JANUARY						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

FEBRUARY						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

RCWD BOARD OF MANAGERS WORKSHOP

Monday, January 6, 2025, 9:00 a.m.

Rice Creek Watershed District Conference Room
4325 Pheasant Ridge Drive NE, Suite 611, Blaine, Minnesota
or via Zoom Meeting:
https://us06web.zoom.us/j/86002518114?pwd=Cpa0unh8IQJ4CbLY29YvIaQy0vgEx4.1
Meeting ID: 860 0251 8114
Passcode: 159486
+1 312 626 6799 US (Chicago)
Meeting ID: 860 0251 8114
Passcode: 159486

Agenda

ITEMS FOR DISCUSSION (times are estimates only)

9:00 District IESF Operations and Maintenance Update

9:30 IESF Monitoring Reports

9:45 CAC Member Appointments for 2025

10:15 Discuss Administrator Performance Review Process

Administrator Updates (If Any)

9:00 District IESF Operations and Maintenance Update

MEMORANDUM
Rice Creek Watershed District

Date: December30, 2024
To: RCWD Board of Managers
From: Tom Schmidt, Drainage & Facilities Manager
Subject: District Iron Enhanced Sand Filter Operations and Maintenance Update

Introduction
The Board had previously asked staff for an informational update on the operation and maintenance of the District's Iron Enhanced Sand Filters (IESF).

Background
IESF are a well-researched, relatively new method of stormwater treatment. IESF facilities use filtration media, typically sand infused with iron fillings, to filter out dissolved phosphorus from stormwater. The stormwater is pumped onto the infiltration beds, filters through the media, and then returns to the conveyance via pipes under the infiltration beds. Plain sand filters have been used for years to remove solids and some pollutants from stormwater, but it was found that adding steel fibers to the sand efficiently removes dissolved phosphorus. Research from the University of Minnesota and District water quality monitoring indicates this practice can remove up to 90 percent of dissolved phosphorus in the contributing stormwater. Research indicates the media should last many years before requiring replacement, and staff continue to monitor its iron-enhanced sand filters to determine their continued effectiveness over time.

The District has three IESF among its District Facilities. The Hansen Park IESF treats water from Ramsey County Ditch #2 in New Brighton before discharging to Pike and Long Lakes. The Bald Eagle IESF treats water from Ramsey County Ditch #11 in White Bear Lake before discharging to Bald Eagle Lake. Oasis Pond IESF treats water from Ramsey County Ditch #4 in Roseville before discharging to Lake Johanna. Each of these facilities has presented some operation and maintenance challenges, yet IESF remain one of the most effective and cost-efficient ways to remove dissolved phosphorus from stormwater and improve water quality. Some of the challenges the District has seen include:

- Complicated/delicate electronics installed in harsh environments
- Water ingress into the pump control box
- Annual pump installation and maintenance
- Infiltration bed vegetative/sedimentation management

Attachment
District Iron Enhanced Sand Filter (IESF) Operations and Maintenance Update - PowerPoint Presentation

District Iron Enhanced Sand Filter (IESF) Operations and Maintenance Update

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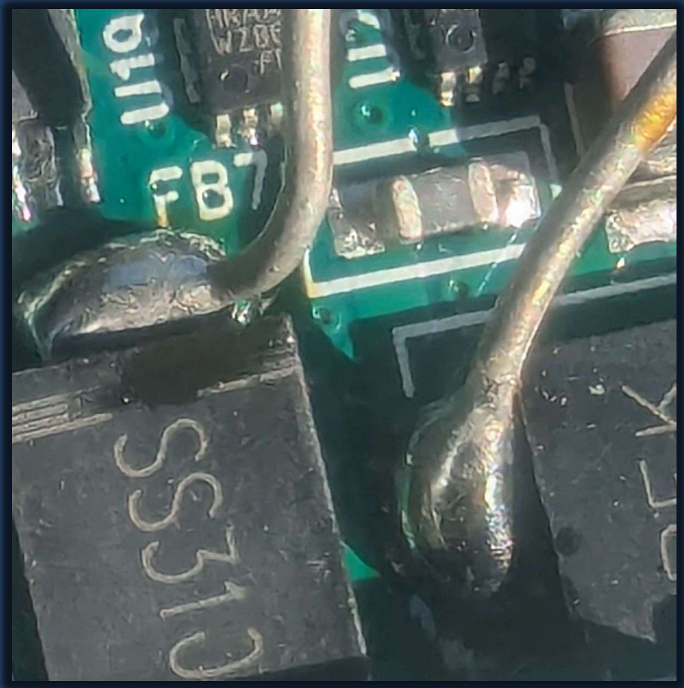
Bald Eagle IESF

Bald Eagle IESF- the Electronic Control Unit (ECU) failed and started on fire and is completely inoperable, we are retro-fitting this site with the newer style ECU that is more reliable and less complex. BE IESF site should be 100% operational spring 2025



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Hansen Park

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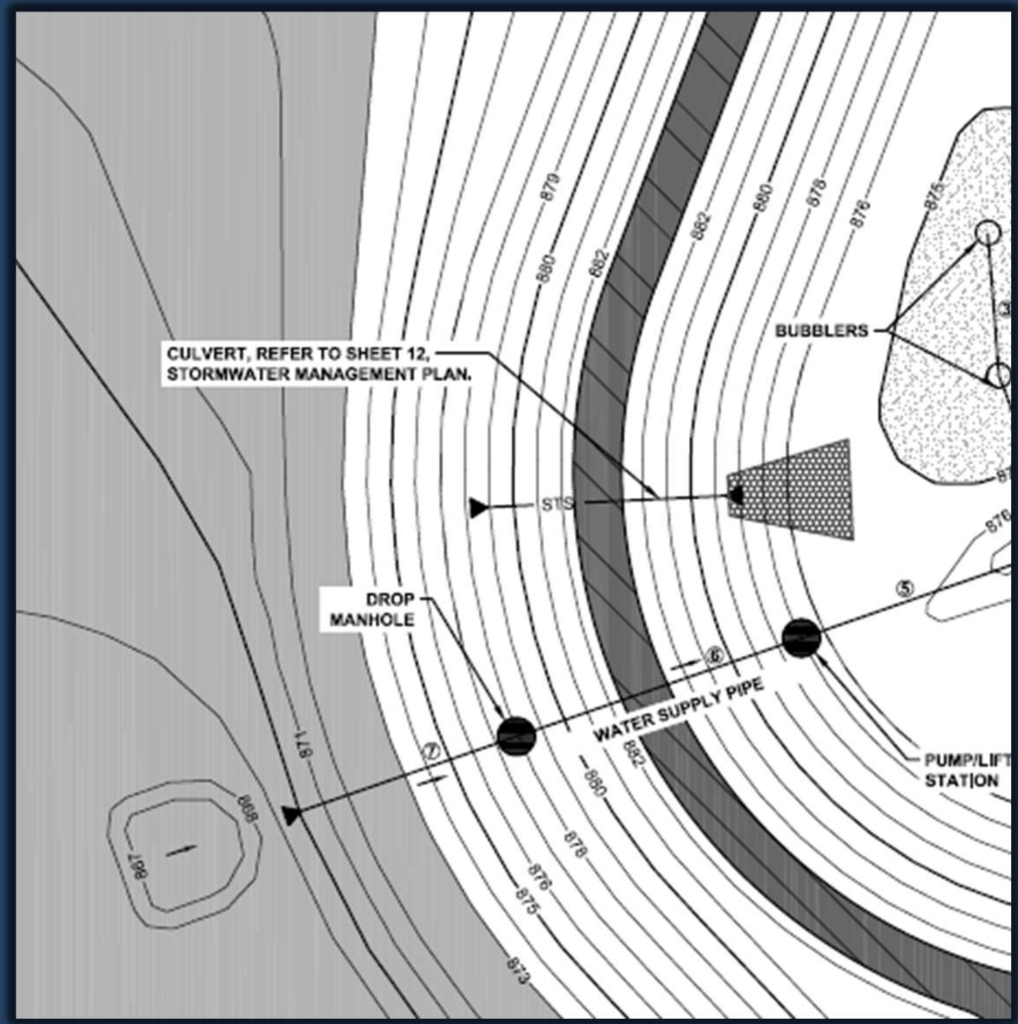
Easy fix problem at Hansen is the pump motor lead box sits directly on the manhole, during high water events water runs up pipe and through box depositing debris and corroding connections

Motor lead cable damaged by muskrat and made pump inoperable, has been repaired

RCWD RICE CREEK WATERSHED DISTRICT

More difficult fix at Hansen is creating a way to reduce sedimentation at the end of the inlet pipe or creating a way to remove it and do maintenance



August 22nd, 2023

May 3rd, 2024

August 30th, 2024

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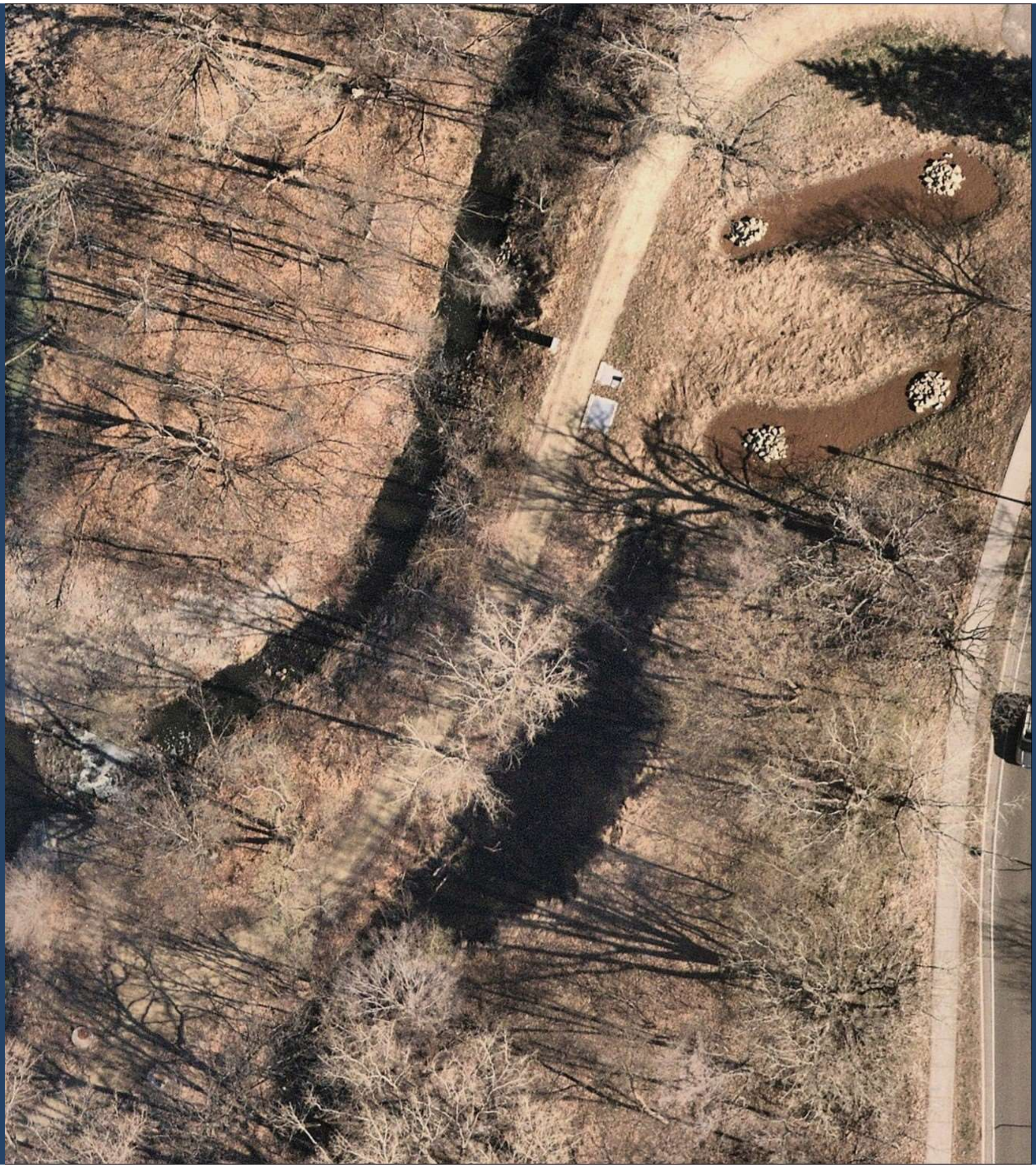

Oasis Pond IESF

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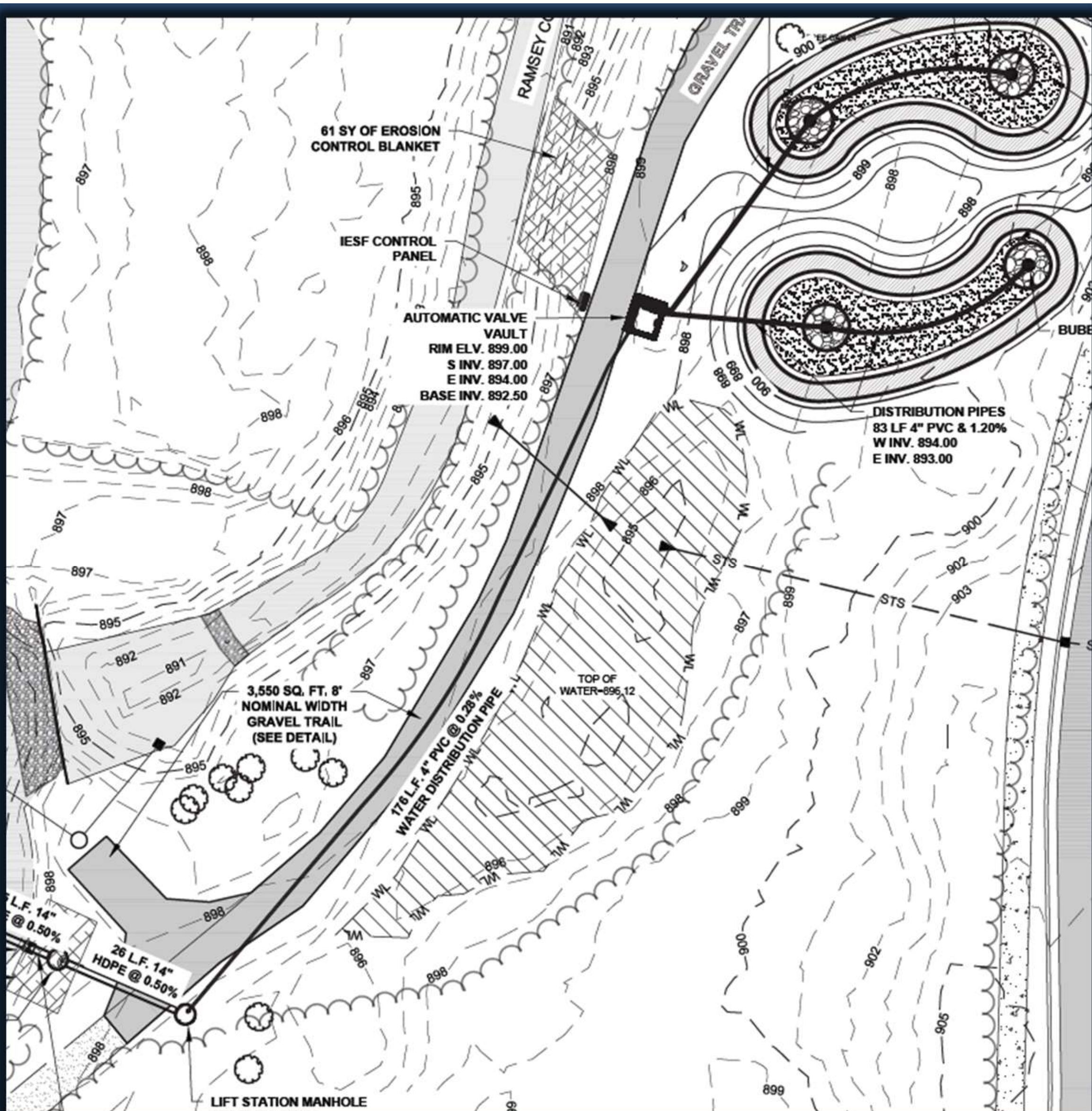
Oasis Pond IESF



Summer of 2024, Staff replaced the failed pipe that connected the lift station to the valve vault; it should be fully functioning next spring.

The city of Roseville plans on paving the trail adjacent to the pipe, so the decision was made to get as much of the pipe out from under the trail as possible

many breaks were discovered in the pipe that caused the system to lose pressure, the loss of flow stops the pump from running to prevent burning it out

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9:30 IESF Monitoring Reports

MEMORANDUM
Rice Creek Watershed District

Date:	**December 30, 2024**
To:	**RCWD Board of Managers**
From:	**Matt Kocian, Lake and Stream Manager**
Subject:	**Monitoring Reports on District Iron-Enhanced Sand Filters**

Introduction

The District's monitoring program will present performance data from two Iron-Enhanced Sand Filter projects.

Background

The District has completed several iron-enhanced sand filter (IESF) projects in recent years, to capture particulate and dissolved phosphorus. There are few tools to capturing dissolved phosphorus – often referred to as *ortho-phosphate.* For example, stormwater ponds are not good at capturing dissolved phosphorus.

At the Board's January 9^{th}, 2025 Workshop, District staff will share results of monitoring data analysis from two District IESF projects: Centennial Green and Hansen Park. Sufficient monitoring data have been collected from each of these project sites to draw meaningful conclusions on system performance and make recommendations for system maintenance.

The two projects are an interesting contrast. Centennial Green is a *passive* IESF, with stormwater only spilling into the IESF filter trench during rain events, when the level of the adjacent pond jumps. Hansen Park is an *active* IESF, with water being pumped from Hansen Park pond into several different adjacent IESF beds. Monitoring results are generally positive, showing that IESF's are a viable way for removing both total and dissolved phosphorus. However, there are important considerations for system maintenance, especially for Hansen Park.

Staff will provide an overview of each monitoring report at the 1/9/2025 workshop.

Centennial Green Iron-Enhanced Sand Filter **January 2022 (Data Through 2020)**

Executive Summary

- The Centennial Green Iron-Enhanced Sand Filter Project was designed to remove total and dissolved phosphorus from Centennial Green Pond, before it flows out to Golden Lake
- The Project is removing nearly 80% of incoming phosphorus
- As of 2020, there is no evidence for filter media depletion
- The Project is removing approximately 18-38 pounds of phosphorus annually

Purpose

The purpose of this document is to summarize monitoring data associated with the Centennial Green Iron-Enhanced Sand Filer Project, to assess project performance, and to suggest potential changes in operation to improve performance.

Introduction

Golden Lake is listed as impaired by the Minnesota Pollution Control Agency. The lake often exceeds state nutrient standards, and algae blooms are common. The subsequent Total Maximum Daily Load (TMDL) Study determined that reductions in watershed phosphorus loading were needed to improve water clarity and meet state standards.

In 2014, the Anoka Conservation District (ACD), working with partners at Rice Creek Watershed District (RCWD), obtained a Minnesota Clean Water Fund Grant to implement the *Centennial Green Iron-Enhanced Sand Filter Project*[1]. The project was designed to capture stormwater runoff as is exited Centennial Green Pond in Blaine, MN, and run it through an iron-enhanced sand filter (IESF) bed. The filter is passive; as pond water levels increase following precipitation, water would flow over and through the filter beds, before discharging to Anoka County Ditch 53-62, which runs to Golden Lake. The filter was designed to reduce both particulate phosphorus (mechanically, as particulates are trapped in the sand), and dissolved phosphorus (chemically, as dissolved phosphate adsorbs and/or precipitates with oxidized iron). Thus, phosphorus load reduction to Golden Lake would be achieved by intercepting stormwater outflow from Centennial Green Pond, and capturing phosphorus in iron-sand filter beds. **Specifically, the *Centennial Green IESF* was designed to reduce phosphorus loading by 21 pounds per year. This is based on an assumption of approximately 75% phosphorus removal and 48 ac/ft of filtered water.**

[1] The official name of this project in grant documents is "Golden Lake Iron-Enhanced Sand Project". In this report, we use "Centennial Green" to avoid confusion with the more recent IESF constructed in cooperation with the City of Circle Pines, near the outlet of ACD53-62.

Figure 1. Photos of the Centennial Green IESF. Left: Outlet structure and filter bed during construction Right: Filter bed inundated; water would be flowing through filter and into outlet structure.

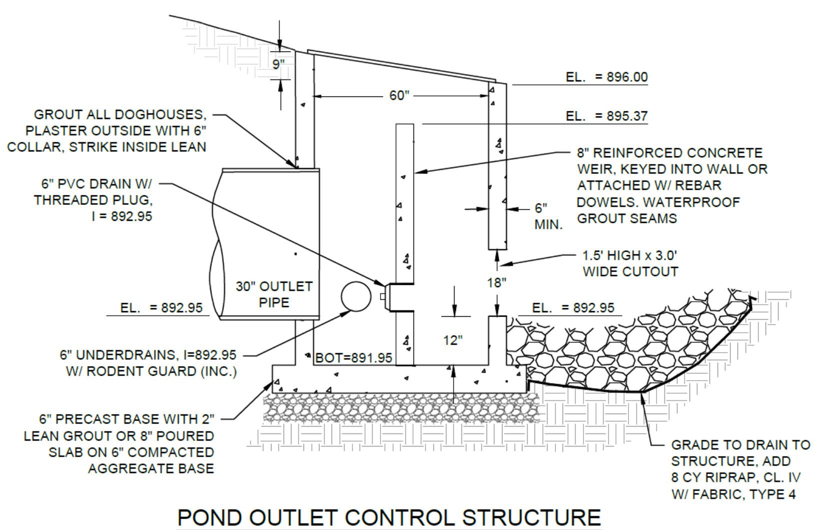

Figure 2. Outlet structure drawing. 'Treated' samples collected on left side of structure, near 30" outlet pipe.

A monitoring plan was developed by the project engineer in collaboration with the RCWD. RCWD staff are responsible for implementing the monitoring plan. To monitor the effectiveness of the Project, and to identify potential maintenance needs, the plan identified the following points:

- Collect water samples for at least the first 3 years after project completion
- Collect untreated water samples near the pond outlet, and treated water samples from the outlet of the IESF
- Analyze samples for total phosphorus, soluble reactive phosphorus, and iron
- Estimate discharge from the pond and IESF using level loggers
- Regarding indicators for IESF maintenance: "If multiple TP measurements taken at the IESF outlet are above 60-70 µg/L, phosphorus binding sites within the filter media may have been exhausted. If this occurs, soil samples should be taken from the sand-iron media and analyzed to determine the ratio between TP and total iron. TP to total iron ratios that exceed 5 mg-TP per 1 g of elemental iron indicate that phosphorus binding sites have reached capacity and that the filter media should be replaced."

Methods

Water samples were collected at two locations. An untreated sample was collected from the surface of the pond near the outlet. Since the pond was frequently covered in duckweed (*Lemna spp.*), staff endeavored to, using the bottom of the sample bottle, gently brush-aside surface mats of duckweed before collecting a water sample. Skimmers located at the pond outlet prevent the outflow of duckweed mats; this procedure was used to collect samples that were most representative of untreated pond water that would be flowing out, if not for the Project. A treated sample was collected from the IESF outlet structure, on the downstream side of the concrete weir, adjacent to the outlet pipe (Figure 2). Samples were collected in new, sterile, 1000 mL polyethylene bottles. A well-mixed portion of each sample was transferred to a 500 mL polyethylene bottle preserved with 5N H_2SO_4. Samples were labeled with date, time, and RCWD sample number. Samples are stored in coolers with ice to decrease temperature to <6 ^{o}C. Samples are delivered to a commercial laboratory that is accredited by the Minnesota Department of Health within the proper sample holding time. Procedures above, as well as sample holding times, were dictated by *Standard Methods* (APHA, 2012, Standard Methods for the Examination of Water and Wastewater, 22nd Ed.) and the Rice Creek Watershed District's Monitoring Plan (from RCWD District-Wide Modelling Report, Year 1, January 6, 2010).

Physical measurements were collected at the sample location as the treated samples using multi-parameter sonde (YSI EXO 1, YSI Inc., Yellow Springs, OH). Individual probes were calibrated regularly, following specifications provided by the manufacturer. Pond level was measured using an In-Situ Level TROLL 500 (In-Situ, Inc., Fort Collins, CO). Level readings were regularly checked against a fixed benchmark, located on the concrete weir in the outlet structure, and corrections were made when logger readings were +/- 0.05 ft from measured readings.

Results

RCWD staff collected 17 paired water samples (both treated and untreated) water samples from the Centennial Green IESF Project site between 2015 and 2020. The site was visited many other times, but not sampled due to lack of flow through the filter, or when water was flowing over the weir and mixing with IESF effluent. Few samples were collected in 2020 (n=1) and none in 2021 due to drought. Figure 3 provides a summary of total and dissolved (ortho) phosphorus results from untreated and treated locations. Treated samples consistently showed much lower total and dissolved phosphorus concentrations, and with lower variability.

In untreated samples, dissolved (ortho) phosphorus made-up about 32% of total phosphorus (mean and median).

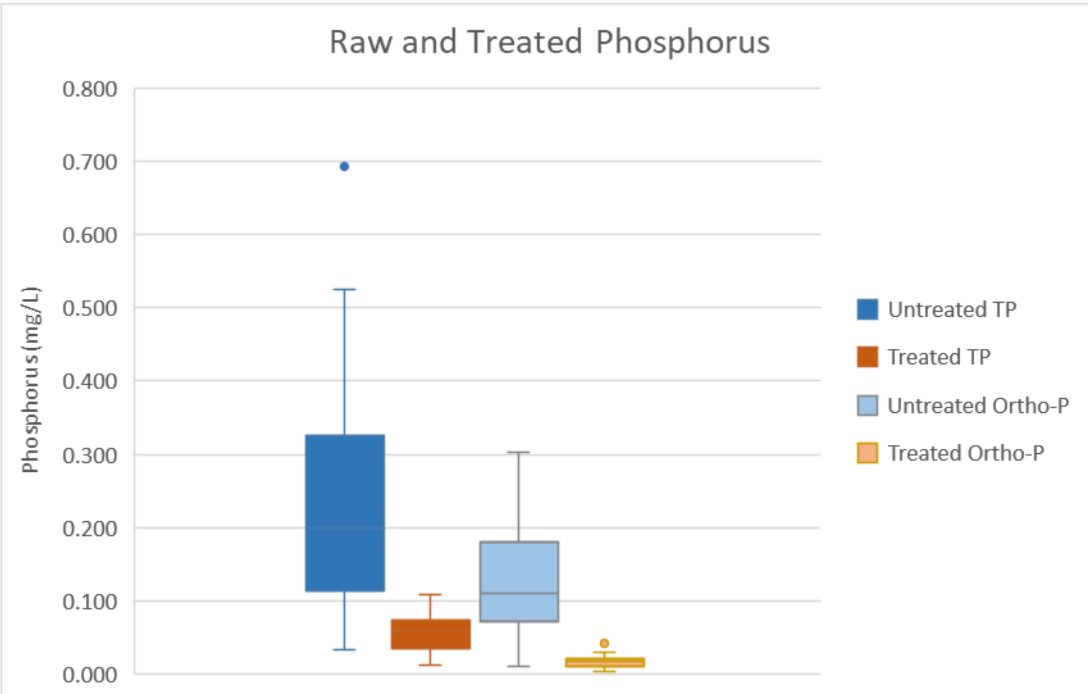

Figure 3. Summary of treated and untreated total and dissolved (ortho) phosphorus samples. Line indicates median, boxes are quartiles, whiskers are range, and dots are outliers.

Figure 4 shows median total and dissolved phosphorus removal percentages, based on paired samples. Overall, the Centennial Green IESF removed 78% of total phosphorus, and 85% of dissolved phosphorus from water that would otherwise flow out to Golden Lake. In one instance, the treated outflow concentration of total phosphorus was slightly higher than the treated sample. However, dissolved phosphorus was always lower in the treated samples, and removal percent was consistently high, with lower variability.

Results from physical measurements indicate that dissolved oxygen was always very low in IESF effluent; mean concentration and % saturation were 0.4 mg/L and 4.4%, respectively, with ranges of 0.2-0.7 mg/L and 2.1-8.4%.

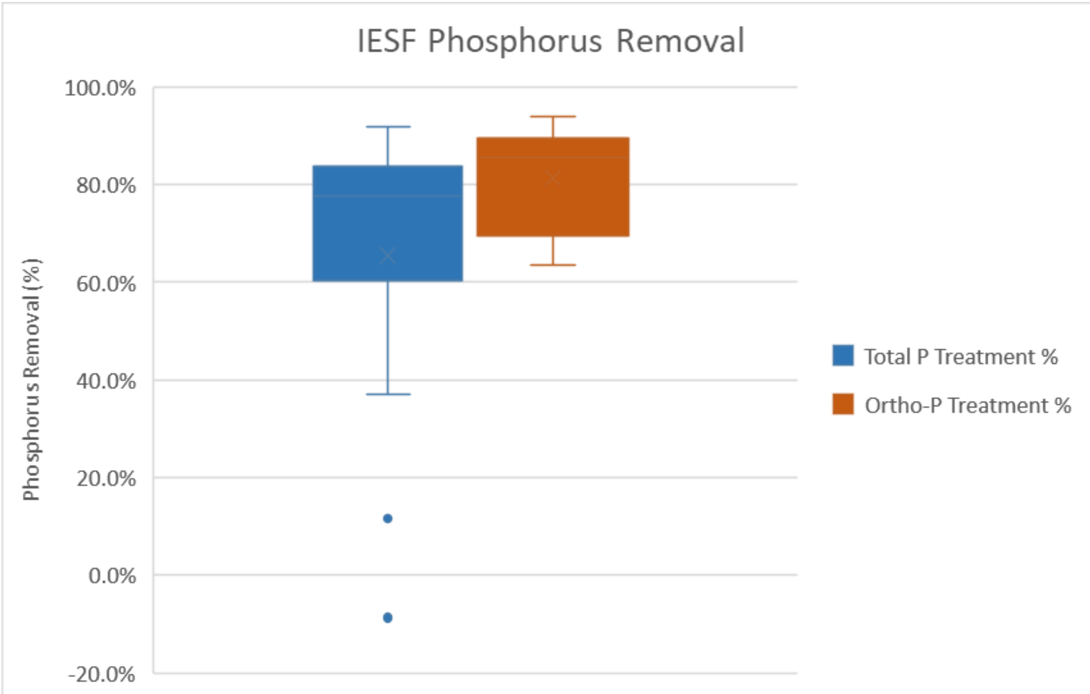

Figure 4. Summary of treated treatment removal percentages for total and dissolved phosphorus. Line indicates median, boxes are quartiles, whiskers are range, and dots are outliers.

Figures 5 shows all treated phosphorus concentrations and removal percentages over time. There is no apparent trend in either IESF effluent concentrations or removal percentages.

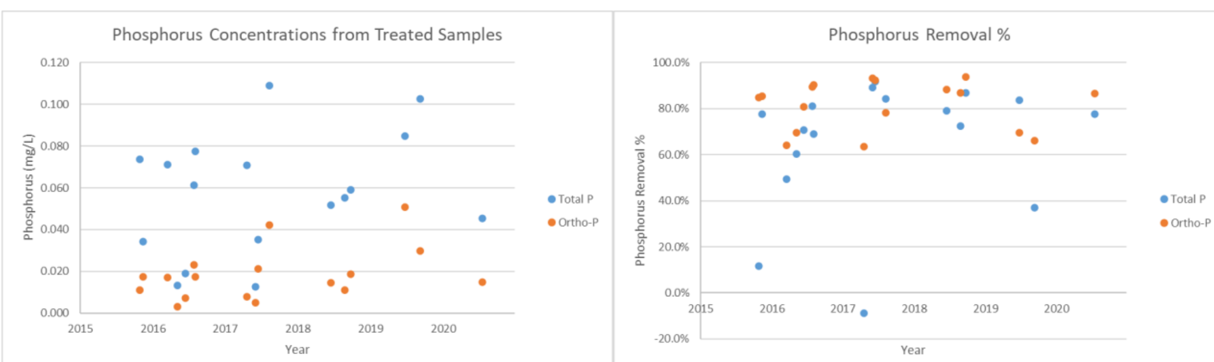

Figure 5. Individual sample results: Treated phosphorus concentrations and removal percentages over time.

Figure 6 shows pond elevations for 2016 and 2017. Unfortunately, it was not possible to estimate outflow using pond stage data, since downstream ditch elevations were highly variable, and often influenced outflow velocity. However, stage data were useful for estimating phosphorus load removal (see Discussion). They also indicate where samples were collected during the hydrograph. Samples were never collected when water was coming over the weir, as it was not possible to isolate IESF effluent from raw pond water. Sample were occasionally collected after the pond elevation dropped below the IESF bed, since it often took several days for all water to drain from the filter.

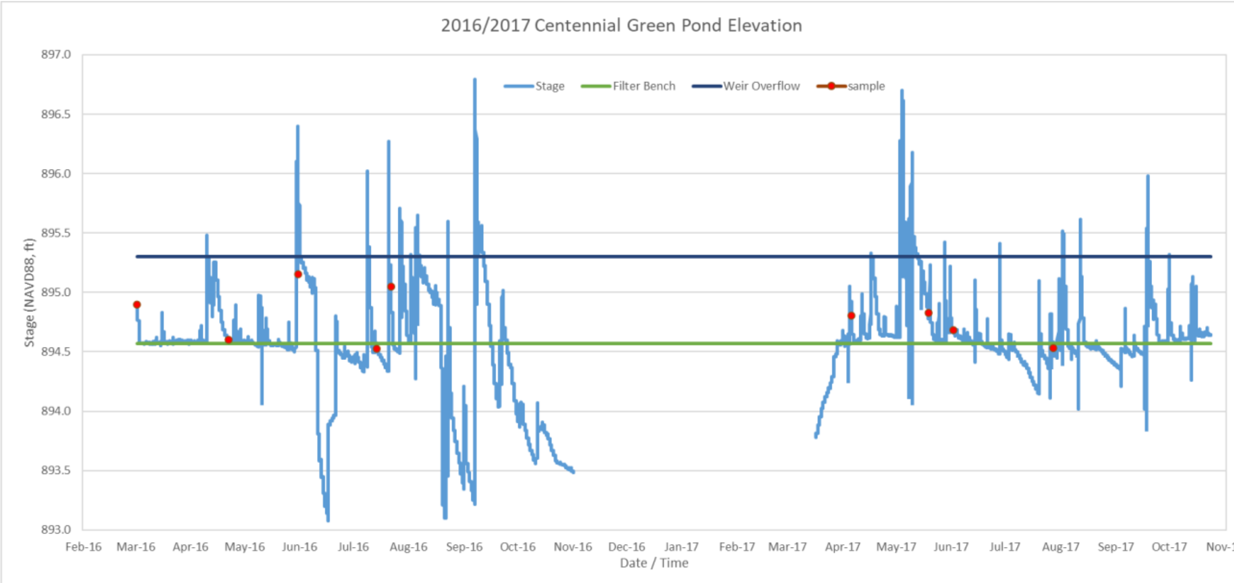

Figure 6. Centennial Green Pond stage, 2016 and 2017.

Discussion

Monitoring results suggest that the Centennial Green IESF Project is functioning well. The filter appears to consistently remove high percentages of total and dissolved phosphorus.

Initially, RCWD staff expressed concern over very low dissolved oxygen readings in the IEFS effluent. In past research, sorption and precipitation of phosphorus (i.e. phosphorus capture and sequestration) requires the oxidizing conditions; reducing conditions may result in release of phosphorus from iron. It is possible that either: 1) the performance of the filter is not negatively influenced by low dissolved oxygen, or 2) dissolved oxygen concentrations in the filter bed are sufficient to capture phosphorus, and oxygen is lost (e.g. due to microbial activity) "downstream" of the main filter area.

Data suggest that performance of the Centennial Green IESF is not decreasing over time (Fig 5). There appears to be no trend in both phosphorus concentrations in treated samples and removal percentages. Total phosphorus concentrations often exceed the 70 ug/L threshold at which maintenance was suggested in the monitoring plan. However, these exceedances begin occurring shortly after construction, suggesting that phosphorus binding sites in the filter media are not exhausted. RCWD staff have observed regular maintenance performed by Anoka Conservation District. These maintenance activities are likely very important for the consistent performance of the IESF.

Rough estimates of total phosphorus load removal can be obtained by using treatment volume estimates and phosphorus removal numbers from our water samples. Phosphorus load removal estimates are presented below in Table 1. Estimates 1 and 2 are using stage data from 2016. The total time that the filter bench was inundated was summed, then divided by 48 hrs (the amount of time to filter 1.29 acre feet, according to the project engineer), to get "events". P removal differences (0.14 and

0.18 mg/L) are the mean and medians of all P removal amounts, from our samples. Estimates 3 and 4 are the same as 1 and 2, but for 2017 data (2017 had slightly more outflow). Estimates 5 and 6 are with the outflow volume estimates provided by the project engineer prior to construction.

	Estimate 1	Estimate 2	Estimate 3	Estimate 4	Estimate 5	Estimate 6
acre feet per event	1.29	1.29	1.29	1.29		
"events"	51	51	60	60		
annual vol filtered, ac ft	65.79	65.79	77.4	77.4	47.77	47.77
annual vol filtered, ft3	2865805.821	2865805.821	3371536.3	3371536.3	2080856.423	2080856.423
annual vol filtered, L	81150583.8	81150583.8	95471275	95471275	58923292.11	58923292.11
P removal, mg/L	0.14	0.18	0.14	0.18	0.14	0.18
P removal, lbs/L	3.08647E-07	3.96832E-07	3.086E-07	3.968E-07	3.08647E-07	3.96832E-07
annual P removal, lbs	25.04689779	32.20315431	29.466939	37.886064	18.18650718	23.38265209

Table 1. Annual phosphorus load removal estimates with varying treatment volume and phosphorus removal assumptions.

In summary, the Centennial Green IESF Project appears to be performing well. The project removes approximately 78% and 85% of total phosphorus and ortho-P, respectively. As of 2020, data do not suggest that the filter media requires replacement. Annual phosphorus load removal estimates range from 18-38 lbs, depending on treatment volumes; this meets or exceeds the project goals.

Limitations

- Analysis here is limited to "grab" water quality samples. Water samples collected throughout the hydrograph may provide more precise estimates of phosphorus treatment.
- Phosphorus load removal calculations presented here were done using mean and median phosphorus removal amounts, and with very rough approximations of treatment volume. More precise measurements of volume, matched to individual water sample results, may provide more accurate estimates. Nevertheless, the estimates presented here are similar, with relatively low variability, and in-line with engineer's estimates.

RCWD Monitoring Report

Hansen Park Pond and Iron-Enhanced Sand Filter **December 2024**

Executive Summary

- The RCWD monitoring program has collected performance data on the Hansen Park Iron Enhanced Sand Filter (IESF) Project since 2019
- The Hansen Park IESF generally performs well, removing 95% of total suspended solids, 70-75% of total phosphorus, and 60-70% of dissolved phosphorus
- System performance generally increases as inlet phosphorus concentration increases
- There is no apparent change in system performance over time
- Annual phosphorus load reduction varies by year, ranging from 14-33 lbs of P removed
- IESF bed #1 is performing poorly; additional inspection is recommended and filter media maintenance or replacement may be required

Data and Report by the RCWD Monitoring Team: Matt Kocian, Catherine Nester, Ali Chalberg

Purpose

The purpose of this document is to summarize monitoring data collected by the Rice Creek Watershed District (RCWD) at the Hansen Park Project site, assessing performance of the project. Data are presented through 2023.

Introduction

The Rice Creek Watershed District (RCWD) monitoring program regularly collects data at water samples at District projects and facilities. Data are used to monitor system performance, identify problems, and make recommendations for improvements.

The RCWD completed the Hansen Park Project in 2017. This project was partially funded by a Clean Water Fund grant (specifically, a *Targeted Watershed* grant). The purpose of this grant was to decrease nutrient loading to downstream Pike and Long Lakes, both *impaired* for excess nutrients, and exhibiting frequent algae blooms. The Hansen Park Project had many components, including removal of accumulated sediment from Hansen Park Pond, and the installation of an active iron-enhanced sand filter (IESF) system. Dredging in the pond was completed during the winter of 2016/2017, and the IESF system came on-line in 2018.

The goals of the Hansen Park Pond project included 1) flood protection, via creation of live storage in the Hansen Park pond, and 2) water quality treatment via particulate settling in the pond, and via iron-sand filter beds. Water is pumped from the pond to the surface of four adjacent IESF beds; the water slowly filters down through the beds, before being collected by an under-drain and discharged to Ramsey County Ditch 2, downstream of the pond. The iron-sand matrix is designed to capture nutrients (primarily phosphorus) in both particulate and dissolved forms. Particulate phosphorus is captured mechanically by the sand filter. Dissolved phosphorus (ortho-phosphate) is sorbed by the oxidized iron. Iron-sand is one of the few tools available for capturing dissolved phosphorus.

RCWD staff have been collecting water samples from Hansen Park since approximately 2006. Prior to the Hansen Park Project, the purpose of the monitoring was assessing long-term condition of the Ramsey County Ditch 2 sub-watershed. With the construction of the IESF, staff modified the monitoring approach to collect samples from the influent (inlet) and effluent (outlet) of the iron-sand filter system. The RCWD monitoring program was consulted during the design of the project, and sample collection points were constructed for the purpose of long-term monitoring and assessment of project performance. Figure 1 shows the system layout and sampling locations.

Figure 1. Hansen Park Pond and Iron-Enhances Filter System; RCWD monitoring locations are marked with gold stars. The inset photo shows outlet pipes for each iron-enhanced sand bed.

This monitoring report will present monitoring data collected by the RCWD at the Hansen Park Pond and IESF site. With this analysis, we seek to answer questions about performance of Hansen Park project, including:

1. Did dredging of Hansen Park Pond improve water quality at the pond outlet
2. Are the IESF beds removing nutrients and solids? If so, how much?
3. Are all IESF beds performing similarly?
4. Is system performance related to inlet phosphorus concentrations?
5. Is the performance of the IESF beds changing over time?
6. What implications, if any, do the monitoring data have for system operations and maintenance?
7. Is the Hansen Park IESF system achieving its design goals?

Methods

Water samples were collected at 6 locations, indicated by the gold stars in Figure 1. A description and purpose of each site is shown in Table 1.

Monitoring Site ID	Description	Purpose
RCD2	Surface outlet of Hansen Park pond	Long-term condition monitoring of RCD2 subwatershed; pre- and post-project performance monitoring of Hansen Park pond
RCD2.1	Constructed (pipe) low-flow outlet of Hansen Park pond	Pre-treatment (inlet) sample, prior to iron-enhanced sand filtration
Hansen 1, 2, 3, 4	Iron-enhanced sand filter outlet pipes	Assess treatment performance of iron-enhanced sand filter beds

Table 1. Monitoring site description and purpose

Water samples were collected regularly throughout the open-water period, typically April-November. Approximately 6-12 samples were collected each calendar year; at times, sampling was limited by IESF system operation.

Water samples were collected for chemical analysis with a *Nasco*-brand swing sampler, and stored in both treated (5N H_2SO_4) and untreated sterile polyethylene bottles. Samples were immediately cooled and delivered to a commercial laboratory. Procedures above, as well as sample holding times, were dictated by *Standard Methods* (APHA, 2012, Standard Methods for the Examination of Water and Wastewater, 22nd Ed.) and the Rice Creek Watershed District's Monitoring Plan (from RCWD District-Wide Modelling Report, Year 1, January 6, 2010).

Water volume was calculated using a rating curve developed by Houston Engineering, and a level sensor integrated into the IESF pump system.

Samples collected from "RCD2" were used to assess changes in pollutant concentrations leaving the Hansen Park pond. Restoration of dead storage (i.e. dredging) in the pond should have provided additional treatment of particulate phosphorus. Samples collected from "RCD2.1" and "Hansen1-4" were used to assess performance of the IESF. RCD2.1 was untreated, inlet water from the pond, while Hansen1-4 was treated outlet water from each filter bed.

Results

RCD2 / Hansen Park Pond

From 2008-2016, 97 pre-project samples were collected from the RCD2 site. From 2018-2023, 5 post-project samples were collected. Post-project sample collection is limited to very high flow events only. Post-project, water rarely flows over the new spillway, the location of the RCD2 sampling site. The majority of pond outlet flow is via the new pipe (i.e. sample site "RCD2.1").

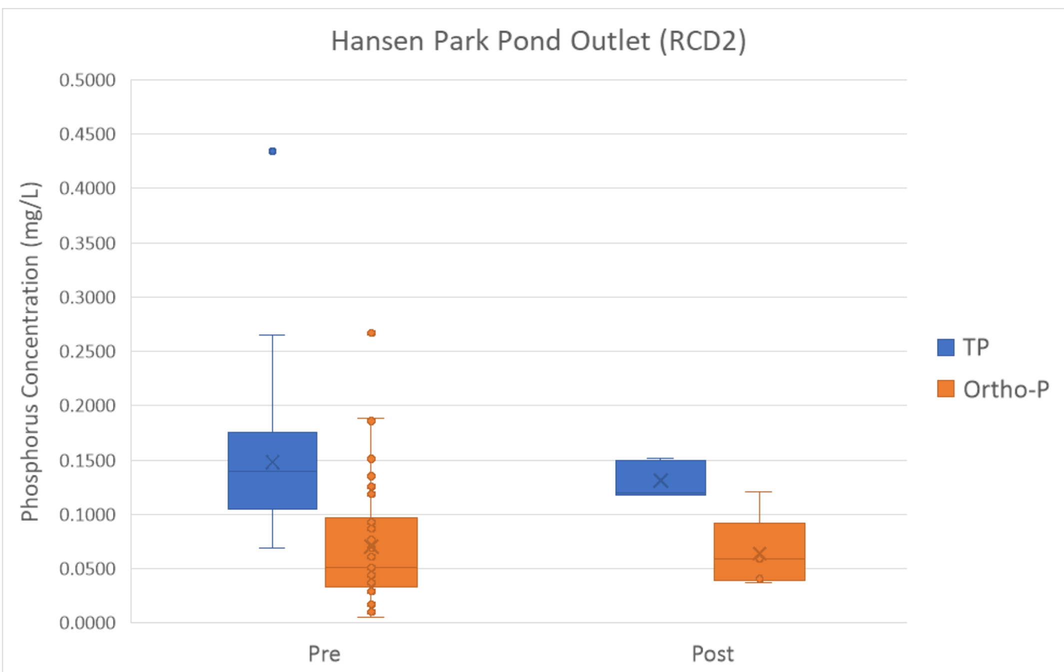

Figure 2. Total and dissolved (ortho-P) phosphorus at the outlet of Hansen Park pond, pre- and post-project. Very low flow samples were omitted from the 'pre-' dataset, as they would not be represented in the 'post-' dataset.

Data presented in Figure 2 suggest no statistical difference in total and dissolved phosphorus, pre- and post-project. However, the low number of post-project samples (n=5) limits the ability to draw conclusions. Additional considerations are presented in the Discussion section.

RCD2.1 / IESF

From 2019-2023, 37 paired samples were collected from the RCD2.1 and Hansen1-4 sites.

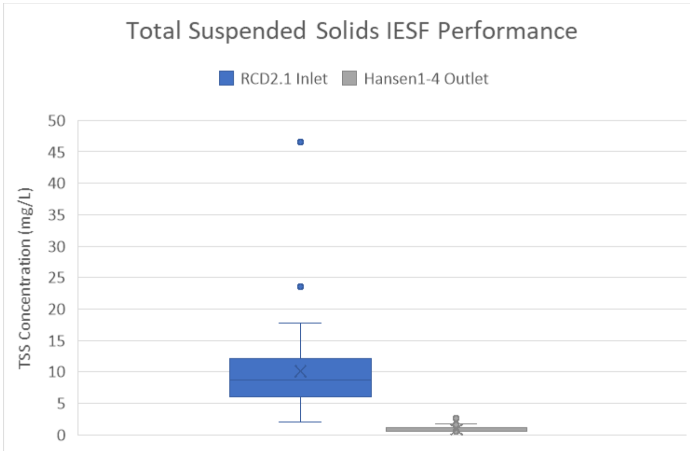

Figure 3

Figure 3 shows performance of the IESF in removing total suspended solids (TSS). Over all years and IESF beds, the system removed approximately 95% (median) of TSS.

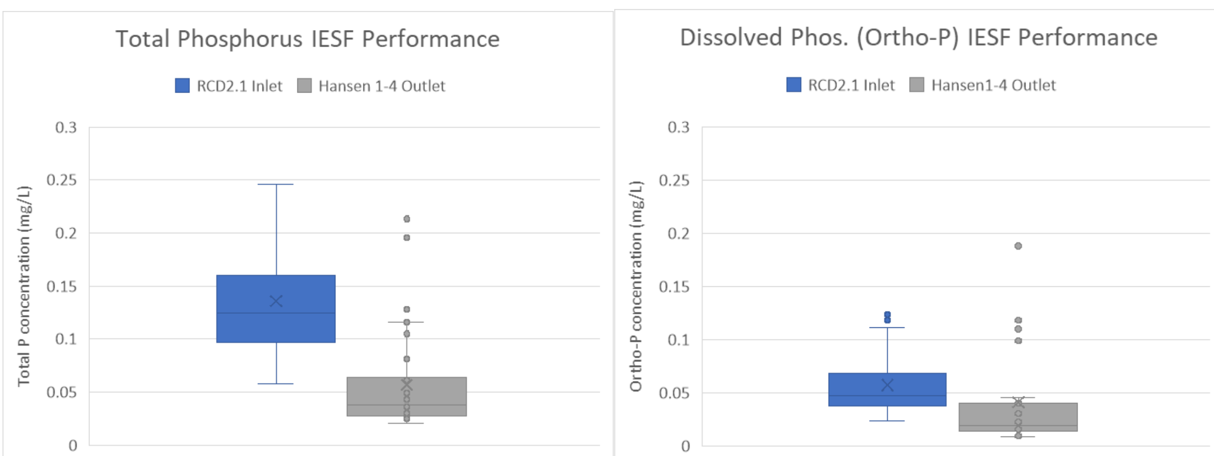

Figure 4

Figure 4 shows the IESF system performance for removal of total and dissolved phosphorus. Over all years and all filter beds, total phosphorus concentrations were reduced by approximately 70%, and dissolved phosphorus was reduced by about 60%. Several high statistical outliers are present in the IESF outlet datasets (shown by individual grey dots), raising question about periodic poor performance. Fortunately, the design of the IESF accommodated a deeper dive into performance of each IESF bed, since samples could be collected from the outlet of each individual bed.

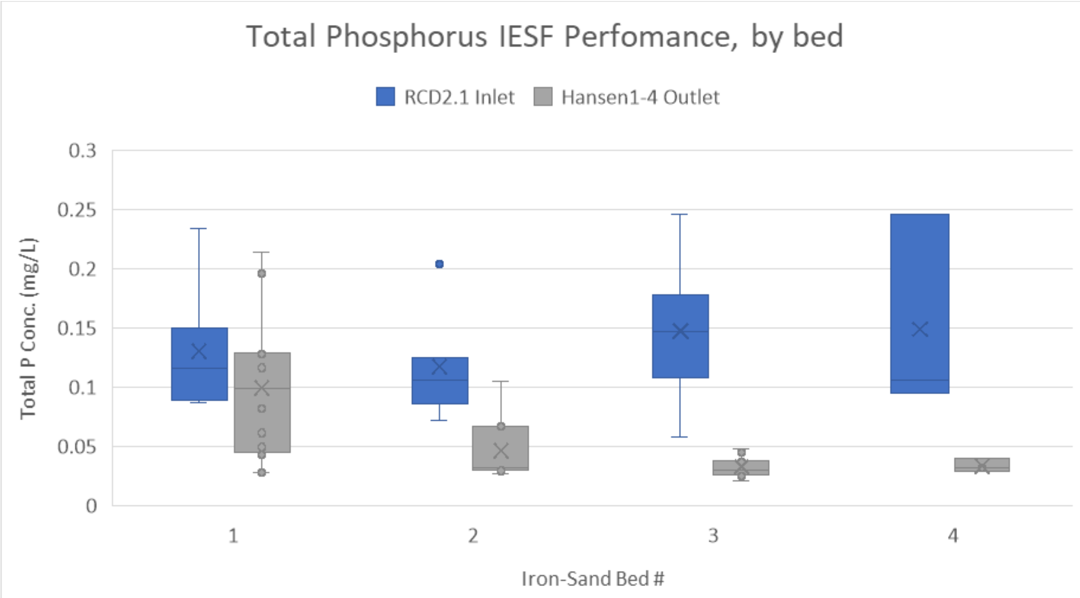

Figure 5.

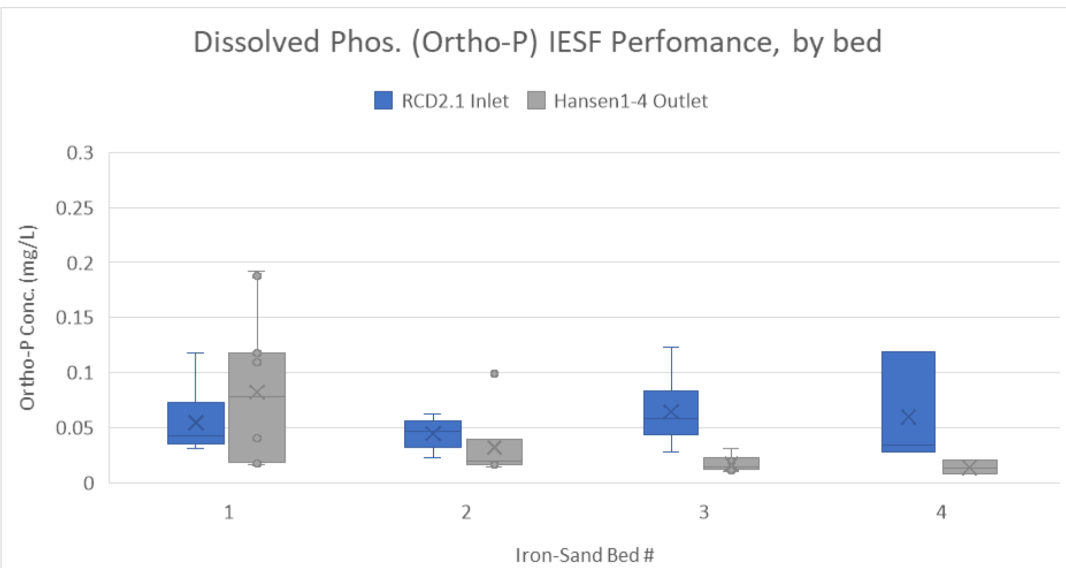

Figure 6.

Figures 5 and 6 show total and dissolved phosphorus removal performance of the IESF by filter bed. Filter beds 2, 3, and 4 captured high amounts of both total and dissolved phosphorus, reducing concentrations by approximately 70-80% and 60-75% respectively. Filter bed 1, however, only reduced total phosphorus concentrations by about 15%, and *increased* concentrations of dissolved phosphorus by about 85%.

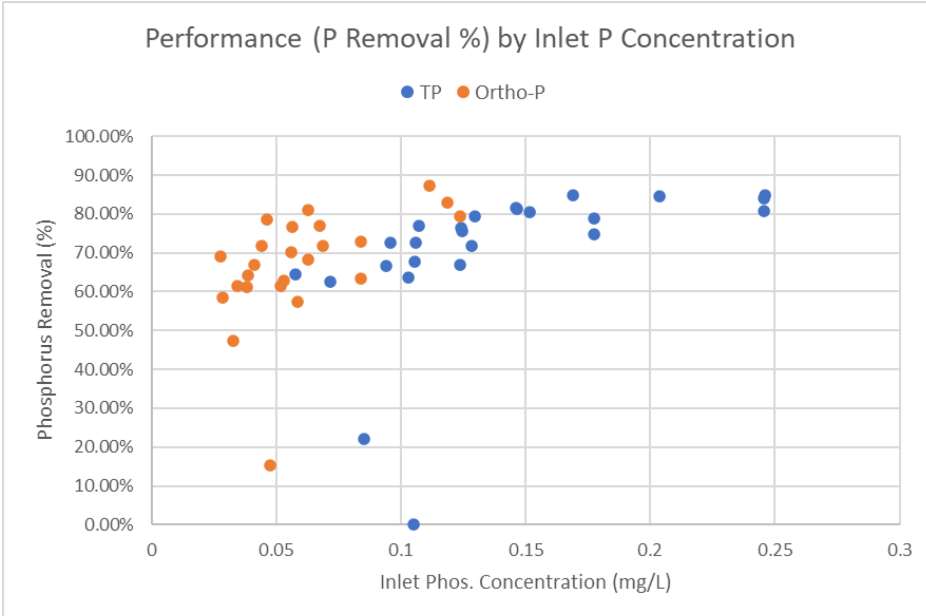

Figure 7. Reduction in phosphorus concentration (%) by incoming phosphorus concentration. Due to possible problems with filter media in IESF bed 1, data from bed 1 are omitted.

Figure 7 shows the performance of the IESF based on the inlet concentrations of both total and dissolved phosphorus. Due to the poor performance of bed 1 (Figures 5 and 6), data from bed 1 are omitted here. Data indicate a slight upward trend in phosphorus removal performance as incoming concentrations increase.

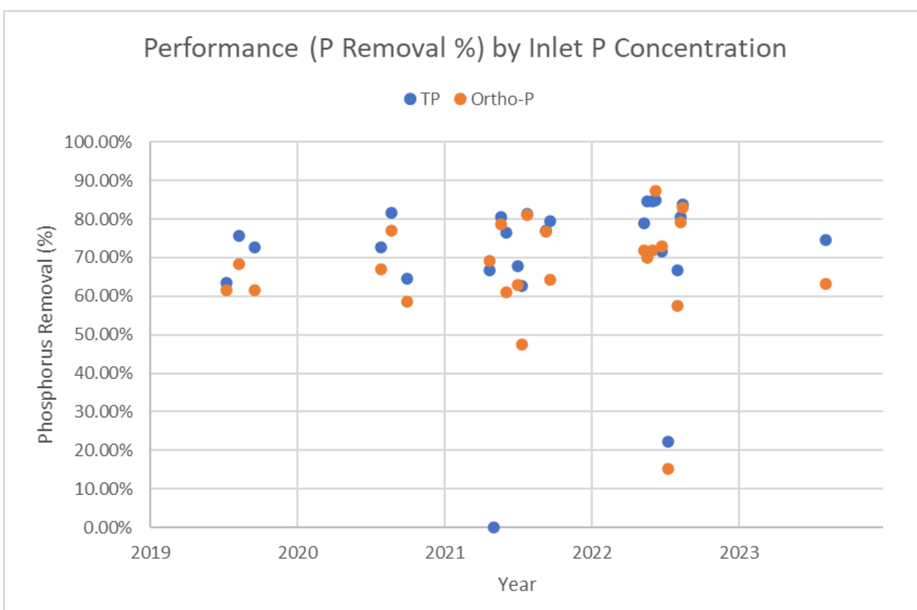

Figure 8. Reduction in phosphorus concentration (%) over time. Due to possible problems with filter media in IESF bed 1, data from bed 1 are omitted.

Figure 8 shows phosphorus removal performance over time. There is no apparent trend in phosphorus removal performance.

Total phosphorus load reduction estimates were made using IESF pumping volumes and concentration reduction estimates from water samples. The median reduction in total phosphorus concentrations from all beds over all years was 0.087 mg/L. Table 2 shows load reduction estimates using volumes and pollutant reduction concentrations. Annual phosphorus load reductions range from approximately 14 – 33 pounds. The annual goal set in the project grant workplan was 33.5 lbs.

	gallons treated	liters treated	mg/L reduction	mg reduction	**lbs reduction**
2024		* system not operational in 2024			
2023	19,228,168	72786533.7	0.086908486	6325767.449	**13.9**
2022	45,186,252	171048571	0.086908486	14865572.32	**32.8**
2021	41,056,941	155417428	0.086908486	13507093.39	**29.8**
2020	30,254,490	114525703	0.086908486	9953255.454	**21.9**

Table 2. Phosphorus load reduction estimates from the Hansen Park IESF, by year

Discussion

RCWD staff have been collecting monitoring data from the Hansen Park pond and iron-enhanced sand filter outlets since 2019. Analysis of that data, presented here, provide insights into system performance and implications for maintenance and operation.

RCD2 / Hansen Park Pond

Analysis of samples leaving Hansen Park pond suggest little change, pre- and post-project (Figure 2). However, several considerations are not evident in the data analysis. First, the post-project dataset is very small; due to the design of the project and creation of live-storage in the pond, there are fewer instances of water flowing over the dam – the sampling point. With so few post-project samples, it is difficult to draw meaningful conclusions. Second, although median phosphorus concentrations show no change, we see very few high values in the post-project dataset. It's possible that the pond is removing phosphorus when incoming concentrations are very high. As additional samples are collected in future years, additional analysis may yield insights into pond performance.

RCD2.1 / IESF

Overall, the monitoring data suggest that the Hansen Park iron-enhanced sand filter (IESF) is functioning well. Over all IESF bed outlets and all years, total suspended solids concentrations are reduced by ~95%, and total and dissolved phosphorus concentrations are reduced by 70% and 60%, respectively (Figures 2 and 3)

Analysis of individual IESF bed performance yields very important insights (Figures 4-6). Data from IESF beds 2-4 suggest very good performance, with higher reductions in total and dissolved phosphorus concentrations (75% and 70% respectively). Also, total phosphorus concentrations coming from IESF beds 2-4 are consistently below 0.07 mg/L, a benchmark often used as an indicator for maintenance needs. Alternately, data from IESF bed #1 shows very poor performance, with only small reductions in total phosphorus, and an *increase* in dissolved phosphorus. Bed 1 outlet concentrations also regularly exceed the common maintenance threshold of 0.07 mg/L. It's possible that the filter media in bed 1 is exhausted and no longer functions as designed. Field observations from RCWD staff indicate that bed 1 – which is closest to the pond, and the adjacent manhole (Figure 1) - is commonly inundated with raw stormwater during flood events. RCWD staff suggest the following actions: 1) Immediately cease using IESF bed 1 (but continue using other beds), 2) collect filter media samples and test performance[1], and 3) develop options for filter media maintenance or replacement.

As incoming IESF phosphorus concentrations increase, the effectiveness (% phosphorus removal) increases (Figure 7). This finding was also observed by a neighboring watershed district[2]. This is perhaps expected, as chemical sorption efficiency increases at higher concentrations. When incoming phosphors concentrations are lower (<0.1 mg/L), system performance is around 60-70%. As incoming phosphorus concentrations increase, system performance increases to 70-80%+. Due to the aforementioned filter media issues in IESF bed 1, those data are omitted from this analysis.

There is no apparent trend in IESF performance over time (Figure 8). This analysis could be used to identify the need for filter media testing, maintenance, and replacement, *if* there were a downward trend in performance over time. Due to the aforementioned filter media issues in IESF bed 1, those data are omitted from this analysis. Thus, data from beds 2-4 do not suggest replacement is necessary. However, given the problems with bed 1, system-wide filter media testing would be prudent.

Data presented here are from grab samples, and not linked to bed pumping timing or other variables. To better understand system performance under varying conditions, a synoptic monitoring study should be considered. This study would look at system performance based on pump run time (i.e. pump "hydrograph") and other input variables, to better understand variability in existing results. Although most variability in system performance (nutrient

[1] See MN Stormwater Manual, "Filter Media Capacity Testing"

[2] Dauphinais, J., Coon Creek Watershed District, *Minnesota Water Resources Conference*, 2024

removal %) is within the IESF bed 1 dataset, some variability and outliers remain. A better understanding of the conditions that lead to good vs poor performance would be very useful, allowing RCWD to optimize system performance. This could include altering the bed pumping duration, or the downtime (i.e. drying time) between pumping events.

Annual phosphorus removal via the IESF ranges from 14-33 pounds. The annual goal, set in the project workplan, was 33.5 lbs. At peak performance – i.e. >45 million gallons pumped per year – the system will meet design goals. Phosphorus load removal calculations presented here were done using multi-year median removal estimates. Matching pumping times and amounts to individual water sample results may provide more accurate load reduction estimates.

Recommendations

- Cease operation of Hansen Park IESF bed #1 until additional testing, maintenance, and potential media replacement occurs.
- Consider retrofit opportunities to limit inputs of organic material to filter beds (#1 and 2) adjacent to Hansen Park pond.
- Consider additional, synoptic monitoring of each IESF bed, to identify optimal performance criteria. The RCWD monitoring program is exploring this option, with support from the U of MN, St. Anthony Falls Lab.[3]

[3] See Erickson et al 2018

9:45 CAC Member Appointments for 2025

MEMORANDUM
Rice Creek Watershed District

Date: December 30, 2024
To: RCWD Board of Managers
From: Kendra Sommerfeld, Communications & Outreach Manager
Subject: Citizen Advisory Committee Member Appointments for 2025

Introduction

The Board of Managers is required to maintain a Citizen Advisory Committee (CAC) to advise and assist the Board with all matters affecting the interests of the watershed district as well as to make recommendations on proposed RCWD projects and improvements. The Board appoints or re-appoints members annually or as vacancies occur.

Background

The "Advisory Committee Operating Procedures" (adopted in 2020) includes provisions for:

- A maximum of 12 members
- Up to 4 members from each of the counties of Anoka, Ramsey, and Washington (ideally) with one of those being a representative of the conservation district/department

Staff have prepared a slate of 10 individuals (see table) who have indicated their willingness to serve on the RCWD CAC in 2025. There is 1 new CAC application for 2025 (Ellen Donaldson), a highly qualified individual and staff recommend they be appointed representing Ramsey County for 2025. There is one vacancy in Washington County for Washington SWCD representative and one in Anoka County, staff are actively recruiting.

Staff Recommendation

Staff recommends the presented slate for the 2025 CAC.

Name		Affiliation or Organization	County
Vacant			Anoka
Rebecca Keller		Lino Lakes	Anoka
Truchon, Mary Jo*		Anoka Conservation District	Anoka
O'Connell, Teresa		Lino Lakes	Anoka
Ellen Donaldson		White Bear Township	Ramsey
Lazarus, William		Shoreview	Ramsey
Andrew Kovacs		Mounds View	Ramsey
Schroeder, Michael*		Ramsey Conservation Department	Ramsey
Richard Thompson		Forest Lake	Washington
Larsen, Peter		Hugo	Washington
Ramseth, Douglas		Forest Lake, Clear Lake	Washington
Vacant*		Washington County CD	Washington

*Representatives of the county conservation districts/departments are put forth by the conservation district/department for Board consideration.

Request for Board Consensus

Staff seek Board consensus on proposed 2025 CAC slate for appointment at January 9th 2025 Board Meeting.

Attachments

- Ellen Donaldson CAC Application

Citizen Advisory Committee Application

RCWD RICE CREEK WATERSHED DISTRICT

General Information

Please provide your personal information

FIRST NAME: Ellen
LAST NAME: Donaldson
M.I: G

ADDRESS / CITY / STATE: [redacted]

ZIP CODE / COUNTY / EMAIL ADDRESS: [redacted]

PRIMARY PHONE NUMBER / IS IT A CELL PHONE ● / SECONDARY PHONE NUMBER: [redacted]

ARE YOU A RCWD RESIDENT

- [x] YES, HOW LONG: 1+
- [ ] NO

PREFERRED CONTACT

- [x] EMAIL
- [ ] MAIL
- [ ] PHONE

Experience

Membership Category

- [ ] Soil and Water Conservation District/Department Rep.
- [ ] County Board Member
- [ ] City or Town Official
- [ ] Sportmen's Organization Member
- [ ] Agriculture
- [x] Citizen (at large)
- [ ] Other:

Qualifications (include: education, occupation, volunteer experiences, etc.)

1. Received grant from RCWD to assist in major shoreline preservation/restoration project at my new home on Bald Eagle Lake. Implemented plan including shoreline cleanup, 10 feet of stone riprap, extensive landscaping/plantings to help preserve land/prevent erosion. Also, put in large rain garden in back yard to help filter stormwater. My shoreline restoration and rain garden projects serve as model for community.
2. Learned about watershed preservation/restoration while living in Davidson, NC and participating on Town of Davidson Planning Board for 6 years. Participated in subcommittee that developed the Watershed Ordinance for the Town of Davidson (Catawba River and Lake Normam Watershed Districts). Worked closely with County, local Watershed, and Davidson College Department of Biology experts to develop and implement Watershed Ordinance.

Civic, professional and community activities (past and present)

When I retired early in 2011 from my career as a healthcare communications company CEO, immediately sought volunteer opportunities with local nonprofit and civic organizations in Davidson, NC. Activities include:

1. Rotary Club of Davidson, NC, 2011-2023 -- Charter member; Board member x 11 years
2. Davidson Community Foundation, 2020-2023 -- Founded DCF in 2020; raised >$750k in 6 mos for COVID community aid
3. Town of Davidson, NC Planning Board, 2017-2022 -- 6 years (2 terms); developed Watershed and Tree Ordinances
4. Town of Davidson Strategic Plan Citizen Advisory Board, 2021-2022
5. Davidson-Cornelius Child Development Center, 2012-2019 -- Board President x 3 years; Board member
6. Duke University School of Nursing Alumni Advisory Board, 2019-2022

RCWD
RICE CREEK WATERSHED DISTRICT

Reasons for wanting to serve on the RCWD Citizen Advisory Committee

The natural area, lakes and woodlands here in MN are just beautiful! I would like to be able to contribute towards greater citizen understanding and appreciation of what we can do to help preserve, restore and maintain our watershed area. I bring some experience from working on the Watershed (and Tree) Ordinance while I was living in NC, and would like to continue pursuing watershed preservation and restoration now that I'm a Minnesotan! I have greatly enjoyed working with Molly and others from RCWD and Ramsey County, and hope to continue the partnership.

Other comments

Please let me know if you have any questions or would like additional information! I'm also happy to provide references for my involvement with the Town of Davidson, NC Planning Board and Watershed & Tree Ordinances.

SIGNATURE: Ellen G Donaldson

DATE: 10-15-2024

Please note the following before submission:

- We encourage electronic submission, but will accept applications through mail
- Once completed, save the document as "CACAPP_LASTNAME_FIRSTINTIAL_DATE"
- If emailing subject: Citizen Advisory Committee Application
- Applications for the given year must be received on or before October 31st
- CAC members are appointed by the RCWD Board of Managers annually, but are encouraged to serve for a minimum of two years
- Current members may be re-appointed to serve beyond the initial one-year term at will
- The Citizen Advisory Committee (CAC) is appointed by the Rice Creek Watershed District (RCWD) Board of Mangers to advise and assist on matters affecting the RCWD, including reports, activities, and the RCWD cost-share program
- The CAC meets six to ten times a year with no meetings scheduled for the months of July and January; the meetings held the first Wednesday of the month from 5:30-7:30 PM at the RCWD office
- The CAC consists of twelve members representing the counties in the district and various interests (see the CAC recruitment document for more details)

Please submit application to Kendra Sommerfeld

Rice Creek Watershed District
4325 Pheasant Ridge Drive NE #611
Blaine, MN 55449

Cell: 763-398-3073
Email: ksommerfeld@ricecreek.org
Visit our website: www.ricecreek.org

10:15 Discuss Administrator Performance Review Process