Falcon Heights, City of St. Paul
Imagery: 2009 Ramsey County Aerials

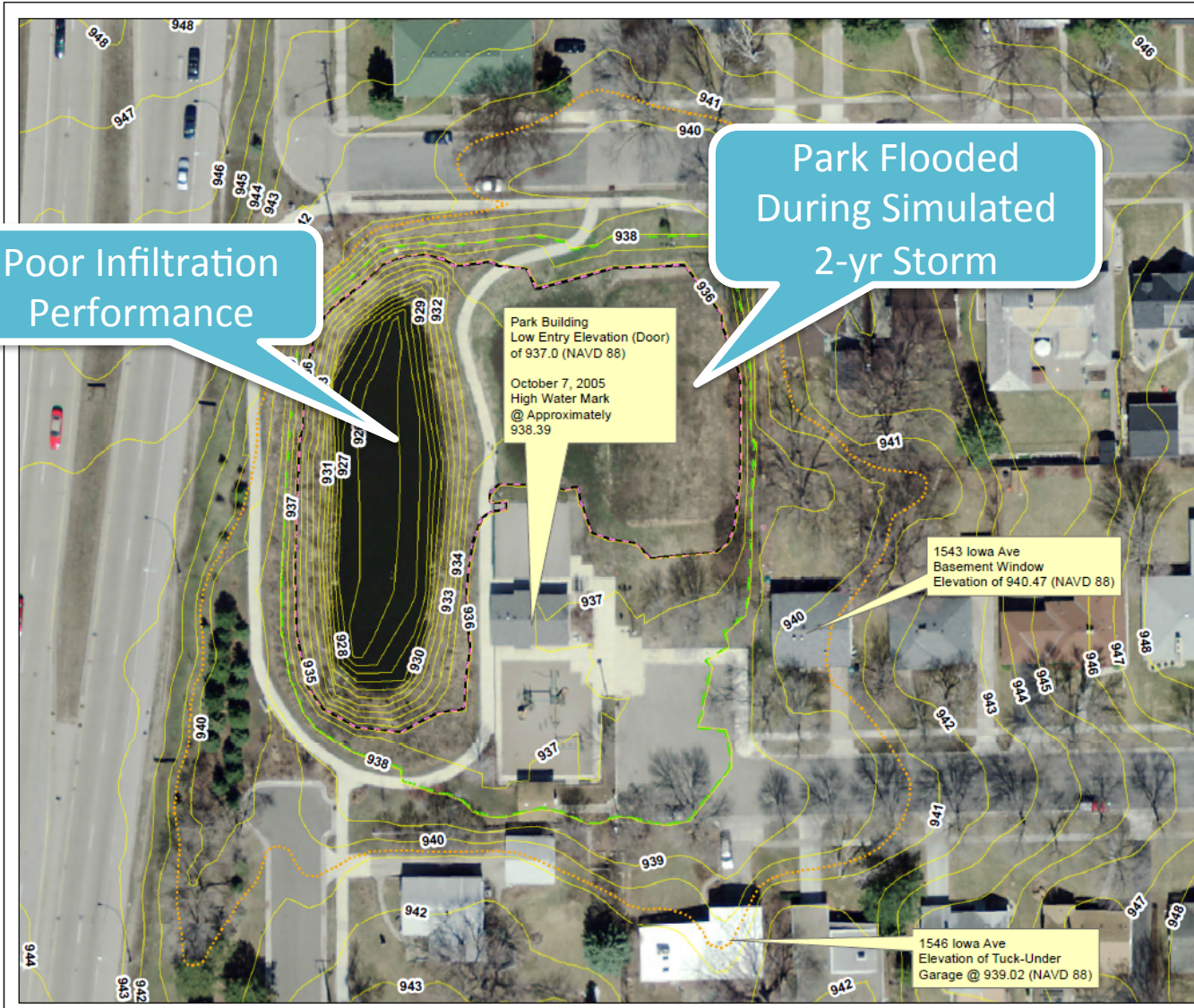
Figure 3 Drainage Areas Fully or Partially Contributing to Curtiss Pond

Scale: AS SHOWN	Drawn by: SMW	Checked by:	Project No.: 6475-008	Date: 8/15/2013	Sheet: 1 of 1
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*Figure courtesy of Feasibility Study Report prepared by Houston Engineering, Inc. (2013)

Background

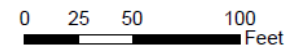


Capitol Region Watershed District Curtiss Pond



Legend

- 1 Foot Contours Created from LIDAR and Survey Data
- 2-Year Approximate HWL @ 935.9
- 10-Year Approximate @ 937.9
- 100-Year Approximate HWL @ 940.6

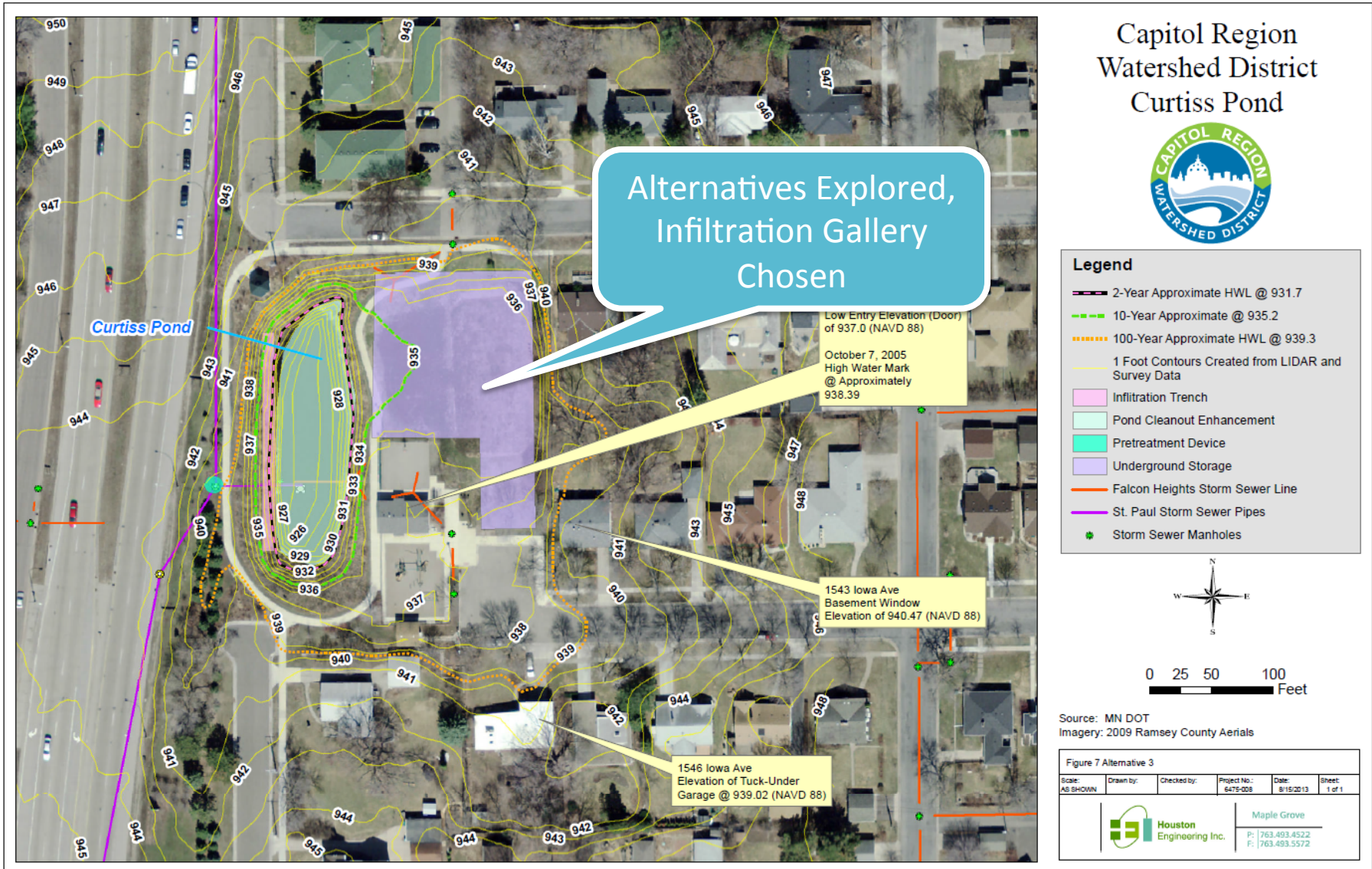


Source: MN DOT
Imagery: 2009 Ramsey County Aerials

Figure 5 Estimated Existing Conditions High Water Levels					
Scale:	Drawn by:	Checked by:	Project No.:	Date:	Sheet:
AS SHOWN			6475-008	8/15/2013	1 of 1
Houston Engineering Inc.			Maple Grove P: 763.493.4522 F: 763.493.5572		

*Figure courtesy of Feasibility Study Report prepared by Houston Engineering, Inc. (2013)

Background



*Figure courtesy of Feasibility Study Report prepared by Houston Engineering, Inc. (2013)

Background



Background



*Image Courtesy of: <http://www.capitolregionwd.org/our-work/>

Challenge for Capital Region Watershed District

- Can System Performance be Further Improved to meet site needs?



- Hurdles:

Cost
Constraints

Limited
Footprint

Site
Constraints

No Outlet!

Solution: Intelligent Retention!

- **Primary Goal:**
 - Increase Efficiency and of Pond and Infiltration Gallery by Retrofitting with Real-Time Monitoring and Control

- **System Benefits:**

Minimize
Flooding &
Reduce Site Risk

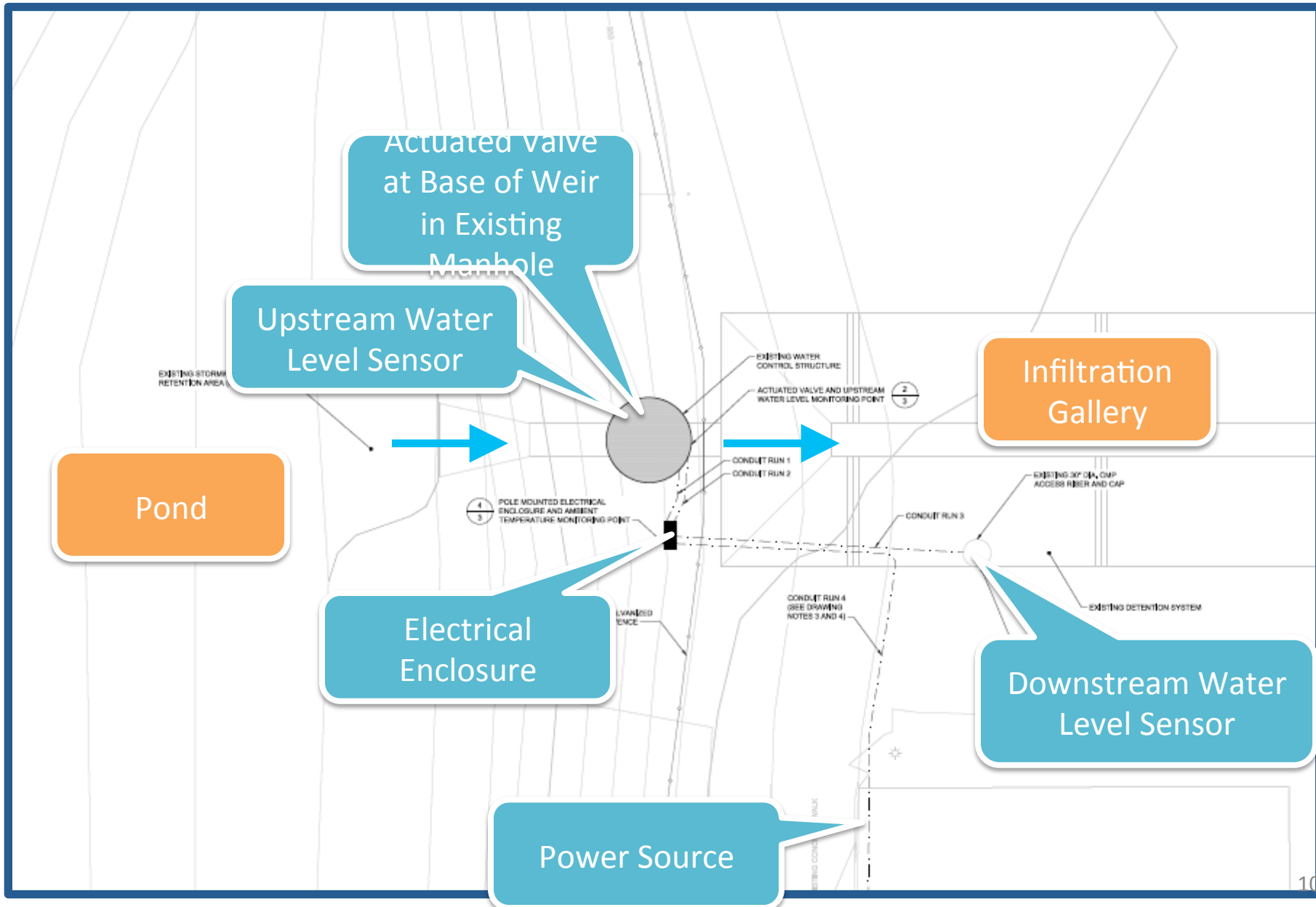
Intelligent
Infiltration

Minimal
Maintenance

Remote
Monitoring &
Programming



Component Overview

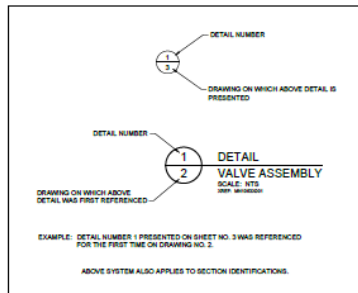


Design

MONITORING AND CONTROL SYSTEM FOR CURTISS POND

1551 WEST IOWA AVE
FALCON HEIGHTS, MN 55108

FINAL DESIGN MARCH 2015 - BIDDING SET



LIST OF DRAWINGS	
DRAWING NO.	DRAWING TITLE
1	TITLE SHEET
2	PROPOSED SITE CONDITIONS
3	DETAILS I
4	DETAILS II

PREPARED FOR:




CAPITOL REGION WATERSHED DISTRICT
1410 ENERGY PARK DRIVE, SUITE 4
SAINT PAUL, MN 55108

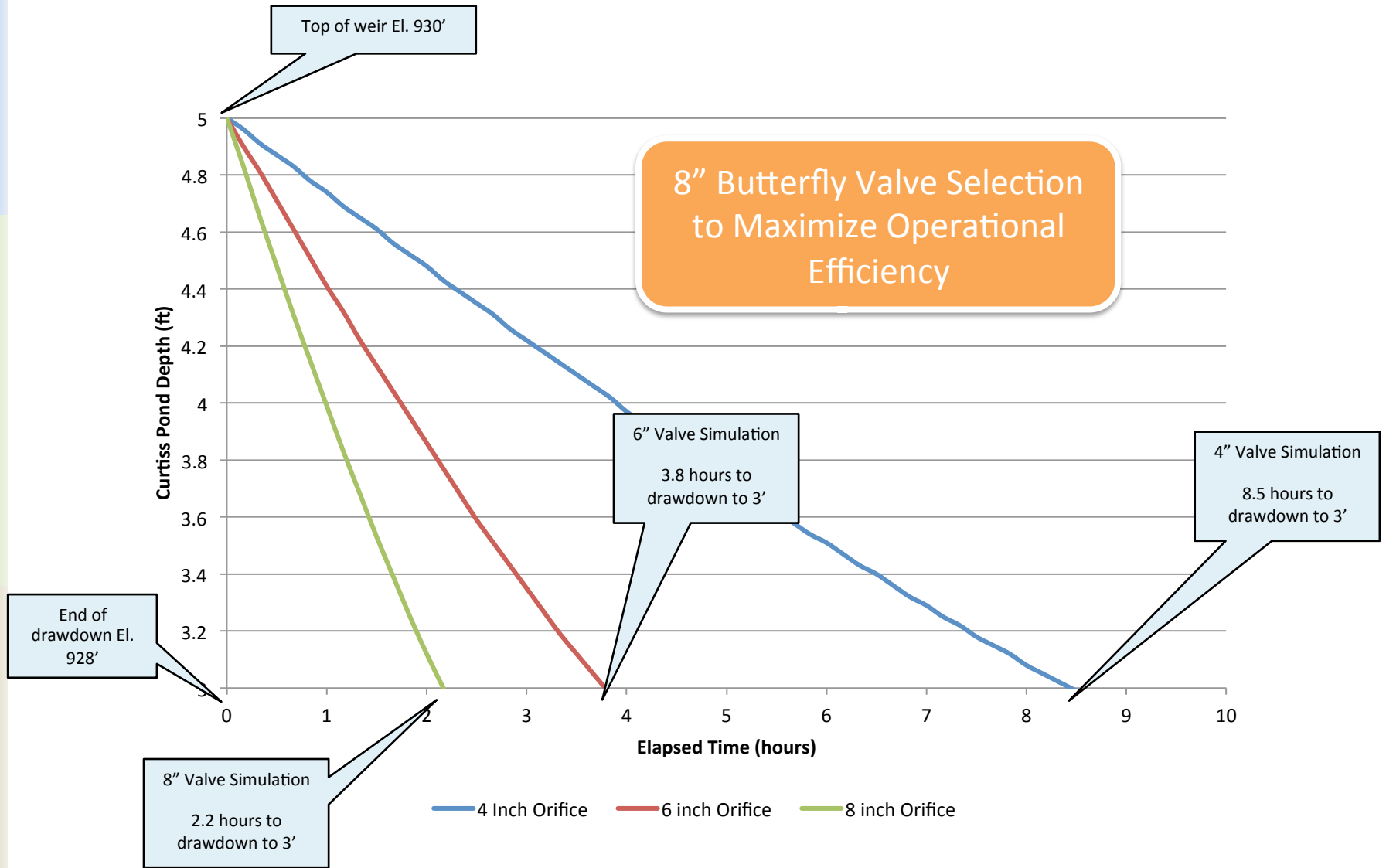
PREPARED BY:



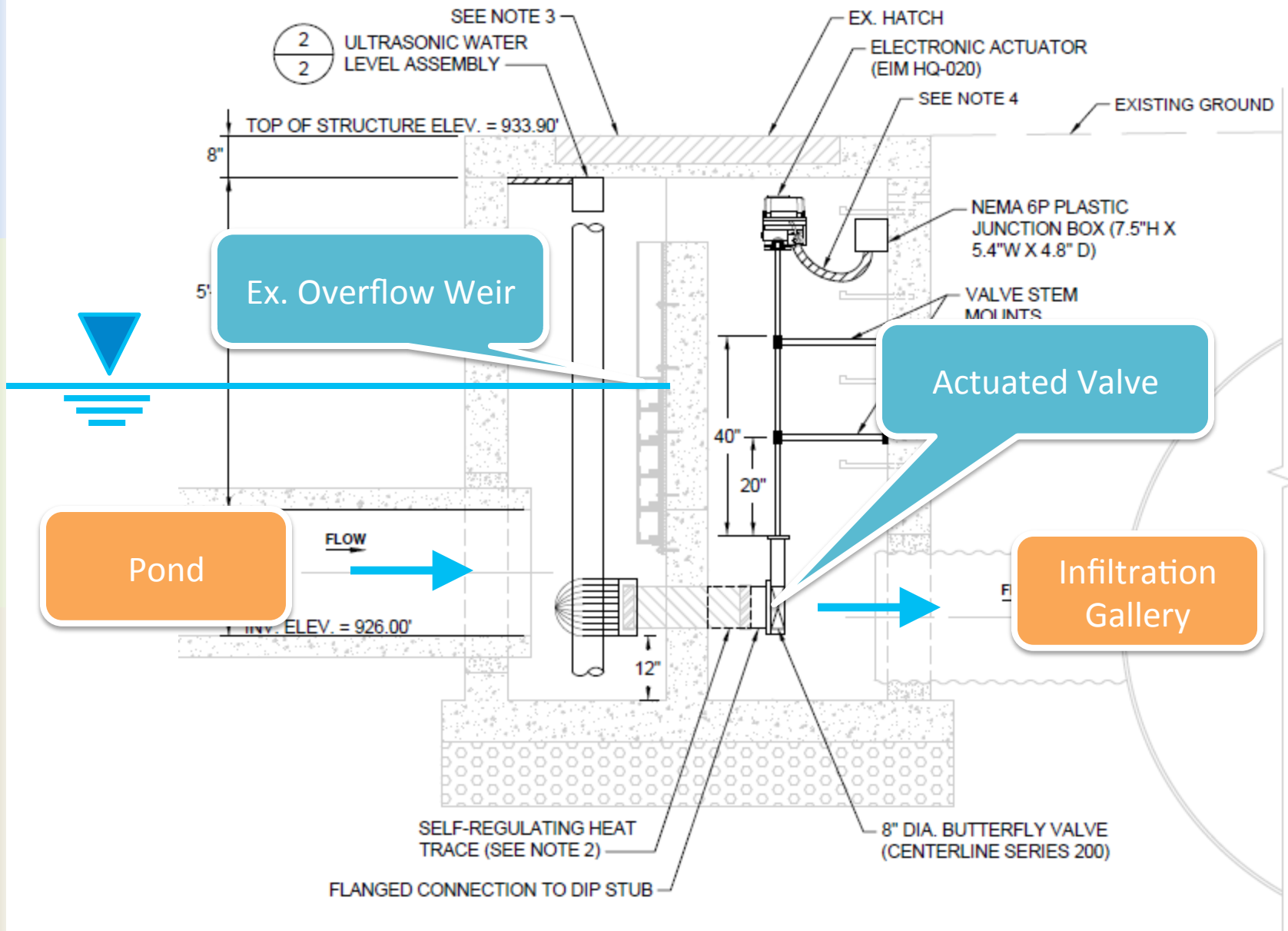
GEOSYNTEC CONSULTANTS
100 WASHINGTON AVENUE SOUTH, SUITE 1590
MINNEAPOLIS, MN 55401
PHONE: 612.253.8200

REV	DATE	DESCRIPTION	DRN	APP	
 100 WASHINGTON AVENUE SOUTH, SUITE 1590 MINNEAPOLIS, MN 55401					
TITLE SHEET					
PROJECT: MONITORING AND CONTROL SYSTEM FOR CURTISS POND					
SITE: 1551 WEST IOWA AVE FALCON HEIGHTS, MN 55108					
<small>UNLESS OTHERWISE SPECIFIED, DIMENSIONS SHALL BE IN METERS AND DECIMALS THEREOF SHALL BE TO THE NEAREST MILLIMETER. DIMENSIONS SHALL BE TAKEN FROM THE CENTER OF GRADE.</small>		DRAWN BY: DCR CHECKED BY: DCR REVISIONS BY: DLR APPROVED BY: DLR	DATE: MARCH 2015 PROJECT NO.: MN1063 FILE: MN1063P001 DRAWING NO.: 1 OF 4		

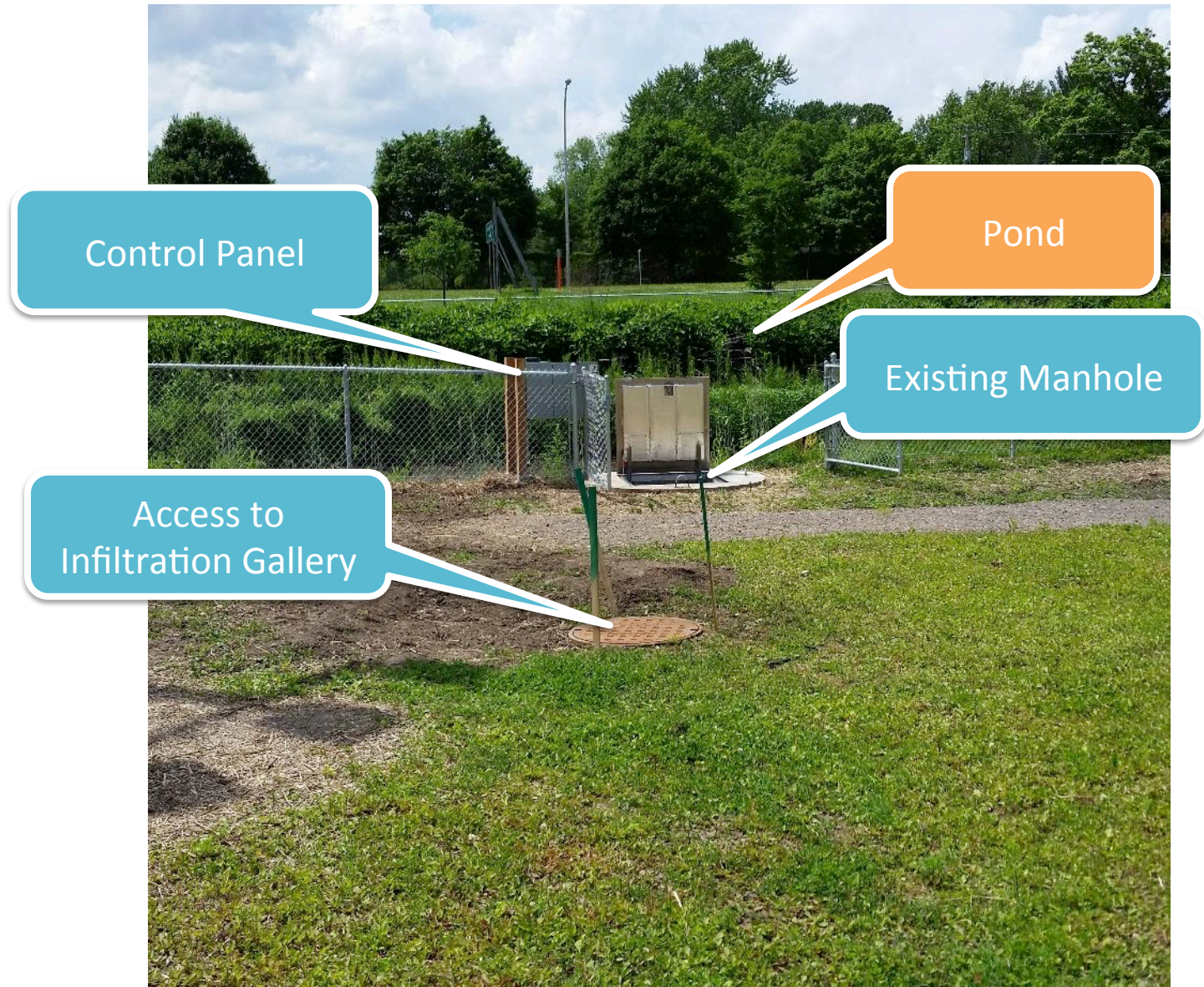
Valve Sizing



Manhole Detail



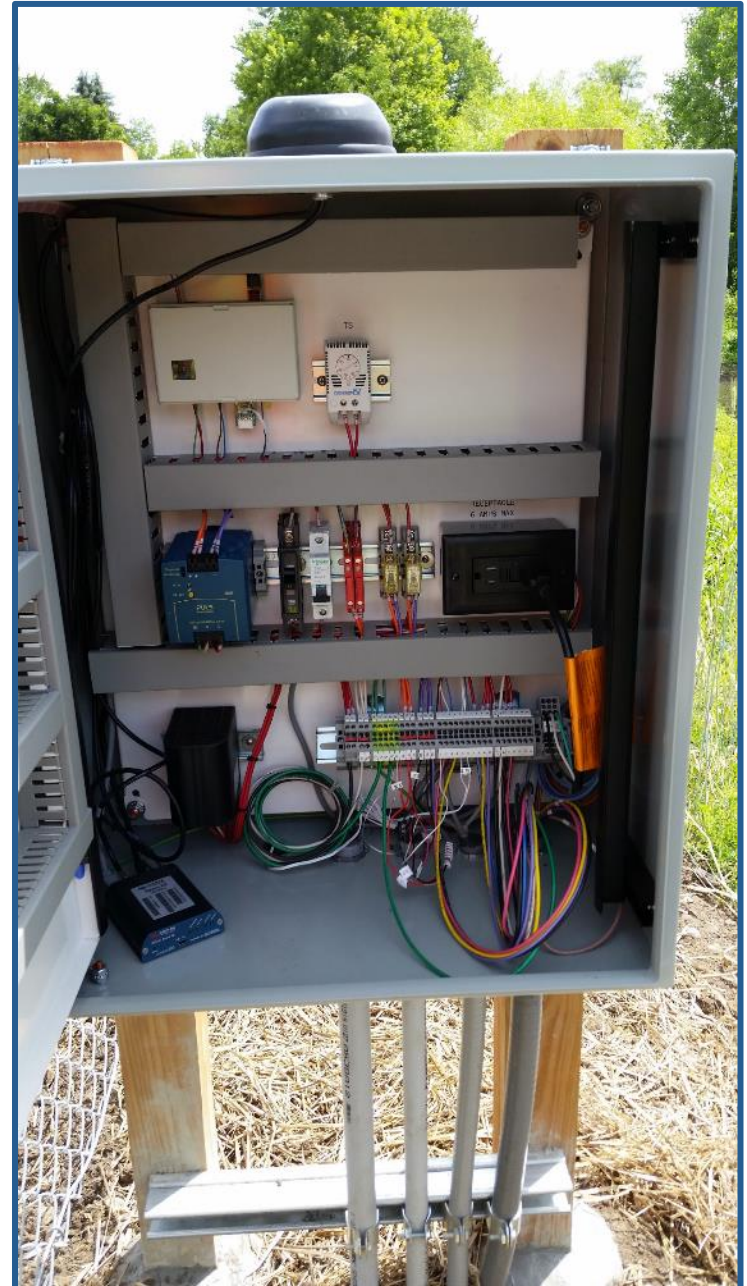
Commissioning



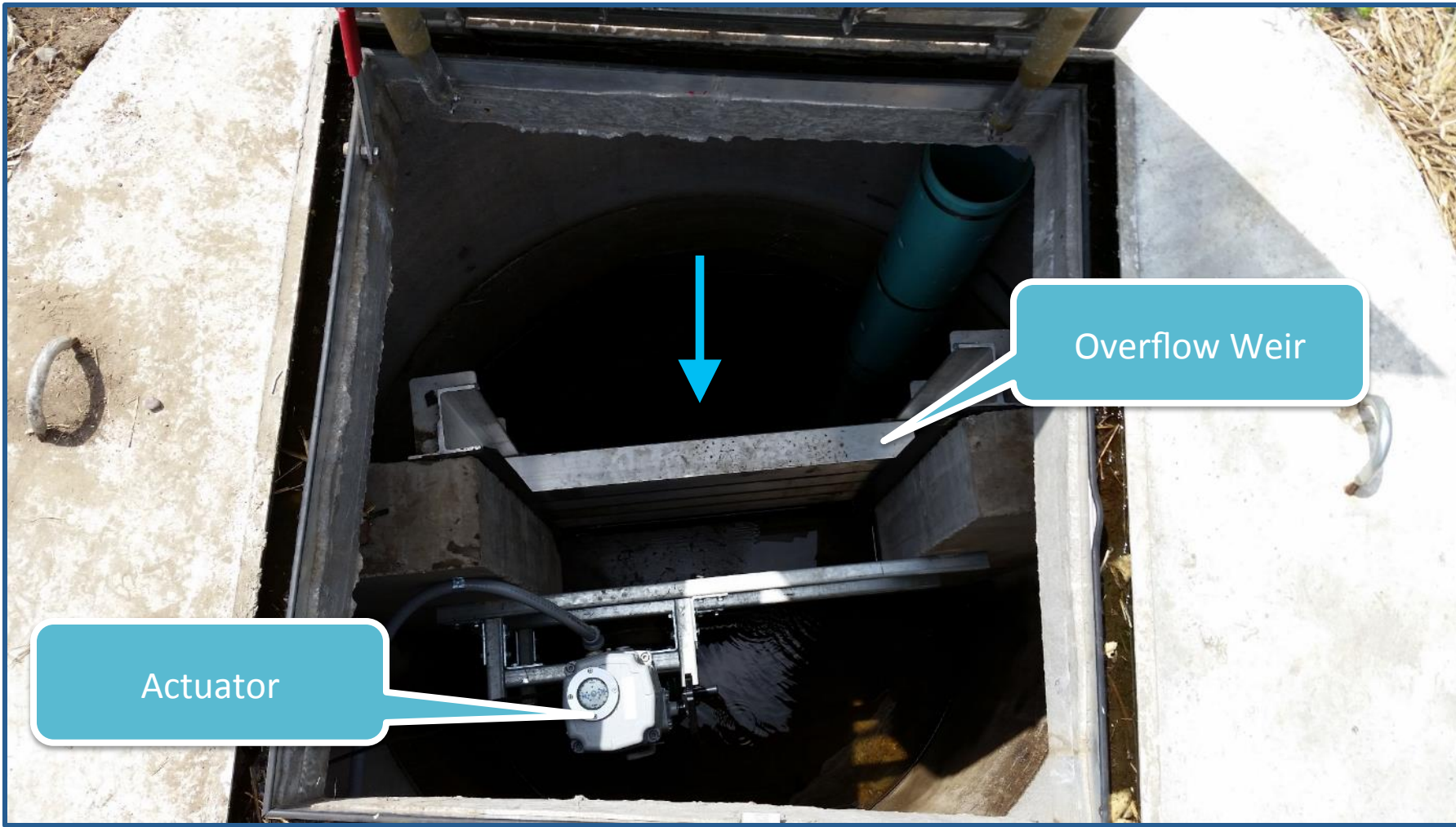
Commissioning



Commissioning



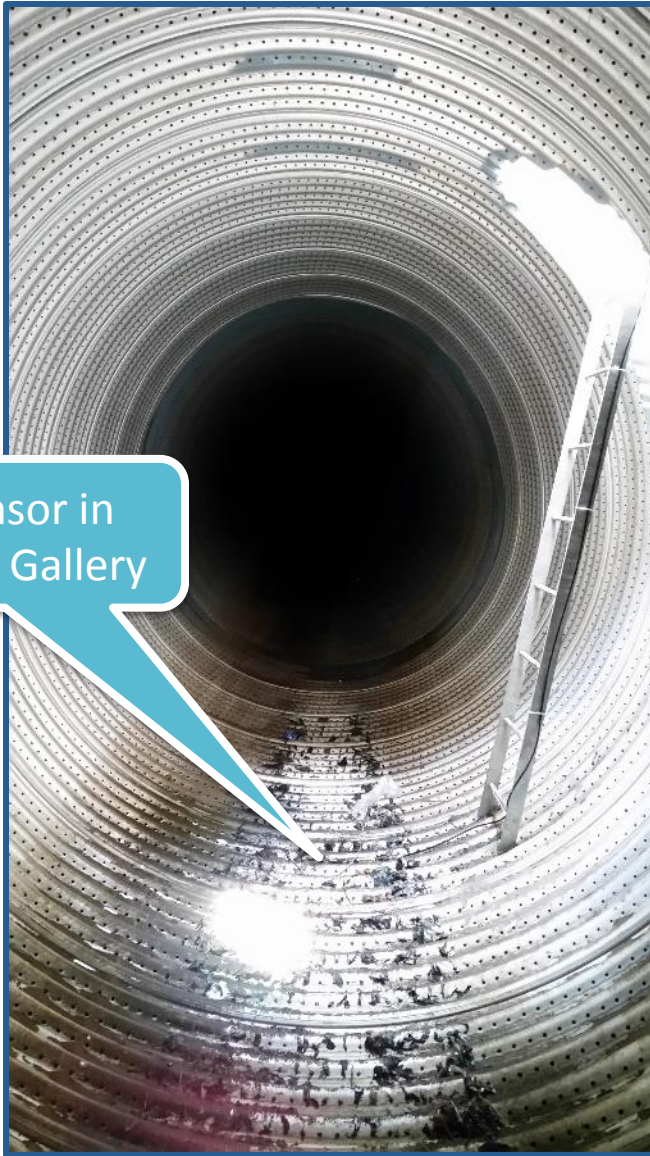
Commissioning



Commissioning



Commissioning



Level Sensor in
Infiltration Gallery





Monitoring and Control System for Curtiss Pond Operations and Maintenance Manual

Prepared for

Capitol Region Watershed District
1410 Energy Park Drive
Suite 4
Saint Paul, MN 55108

Prepared by

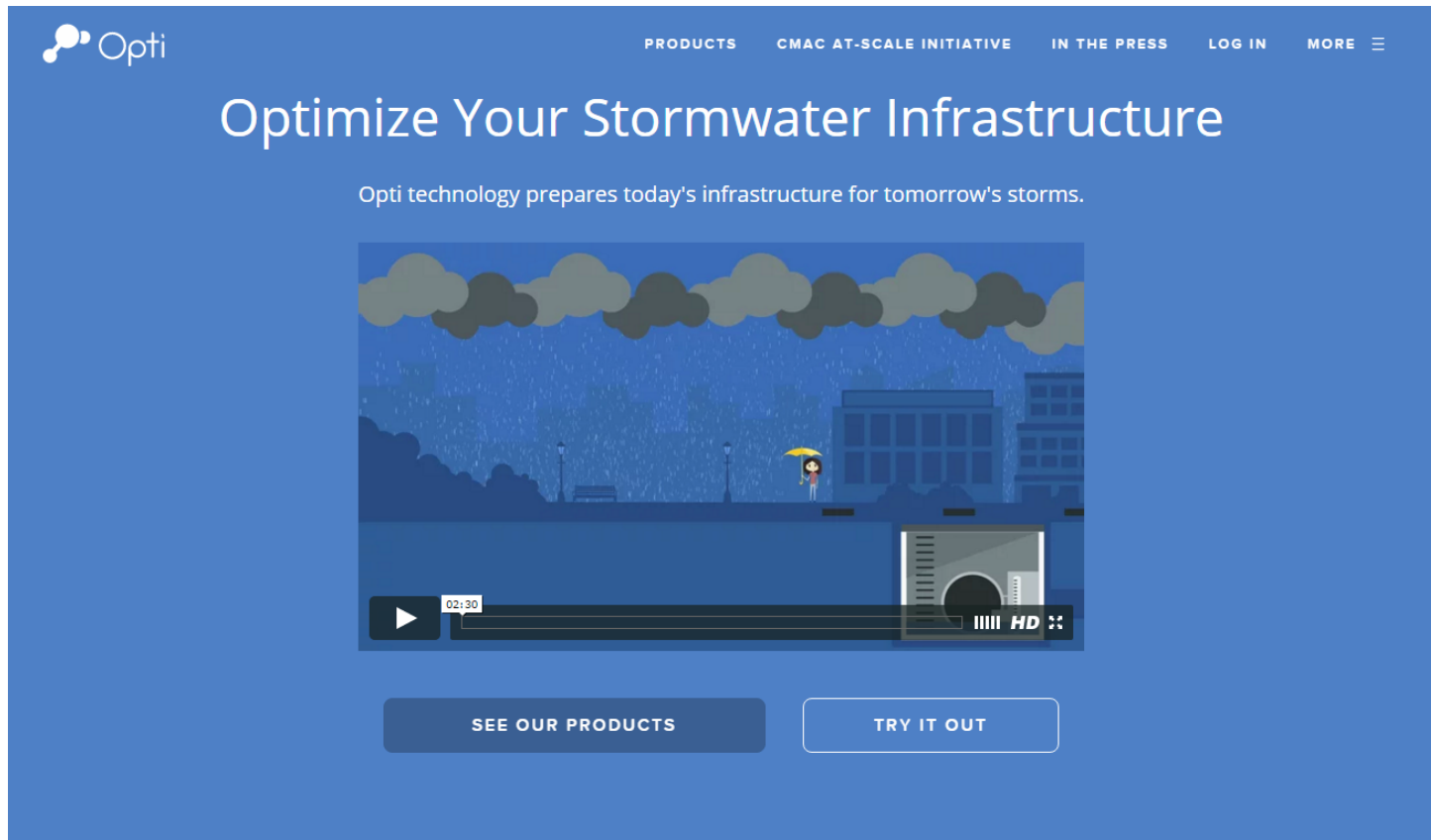
Geosyntec Consultants
1330 Beacon Street
Brookline, MA 02446

OptiRTC, Inc.
356 Boylston Street
2nd Floor
Boston, MA 02116

July 2015

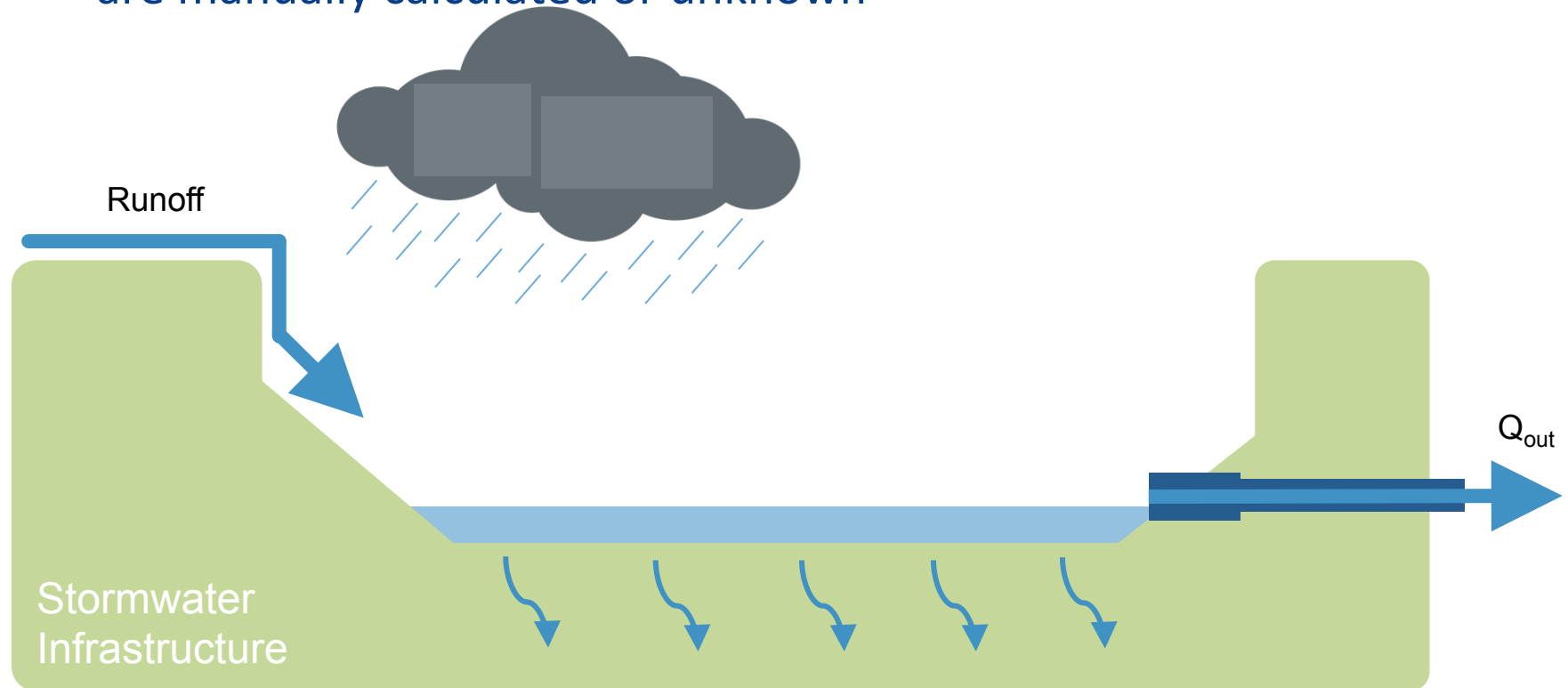
How Does the System Function?

- **OptiRTC** is a cloud-native platform that uses sensor data, forecast information, & modeling to actively control and/or maintain/monitor water infrastructure.
- <https://www.optirtc.com/>

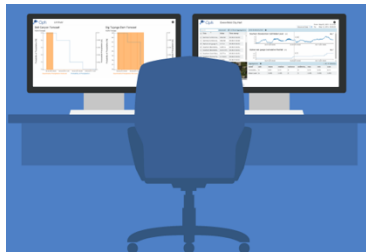
A screenshot of the Opti website homepage. The background is a solid blue color. At the top left is the Opti logo. To the right of the logo is a navigation menu with the following items: "PRODUCTS", "CMAC AT-SCALE INITIATIVE", "IN THE PRESS", "LOG IN", and "MORE" followed by a hamburger menu icon. Below the navigation is the main heading "Optimize Your Stormwater Infrastructure" in a large, white, sans-serif font. Underneath the heading is a sub-headline: "Opti technology prepares today's infrastructure for tomorrow's storms." Below the sub-headline is a video player. The video player shows a dark blue scene of a city street during a rainstorm. There are grey clouds at the top, rain falling, and a person with a yellow umbrella walking on the sidewalk. In the background, there are silhouettes of buildings and streetlights. The video player has a play button on the left, a progress bar in the middle showing "02:30", and a volume icon on the right. Below the video player are two buttons: "SEE OUR PRODUCTS" and "TRY IT OUT".

Traditional Infrastructure

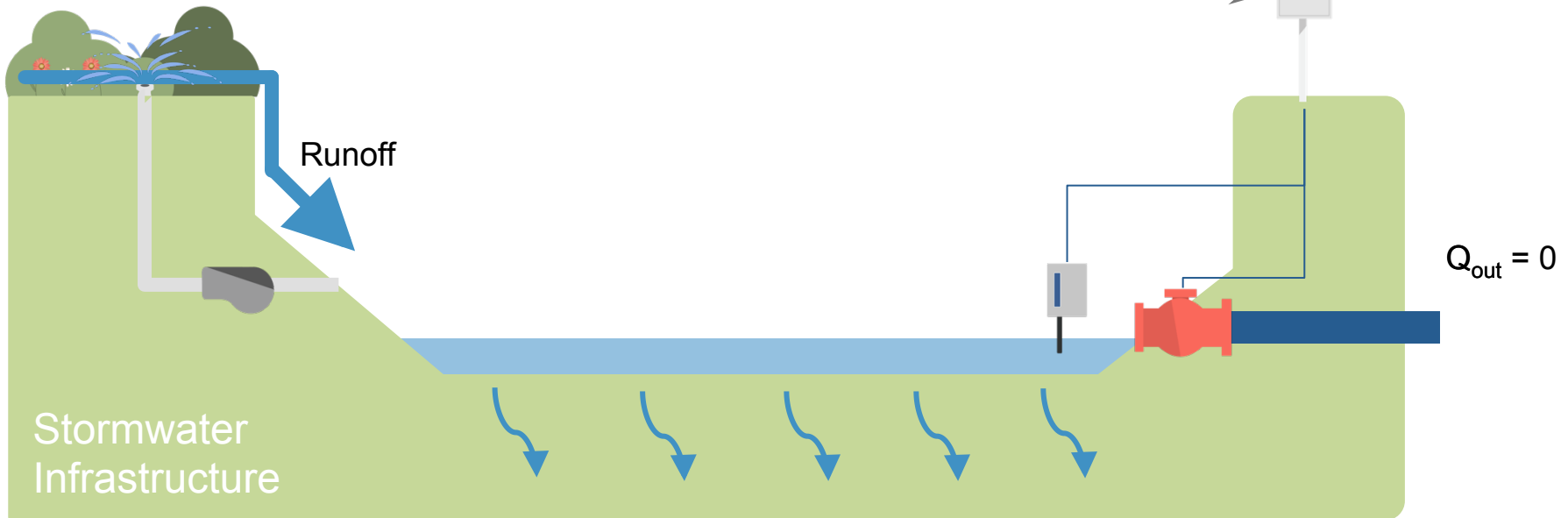
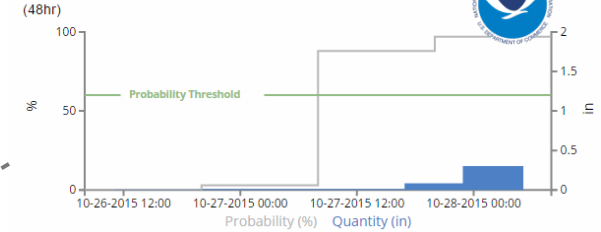
- Stormwater runoff is managed with passive infrastructure designed for a single purpose and design storm
- Performance and maintenance needs of stormwater infrastructure are manually calculated or unknown



Continuous Monitoring and Adaptive Control



Precipitation Forecast (48hr)

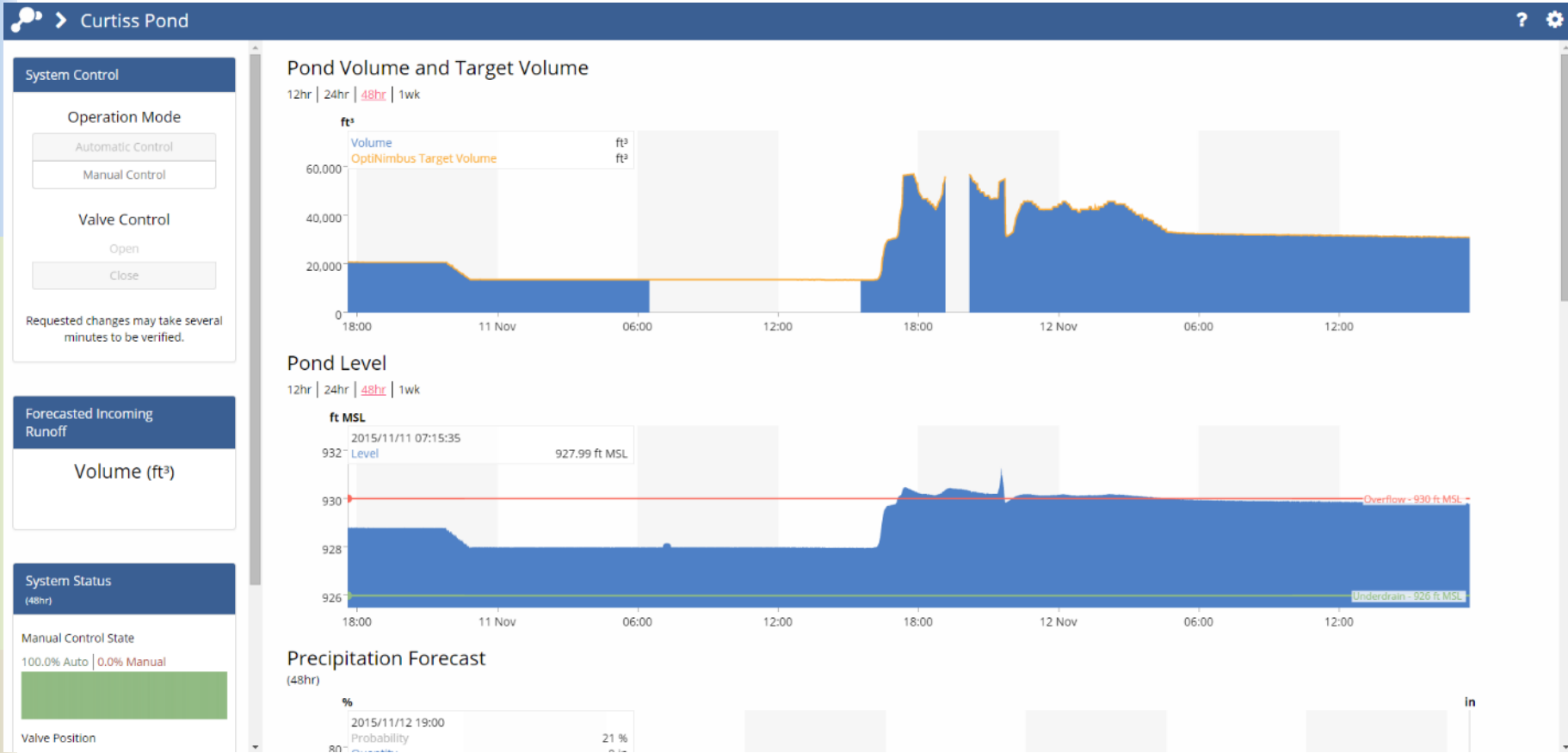


*Image Courtesy of OptiRTC

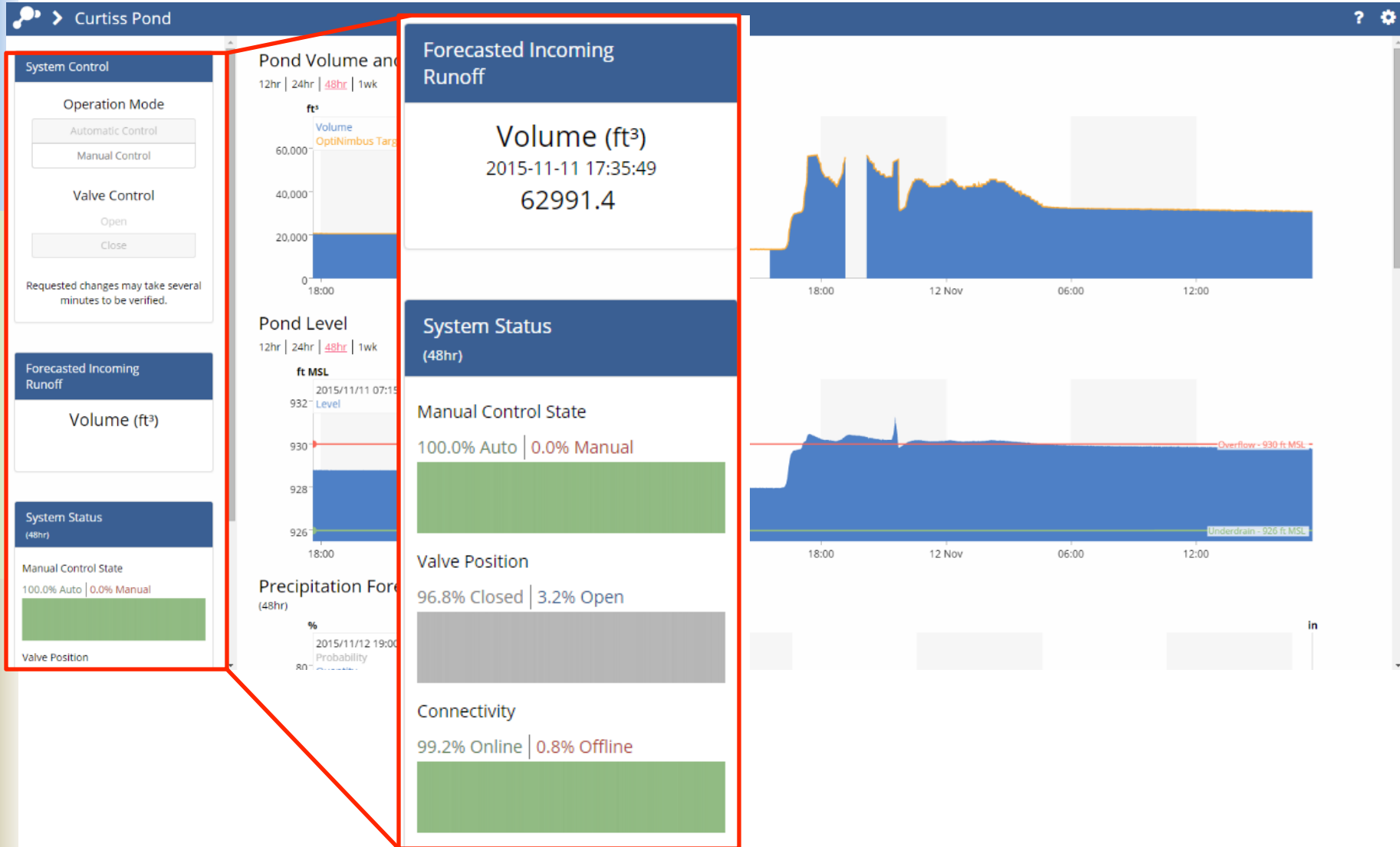
System Operational Sequence



Example Dashboard Visualization



Example Dashboard Visualization



Example Dashboard Visualization

Pond Level

12hr | 24hr | **48hr** | 1wk

ft MSL

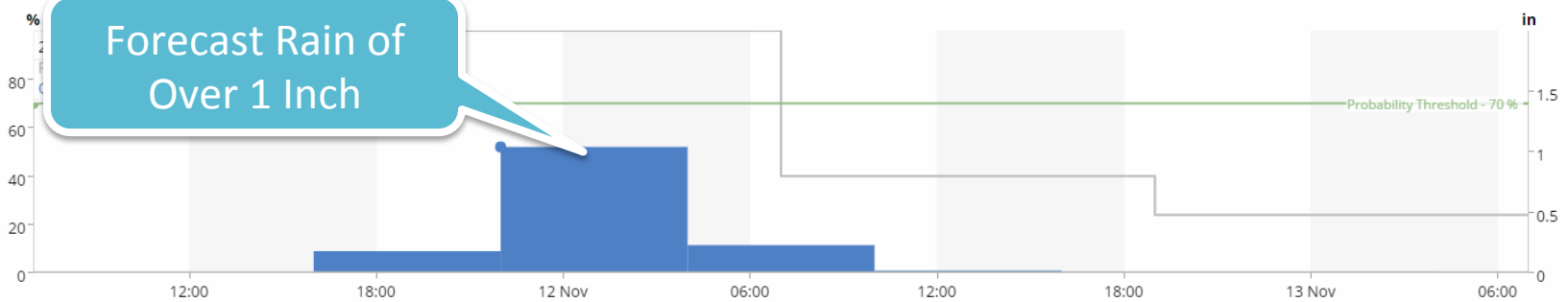
2015/11/09 23:12:36

932.7 Level



Precipitation Forecast

(48hr)



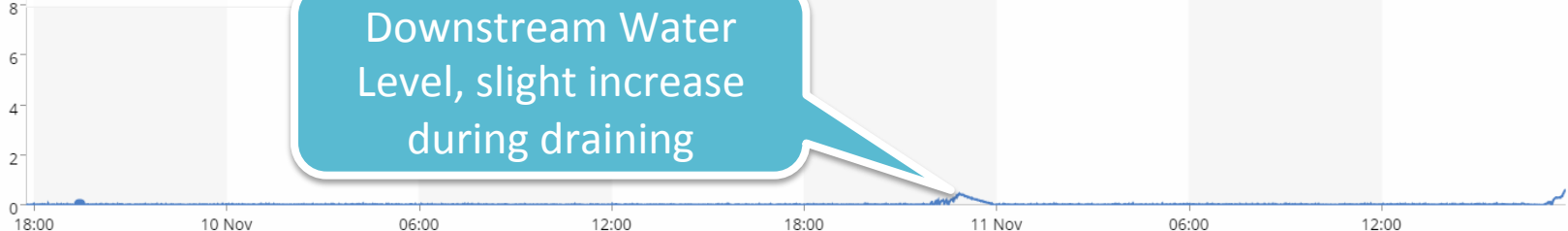
Infiltration Gallery

12hr | 24hr | **48hr** | 1wk

ft

2015/11/09 19:25:37

Level



Example Dashboard Visualization

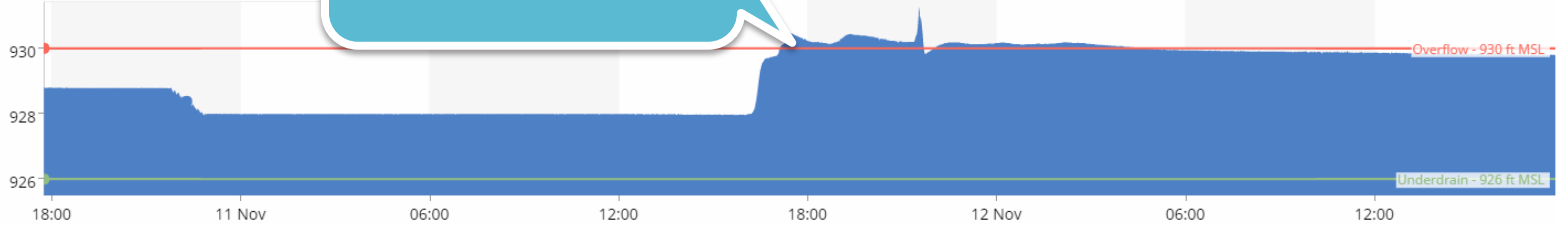
Pond Level

12hr | 24hr | 48hr | 1wk

ft MSL

2015/11/10 22:17:33

Level



Post-Storm

Precipitation Forecast

(48hr)

%

2015/11/13 04:00

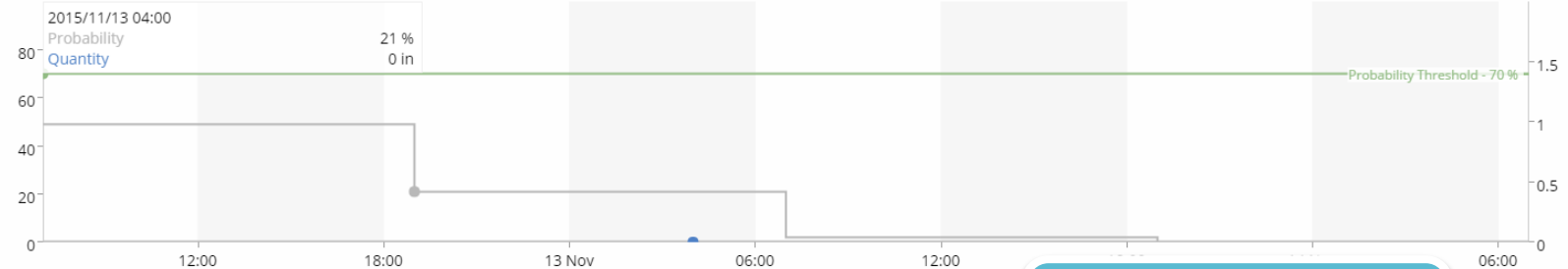
Probability

21 %

Quantity

0 in

in



Infiltration Gallery

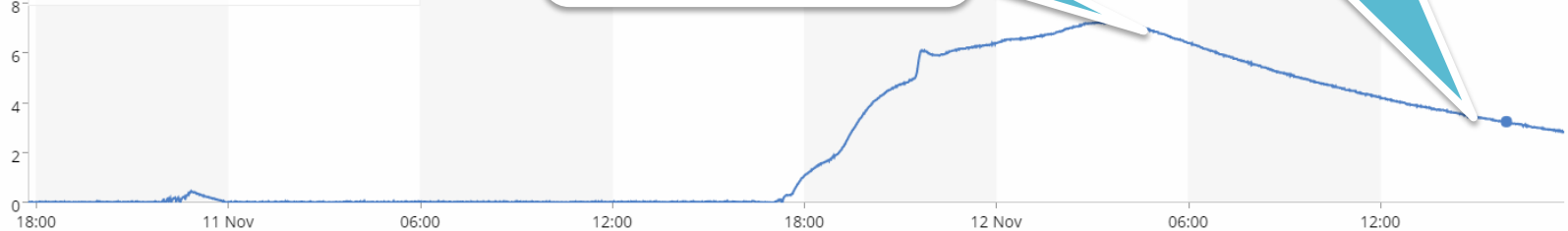
12hr | 24hr | 48hr | 1wk

ft

2015/11/12 15:56:43

Level

3.25 ft



How much of a difference can these systems make?

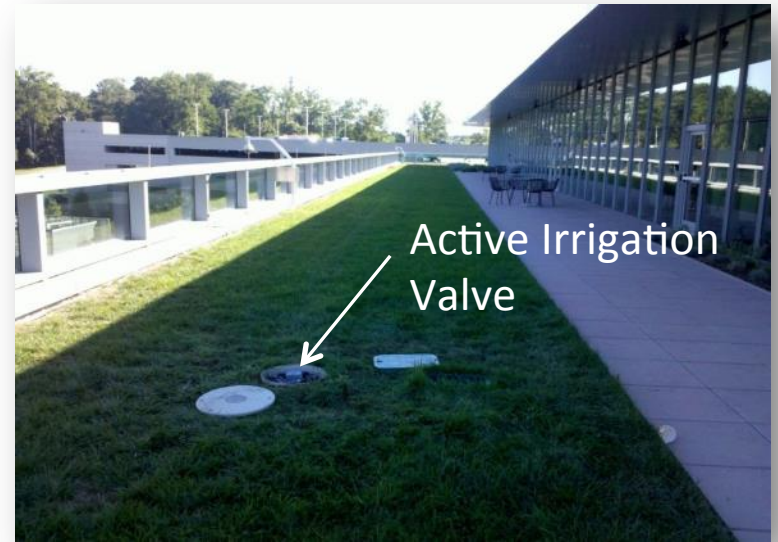
Results from a similar system at NC State University:

	Observed (With Controls)	Modeled (No controls)
Overall Wet Weather Discharge Volume Reduction	86%	21%
Mean Peak Flow Reduction	93%	11%
Overflow Frequency	18%	58%

*DeBusk, 2013

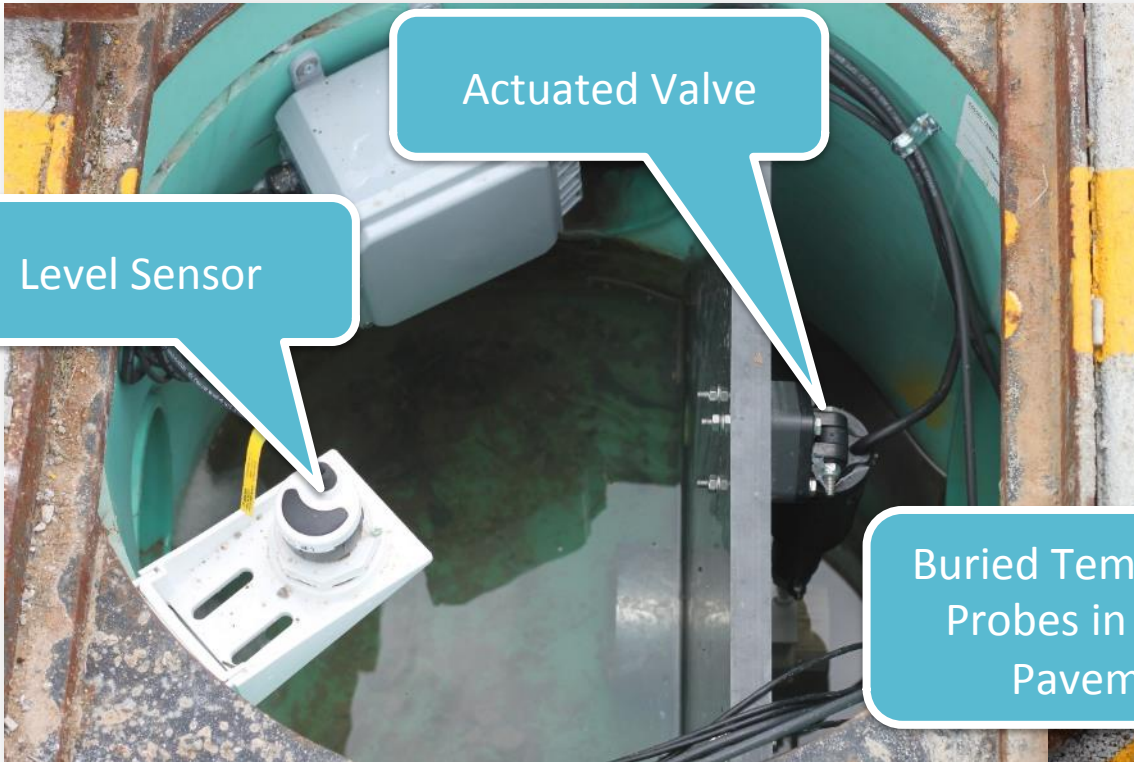
Many Other Applications

- Green Roofs



Many Other Applications

- Porous Pavement



Actuated Valve

Level Sensor



Buried Temperature Probes in Porous Pavement



Many Other Applications

- Rainwater Harvesting



Thank you for your time!



Contact:

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(droman@geosyntec.com)

Geosyntec
consultants

Special Thanks to:

