



## BELOW THE SURFACE

### Filtration, innovation, and collaboration

#### THE NEED FOR STORMWATER FILTRATION

For most in the general public, seeing a storm pop up on the radar makes our biggest concern getting caught outside without an umbrella.

For those who manage water resources, there is much more at stake. They have many concerns, the largest being where all the water will go and what particles it will move with it. For staff at the Rice Creek Watershed District (RCWD) in Blaine, MN, this concern is a big part of their day-to-day work.

When you think of treating water, what comes to mind? For many, it might be a water treatment plant that returns water to our home taps. Closer to home, you might even imagine the Brita filter you use to ensure your drinking water is safe and tastes its best. In a larger context, we have to consider treating rain water in its natural ecosystem too, even when there may not be such a direct connection to our daily use. The stormwater that falls during a rain shower will find its way to our nearest lakes, streams and rivers, and ultimately oceans. We need to ensure it's as clean as possible when it reaches these broader waters.

**As the RCWD explored, an innovative large-scale filtration system for stormwater is just the answer. This style of filtration is proving very effective for water quality.**

#### TAKING IRON-ENHANCED SAND FILTERS TO THE NEXT LEVEL

The RCWD was interested in using iron-enhanced sand filters (IESF), a new and natural method to treat stormwater. However, they wanted to develop an improved concept to meet their unique needs. Hansen Park in New Brighton, MN, was identified as a public site for flood storage and to capture flowing stormwater that was moving phosphorus—a mineral found in stormwater that can have harmful effects in concentration—along to other waterbodies.

Before the Hansen Park project, IESF systems in Minnesota were primarily passive; meaning the treatment only occurred during rainfall events as stormwater was routed over the filter system. The District was interested in an automated pumping solution that would maximize stormwater treatment through the ability to pump stormwater continuously. A pump would give the District more control during a rainfall event, a great advantage to how effectively the water is treated. However, a pump generally requires human operation and the RCWD couldn't station someone at the project to provide this hands-on approach. That's where Houston Engineering, Inc. (HEI) and EPG Companies came in!

The design the District was envisioning wasn't available off the shelf and no commercial irrigation systems had addressed this need. HEI-EPG had created other pump systems from previous joint work on landfills, and teamed up again to marry technology used in waste management and irrigation industries.

HEI has been a go-to for providing the District's stormwater engineering for many years. EPG Companies is also based in Maple Grove, MN, providing engineering, design, and fabrication of pumps and controls for a variety of environmental challenges. The two firms were excited to partner with RCWD on this unique IESF approach, challenging each other to find an answer where there wasn't one already.



#### CHALLENGES FACED

There were multiple challenges the RCWD faced that caused them to look for a new approach to traditional projects.



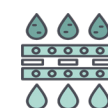
##### Phosphorus (P) in Lakes

Excess P in stormwater was causing algae growth in RCWD lakes. It can only be removed by infiltrating water into the ground naturally or through a practice like an IESF.



##### Fully Developed Area

With limited public land to construct effective practices to treat stormwater, RCWD has to explore unique methods to get the most P removal.



##### Passive Practice Issues

With other management practices, it can be difficult to take them offline for maintenance and they typically treat stormwater only during rainfall events.

#### PUMPED UP IESF

To address all of these challenges, HEI-EPG started brainstorming a new system to reduce the most phosphorus with the most automation. The District wanted to manage the pumping and dosing across multiple filter beds to really maximize the treatment given the changing water levels in the adjacent pond. To work effectively, the sand has to be dry twice as long as it is wet.

The group amplified the concept through many meetings, emails, and in-person sessions. Pumping components that had never been used in the stormwater realm became part of the new IESF blueprint.

All partners drove the overall creativity, bringing their ingenuity to the solution. As shown in the diagram below, the new IESF is far from simple beneath the surface. "Through our collaboration with RCWD and EPG, we really programmed the heck out of this thing!" recalls HEI's Project Manager Dennis McAlpine, PE.

EPG helped design the system with a keen focus on the programming, including how it would be controlled and what the interface would look like. In the end, the automated system can be operated and controlled from a cell phone!

#### FORWARD-THINKING SOLUTION

As our region sees increases in both storm frequency and intensity as urbanization continues, solutions like the Hansen Park IESF will be more necessary than ever to treat stormwater. New issues will charge engineers, manufacturers, watershed districts and other local government organizations, and the public to face new challenges in new ways.

To date, RCWD has installed successful IESF systems designed by HEI-EPG at Hansen Park and Oasis Pond in Roseville, MN, with another install scheduled soon at Bald Eagle Lake. Total P reductions have ranged from 50-90%, with huge reductions seen in total suspended solids (particles that cannot be dissolved) at a rate of 80-95%!

#### YOUR WATERSHED OR CITY COULD BE NEXT! HERE ARE A FEW TIPS TO KEEP IN MIND.

IESFs have proven to be a great system for removing phosphorus and particles. In fact, with lessons learned to date, RCWD is moving forward with new installations. If you're considering a project of your own, Kyle Axtell of RCWD gives a few tips on what you should consider:

- ✓ Don't underestimate maintenance! The filter beds require regular tilling and some removal of algae and weeding.
- ✓ Staff will need to learn how to troubleshoot and monitor operation of the system.
- ✓ Total phosphorus reductions may fluctuate depending on weather patterns and the concentration level within the water that's entering the filtration system.

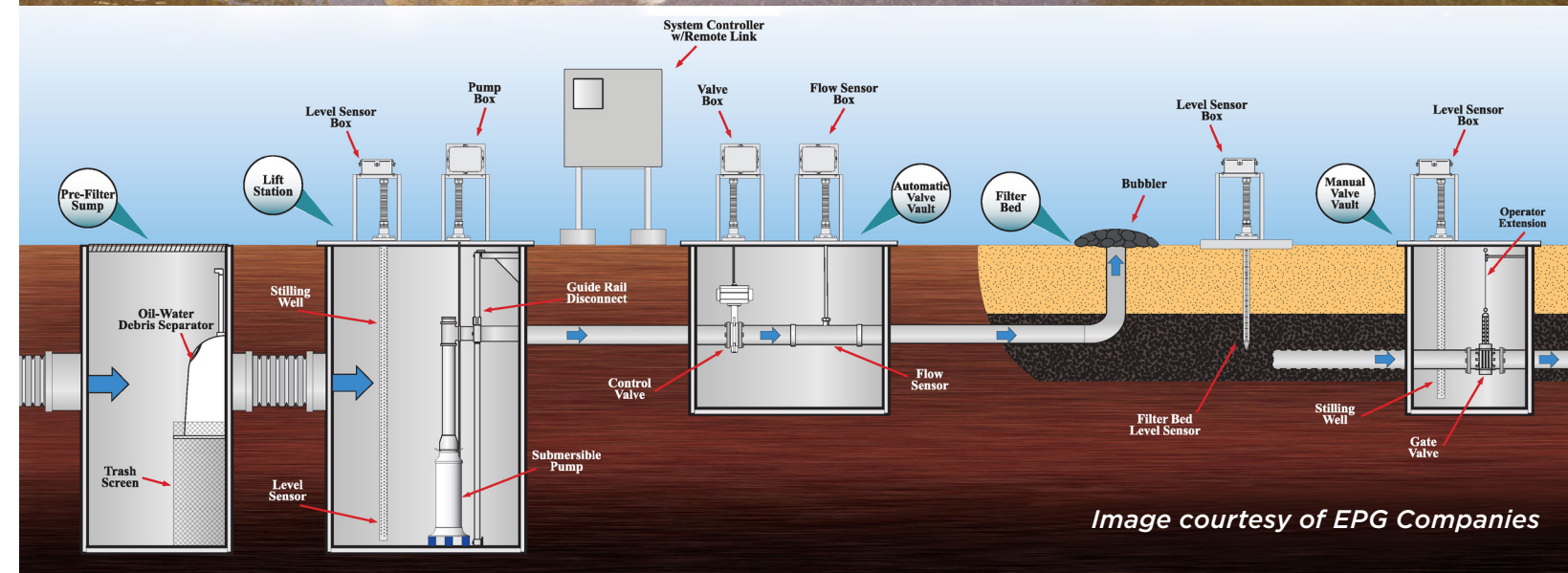
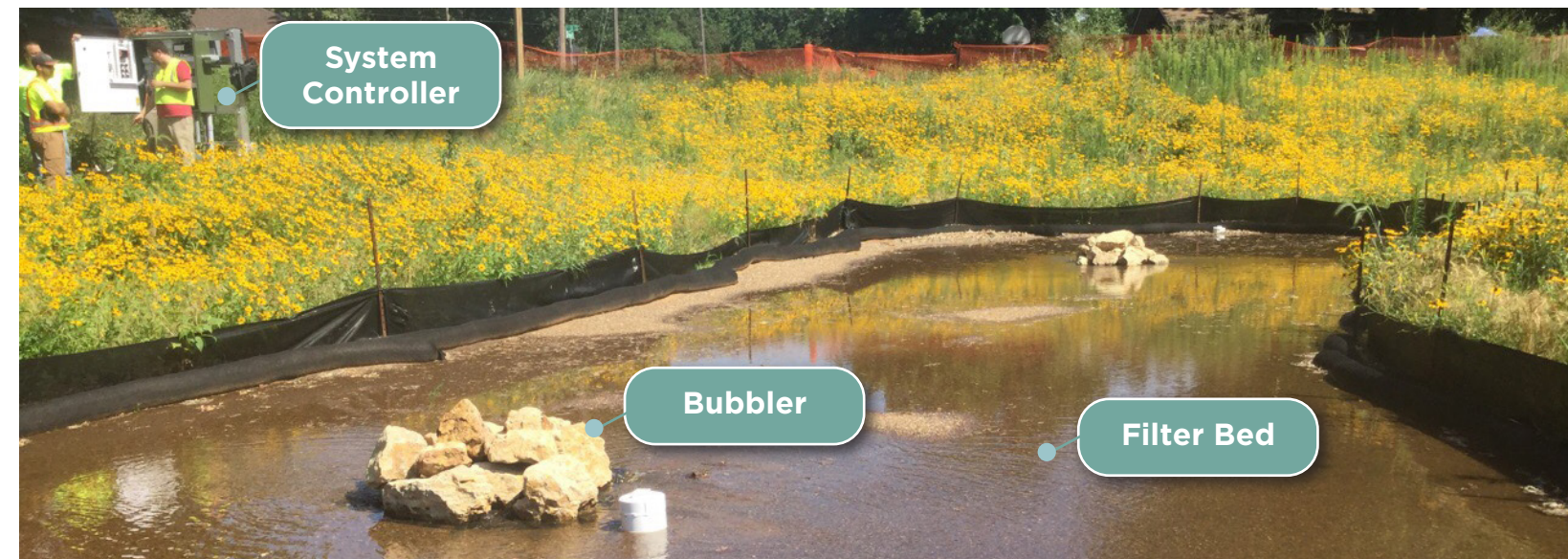


Image courtesy of EPG Companies