Engineering Enterprises, Inc.

Phosphorus Removal Feasibility Study

November 2016

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PHOSPHORUS REMOVAL FEASIBILITY STUDY

Village of Huntley, IL

TABLE OF CONTENTS

List of Tables

List of Exhibits

List of Appendices

Abbreviations

1 BFP: Belt Filter Press
2 BNR: Biological Nutrient Removal
3 BOD: Biochemical Oxygen Demand
4 BOD_5: Five-Day Biochemical Oxygen Demand
5 COD: Chemical Oxygen Demand
6 DAF: Design Average Flow
7 EBPR: Enhanced Biological Phosphorus Removal
8 ffCOD: Flocculated-Filtered COD
9 FRSG: Fox River Study Group
10 FY: Fiscal Year
11 GBT: Gravity Belt Thickener
12 GFD: Gallons per Square Foot per Day
13 GPCD: Gallons per Capita per Day
14 HFO: Hydrous Ferric Oxide
15 HRT: Hydraulic Retention Time
16 IEMA: Illinois Emergency Management Agency
17 IEPA: Illinois Environmental Protection Agency
18 ISWS: Illinois State Water Survey
19 LF: Lineal Feet
20 MF: Microfiltration
21 MGD: Millions of Gallons per Day
22 NF: Nanofiltration
23 NPDES: National Pollutant Discharge Elimination System
24 ORP: Oxidation-Reduction Potential
25 PE: Population Equivalents
26 PHF: Peak Hourly Flow
27 RAS: Return Activated Sludge
28 $_{RB}$COD: Readily Biodegradable Chemical Oxygen Demand
29 RO: Reverse Osmosis
30 SBR: Sequencing Batch Reactor
31 SCOD: Soluble Chemical Oxygen Demand
32 SRT: Solids Retention Time
33 TMDL: Total Maximum Daily Load
34 UCT: University of Cape Town
35 VIP: Virginia Initiative Plant
36 UF: Ultrafiltration
37 USEPA: United States Environmental Protection Agency
38 VFA: Volatile Fatty Acid

39 VFD: Variable Frequency Drive
40 WAS: Waste Activated Sludge
41 WRP: Water Reclamation Plant
42 WWTF: Wastewater Treatment Facility

Definitions

1 Basin: the aggregation of Huntley's entire sanitary sewer network
2 Eastern Tributary Subbasins: the aggregation of Subbasins that are tributary to the East WWTF
3 Infiltration: water other than wastewater that enters a sewer system from the ground through sources such as the as defective pipes, pipe joints, connections, or leaking manhole joints
4 Inflow: water other than wastewater that enters a sewer system from sources such as roof leaders, cellar drains, yard drains, area drains, foundation drains, catch basis, drainage, or open manhole lids
5 Population Equivalents: the average amount of resources consumed by one person; this simplifies all resources consumed by industrial and commercial establishments and attributes them to the general population
6 Subbasin: the sections of the Basin that represent different collection system areas, usually signified by all sewers in the area flowing towards one common exit point from the Subbasin; these Subbasins were determined in the years prior to this planning document
7 Western Tributary Subbasins: the aggregation of Subbasins that are tributary to the West WWTF

Section 1: Introduction

1.1 The Village of Huntley

According to a special census completed in January, 2016, the Village of Huntley, Illinois has a population of 26,632 people. Chicago Metropolitan Agency for Planning (CMAP) projections estimate a population of nearly 59,000 by 2040. The Village is located between Rockford, Illinois and Chicago, Illinois directly on the crossroads of Interstate 90 and Route 47. Huntley has land in both McHenry and Kane Counties.

The Village of Huntley municipal wastewater collection, conveyance and treatment system was first installed in the late 1940s. The original WWTF was located east of Route 47, just south of the existing Main and Bakley Streets intersection. The sanitary sewer system has continued to broaden as areas within the Village have developed. The increase in flows required the original wastewater treatment facility, currently named the East WWTF, to expand several times. Its current Design Average Flow (DAF) capacity is 1.8 MGD. As the Village's planning boundaries continued to expand and the build out of the East WWTF property was in sight, the Village planned for a second WWTF. The West WWTF was originally constructed in 1999. It is located west of Route 47 near the southwest corner of the intersection of Main Street and Kreutzer Roads, and, after several expansions, its current DAF capacity is 2.6 MGD. The wastewater from the Southwind Subdivision, which has a population of about 2,400, is tributary to the Lake in the Hills Sanitary District.

1.2 The Village of Huntley's Phosphorus Removal Feasibility Study Requirements

WWTFs that discharge into navigable waters are required by the United States Environmental Protection Agency (USEPA) to have a National Pollutant Discharge Elimination System (NPDES) permit. Therefore, both the East and West WWTFs have NPDES permits. The NPDES Permit for the East WWTF (Permit No. IL0029238) includes Special Condition 16, which details requirements for a Phosphorus Removal Feasibility Study. NPDES Permit No. IL0029238, dated May 28, 2015, is included in Appendix A. Although the West WWTF is not currently required to complete a Phosphorus Removal Study, it will also be included in this report with the assumption that it is likely to have the same requirement for a Phosphorus Removal Feasibility Study in its next NPDES permit.

1.3 Phosphorus Removal Feasibility Study Overview

1.3.1 Purpose of the Phosphorus Removal Feasibility Study – Under the direction of the Clean Water Act, the United States Environmental Protection Agency (USEPA) has been charged with evaluating the deleterious effects of nutrients, amongst other constituents, on waters of the United States. USEPA efforts to develop nutrient regulations to reduce impairments caused by nutrients within inland and coastal waters have been ongoing for decades. Within the Midwest, USEPA's primary motivation for nutrient reduction is to reduce and control hypoxia in the Gulf of Mexico. In 2015, the Gulf Hypoxia zone within the Gulf of Mexico, was estimated to be 6,474 square miles, where dissolved oxygen levels are so low that the waterbody cannot sustain most marine life. While this number is above average of the past five years (5,500 square miles), it is less than the maximum area of 8,497 square miles in 2002. It is believed that nutrient loads within the

Mississippi Watershed contribute to the Gulf Hypoxia problem. The Gulf Hypoxia Task Force Action Plan has established a goal of 45% reduction in nutrient loads from the Mississippi Watershed with a hypoxic zone area goal of 1,900 square miles[1].

1.3.2 History of the Phosphorus Removal Feasibility Study – Federal and statewide nutrient regulations have been discussed for many years, even decades. In the last decade, they have generally only been applied to Wastewater Treatment Facility (WWTF) discharge permits undergoing a plant expansion in Illinois. However, in recent years there has been heightened focus on developing statewide nutrient standards from the national and state level. The statewide efforts, along with recent results from Total Maximum Daily Load (TMDL) studies, have provided the momentum for the Illinois Environmental Protection Agency (IEPA) to add nutrient standards to WWTF National Pollutant Discharge Elimination System (NPDES) renewals.

While several research studies have struggled to define the cause/effect relationship between phosphorus levels and impairment in Illinois streams, federal nutrient reduction initiatives have forced the state to proceed with the development of nutrient standards. In May of 2011, the IEPA moderated a nutrient summit where stakeholders were informed of the results of research to date, existing statewide nutrient management initiatives and federal programs for nutrient management. In the beginning of 2012, four workgroups, namely: 1) narrative water quality standard, 2) technology based effluent standards, 3) determining significant sources of phosphorus, and 4) low phosphorus waters, began the process of meeting each workgroup's goal toward nutrient management. Each of the workgroups made progress toward their goal, but have generally been put on hold until the Illinois Nutrient Reduction Strategy is developed.

On March 11, 2013, the IEPA and Illinois Department of Agriculture initiated the mission to develop an Illinois Nutrient Reduction Strategy. The statewide strategy will be Illinois' plan to meet the goals established in the Gulf Hypoxia Task Force Action Plan. This two-tiered approach, scientific assessment and then policy development, likely will result in statewide phosphorus and nitrogen standards. Currently, municipal wastewater treatment facilities seem to be taking the brunt of the nutrient removal action; however, on March 1, 2016 the IEPA passed stormwater requirements updating the NPDES requirements for stormwater. Stormwater NPDES permit holders must now track measurable best management practices (BMPs) in order to minimize the amount of nutrients in runoff entering waterways.

1.3.3 Components of the Phosphorus Removal Feasibility Study – The Phosphorus Removal Feasibility Study will identify the method, timeframe, and costs of reduction phosphorus levels in its discharge to a level of 0.5 mg/L and 0.1 mg/L at the East and West WWTF's. Since the East WWTF has a pending phosphorus limit of 1.0 mg/L, the report will also review the required modifications for this level of treatment. Analysis of reduction to 0.5 mg/L and 0.1 mg/L at the East WWTF is predicated upon the prior implementation of recommended improvements to meet the pending 1.0 mg/L limit. Since the West WWTF already has a 1.0 mg/L effluent limit, analysis to meet 0.5 mg/L and 0.1 mg/L limits is based upon current facility conditions.

[1] References – Item 1 (Noaa)

The report will also evaluate the construction and Operations & Maintenance (O&M) costs of the application of these limits on a monthly, seasonal, and annual average basis.

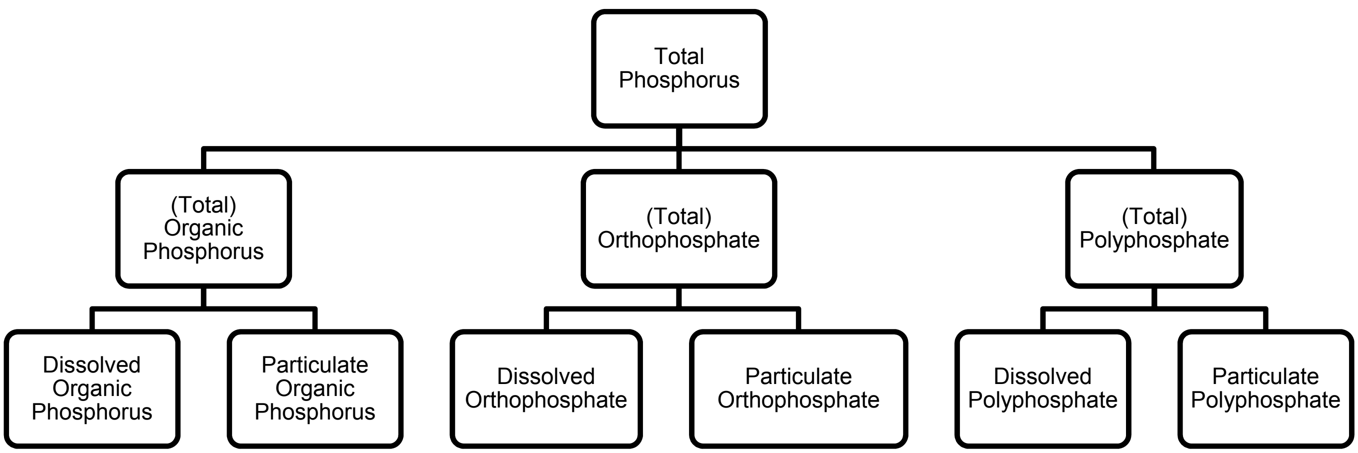
1.4 Phosphorus Forms in Wastewater

Before reviewing the applications of the East and West WWTFs, a general understanding of phosphorus speciations is helpful to understand the goals and options available to each WWTF. Total Phosphorus can be classified as the sum of organic phosphorus, orthophosphate, and polyphosphate. Organic phosphorus is the classified as phosphorus that is associated with a carbon-based molecule such as plant or animal tissue. Orthophosphate can be classified as simple, inorganic forms of phosphate such as PO_4^{3-}, HPO_4^{2-}, H_2PO^{4-} and H_3PO_4; orthophosphate is the form of phosphate most readily taken up by plants and aquatic life. Finally, Polyphosphates have two or more phosphorus atoms with other atoms such as hydrogen or oxygen in one complex molecule. Polyphosphates can undergo hydrolysis and revert to the orthophosphate forms.

Phosphorus can also be classified as either soluble/dissolved (passing through a 45 μm filter) or insoluble/particulate (not passing through a 45 μm filter). The sum of soluble organic phosphorus, soluble orthophosphate, and soluble polyphosphate will produce the total soluble phosphorus; and the sum of particulate organic phosphorus, particulate orthophosphate, and particulate polyphosphate will produce the total particulate phosphorus. Exhibit 1-1 displays a flowchart for the speciations of phosphorus.

Exhibit 1-1: Phosphorus Speciation Flowchart

Village of Huntley



Measuring phosphorus fractions, as opposed to only total phosphorus, can prove to be very beneficial. Certain forms of phosphorus are more easily converted into forms that can be removed in the wastewater treatment process either biologically or chemically. Additionally, high levels of specific phosphorus fractions in the influent can be an indicator that a large commercial process is releasing high levels of phosphorus into the sanitary sewers. If communities do have industries which may release high levels of phosphorus, such as metal cleaning or dairy processing, they may choose to issue an ordinance regarding phosphorus effluent or to permit such facilities to only release certain levels of phosphorus. Further discussion of phosphorus speciations, as they relate to phosphorus removal practices is including in Section 3 of this report.

Section 2: Existing East WWTF and West WWTF

2.1 East WWTF

2.1.1 Existing Facilities Overview - The East WWTF was originally constructed in the 1940s and is located east of Route 47, just south of the existing Main and Bakley Streets intersection. While there are limited records of the original WWTF construction, it would appear the original facility contained an Imhoff tank as the primary treatment process. Following the original construction of the East WWTF in 1950, trickling filters were added in 1960. In 1977, along with the presumed need to meet lower ammonia discharge standards, Rotating Biological Contactors (RBCs) were added to the facility. In 1988, the plant was expanded to 0.61 MGD. The 1988 improvements included the addition of two primary clarifiers, the Northwest Orbal configuration oxidation ditch (No. 1), an additional final clarifier (No. 1), the filter building, aerobic digestion improvements and a sludge storage area. In 2000, the plant was expanded to 1.2 MGD. The 2000 expansion added the screening, the northeast closed loop reactor oxidation ditches (No. 2 – after demolition of the primary clarifiers), two new secondary clarifiers (No. 2 and 3) and a RAS/WAS pump station upgrade. The facility was expanded to its current capacity of 1.8 MGD in 2002. The 2002 expansion added the West Orbal configuration oxidation ditch (No. 3), two additional secondary clarifiers (No. 4 and 5), the ultraviolet disinfection system, a dewatered sludge storage pad and the north garage. While the rated DAF is 1.8 MGD, it currently treats approximately 1.1 MGD of wastewater on an average day. The rated Design Maximum Flow (DMF) of the East WWTF is 4.5 MGD.

The East WWTF treatment train consists of fine screens, oxidation ditches, secondary clarification and ultraviolet disinfection. The facility contains two rapid sand filter basins, which are currently not in service due to operational difficulties with the equipment. Alum is currently fed within the treatment train with a temporary feed system to aid in the removal of barium from the liquid phase stream to meet the pertinent water quality standard. The biosolids treatment train consists of aerobic digestion and mechanical dewatering with the use of a belt filter press. The facility also has a gravity sludge thickener tank, which is currently not in service.

Exhibit 2-1 displays an aerial view of the current East WWTF layout and the Process Flow Diagram outlined in Exhibit 2-2 displays the overall flow of the system.

Exhibit 2-1: Existing East WWTF Aerial View

Village of Huntley, IL

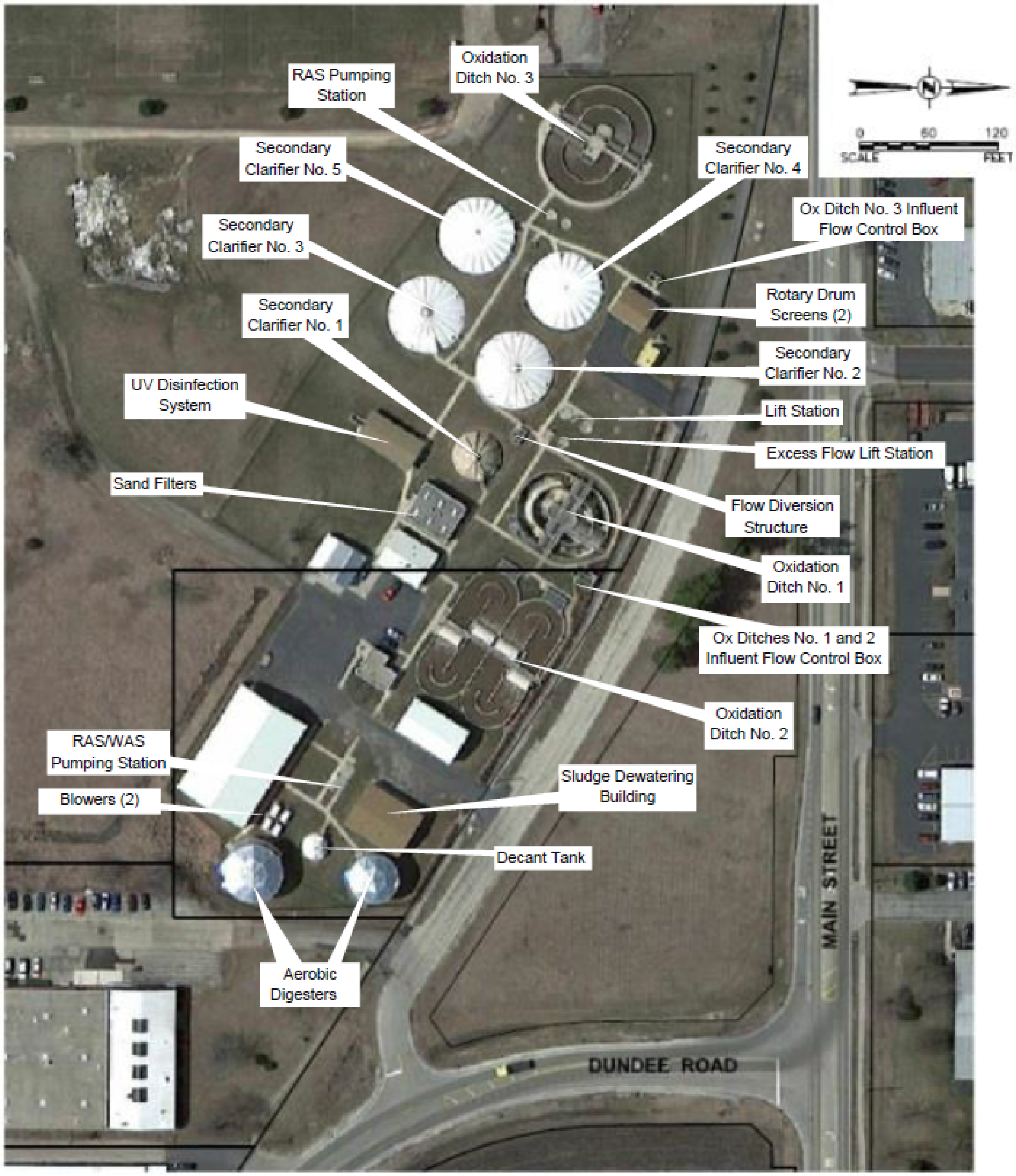
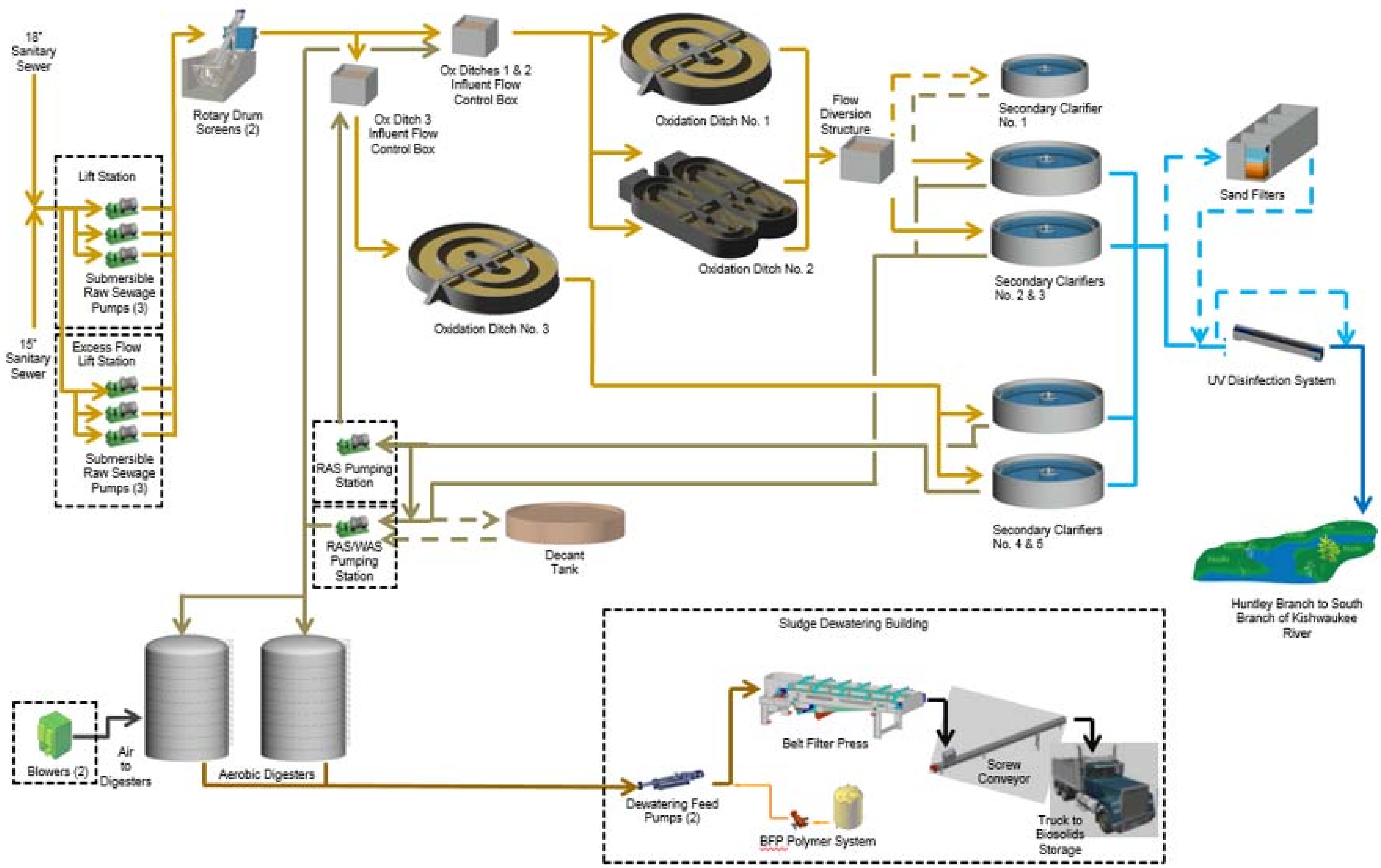


Exhibit 2-2: Existing East WWTF Process Flow Diagram

Village of Huntley, IL

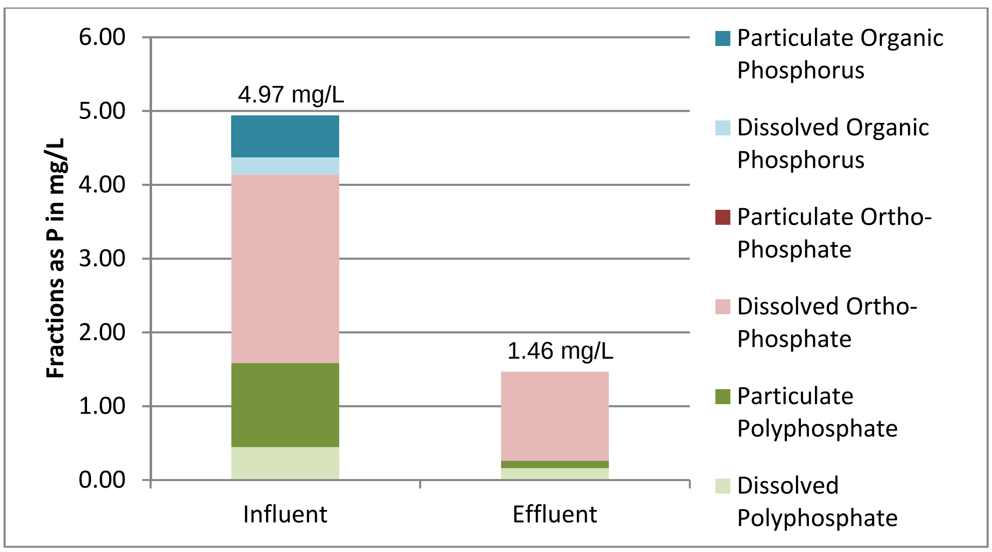


2.1.2 Historic Nutrient Mitigation Strategy - While influent and effluent wastewater samples are routinely taken for the operation of the facility, additional sampling was performed for the Phosphorus Discharge Optimization Plan (submitted under separate cover) and Phosphorus Removal Feasibility Study. As seen in Appendix C, samples were taken from the influent and effluent of the East WWTF from October, 2014 to February, 2016. These samples measured total phosphorus and various phosphorus fractions. Various other constituents, such as VFAs, were measured as well. The average total influent phosphorus was 4.97 mg/L which is on the low end of average range typically found at municipal wastewater treatment facilities. Additionally, there were no anomalies in the phosphorus fractions that make up total phosphorus. Average influent phosphorus and a lack of anomalies in phosphorus fractions are indicative that there are no major industrial phosphorus contributors for the East WWTF.

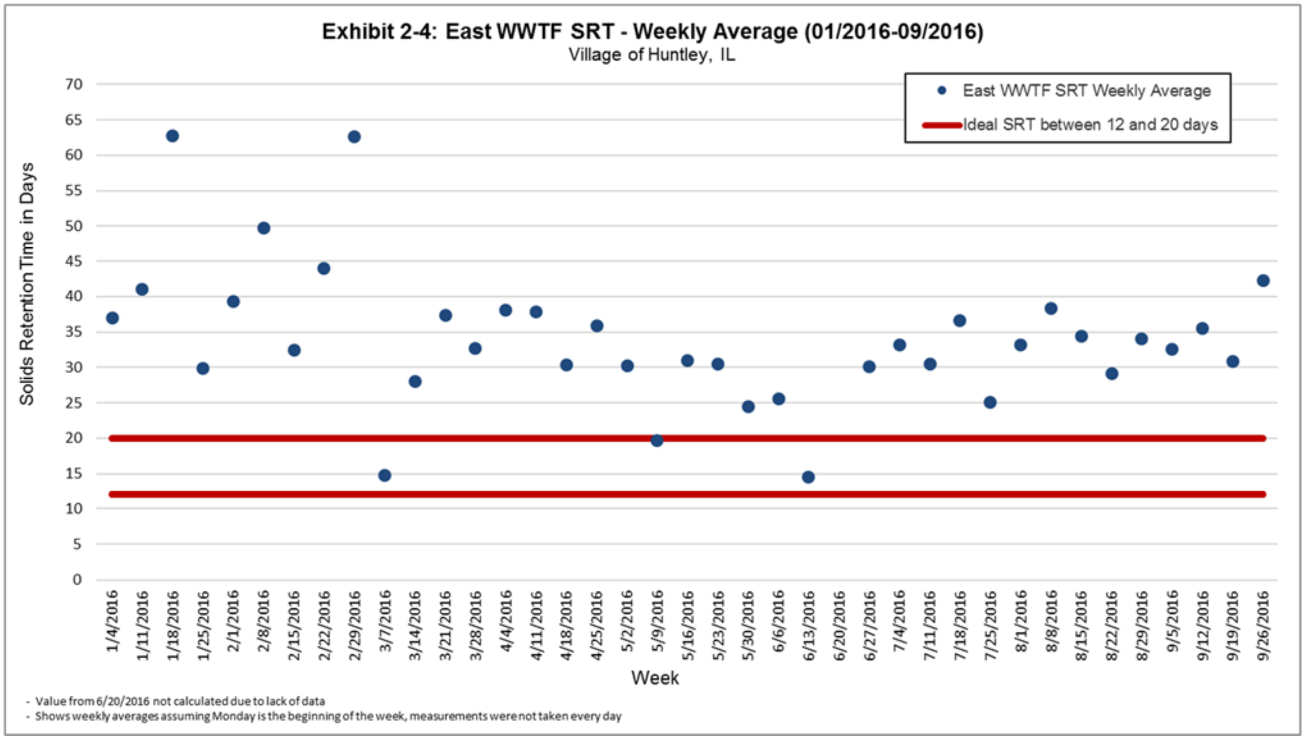
The average of the effluent total phosphorus was found to be 1.46 mg/L which is a 70% removal rate. Exhibit 2-3 below displays the influent and effluent phosphorus fractions. Although much of the phosphorus is being removed, the average effluent phosphorus is almost 0.5 mg/L higher than the pending 1.0 mg/L effluent phosphorus limit.

Exhibit 2-3: East WWTF Influent/Effluent Analysis (10/2014-02/2016)

Village of Huntley, IL



The Village also monitored the solids retention time (SRT) of their facility as well as their dissolved oxygen (DO) concentrations in the operating oxidation ditches. Maintaining optimal SRT and DO is crucial for biological phosphorus removal. Appendix E shows the East WWTF SRT tracking sheets from January, 2016 to September, 2016 and Exhibit 2-4 summarizes the information based on weekly averages. Although the SRT is higher than the recommended SRT range, the facility staff have worked to reduce the SRT since the start of monitoring in January. The age of some of the equipment and process limitations are complicating factors related to SRT optimization.



Appendix F shows the DO tracking sheets for the operational oxidation ditches from February, 2016 to September, 2016 and Exhibit 2-5 summarizes the information based on weekly averages. The Village has made strides to optimize the DO in both operational ditches. Avoiding over-aeration of wastewater also can reduce operational costs from electricity and corrosion (lower pH). The same operational constraints that affect the SRT affect the aeration of the wastewater in oxidation ditches. None of the aeration drives at the East WWTF have VFDs, which can make precise aeration difficult. A more detailed analysis of current and proposed nutrient reduction strategies utilizing existing processes/equipment at the WWTF is included in the Phosphorus Discharge Optimization Plan.

2.1.3 Influent Flows and Loading – Table No. 2-1 below outlines the 2014 and 2015 loading rates at the East WWTF along with the calculated values at DAF if the concentrations remain constant. NPDES Permit effluent limits are also included for reference. The East WWTF is not expected to gain influent from additional residential or non-residential development past its permitted DAF; however, as the Village's sanitary sewer system ages the East WWTF may see increased flow due to additional I/I caused by an older conveyance system.

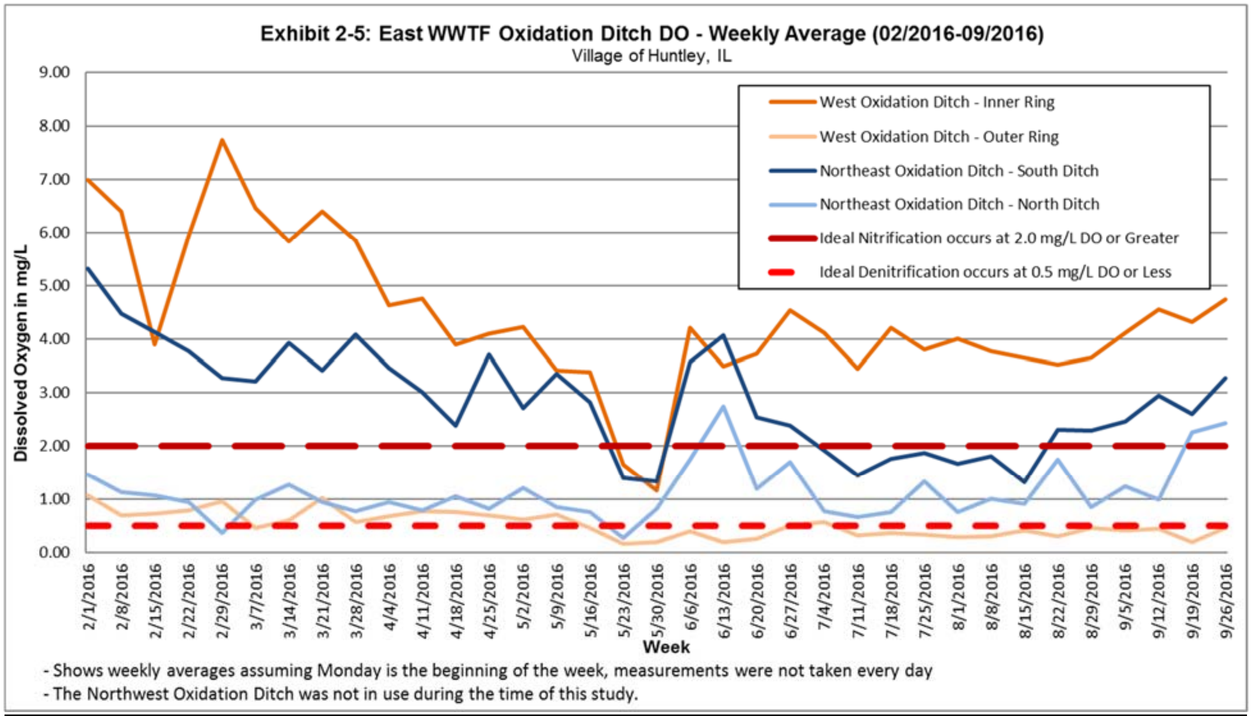


Table No. 2-1: East WWTF Historic and Projected Flow and Loading

Village of Huntley, IL

	WWTF Loading	BOD Loading*		TSS Loading*		P Loading**	
	MGD	mg/L	Lb/Day	mg/L	Lb/Day	mg/L	Lb/Day
2014	1.07	286.8	2,572.3	406.2	3,643.3	4.94	44
2015	1.05	283.0	2,468.0	344.4	3,003.6		
2014-2015 Average	1.06	284.9	2,520.2	375.3	3,323.5	4.94	44
Projected Loading***	1.80	284.9	4,279.5	375.3	5,637.5	4.94	74
NPDES Effluent Requirements	1.80	10	150.0	12	180.0	1.0	15

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Notes:

*2014-2015 values are from DMRs

**2014-2015 values are from phosphorus and nitrogen testing completed from 2014-2016

***Based on DAF flowrates and 2014-2015 Average concentrations

2.2 West WWTF

<u>2.2.1 Existing Facilities Overview</u> - The West WWTF was originally constructed in 1998. An aerial overview of the West WWTF is included in Exhibit 2-6. The Phase 1 improvements, which combined together provided a DAF capacity of 0.65 MGD, included the 24" influent sewer, influent lift station and northern screening structure. Phase 1 also included Oxidation Ditch No. 1 (northern oxidation ditch), Secondary Clarifiers No. 1

and 2 (northern most clarifiers), Sand Filter Building A (northern sand filter building) and the attached UV System and the effluent parshall flume. The biosolids management approach in Phase 1 included the use of the outer ring of the three-ring oxidation ditch for aerobic digestion, sludge dewatering with a belt filter press and then biosolids storage on a concrete pad. The current Administration/Laboratory building, which also included the blowers for the aerobic digestion process and the belt filter press, was constructed as part of Phase 1.

The Phase 2 improvements, which were completed in 2001, expanded the plant to a DAF of 1.6 MGD. Oxidation Ditch No. 2 (middle ditch) and Secondary Clarifier No. 3 were constructed as part of these improvements. Excess capacity in the other treatment processes that were constructed as part of Phase 1 allowed the plant to be rated for 1.6 MGD.

The Phase 3 improvements, where were completed in 2006, expanded the plant to a DAF of 2.6 MGD. The Phase 3 improvements included the construction of Raw Sewage Pump Station No. 2, the second screening building, the two ring Oxidation Ditch No. 3 (southern oxidation ditch), Secondary Clarifiers No. 4 – 5, Sand Filter Building B and the attached UV channel. The alum feed building was installed as part of this improvement due to the new Total Phosphorus standard of 1.0 mg/l being added to the NPDES permit at that time. A new bank of aerobic digesters was installed along with a new building that housed the gravity belt thickener and new blowers. Finally, the sludge storage pad was expanded to increase the biosolids storage capacity of the facility.

The Phase 3 expansion was the most recent expansion. Therefore, the West WWTF currently has a DAF capacity of 2.6 MGD and a DMF capacity of 6.5 MGD. It currently treats approximately 1.0 MGD of wastewater on an average day. The West WWTF treatment train consists of screening, oxidation ditches, secondary clarification, filtration and ultraviolet disinfection. Alum is currently fed within the treatment train to aid in the removal of barium and phosphorus from the liquid phase stream to meet the pertinent water quality standards. The biosolids treatment train consists of thickening with gravity belt thickeners, aerobic digestion, and mechanical dewatering with the use of a belt filter press. Exhibit 2-7 is a process flow diagram of the facility.

2.2.2 Historic Nutrient Mitigation Strategy - Similarly to the East WWTF, influent and effluent wastewater samples are routinely taken for the operation of the West WWTF. Additional sampling was required to make observations for the Phosphorus Discharge Optimization Plan (submitted under separate cover) and Phosphorus Removal Feasibility Study. As seen in Appendix D, samples were taken from the influent and effluent of the West WWTF from October, 2014 to February, 2016. These samples measured total phosphorus and various phosphorus fractions. Various other constituents, such as VFAs, were measured as well. The average total influent phosphorus was 6.31 mg/L, which is within the expected range of influent phosphorus rates for municipalities. Additionally, there were no anomalies in the phosphorus fractions. Average influent phosphorus concentrations and a lack of anomalies in phosphorus fractions are indicative that there are no major industrial phosphorus contributors for the West WWTF.

Exhibit 2-6: Existing West WWTF Aerial View

Village of Huntley, IL

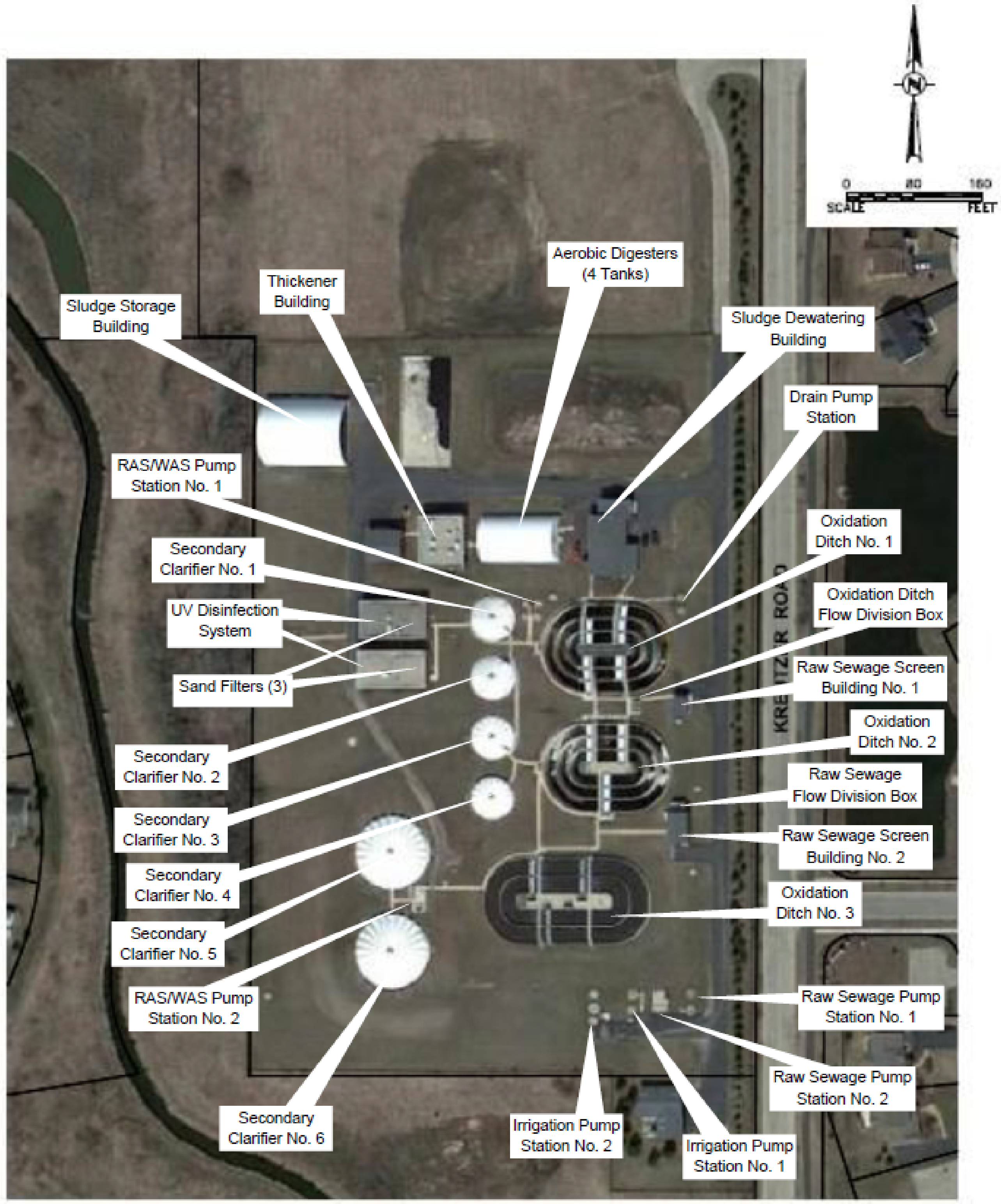


Exhibit 2-7: Existing West WWTF Process Flow Diagram

Village of Huntley, IL

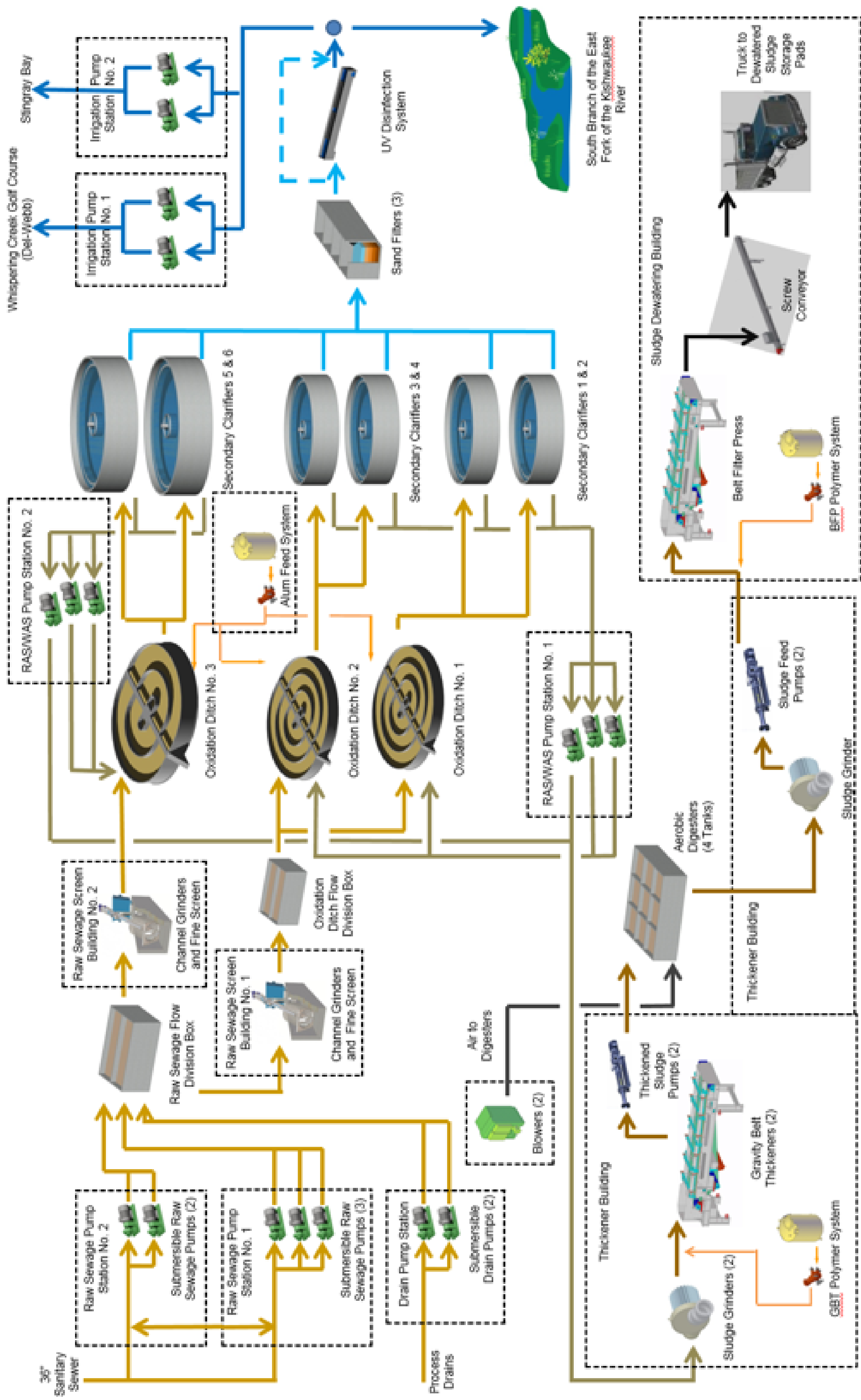
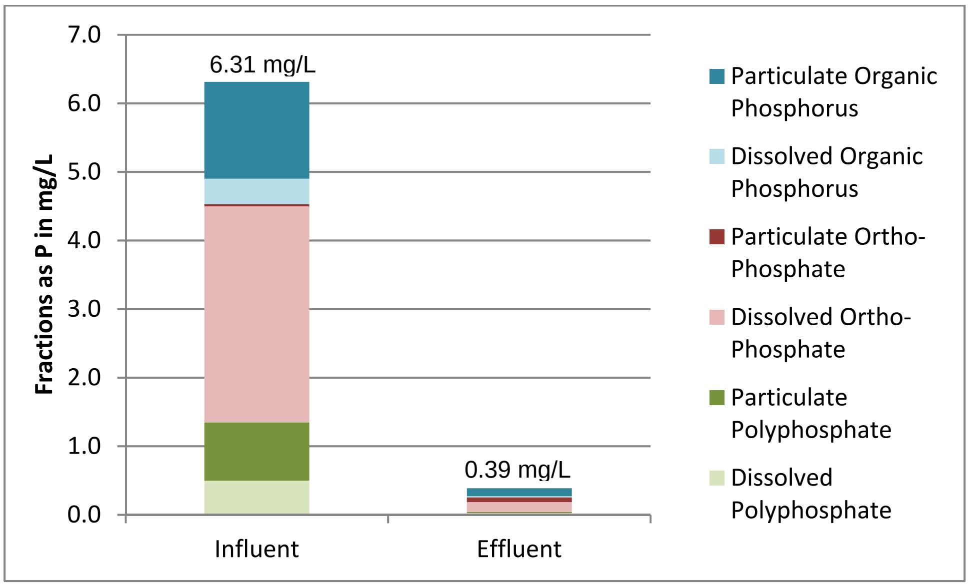


Exhibit 2-8 below displays the influent and effluent phosphorus fractions. The average of the effluent total phosphorus was found to be 0.39 mg/L which equates to a 94% removal rate. The West WWTF is already subject to a phosphorus effluent limit of 1.0 mg/L, as wells as 2.0 mg/L barium effluent limit. Due to the barium limit, a significant amount of chemical addition is utilized, which impacts the phosphorus removal at the WWTF. The chemical addition makes it difficult to understand the biological phosphorus removal performance at the facility and consistent biological phosphorus removal below 1.0 mg/L should not be expected with the existing process.

Exhibit 2-8: West WWTF Influent/Effluent Analysis (10/2014-02/2016)

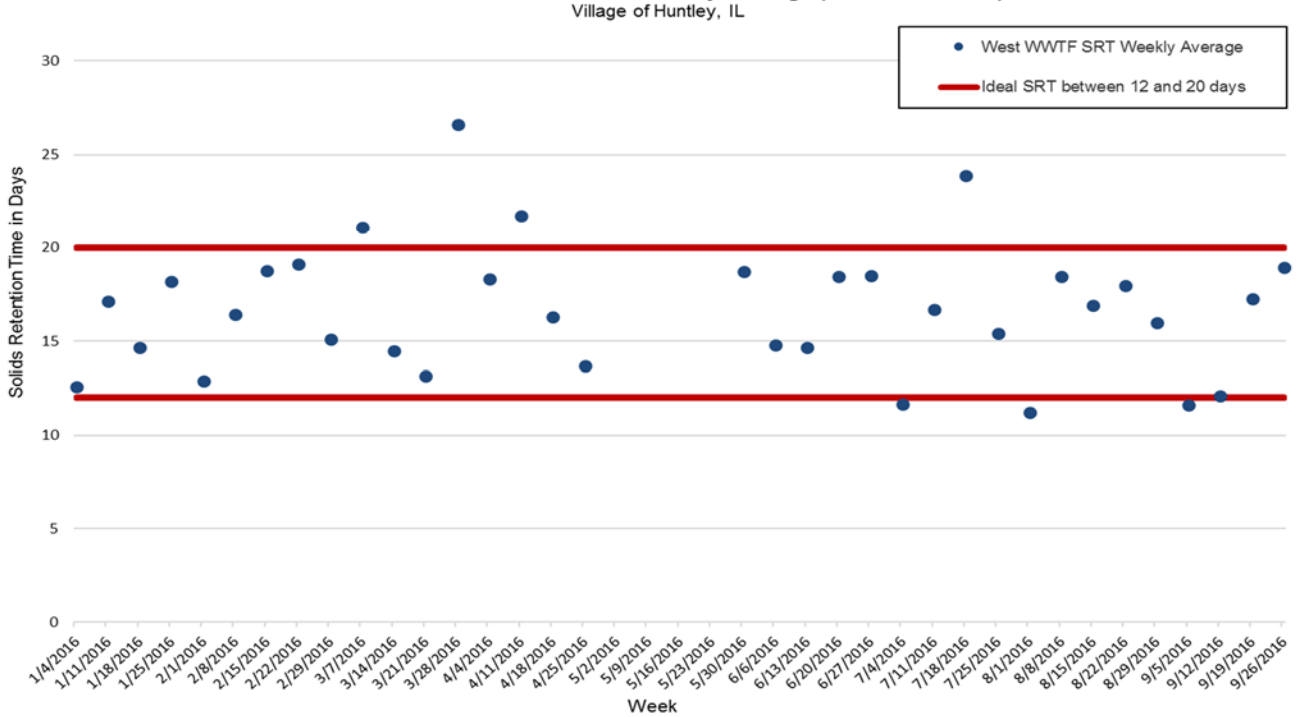
Village of Huntley, IL



The Village also monitored the SRT and DO at the West WWTF. Appendix G and H show the SRT and DO tracking sheets respectively. Exhibit 2-9 shows the West WWTF SRT from January, 2016 until September 2016. The West WWTF has kept their SRT in the ideal zone for most of the monitoring period.

The weekly average DO from February, 2016 to September, 2016 can be seen in Exhibit 2-10. Although the West WWTF has three oxidation ditches, only one oxidation ditch is currently in service due to influent flows. This oxidation ditch (No. 3, South), has VFDs as well as DO and ORP probes, although it is only a two-ring ditch. As shown below, the weekly averages are near ideal for both the nitrification and denitrification zones. A more detailed analysis of current and proposed nutrient reduction strategies utilizing existing processes/equipment at the WWTF is included in the Phosphorus Discharge Optimization Plan.

Exhibit 2-9: West WWTF SRT - Weekly Average (01/2016-09/2016)
Village of Huntley, IL



- Values from 5/2/2016, 5/9/2016, 5/16/2016, or 5/23/2016 are not calculated due to lack of data
- Shows weekly averages assuming Monday is the beginning of the week, measurements were not taken every day

Exhibit 2-10: West WWTF Oxidation Ditch DO - Weekly Average (02/2016-09/2016)
Village of Huntley, IL

- Shows weekly averages assuming Monday is the beginning of the week, measuresments were not taken every day
- The Northern and Middle Oxidation Ditches were not in use at the time of this study

2.2.3 Influent Flows and Loading – The West WWTF is expected to receive a majority of wastewater from growth within the Village. Table No. 2-2 below outlines the 2014 and 2015 loading rates at the West WWTF along with the loading rates at DAF if the average influent concentrations remain constant. The effluent NPDES permit limits are also included for reference.

Table No. 2-2: West WWTF Historic and Projected Flow and Loading

Village of Huntley, IL

	WWTF Loading	BOD Loading*		TSS Loading*		P Loading**	
	MGD	mg/L	Lb/Day	mg/L	Lb/Day	mg/L	Lb/Day
2014	1.08	212.5	1,922.5	215.3	1,947.5	6.31	57
2015	1.11	223.2	2,061.3	244.2	2,255.0		
2014-2015 Average	1.10	217.8	1,991.9	229.7	2,101.3	6.31	57
Projected Loading***	2.6	217.8	4,726.6	229.7	4,984.2	6.31	137
NPDES Effluent Requirements	2.6	10	217.0	12	260.0	1.0	22

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Notes:
*2014-2015 values are from DMRs
**2014-2015 values are from phosphorus and nitrogen testing completed from 2014-2016
***Based on DAF flowrates and 2014-2015 Average concentrations

The BOD and TSS loading rates at the West WWTF are less concentrated than seen at the East WWTF. This weaker wastewater could be due to industrial contributors, water efficient practices, or more I/I in the wastewater, as compared to the East WWTF collection system. However, the P loading rate is higher at the West WWTF, which could possibly be attributed to industrial users in the area.

The facility is currently in the third phase of a five-phase construction plan. The current and future capacities of the West WWTF can be seen in Table No. 2-3. This report will focus on the existing capacity of the WWTF (2.6 MGD DAF) and will not investigate improvements required for future design capacities.

Table 2-3: West WWTF Existing and Future Construction Phase Capacities

Village of Huntley, IL

Phase	DAF (MGD)	DMF (MGD)
Phase 3	2.6	6.5
Phase 4	4.9	11.0
Phase 5	7.8	15.6

Section 3: General Phosphorus Reduction Strategies for Extended Aeration Activated Sludge WWTFs

3.1 General Phosphorus Removal Considerations

A wide variety of phosphorus reduction options are available that vary based on initial cost, operating cost, ease of operation, and a host of other considerations that are often different for each facility. Each of Huntley's WWTFs utilizes the extended aeration activated sludge process via oxidation ditches with secondary clarifiers. While each facility was originally designed for BOD_5, TSS, and Ammonia removal, this process can be utilized to promote phosphorus removal. Therefore, this study will focus on phosphorus reduction strategies using oxidation ditches with secondary clarification.

Phosphorus removal can typically be classified into two different categories – biological phosphorus (Bio-P) removal and chemical phosphorus (Chem-P) removal. Many facilities will use a combination of biological and chemical processes to remove phosphorus and other contaminants. General Bio-P and Chem-P principles are described in the following paragraphs.

Bio-P removal involves the use of phosphate accumulating organisms (PAOs) to remove phosphorus. While typical WWTF activated sludge contains 1.5% to 2.5% phosphorus, PAOs take up phosphates more than their normal biological requirements, typically raising the phosphorus concentration in activated sludge to 3.0% to 6.0% or higher[1]. Enhanced biological phosphorus removal (EBPR) occurs when alternating anaerobic and aerobic zones provide an environment that encourages the growth of PAOs. PAOs will uptake BOD as Volatile Fatty Acids (VFAs) in the anaerobic zone, and release ortho-phosphorus (Ortho-P) into the mixed liquor. As the source of food (BOD/VFA) decreases in the aerobic zone, the PAOs uptake the excess Ortho-P to replenish their poly-phosphate supplies. These PAOs are then ready to be settled and/or filtered and removed in the biosolids process. Generally speaking, EBPR is required to reach phosphorus effluent limits of 1.0 mg/L or less, excluding the aid of chemicals; and all EBPR systems provide an aerobic zone and an anaerobic zone[2]. Instrumentation and controls that monitor and manipulate Dissolved Oxygen (DO) levels in the biological treatment process are ideal for assistance in promoting growth of PAOs. Furthermore, the process tanks must be configured for creating distinct zones for manipulating the DO.

As noted, EBPR occurs when an anaerobic zone is added to work as a PAO selector. In addition to thriving in anaerobic conditions, PAOs also need a 'food source' which typically constitutes of VFAs. If VFAs are not present in a sufficient supply, Bio-P may not occur to the necessary extent. If influent testing shows that the concentration of VFAs is not high enough, the facility may choose to ferment their incoming flow or their RAS to increase the amount of VFAs.

Sampling is suggested to speciate the phosphorus, as well as test for total nitrogen, volatile fatty acids (VFAs), flocculated-filtered chemical oxygen demand (ffCOD), soluble COD ($_S$COD), and readily

[1] References – Item 6 (pg 18)

[2] References – Item 6 (pg 12)

biodegradable COD (rbCOD). In the industry, there is still much research and analysis to be done to further understand the relationship between influent wastewater characteristics and Bio-P removal through a WWTF. However, meeting a 1.0 mg/L phosphorus limit with Bio-P removal generally requires the following ratios at the WWTF influent:

BOD:TP	>20:1
rbCOD:TP	>10:1
VFA:TP	>4:1

rbCOD is a precursor of VFAs and is the most accurate indicator of a wastewater's ability to form phosphorus accumulating organisms (PAOs) for Bio-P removal. Determining WWTF influent rbCOD values provides an estimate of Bio-P removal capabilities. Due to the significant expense of testing specifically for rbCOD, primarily due to the speciation of soluble COD (biodegradable and non-biodegradable), a more cost effective method to determine a reasonable estimate for influent rbCOD is suggested. Since rbCOD is the difference between Particulate (filtered and flocculated COD or ffCOD) and Non-biodegradable soluble COD (rbCOD = ffCOD – Soluble Non-Biodegradable COD), we can look at these parameters more closely. Testing the WWTF effluent soluble COD, which should be essentially free of biodegradable COD, would be essentially testing the non-biodegradable form carried from the plant influent. Therefore, if testing the influent ffCOD and effluent soluble COD (which is the non-biodegradable COD), this should help provide a reasonable estimate of the rbCOD. It should be noted that this method does not provide an exact value for several reasons, including testing of two separate samples (at two locations), loss of some soluble non-biodegradable COD in the biosolids process, and residual amount of soluble biodegradable COD remaining in the effluent. However, it does provide an estimate of rbCOD that is useful in generally determining the wastewater's ability to form PAOs for Bio-P removal.

Dissolved Oxygen (DO) in oxidation ditches should be evaluated not only to determine if distinct anaerobic zones are created, but also whether the oxygenation rates could promote simultaneous nitrification-denitrification. Nitrogen typically enters WWTFs as organic nitrogen and ammonia (NH_3) or ammonium (NH_4^+). For the influent nitrogen to be completely removed, the wastewater must undergo nitrification (a change from ammonia or ammonium to nitrite then nitrate) followed by denitrification (a change from nitrate to nitrogen gas). It is vital to maintain correct amounts of oxygen in each stage for the facility to see proper removal. Excess oxygen not only decreases denitrification, oxygen can eat away at the alkalinity in the system causing an acidic environment. This acidic environment can accelerate the wear on a WWTF and can therefore increase maintenance and replacement costs. Typically, in the nitrification step a DO of 2.0 mg/L or higher is ideal and in the denitrification step a DO of 0.0 mg/L is ideal[3]; however, various sources have stated that denitrification can occur below 0.5 mg/L of DO.

Chem-P removal involves the addition of chemicals to react with soluble phosphate to form solid precipitates that can be removed by a solids separation process. Chemical phosphorus removal is typically not considered as advantageous as biological phosphorus removal due to the cost of the chemicals and the

[3] References – Item 4 (pg 47)

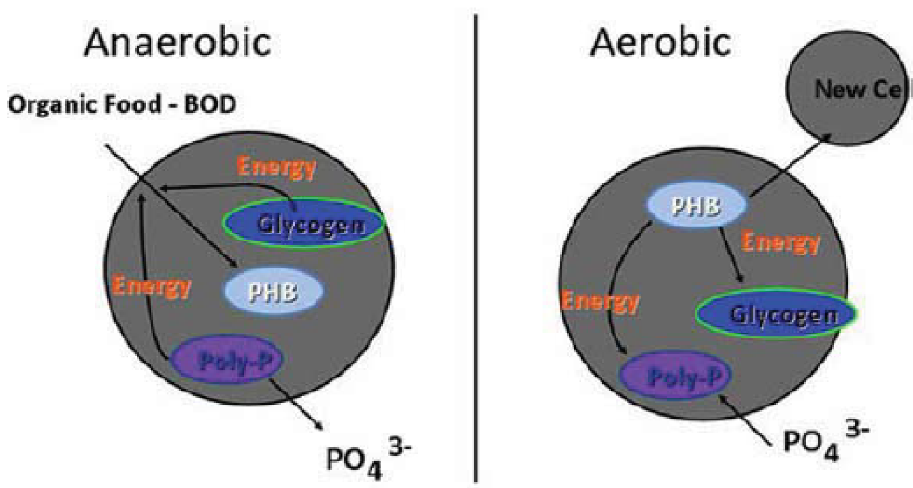
increased solids generation that occur because of chemical use; and it is typically utilized as supplemental action with Bio-P removal. Chemical removal can often convert soluble ortho-phosphate into particulate ortho-phosphate; however, the removal of the ortho-phosphate is still very dependent on the efficiency of the solids and liquids separation process. Further discussion of particular Chem-P options are discussed later in this section.

Not all phosphorus fractions can be easily removed from wastewater and some phosphorus fractions must be converted to a different fraction to be removed by either Bio-P or Chem-P. With the present technology, there is some phosphorus that is recalcitrant, or, that cannot be feasibly removed from wastewater. In the cases of both Bio-P and Chem-P removal, the goal is to effectively and efficiently convert phosphorus to a particulate form for removal in the biosolids process. Wastewater chemistry and biology are both incredibly complex, there are many competing reactions and many environmental factors which will affect all reactions. Factors such as temperature, pH, and DO content can affect the biota available and cause unexpected reactions.

The particulate fractions, which do not pass through a 45 µm filter, are typically assumed to be removed via the same methods used for TSS or solids removal. The dissolved orthophosphate is the fraction that is most easily utilized by PAOs. Once inside the cell, the orthophosphates are stored as polyphosphates. Aerobic zones affect the actions of the PAOs. The PAOs take up the orthophosphate and store it as polyphosphate the aerobic zone and the PAOs release polyphosphate as orthophosphate in the anaerobic zone. Proposed Exhibit 3-1 outlines this phenomenon. Polyphosphates, which are considered non-reactive, can be hydrolyzed to orthophosphates over time.

Exhibit 3-1: PAO – Ortho-Phosphate Uptake and Release

Village of Huntley, IL



Of course, a facility's ability to remove the phosphorus is vital. A good metric for gauging the facilities' solids removal effectiveness is Solids Retention Time (SRT). SRT is not a measured parameter; rather, it is calculated by taking the total solids inventory divided by the total solids wasted. Maintaining a low SRT will help create positive conditions for settling and removing solids in the Final Clarifiers, thus minimizing excursions of solids from this process. Furthermore, if particulate phosphorus remains bound in PAOs for a long period of time, particularly when exposed to anaerobic or anoxic conditions, the particulate phosphorus can convert back to soluble form and release back into the process liquid. Once back into soluble form, the phosphorus is much more difficult to remove. A low SRT will maintain a “younger” sludge age, which prevents conditions conducive for phosphorus release back into soluble form. Literature suggests a SRT range of 12 to 20 days as being optimal for phosphorus removal for extended aeration activated sludge processes with oxidation ditches, which is applicable for both the East and West WWTFs.

Side-streams refer to the return streams from biosolids processing. Although side-streams typically represent < 5% of raw plant flow, they can represent 15% to 40% of the typical discharge nutrient load[4]. The comparative low flows and higher nutrient concentrations can make side-streams a very cost-effective way to remove nutrients as compared to main-stream processes. While anoxic zones are typically a mainstream process, there has been some success treating just the side-stream flow as an anoxic zone before combining the side-stream flow with the influent in the anaerobic zone[5]. The creation of anoxic side-stream treatment would allow more nitrate to be removed from the return flow through denitrification, thus ensuring a more efficient anaerobic zone and better phosphorus uptake.

The following sections will identify major treatment processes at WWTFs and their impact on phosphorus removal performance. While there are many potential processes at WWTFs that impact performance, these sections will focus on the processes that are either existing at the Huntley WWTFs or could be reasonably implemented at their WWTFs.

3.1.1 Headworks – Headworks at WWTFs typically consist of screening, and can also include grit removal. While screening and grit removal processes typically don’t directly correlate to phosphorus removal, it can impact its performance at the facility. Effective removal of inorganic matter can decrease loading and competition in the downstream treatment processes so that can operate more efficiently. However, if the screening process removes organic matter, which is rich in rbCOD/BOD/VFAs, this can negatively impact Bio-P removal performance. Facilities should analyze the screen removal performance in terms of inorganic vs. organic matter removal and make any viable changes to maximize inorganic removal while minimizing organic removal.

3.1.2 Extended Aeration Activated Sludge Process with Oxidation Ditches – There are two common oxidation ditch configurations. One common design utilizes two or three individual rings, and is most commonly seen in the Orbal process as manufactured by Evoqua (formerly US Filter/Siemens). This design uses the outer ring as an anaerobic zone and inner ring as an aerobic zone. 3-ring arrangements are typically more effective at Bio-P removal, as it allows for a more isolated and extended anaerobic zone in the outer ring due to the buffering capability of the middle ring. Another common oxidation ditch design is known

[4] References – Item 5 (pg 13)
[5] References – Item 4 (pg 53)

as a Closed Loop Reactor (CLR), as manufactured by Lakeside, which uses baffle walls in an oval tank to create separate anaerobic and aerobic zones. This design can struggle to match the 3-ring Orbal process in phosphorus removal efficiency due to limitations in creating extended anaerobic conditions. However, in some cases, multiple CLRs are constructed in an arrangement, and can be operated in parallel or series configuration. Operation in series, along with appropriate equipment, can help enhance Bio-P removal if the first CLR is operated as an anaerobic zone and the second CLR as an aerobic zone.

Enhanced biological phosphorus removal (EBPR) occurs when the anaerobic zone works as a PAO selector. In addition to thriving in anaerobic conditions, PAOs also need a ‘food source’ which typically constitutes of VFAs. If VFAs are not present in a sufficient supply, Bio-P may not occur to the necessary extent. If influent testing shows that the concentration of VFAs is not high enough, the facility may choose to ferment their incoming flow or their RAS in order to increase the amount of VFAs. This fermentation zone can be done in the outer ring of a 3-ring oxidation ditch, if there is adequate capacity. If there is no capacity in the oxidation ditch to create a fermentation zone, a separate tank can be utilized to ferment raw sewage or RAS prior to introduction into the oxidation ditch.

In each oxidation ditch configuration, Bio-P operation is enhanced with monitoring and control of DO levels in each tank. DO and ORP probes in the oxidation ditches is a cost-effective way to allow the WWTF operators to more effectively track the DO and ORP, thus helping them avoid over-aeration. Other modifications to assist with DO control include adding VFDs for the oxidation ditch aerators, removing disks from the aerators, adding mixers to supplement the aerators in the anaerobic zones (particularly for the CLRs), and implementing controls to automatically adjust aerator speeds based on DO/ORP measurements.

Secondary clarification is typically lumped with the oxidation ditch process when referring to the Extended Aeration Activated Sludge Process. Circular clarifiers are the most common form of secondary clarification for this process. Operation of the clarifiers as related to phosphorus removal is not as sensitive as operation of the oxidation ditches, but still warrants consideration. Phosphorus removal is directly correlated to converting and binding phosphorus in the particulate form, and the function of clarifiers is to settle and remove particulate solids from the treatment stream. Therefore, it is essential to maintain optimum solids removal efficiency in the clarifiers. Furthermore, since phosphorus release can occur from PAOs once exposed to extended anaerobic conditions, it is important to maintain a minimal sludge blanket in the clarifiers to minimize the potential for this secondary phosphorus release.

3.1.2.1 Ballasted Media – Ballasted flocculation, also known as high rate clarification, is a proprietary process where a ballasting agent (typically a silica microsand) is used to form dense microfloc particles. This act of ballasting causes the floc to settle rapidly – decreasing the time needed for clarification and increasing the efficiency of it. Ballasting has been used both to optimize current processes, as well as optimize use during wet weather events causing an increase in flows. Ballasting occurs after a metal salt has been added to destabilize the solids. The three zones of ballasting are discussed below. These zones can occur in a single vessel or in several different compartments depending on the manufacturer of the system.

1) Mixing Zone – In the mixing zone microsand and polymer are injected to maximize the efficiency of flocculation and enhance the settling of the suspended solids.
2) Maturation Zone – The maturation zone is used to keep the particles in suspension while the floc grows and develops.
3) Settling Zone – The solids settle out and are removed from the clarifier. It should be noted that either conventional settling or lamella plate setting can be used to settle the solids.

Once the solids have been removed from the clarifier, the microsand is removed from the other solids to reuse the microsand. The solids created are then processed as usual.

This technology can be particularly useful for phosphorus removal at facilities that do not already have filtration. However, for facilities that do already have filtration, retrofitting the existing filters is often more cost efficient than using ballasted media. In Huntley's case, each of the existing facilities currently has filtration, so ballasted media has not been investigated further in the following sections.

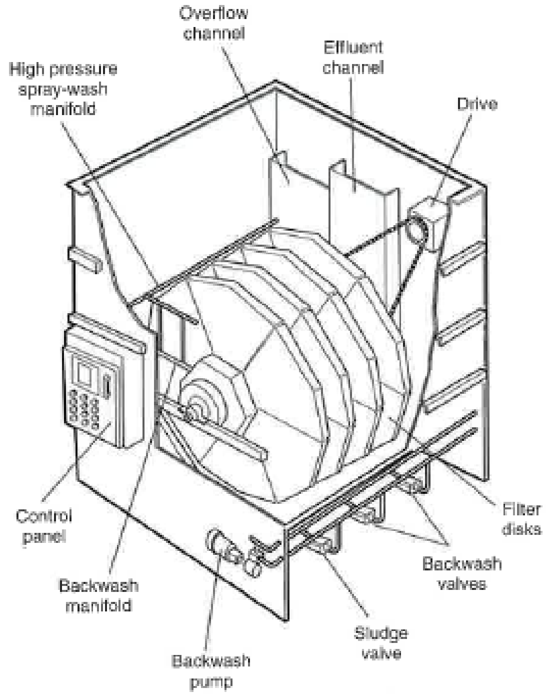
3.1.3 Filtration – Filtration is a tertiary treatment technology that is currently used by both the East and West WWTFs. There are many different filtration types available including sand filters, disk filters, membrane filters, and reactive media bed filters. The level of required solids removal is the most important factor in designing filtration systems. The anticipated influent characteristics (TSS, Turbidity, etc.), hydraulic profile, and physical limitations can also impact filtration system design.

3.1.3.1 Sand Filters – Sand filters are the most commonly used and historically most tenured form of filtration. They typically use graded media which may include gravel or anthracite to catch various sizes of contaminants. At a certain headloss set point, the backwash will initiate and will remove debris that has built up on the filter. There are many factors that impact sand filter performance, including influent fluid characteristics, filter run times, as well as filter medium pore size, uniformity, and bed depth. Sand filters become less effective as the treatment objectives become more stringent, especially when compared to the forms of filtration of the options presented herein.

3.1.3.2 Disk Filters – Disk filters can work as very effective tertiary filters for wastewater treatment. Disk filters work by allowing influent water to travel through a cartridge of fabric disks. At a certain headloss set point, the backwash will initiate and will remove debris that has built up on the filter. The headloss, flowrates, and removal efficiency will vary based on the design and capacity of the disk filter. Advantages over sand filters include better filter medium uniformity (and thus better removal performance), less footprint required for installation, and more flexibility for staging backwashes. Exhibit 3-2 below shows a standard disk filter design.

Exhibit 3-2: Typical Disk Filter Design[6]

Village of Huntley, IL



3.1.3.3 Membrane Filters – Membranes work by providing a physical barrier which only allows passage to particles up to a certain size, shape, or character and doesn't permit particles beyond this size. Treated water passes through the membrane and phosphorus compounds are too large to pass through the pores. Once the headloss across the filter particle has reached a preset level, the filter will backwash and remove all particles from the filter and into further treatment.

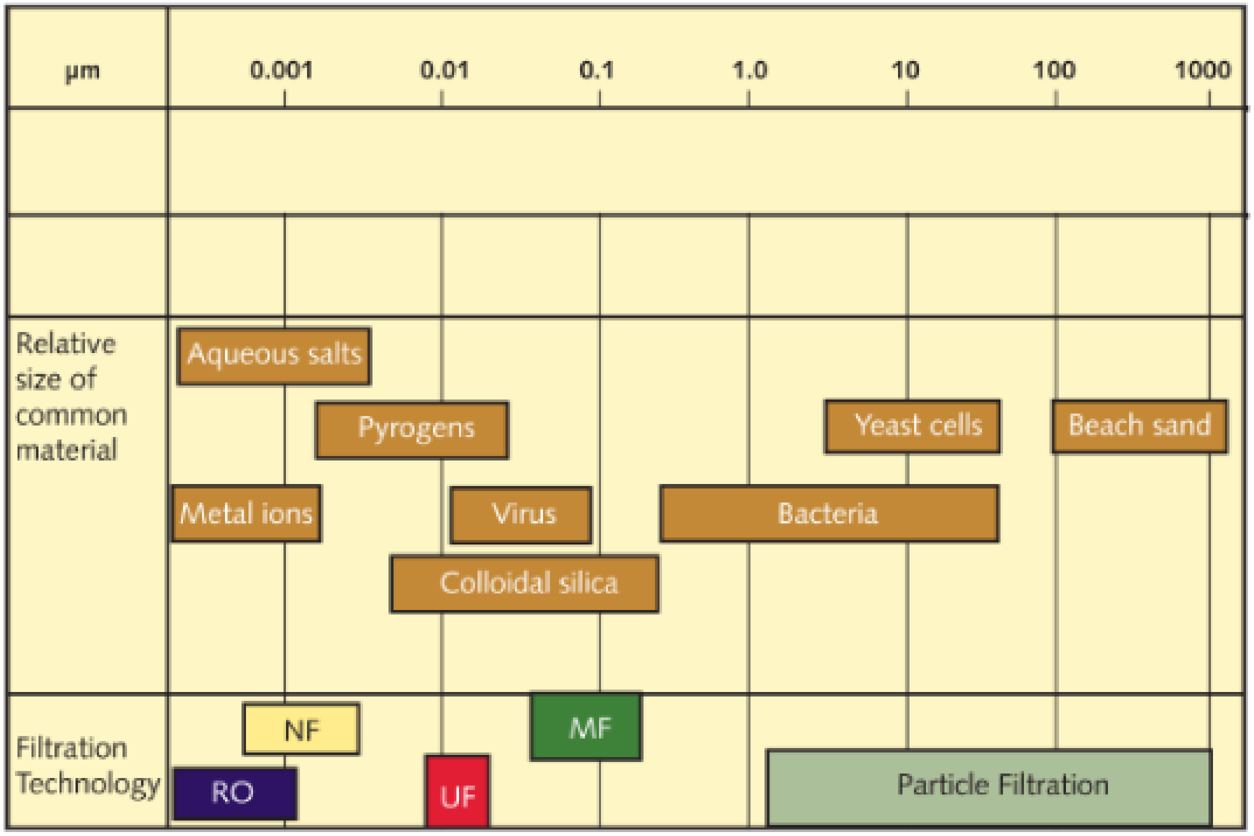
Exhibit 3-3 outlines the sizes of several kinds of membrane filters compared with the size of several filterable wastewater contaminants. The pore size of membranes will be determined, amongst other things, based on the contaminants the membrane is in place to remove. However, microfiltration or ultrafiltration is typically sufficient for wastewater applications, even those requiring stringent effluent phosphorus limits.

Membranes typically provide the most effective removal of solids of all the filtration options. They also require a relatively small footprint. However, they have the highest operation and maintenance costs due to the required membrane feed pumping and chemical clean-in-place systems. They also produce a high amount of reject water that must be re-treated or sent to the biosolids process.

[6] Photo Credit – References, Item 6 (pg 1101)

Exhibit 3-3: Membrane Filtration Spectrum for Water and Wastewater Treatment[7]

Village of Huntley, IL



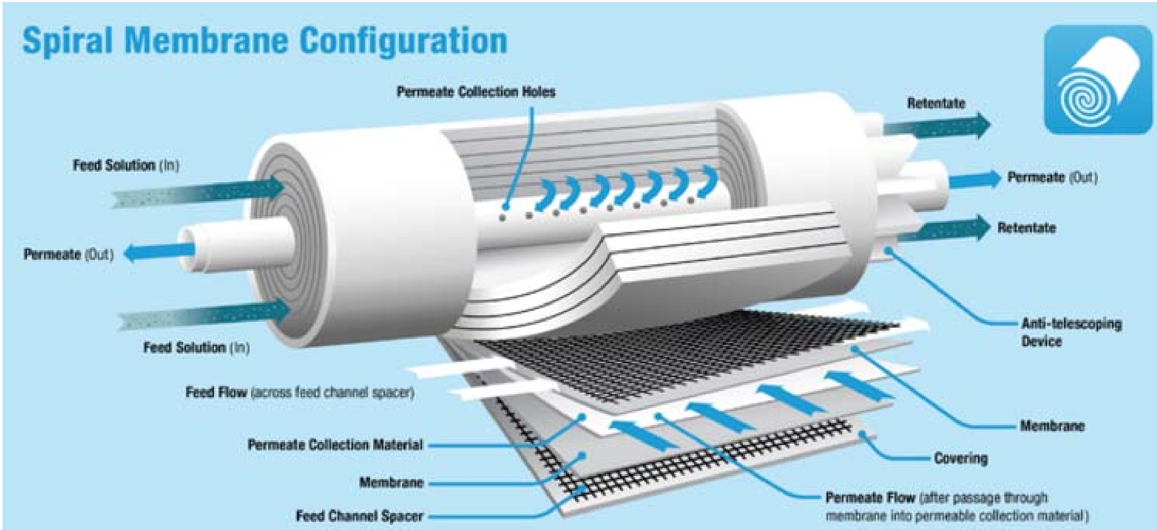
In addition to varying based on pore size, membranes also vary on based on 'modules'. In the field of membrane filtration, a 'module' refers to a complete unit including membranes, pressure support structure for the membranes, feed inlet, outlet permeate (treated water) retentate ports, and overall support structure. There are three main modules used in wastewater 1) Spiral, 2) Tubular, and 3) Hollow fiber. These modules will briefly be described below.

1) Spiral modules follow a tight circular configuration where the wastewater flows through a rolled up arrangement of membranes and support sheets in a spiral pattern, as shown in Exhibit 3-4.

[7] References – Item 13

Exhibit 3-4: Spiral Membrane Module[8]

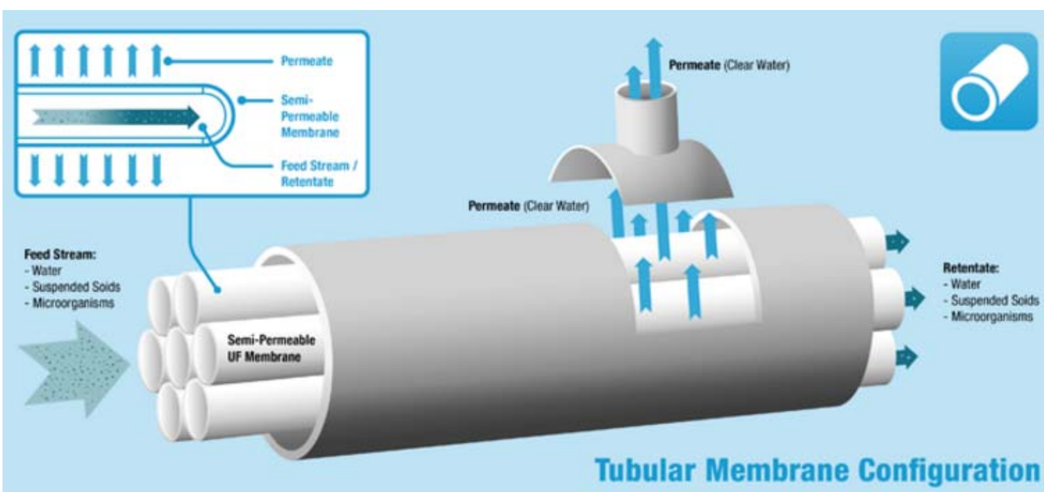
Village of Huntley, IL



2) Tubular modules categorize a configuration where several tubes are placed in a pressure vessel and the membranes are cast on the inside of the support tube. The tubes can be placed in a bundle as seen in the first picture in Exhibit 3-5 or individually as seen in the second picture of the exhibit. Water is fed on the inside of the tubes and exits on the outside. Tubular units are cleaned mechanically by passing a 'foamball' or 'spongeball' and chemicals through the tubes to mechanically wipe the membrane. Because of their unique cleaning capacity, tubular membranes are often used for wastewater that has high suspended solids or plugging potential.

Exhibit 3-5: Tubular Membrane Module[9]

Village of Huntley, IL

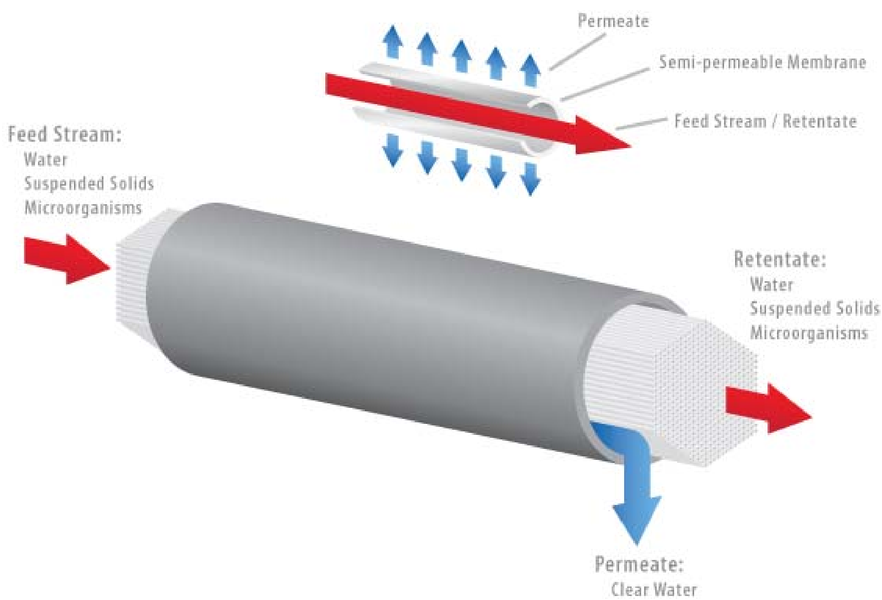


[8] References – Item 14
[9] References – Item 15

3) Hollow fiber modules have hundreds or thousands of fibers in a bundle within a pressure vessel. Unlike the tubular modules, hollow fiber modules can work by pumping water into the fibers and allowing the effluent flow out of the fibers or by pumping water into the area surrounding the fibers and letting the water flow into and then out through the fibers. Exhibit 3-6 shows two hollow fiber module setups.

Exhibit 3-6: Hollow Fiber Module[10]

Village of Huntley, IL



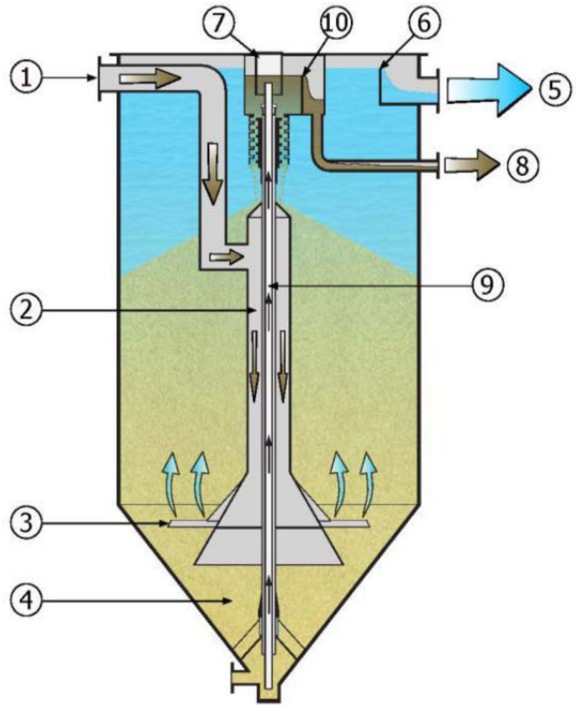
3.1.3.4 Reactive Media Bed Filters – Reactive media bed filtration is a relatively new concept compared to the other filtration methods presented, but studies have shown that it can be very effective for low level phosphorus limits. For the purposes of this study, the Blue PRO® system by Blue Water Technologies, Inc. will be singularly referenced for this process. It is a continuous backwash sand filtering product, though which influent water is dosed and is pumping up through rounded sand particles. The rounded sand particles are coated with continuously regenerated hydrous ferric oxide (HFO) which creates an adsorptive surface. The large surface area created by the rounded sand particles allows for maximum reaction time between the wastewater and the adsorptive media. The treated water will leave the top of the tank and the effluent HFO, phosphorus, and solids are removed from the bottom of the tank through the backwash or reject stream. The reject stream ‘scrubs’ the adsorbed phosphorus and HFO away from the sand and the sand is redistributed at the top of the filter. The Blue PRO® system comes in several configurations and is modular in nature. The systems can either be freestanding fiberglass or stainless steel units or can be in-ground concrete cells. Studies provided by the manufacturer indicate there is a need for fewer chemicals to achieve the level of

[10] References – Item 16

phosphorus removal consistent with comparable technologies; and therefore, have decreased costs associated with chemicals, sludge storage, and sludge handing and transportation costs.

Exhibit 3-7: Blue PRO® Filter System Schematic[11]

Village of Huntley, IL



1. Influent
2. Central Feed Chamber
3. Radial Arms
4. High Quality Silica Media
5. Filtrate
6. Fixed Effluent Weir
7. Washbox
8. Reject
9. Airlift
10. Adjustable Weir

3.1.4 Chemical Phosphorus Removal – Chem-P removal involves the addition of metal salts to react with soluble phosphate to form solid precipitates that can be removed by a solids separation process. There are several chemicals that can be utilized, including Calcium/Lime (Ca/CaO), Ferrous Sulfate ($Fe(SO_4)_3$), Ferric Chloride ($FeCl_3$), and Aluminum Sulfate/Alum ($AL_2(SO_4)_3$-$14H_2O$). In Huntley's case, Aluminum Sulfate (Alum) is already used at the West WWTF to aid with phosphorus and barium removal, and the Village has begun using Alum at the East WWTF for barium removal. Therefore, it is assumed the Village will continue to utilize Alum as the metal salt for Chem-P removal, and this study will focus on this chemical only.

Alum reacts with alkalinity of phosphate to form insoluble aluminum salts. Alum is also commonly used to remove other contaminants such as barium. The chemical reaction seen when alum is added to wastewater as a phosphorus removal technique is seen below.

$Al^{3+} + H_nPO_4^{3-n} \leftrightarrow AlPO_4 + nH^+$ (References – Item 6, pg 501)

[11] Schematic provided in Blue PRO® presentation to EEI. Additional Blue PRO® information in References – Item 10

Although one mole of aluminum would theoretically precipitate one mole of phosphate, there are many competing reactions occurring and bench tests and full scale tests are necessary to determine the actual amount of dosing that is needed. The use of polymers in the wastewater may have a particularly large effect on the way the Alum reacts with the phosphate. It should also be noted that, although increasing the dosage of Alum is likely to increase the precipitation of phosphorus, it will also increase the solids disposal costs.

Alum can be fed neat or with dilution water via a chemical feed dosing pump. It is recommended to flow pace the pumps, such that the feed concentration remains constant; and this requires tying the chemical pump to the WWTF control system. Chemical storage of at least 10 days is required, based on DAFs. Multiple feed points for Alum should be analyzed, including prior to oxidation ditches, prior to secondary clarification, and prior to filtration. The most efficient application point would seem to be prior to secondary clarification, because this better allows for unrestricted Bio-P removal in the oxidation ditches and more quickly moves the phosphorus bound solids into the biosolids process.

3.1.5 Biosolids Management – It is important to consider the effects of phosphorus removal on the biosolids processes. Since phosphorus is removed in the biosolids, an increase in phosphorus removed invariably results in an increase in biosolids. Depending on the level of phosphorus removal required, this can influence digester, thickening, dewatering, and dewatered biosolids storage capacities and operations. It will also lead to an increase in sludge hauling. Review of the anticipated additional biosolids handling requirements versus these process capacities is an important step to fully identify the necessary plant improvements and resultant costs. Operational checks and balances should be performed to minimize the impacts of additional biosolids production, such as maximizing thickening and dewatering efficiencies, as well as maximum VSS destruction in the digesters.

3.1.6 Side-Stream Flow Optimization – Side-streams refer to the flows from biosolids processes, such as digester decanting, biosolids thickening, and biosolids dewatering that return to the Headworks facilities and require re-treatment. Although side-streams typically represent < 5% of raw plant flow, they can represent 15% to 40% of the typical discharge nutrient load[12]. The comparative low flows and higher nutrient concentrations can make side-streams a very cost-effective way to remove nutrients as compared to main-stream processes.

3.1.6.1 Phosphorus Treatment in Side-Streams – As seen in Appendix I, most textbook phosphorus removal techniques have all anoxic and anaerobic zones in the mainstream processes. However, there has been some success treating just the side-stream flow as an anoxic zone before combining the side-stream flow with the influent in the anaerobic zone[13] similar to the Johannesburg process for phosphorus removal. The creation of anoxic side-stream treatment would allow more nitrate to be removed from the return flow, thus ensuring a more efficient anaerobic zone and better phosphorus uptake.

[12] References – Item 2 (pg 13)
[13] References – Item 4 (pg 53)

3.1.6.2 Nutrient Recovery – Ostara is an example of a company that uses its technology to remove phosphorus from wastewater and then combines the phosphorus with other nutrients in the wastewater to form a high grade agricultural fertilizer. The fertilizer is in the form of small, nutrient rich “pearls” that consist of nutrients from the wastewater as well as some added chemicals. Once the fertilizer has been harvested from the wastewater, Ostara would purchase the fertilizer from the WWTF. The Ostara system claims to remove phosphorus at rates up to 85% and ammonia at rates up to 40%. However, this process requires anaerobic digestion to create the struvite, and it is inefficient for WWTF’s similar in size to the facilities in Huntley. Therefore, this process is not considered to be applicable for this study.

3.1.7 Application of Limit on Monthly, Seasonal, and Annual Average Basis – The NPDES Permit Special Condition requires evaluation of the construction and O&M costs of the application of this limit on a monthly, seasonal and annual average basis. The climate in Northern Illinois impacts biological phosphorus removal efficiencies. Generally speaking, temperatures between 5-30 degrees C are ideal for biological phosphorus removal. However, studies have shown that lower temperatures are more ideal for biological phosphorus removal due to less competition for Phosphorus Accumulating Organisms (PAOs). Therefore, it is theoretically easier to accomplish better phosphorus removal biologically during the winter months. Averaging results from better performing periods (cold weather) with higher results from other periods (warmer months) over a longer reporting time frame would provide benefits to the Village.

Meeting a Total Phosphorus effluent limit as a monthly average requires the highest investment of capital and O&M costs because it is the strictest limit of the options presented. Seasonal and annual average limits would require successively lower capital and O&M costs. The primary reason for the difference in costs is the required chemical dosage and chemical feed system. Maximum chemical usage would be required during the summer months to meet the limit. An annual limit would allow averaging of lower effluent phosphorus results from the winter months with the higher phosphorus results in the summer months, thus allowing for a possible reduction in chemical usage during the summer months. A similar principle would be applied to the seasonal limit, although the exact parameters of the seasonal limit would affect the resultant reduction in required chemicals. More specific discussion of this topic is included in Sections 4 through 8 of this report.

3.2 Meeting a 1.0 mg/L Phosphorus Limit

This section will identify general recommendations for meeting a 1.0 mg/L phosphorus limit, based upon considerations from the prior section.

3.2.1 Extended Aeration Activated Sludge Process with Oxidation Ditches – It is recommended that the oxidation ditches have VFDs for each aerator motor, along with the necessary DO and ORP probes and controls to automatically maintain optimal DO concentrations in each zone for phosphorus removal. The Orbal style oxidation ditches with three rings should have the capability to operate the outer ring at 0 mg/L DO to promote an effective anaerobic zone. These oxidation ditches with two rings should have the capability to operate the outer ring at less than 0.5 mg/L DO to promote an anaerobic zone as best as possible. The CLRs should operate with two tanks in series, with the first tank operating at less than 0.5 mg/L DO.

3.2.2 Chemical Phosphorus Removal – An Alum chemical feed system should be implemented to supplement Bio-P removal in the oxidation ditches and secondary clarifiers. It is recommended to feed the Alum after the oxidation ditches, where possible, to allow the oxidation ditches to more efficiently accomplish Bio-P removal.

3.2.2 Filtration – It is recommended to utilize sand filters or disk filters to supplement settling in the secondary clarifiers for removal of phosphorus-bound solids. This tertiary treatment will provide consistent level of solids removal that should help buffer any potential performance issues in the secondary clarifiers.

3.2.4 Other Considerations – As noted previously in Section 3, the Village should be aware of operational considerations, such as reducing SRTs and optimizing the biosolids management processes. Any operational improvements that reduce the Alum requirements will ultimately save on O&M costs.

3.3 Meeting a 0.5 mg/L Phosphorus Limit

This section will identify general recommendations for meeting a 0.5 mg/L phosphorus limit, based upon considerations from the Section 3.1 and assumes prior implementation of the recommendations from Section 3.2 for meeting a 1.0 mg/L limit.

3.3.1 Extended Aeration Activated Sludge Process with Oxidation Ditches – It is recommended that third rings be added to 2-ring oxidation ditches where possible. The outer rings would then be operated as anaerobic zones, promoting fermentation for production of VFAs, and the subsequent conditions where PAOs thrive. If it is not possible to add a third ring to 2-ring oxidation ditches, fermentation tanks should be implemented to treat raw sewage or RAS prior to feeding into the oxidation ditches. Mixers should be added to CLRs to promote anaerobic zones.

3.3.2 Chemical Phosphorus Removal – The Alum chemical feed system should be modified as required to supplement Bio-P removal in the oxidation ditches and secondary clarifiers. Equipment shall be sized to adequately account for phosphorus removal inefficiencies related to a lower limit, as the required Aluminum to Phosphorus mole ratio will increase with the lower limit. Polymer may also be required to enhance removal characteristics.

3.3.3 Filtration – It is recommended to utilize disk filters to supplement settling in the secondary clarifiers for removal of phosphorus-bound solids. This tertiary treatment will provide consistent level of solids removal that should help buffer any potential performance issues in the secondary clarifiers; and will also provide a more consistent level of filtration as compared to sand filters.

3.3.4 Other Considerations – As noted previously in Section 3, the Village should be aware of operational considerations, such as reducing SRTs and optimizing the biosolids management processes. Any operational improvements that reduce the Alum requirements will ultimately save on O&M costs. This limit would likely drive an increase in solids production. Therefore, improvements to various biosolids processes must be considered, such as implementation or enhancements to aerobic digestion, thickening, dewatering, and dewatered biosolids storage.

3.4 Meeting a 0.1 mg/L Phosphorus Limit

The removal of total phosphorus down to the 0.1 mg/L potential limit would prove to be difficult and may require several different treatments to remove the phosphorus from the wastewater. This section will identify general recommendations for meeting a 0.1 mg/L phosphorus limit, based upon considerations from the Section 3.1 and assumes prior implementation of the recommendations from Section 3.2 for meeting a 1.0 mg/L limit.

3.4.1 Extended Aeration Activated Sludge Process with Oxidation Ditches – It is recommended that third rings be added to 2-ring oxidation ditches where possible. The outer rings would then be operated as anaerobic zones, promoting fermentation for production of VFAs, and the subsequent conditions where PAOs thrive. If it is not possible to add a third ring to 2-ring oxidation ditches, fermentation tanks should be implemented to treat raw sewage or RAS prior to feeding into the oxidation ditches. Mixers should be added to CLRs to promote anaerobic zones.

3.4.2 Chemical Phosphorus Removal – The Alum chemical feed system should be modified as required to supplement Bio-P removal in the oxidation ditches and secondary clarifiers. Equipment shall be sized to adequately account for phosphorus removal inefficiencies related to a lower limit, as the required Aluminum to Phosphorus mole ratio will increase with the lower limit. Polymer would also likely be required to enhance removal characteristics.

3.4.3 Filtration – It is recommended to utilize membrane filtration to supplement settling in the secondary clarifiers for removal of phosphorus-bound solids. This tertiary treatment will provide consistent level of solids removal that should help buffer any potential performance issues in the secondary clarifiers; and will also provide a more consistent level of filtration as compared to sand and disk filters. Reactive bed media filtration should also be considered. However, further analysis would be required before proceeding with this process. Pilot testing of the process would be recommended.

3.4.4 Other Considerations – This limit would drive an increase in solids production. Therefore, improvements to various biosolids processes must be considered and will likely be necessary in some cases. These might include implementation or enhancements to aerobic digestion, thickening, dewatering, and dewatered biosolids storage.

Section 4: East WWTF Phosphorus Removal Feasibility Study – 1.0 mg/L Effluent

4.1 Overview

The East WWTF's NPDES Permit specifies that the East WWTF will be subject to meeting a 1.0 mg/L effluent phosphorus limit in November, 2018. Background sampling completed as part of this study revealed that the current average effluent phosphorus concentration was 1.46 mg/L and the WWTF lacked the key components to reduce the concentration further based on current infrastructure. The Village of Huntley is planning to make several facility upgrades that will aid the East WWTF in complying with the limit. Any future or theoretical plans to reduce the phosphorus effluent concentration to 0.5 mg/L or 0.1 mg/L would utilize the planned changes made to reduce the facilities phosphorus effluent to below 1.0 mg/L.

<u>4.1.1 Modifications to all Oxidation Ditches for VFDs and DO Control Systems</u> – Enhanced operation of the oxidation ditches is vital to facilitate improved Bio-P removal. The East WWTF presently has three (3) separate oxidation ditches, none of which was designed to create a dedicated anaerobic zone nor do they currently have the controls mechanisms necessary to create such a zone.

There are two (2) oxidation ditches (Oxidation Ditch No. 1 and No. 3) with equipment and configuration designed and supplied by Evoqua (formerly US Filter/Siemens). Each of these oxidation ditches is a 2-ring arrangement, which makes it very difficult to create an anaerobic zone while still maintaining an aerobic zone necessary for nitrification (ammonia removal). 3-ring arrangements are a more traditional configuration for promoting Bio-P removal, as the outer ring has the necessary volume and equipment to be operated effectively as an anaerobic zone, the inner channel operated as an aerobic zone, and the middle channel operated as a "swing" zone – buffering between the anaerobic and aerobic zones.

The other oxidation ditch (Oxidation Ditch No. 2) was designed and supplied by Lakeside and is known as their Closed Loop Reactor (CLR) arrangement. There are two (2) tanks in this CLR arrangement and flow can pass through each tank in a parallel or series configuration. This provides a nominal amount of flexibility for creating an anaerobic zone, if the tanks are operated in series and one of the rotors is turned off, while the remaining rotor creates just enough mixing energy to maintain solids suspension. Unfortunately, it can be cumbersome to operate the ditch in this manner without automatic controls.

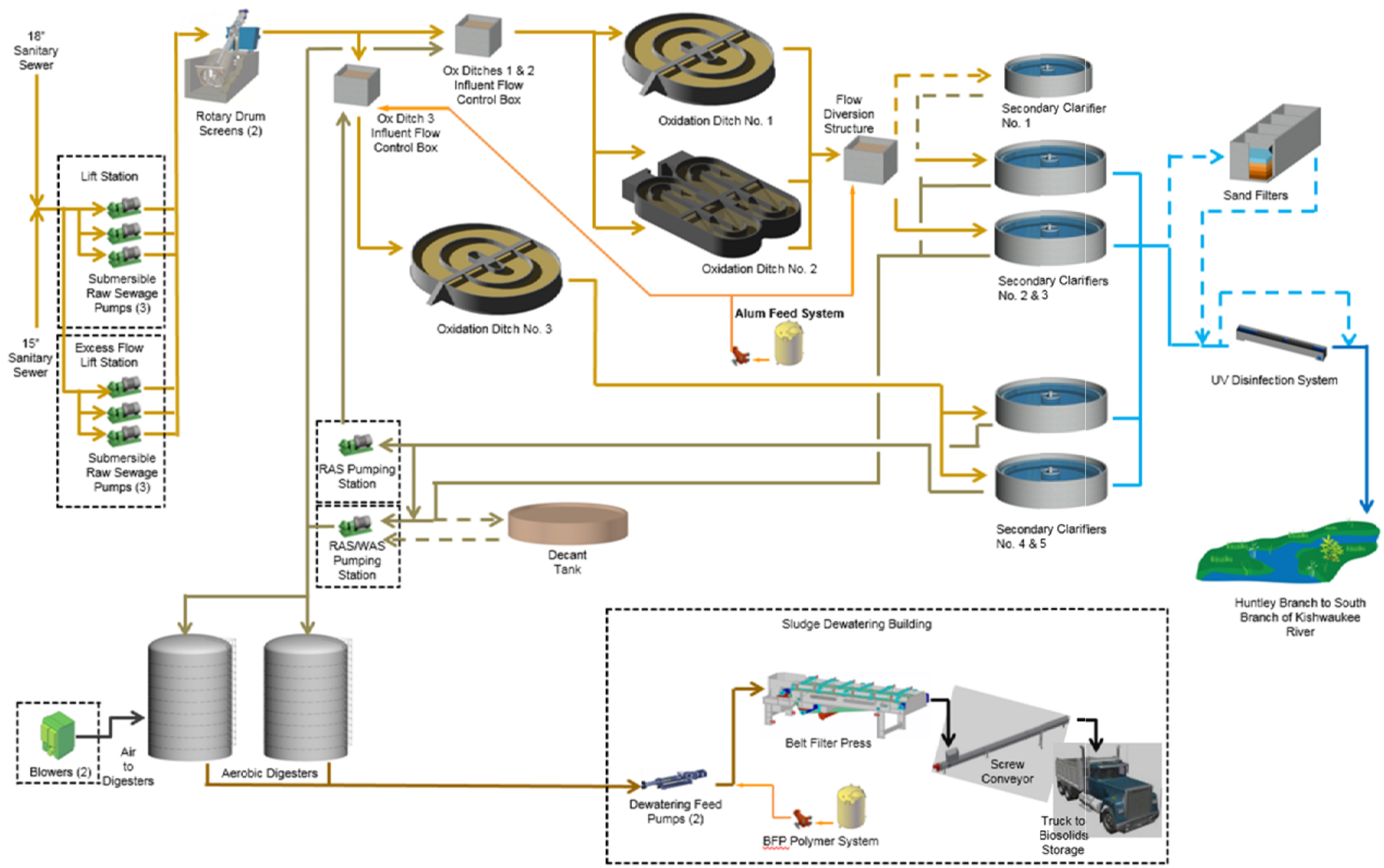
None of the oxidation ditch aerator motors are equipped with VFDs. This limits the ability to adjust aeration in individual zones of the ditches. Since automatic aeration adjustment is not currently possible, permanent Dissolved Oxygen (DO) and Oxygen Reduction Potential (ORP) probes have not been utilized. The lack of essential processes and instrumentation commonly required for Bio-P removal makes nutrient removal optimization difficult.

Exhibit 4-1: East WWTF Aerial View – Recommended Plan – 1.0 mg/L TP Limit

Village of Huntley, IL

Exhibit 4-2: East WWTF Process Flow Diagram – Recommended Plan – 1.0 mg/L TP Limit

Village of Huntley, IL



Permanent DO probes will be added to monitor the oxidation ditch dissolved oxygen to determine if more or less aeration is needed. Additionally, VFDs will be added to all aeration drives so the amount of oxygen added to the oxidation ditches can be fine-tuned to the amount of oxygen that is needed. Controls will be implemented to automatically adjust aerator speeds to meet an operator selected DO set point in each ring/zone of the oxidation ditches.

4.1.2 Add Alum Feed Building – Another component that will be added as part of the modifications to reduce the effluent phosphorus concentration to below 1.0 mg/L is a chemical feed system. The Village currently utilizes a temporary Alum feed system to aid with barium removal. This equipment will be replaced with a permanent system, sized to accomplish the required phosphorus and barium removals. The proposed Alum feed building would be located west of existing Oxidation Ditch No. 1 as seen in Exhibit 4-1.

Alum will be fed neat via a chemical feed dosing pump. Flow Pacing capabilities will be incorporated, such that the feed concentration will remain constant. Chemical storage of at least 10 days will be provided. Multiple feed points for Alum will be utilized because the WWTF effectively has two treatment trains. One feed point will be at the Flow Diversion Structure between Oxidation Ditch No. 1 and 3 and Final Clarifier No. 2 and 3. This should allow for unrestricted Bio-P removal in the oxidation ditches and more quickly move the phosphorus bound solids into the biosolids process. The second Alum feed point will be in the Oxidation Ditch No. 3 Influent Control Box, which mixes raw sewage with RAS prior to introduction into Oxidation Ditch No. 3. It is necessary to introduce Alum at this location because it is not cost effective to construct and maintain a feed line to the center chamber of Oxidation Ditch No. 3 prior to flow into Final Clarifier No. 4 and 5.

4.2 Costs

4.2.1 Capital Costs – The estimated capital cost summary of the scope defined above is included in Table No. 4-1 below.

4.2.2 Operation, Maintenance, and Replacement Costs – The estimated O,M&R cost summary of the scope defined above is included in Table No. 4-2 below. A significant majority of these costs is split between the additional chemicals required to meet the limit and equipment replacement costs of equipment over a 20-year period.

4.2.3 Total Cost Summary – The estimated 20-Year Present Worth Cost Summary is included in Table No. 4-3 below. This includes Capital Costs, Present Worth of Salvage Values, and Present Worth of Annual O,M&R Costs.

TABLE NO. 4-1: CAPITAL COST SUMMARY
EAST WWTF UPGRADES (TP LIMIT = 1.0 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	EXISTING OXIDATION DITCHES IMPROVEMENTS - EQUIPMENT	$650,000	20	$0
2	ALUM FEED SYSTEM - STRUCTURES	$61,700	50	$38,000
	ALUM FEED SYSTEM - EQUIPMENT	$181,500	20	$0
	SUBTOTAL	$893,200		$38,000
	CONTINGENCY (10%)	$89,400		
	BONDS AND INSURANCE @ 2%	$19,700		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$127,800		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$1,130,100		
	ENGINEERING (18%)	$203,500		
	TOTAL ESTIMATED CAPITAL COST	**$1,333,600**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

TABLE NO. 4-2: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY
EAST WWTF UPGRADES (TP LIMIT = 1.0 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$500
2	ADDITIONAL CHEMICALS REQUIRED	$80,000
3	ADDITIONAL LABOR REQUIRED	$7,500
4	ADDITIONAL SLUDGE HAULING REQUIRED	$5,000
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$75,100
	ANNUAL TOTAL	$168,100
	20 YEAR PRESENT WORTH AT 6%	**$1,928,100**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 4-3: PRESENT WORTH COST SUMMARY

EAST WWTF UPGRADES (TP LIMIT = 1.0 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$1,333,600
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($8,800)
3	ANNUAL O, M, & R (20 YEARS)	$1,928,100
	TOTAL PRESENT WORTH	**$3,252,900**

NOTES:

1) BASED ON 2016 DOLLARS

4.2.4 Cost Considerations for Application of Limit on Monthly, Seasonal, and Annual Average Basis – Bio-P removal efficiency will fluctuate slightly during the months of the year based on seasonal temperatures, as described in Section 3.1.7. The estimated costs detailed above are reflective of a monthly average limit. The biggest cost benefits of seasonal and annual average limits would be seen via chemical usage and biosolids production reduction at certain times of the year.

4.2.4.1 Cost Considerations for Seasonal Average Limit – The estimated capital, O,M,&R, and 20-year present worth costs for a seasonal average limit are listed below in Tables No. 4-4, 4-5, and 4-6. The capital cost savings compared to a monthly average limit can be attributed to a slight reduction in the required chemical feed system size. The O,M,&R cost reduction is primarily due to savings in chemical and sludge hauling costs.

TABLE NO. 4-4: CAPITAL COST SUMMARY - SEASONAL LIMIT
EAST WWTF UPGRADES (TP LIMIT = 1.0 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	EXISTING OXIDATION DITCHES IMPROVEMENTS - EQUIPMENT	$650,000	20	$0
2	ALUM FEED SYSTEM - STRUCTURES	$61,700	50	$38,000
	ALUM FEED SYSTEM - EQUIPMENT	$153,800	20	$0
	SUBTOTAL	$865,500		$38,000
	CONTINGENCY (10%)	$86,600		
	BONDS AND INSURANCE @ 2%	$19,100		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$123,800		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$1,095,000		
	ENGINEERING (18%)	$197,100		
	TOTAL ESTIMATED CAPITAL COST	**$1,292,100**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

TABLE NO. 4-5: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY - SEASONAL LIMIT
EAST WWTF UPGRADES (TP LIMIT = 1.0 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$500
2	ADDITIONAL CHEMICALS REQUIRED	$60,000
3	ADDITIONAL LABOR REQUIRED	$6,500
4	ADDITIONAL SLUDGE HAULING REQUIRED	$3,500
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$72,600
	ANNUAL TOTAL	$143,100
	20 YEAR PRESENT WORTH AT 6%	**$1,641,400**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 4-6: PRESENT WORTH COST SUMMARY - SEASONAL LIMIT

EAST WWTF UPGRADES (TP LIMIT = 1.0 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$1,292,100
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($8,800)
3	ANNUAL O, M, & R (20 YEARS)	$1,641,400
	TOTAL PRESENT WORTH	**$2,924,700**

NOTES:
1) BASED ON 2016 DOLLARS

4.2.4.2 Cost Considerations for Annual Average Limit – The estimated capital, O,M,&R, and 20-year present worth costs for an annual average limit are listed below in Tables No. 4-7, 4-8, and 4-9. The capital cost savings compared to a monthly average limit can be attributed to a greater reduction in the required chemical feed system size. The O,M,&R cost reduction is primarily due to savings in chemical and sludge hauling costs.

TABLE NO. 4-7: CAPITAL COST SUMMARY - ANNUAL LIMIT

EAST WWTF UPGRADES (TP LIMIT = 1.0 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	EXISTING OXIDATION DITCHES IMPROVEMENTS - EQUIPMENT	$650,000	20	$0
2	ALUM FEED SYSTEM - STRUCTURES	$61,700	50	$38,000
	ALUM FEED SYSTEM - EQUIPMENT	$127,300	20	$0
	SUBTOTAL	$839,000		$38,000
	CONTINGENCY (10%)	$83,900		
	BONDS AND INSURANCE @ 2%	$18,500		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$120,000		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$1,061,400		
	ENGINEERING (18%)	$191,100		
	TOTAL ESTIMATED CAPITAL COST	**$1,252,500**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

TABLE NO. 4-8: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY - ANNUAL LIMIT

EAST WWTF UPGRADES (TP LIMIT = 1.0 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$500
2	ADDITIONAL CHEMICALS REQUIRED	$40,000
3	ADDITIONAL LABOR REQUIRED	$5,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$2,500
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$70,200
	ANNUAL TOTAL	$118,200
	20 YEAR PRESENT WORTH AT 6%	**$1,355,800**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 4-9: PRESENT WORTH COST SUMMARY - ANNUAL LIMIT

EAST WWTF UPGRADES (TP LIMIT = 1.0 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$1,252,500
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($8,800)
3	ANNUAL O, M, & R (20 YEARS)	$1,355,800
	TOTAL PRESENT WORTH	**$2,599,500**

NOTES:
1) BASED ON 2016 DOLLARS

4.3 Timeframe

The East WWTF NPDES Permit requires the facility to achieve a 1.0 mg/L total phosphorus monthly limit by November 2018. Design for these improvements is currently underway. Construction is expected in begin in spring/summer of 2017 and be complete by spring/summer of 2018. Following the completion of the construction project, the Village will then have several months before their November, 2018 deadline to optimize their system. However, any Bio-P optimization efforts will be somewhat stunted by the existing barium effluent limit, as the Alum feed system must be operational to meet this limit. This will not allow true observation of Bio-P removal performance. The IEPA would have to suspend or relax the barium limit for the Village to truly optimize Bio-P performance.

Section 5: East WWTF Phosphorus Removal Feasibility Study – 0.5 mg/L Effluent

5.1 Overview

The East WWTF's options to reduce the phosphorus effluent concentration down to 0.5 mg/L were evaluated based on cost, land availability, existing operating conditions, forecasted operating conditions, and the expected removal efficiency of each existing process at the facility. It was determined that in addition to the process changes recommended in Section 4 to meet the phosphorus effluent limit of 1.0 mg/L, mixers should be added to the CLRs, two RAS fermenter tanks should be added, the existing sand filters should be converted to disk filter systems, and modifications would be required to the Alum Feed System and RAS/WAS systems. This section outlines all proposed changes for the 0.5 mg/L effluent concentration plan. Exhibit 5-1 shows the proposed aerial plan and Exhibit 5-2 shows the proposed process flow diagram.

5.1.1 Aeration System Modifications – As noted in Section 4, both Evoqua Orbal oxidation ditches (No. 1 and 3) at the East WWTF are two-ring ditches and the Lakeside oxidation ditch (No. 2) is a closed loop reactor (CLR). Both Orbal ditches at the East WWTF lack the flexibility to be converted to three ring Orbal ditches. The improvements noted in Section 4 include adding DO probes and VFDs to all aerator drives in each oxidation ditch to optimize DO levels. The 0.5 mg/L limit requires additional modifications in the CLR. It is recommended to add mixers to each CLR tank, to better allow the creation of anaerobic conditions while maintaining proper solids suspension. Adding mixers to the Orbal oxidation ditches is not practical because the aerators in each ring are driven by common motors. Therefore, you cannot shut off the aerators in the outer rings without also shutting them off for the inner rings.

5.1.2 Add RAS Fermenters – Table No. 5-1 includes the ratios of parameters key to Bio-P performance to the influent phosphorus concentrations at the East WWTF over the recent years, and compares them to the desired ratios conducive for Bio-P removal. In each case, the observed ratio was greater than the desired minimum ratio. This indicates that Bio-P removal to 1.0 mg/L is possible given the proper physical and operational treatment mechanisms. Adding fermenters will enhance VFA production and subsequent Bio-P removal performance with the goal of biologically meeting the 0.5 mg/L limit.

Table No. 5-1: East WWTF Influent Conditions for Bio-P Removal

Village of Huntley, IL

Parameter Ratio	Desired Ratio	Observed Ratio
BOD:TP	>20 :1	57.6 :1
rbCOD:TP	>10 :1	13.9 :1
VFA:TP	>4 :1	5.1 :1

G:\ Publ\ Huntley\ 2015\ HU1501 2016 Wastewater System Planning Documents\ 01B - Phosphorus Discharge Optimization Plan\ Eng\ Water Quality Sampling\ [Phosphorus Ratios.xlsx] Sheet 1

Notes:
-BOD values from DMR Averages 1/2014-12/2015
-rbCOD values from phosphorus testing 10/2014-2/2016
-During phosphorus testing 10/2014-2/2016, every VFA sample measured non-detect (<50 mg/L). An assumed value of half of the non-detect limit, 25 mg/L, was used

Exhibit 5-1: East WWTF Aerial View – Recommended Plan – 0.5 mg/L TP Limit

Village of Huntley, IL

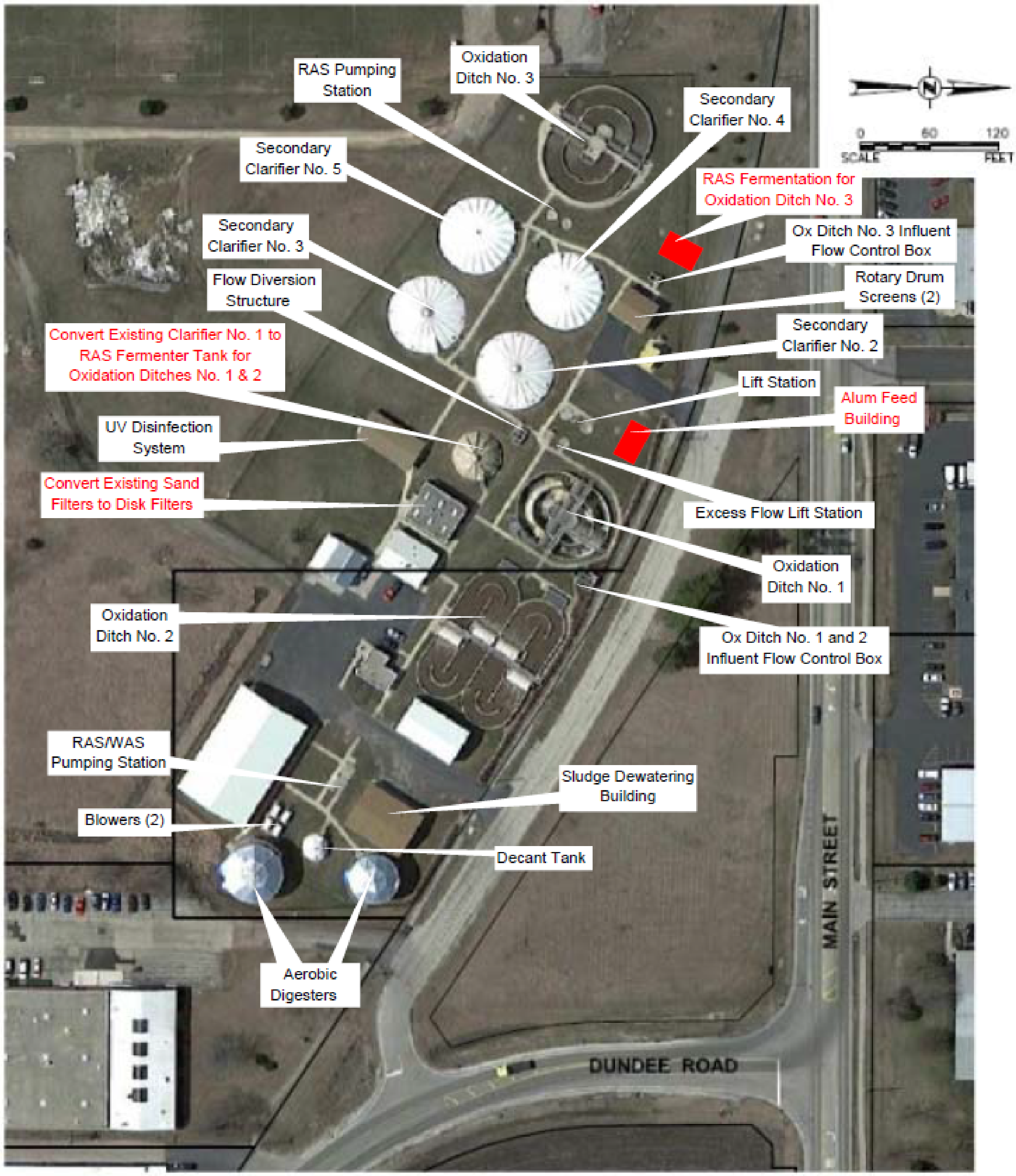
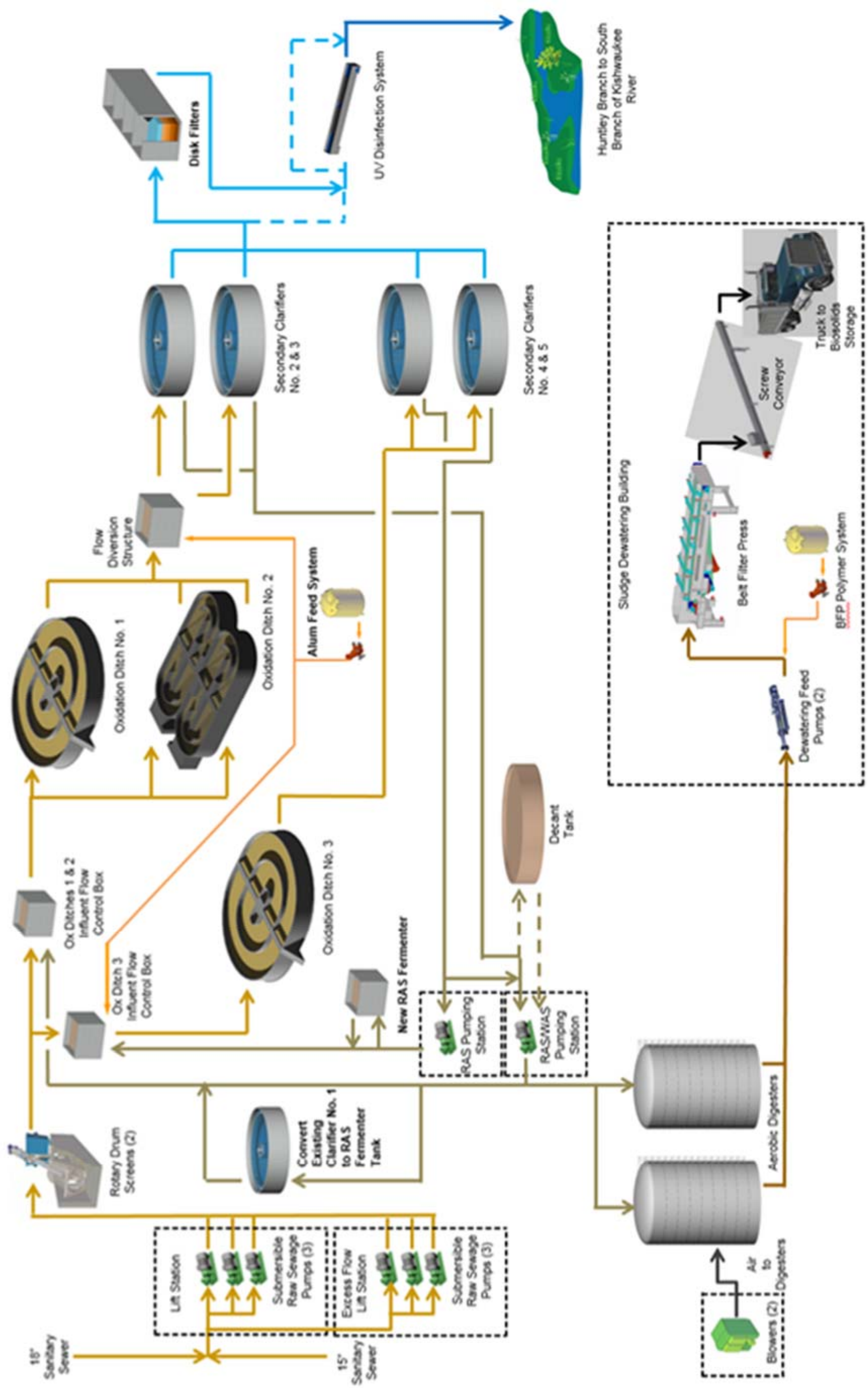


Exhibit 5-2: East WWTF Process Flow Diagram – Recommended Plan – 0.5 mg/L TP Limit

Village of Huntley, IL



Due to space constraints at the East WWTF, additional rings cannot be added to the existing oxidation ditches. Therefore, the oxidation ditches have limited ability to create anaerobic conditions necessary for creation of VFAs through fermentation. There are also hydraulic and space limitations for adding new raw sewage fermenter structures. However, there are opportunities to implement fermenter structures for the RAS flows. The RAS system at the East WWTF is split in two trains: one RAS system returns flows from Secondary Clarifier No. 2 and 3 to the Lakeside Oxidation Ditch (No.2) and would return it to Northwest Oxidation Ditch (No. 1); and the other RAS system returns flows from Secondary Clarifier No. 3 and 4 to the Western Oxidation Ditch (No. 3). Therefore, two separate RAS fermenters are required at the facility.

If the East WWTF was operating at the design capacity of 1.8 MGD DAF, Oxidation Ditch No. 1 and 2 would receive 1.26 MGD (70%) and Oxidation Ditch No. 3 would receive 0.54 MGD (30%) of the flow. The RAS fermenters would be sized for a minimum 2.0-Hours Hydraulic Retention Time (HRT) at 100% RAS flow (as a function of DAF). Mixers would be installed in the RAS fermenters for intermittent resuspension of solids in the tanks.

Existing Secondary Clarifier No. 1 can be remodeled as the RAS fermenter for Oxidation Ditch No. 1 and 2. This clarifier is not required to provide rated clarification, as the other four clarifiers provide sufficient clarification capacity to meet rated treatment requirements. Due to its current function as a clarifier, it could be retrofitted to incorporate mixing required for a fermenter. The tank is 40' in diameter and 12'-0" in height which equates a capacity of 112,740 gallons. The fermenter could provide 2.15 hours HRT at 100% RAS flow (1.26 MGD at DAF). In addition to retrofitting the tank, underground piping connections must be modified to appropriately divert flows to/from the tank.

In addition to the fermenter for Oxidation Ditches No. 1 and 2, a new fermenter would be required for Oxidation Ditch No. 3. This new fermenter would be west of the existing Influent Flow Control Box for Oxidation Ditch No. 3 and would allow the RAS from Clarifier No. 3 and 4 to flow from the fermenter to the Influent Flow Control Box before reaching the Oxidation Ditch. To accommodate a 2-Hour HRT under the DAF assuming the same flow ratios described above, and assuming a 100% RAS rate (0.54 MGD at DAF), the tank size requirement is 45,000 gallons. If a 15-foot depth is assumed and the tank is assumed to be a square, each side would be 20-feet long.

<u>5.1.3 Replace Existing Sand Filters with Disk Filters</u> – The existing sand filtration equipment is beyond its useful life, particularly for meeting a more stringent 0.5 mg/L limit. Therefore, alternate filtration methods should be analyzed. The filtration method most applicable for this application is disk filtration, which is a system more fully described in Section 3.1.3.2. These filters should be designed to maintain a hydraulic surface loading less than 5.0 gpm/ft^2 at the facility's DMF of 4.6 MGD with one unit (group of disks) out of service.

A total filter area of 864.0 ft^2 with four (4) filter units is recommended. This would result in a hydraulic loading rate of 4.9 gpm/ft^2 at 4.6 MGD with one unit out of service (or in a backwash). The existing sand filter concrete basins would house the new disk filter units, and each of the two (2) existing concrete basins has an internal dimension of 9-feet by 20-feet. Two (2) disk filter units would go in each concrete basin. There would be 20 disks per unit for a total of 80 disks, and each disk would have a surface area of 10.8 ft^2. Due to the sizing constraints of the basins, a platform in the building to support the valves, pumps, and provide access to the drive units is required. Preliminary analysis of the hydraulics indicates that the disk filtration system would fit within the hydraulic profile at this location, although more detailed analysis would be required prior to implementation.

5.1.4 Alum Feed System Modifications – An Alum Feed System is planned to be implemented to assist with meeting the pending 1.0 mg/L limit, and it is assumed this would be constructed and operational prior to implementation of a potential 0.5 mg/L limit. An increase in Alum Feed System capacity is expected to consistently meet the lower limit. This would require upsizing the chemical feed pumps, storage tanks, and building. The remainder of the chemical feed system would remain the same.

5.1.5 RAS/WAS System Improvements – Currently, there is no flow meter for the RAS system on the treatment train for Oxidation Ditches 1 and 2. Therefore, the operators cannot effectively measure and adjust the amount of RAS conveyed to these oxidation ditches, and this can affect the food to mass ratio while influent flows fluctuate. Installing flow meters and control valves in underground vaults and connecting them to the SCADA system will allow for better control of the RAS system for these oxidation ditches.

5.1.6 Other Considerations – As part of the Phosphorus Discharge Optimization Plan and Phosphorus Removal Feasibility Study, the side streams were evaluated for phosphorus, total nitrogen, nitrite/nitrate, and TKN. Table No. 5-2 outlines the sampling that was completed for the East WWTF side-stream flows.

Table No. 5-2: East WWTF Decant and BFP Filtrate Nutrient Sampling (02/2016)

Village of Huntley, Illinois

Sampling Date	McHenry Analytical Water Laboratory, Inc. / PDC	Total Phosphorus (as P) (mg/L)	Total Nitrogen (mg/L)	Nitrate/Nitrite - N (mg/L)	Total Kjeldahl Nitrogen (TKN) (mg/L)
2/4/2016	16B0423 / 6021116	5.04	16.00	16.00	< 1.0

G:\Public\Huntley\2015\HU15012016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\Water Quality Sampling\[Nutrient WQ Sampling Results.xlsm]Side Stream Samples

Most textbook phosphorus removal techniques have all anoxic and anaerobic zones in the mainstream processes. However, there has been some success treating just the side-stream flow as an anoxic zone before combining the side-stream flow with the influent in the anaerobic zone[1] similar to the Johannesburg process for phosphorus removal. The creation of anoxic side-stream treatment would allow more nitrate to be removed from the return flow, thus ensuring a more efficient anaerobic zone and better phosphorus uptake. Given the relatively low side-stream nutrient content at the East WWTF, as shown in Table 5-2, it is assumed in this study that side-stream treatment would not provide a cost-effective benefit to the facility.

Furthermore, due to additional solids wasting and subsequent biosolids treatment, further analysis of the biosolids treatment systems must be accomplished. Current analysis indicates that the existing biosolids systems will be adequate to handle additional loading due to the 0.5 mg/L phosphorus limit. However, there

[1] References – Item 4 (pg 53)

are a handful of variables effecting biosolids production that would only be fully understood upon implementation of other modifications in this section. This report assumes no biosolids treatment modifications would be required for a 0.5 mg/L phosphorus limit.

5.2 Costs

5.2.1 Capital Costs – The estimated capital cost summary of the scope defined above is included in Table No. 5-3 below.

TABLE NO. 5-3: CAPITAL COST SUMMARY
EAST WWTF UPGRADES (TP LIMIT = 0.5 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	EXISTING OX DITCH NO. 2 IMPROVEMENTS - EQUIPMENT	$690,000	20	$0
2	NEW RAS FERMENTER FOR OX DITCH NO. 3 - STRUCTURES	$309,800	50	$186,000
	NEW RAS FERMENTER FOR OX DITCH NO. 3 - EQUIPMENT	$303,300	20	$0
3	EXIST. FST NO. 1 CONVERSION TO RAS FERMENTER - STRUCTURES	$97,000	50	$59,000
	EXIST. FST NO. 1 CONVERSION TO RAS FERMENTER - EQUIPMENT	$314,000	20	$0
4	ALUM FEED SYSTEM MODIFICATIONS - EQUIPMENT	$46,500	20	$0
5	TERTIARY DISK FILTRATION - STRUCTURES	$151,800	50	$92,000
	TERTIARY DISK FILTRATION - EQUIPMENT	$977,600	20	$0
6	RAS/WAS PUMPING IMPROVEMENTS - STRUCTURES	$27,800	50	$17,000
	RAS/WAS PUMPING IMPROVEMENTS - EQUIPMENT	$203,300	20	$0
	SUBTOTAL	$3,121,100		$354,000
	CONTINGENCY (10%)	$312,200		
	BONDS AND INSURANCE @ 2%	$68,700		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$446,400		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$3,948,400		
	ENGINEERING	$592,300		
	TOTAL ESTIMATED CAPITAL COST	**$4,540,700**		

OTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

5.2.2 Operation, Maintenance, and Replacement Costs – The estimated O,M&R cost summary of the scope defined above is included in Table 5-4 below. A significant majority of these costs is split between the additional chemicals required to meet the limit and equipment replacement costs of equipment over a 20-year period.

5.2.3 Total Cost Summary – The estimated 20-Year Present Worth Cost Summary is included in Table 5-5 below. This includes Capital Costs, Present Worth of Salvage Values, and Present Worth of Annual O,M&R Costs.

TABLE NO. 5-4: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY

EAST WWTF UPGRADES (TP LIMIT = 0.50 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$18,300
2	ADDITIONAL CHEMICALS REQUIRED	$130,000
3	ADDITIONAL LABOR REQUIRED	$20,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$10,000
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$209,400
	ANNUAL TOTAL	$387,700
	20 YEAR PRESENT WORTH AT 6%	**$4,446,900**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 5-5: PRESENT WORTH COST SUMMARY

EAST WWTF UPGRADES (TP LIMIT = 0.50 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$4,540,700
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($81,500)
3	ANNUAL O, M, & R (20 YEARS)	$4,446,900
	TOTAL PRESENT WORTH	**$8,906,100**

NOTES:
1) BASED ON 2016 DOLLARS

5.2.4 Cost Considerations for Application of Limit on Monthly, Seasonal, and Annual Average Basis – Bio-P removal efficiency will fluctuate slightly during the months of the year based on seasonal temperatures, as described in Section 3.1.7. The estimated costs detailed above are reflective of a monthly average limit. The biggest cost benefits of seasonal and annual average limits would be seen via chemical usage and biosolids production reduction at certain times of the year.

5.2.4.1 Cost Considerations for Seasonal Average Limit – The estimated capital, O,M,&R, and 20-year present worth costs for a seasonal average limit are listed below in Tables 5-6, 5-7, and 5-8. The capital cost savings compared to a monthly average limit can be attributed to a slight reduction in the required chemical feed system modifications. The O,M,&R cost reduction is primarily due to savings in chemical and sludge hauling costs.

TABLE NO. 5-6: CAPITAL COST SUMMARY - SEASONAL LIMIT
EAST WWTF UPGRADES (TP LIMIT = 0.5 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	EXISTING OX DITCH NO. 2 IMPROVEMENTS - EQUIPMENT	$690,000	20	$0
2	NEW RAS FERMENTER FOR OX DITCH NO. 3 - STRUCTURES	$309,800	50	$186,000
	NEW RAS FERMENTER FOR OX DITCH NO. 3 - EQUIPMENT	$303,300	20	$0
3	EXIST. FST NO. 1 CONVERSION TO RAS FERMENTER - STRUC	$97,000	50	$59,000
	EXIST. FST NO. 1 CONVERSION TO RAS FERMENTER - EQUIPI	$314,000	20	$0
4	ALUM FEED SYSTEM MODIFICATIONS - EQUIPMENT	$36,700	20	$0
5	TERTIARY DISK FILTRATION - STRUCTURES	$151,800	50	$92,000
	TERTIARY DISK FILTRATION - EQUIPMENT	$977,600	20	$0
6	RAS/WAS PUMPING IMPROVEMENTS - STRUCTURES	$27,800	50	$17,000
	RAS/WAS PUMPING IMPROVEMENTS - EQUIPMENT	$203,300	20	$0
	SUBTOTAL	$3,111,300		$354,000
	CONTINGENCY (10%)	$311,200		
	BONDS AND INSURANCE @ 2%	$68,500		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$445,000		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$3,936,000		
	ENGINEERING	$590,400		
	TOTAL ESTIMATED CAPITAL COST	**$4,526,400**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

TABLE NO. 5-7: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY - SEASONAL LIMIT

EAST WWTF UPGRADES (TP LIMIT = 0.50 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$18,300
2	ADDITIONAL CHEMICALS REQUIRED	$90,000
3	ADDITIONAL LABOR REQUIRED	$15,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$7,500
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$208,500
	ANNUAL TOTAL	$339,300
	20 YEAR PRESENT WORTH AT 6%	**$3,891,800**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 5-8: PRESENT WORTH COST SUMMARY - SEASONAL LIMIT

EAST WWTF UPGRADES (TP LIMIT = 0.50 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$4,526,400
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($81,500)
3	ANNUAL O, M, & R (20 YEARS)	$3,891,800
	TOTAL PRESENT WORTH	**$8,336,700**

NOTES:
1) BASED ON 2016 DOLLARS

5.2.4.2 Cost Considerations for Annual Average Limit – The estimated capital, O,M,&R, and 20-year present worth costs for an annual average limit are listed below in Tables 5-9, 5-10, and 5-11. The capital cost savings compared to a monthly average limit can be attributed to a greater reduction in the required chemical feed system modifications. The O,M,&R cost reduction is primarily due to savings in chemical and sludge hauling costs.

TABLE NO. 5-9 - CAPITAL COST SUMMARY - ANNUAL LIMIT
EAST WWTF UPGRADES (TP LIMIT = 0.5 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	EXISTING OX DITCH NO. 2 IMPROVEMENTS - EQUIPMENT	$690,000	20	$0
2	NEW RAS FERMENTER FOR OX DITCH NO. 3 - STRUCTURES	$309,800	50	$186,000
	NEW RAS FERMENTER FOR OX DITCH NO. 3 - EQUIPMENT	$303,300	20	$0
3	EXIST. FST NO. 1 CONVERSION TO RAS FERMENTER - STRUC	$97,000	50	$59,000
	EXIST. FST NO. 1 CONVERSION TO RAS FERMENTER - EQUIPM	$314,000	20	$0
4	ALUM FEED SYSTEM MODIFICATIONS - EQUIPMENT	$26,000	20	$0
5	TERTIARY DISK FILTRATION - STRUCTURES	$151,800	50	$92,000
	TERTIARY DISK FILTRATION - EQUIPMENT	$977,600	20	$0
6	RAS/WAS PUMPING IMPROVEMENTS - STRUCTURES	$27,800	50	$17,000
	RAS/WAS PUMPING IMPROVEMENTS - EQUIPMENT	$203,300	20	$0
	SUBTOTAL	$3,100,600		$354,000
	CONTINGENCY (10%)	$310,100		
	BONDS AND INSURANCE @ 2%	$68,300		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$443,400		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$3,922,400		
	ENGINEERING	$588,400		
	TOTAL ESTIMATED CAPITAL COST	**$4,510,800**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

TABLE NO. 5-10: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY - ANNUAL LIMIT

EAST WWTF UPGRADES (TP LIMIT = 0.50 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$18,300
2	ADDITIONAL CHEMICALS REQUIRED	$75,000
3	ADDITIONAL LABOR REQUIRED	$12,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$6,000
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$207,500
	ANNUAL TOTAL	$318,800
	20 YEAR PRESENT WORTH AT 6%	**$3,656,700**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 5-11: PRESENT WORTH COST SUMMARY - ANNUAL LIMIT

EAST WWTF UPGRADES (TP LIMIT = 0.50 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$4,510,800
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($81,500)
3	ANNUAL O, M, & R (20 YEARS)	$3,656,700
	TOTAL PRESENT WORTH	**$8,086,000**

NOTES:
1) BASED ON 2016 DOLLARS

5.3 Timeframe

It is assumed that this potential requirement would not be established until after the November 2018 deadline for the East WWTF to meet the pending 1.0 mg/L limit. Work scope for the 0.5 mg/L phosphorus limit would include a Facilities Plan (assuming funding through a SRF loan), loan approval, design, and construction. These work scope items would require a minimum of five (5) years to accomplish. It is also expected that an optimization period would follow construction to allow for operational adjustments to enhance Bio-P removal, prior to the start of the 0.5 mg/L limit requirements. A one (1) year optimization period is reasonable to account for seasonal variations in Bio-P removal performance. Therefore, a minimum of six (6) years is needed to meet NPDES Permit limit of 0.5 mg/L after establishment of the requirement.

Section 6: East WWTF Phosphorus Removal Feasibility Study – 0.1 mg/L Effluent

6.1 Overview

The East WWTF's options to reduce the phosphorus effluent concentration down to 0.1 mg/L were evaluated based on cost, land availability, existing operating conditions, forecasted operating conditions, and the expected removal efficiency of each process at the facility It was determined that in addition to the process changes recommended in Section 4 to meet the phosphorus effluent limit of 1.0 mg/L, mixers should be added to the CLRs, two RAS fermenter tanks should be added, the existing sand filters should be converted to membrane filter systems, and modifications would be required to the Alum Feed System and RAS/WAS systems. This section outlines all proposed changes for the 0.1 mg/L effluent concentration plan. Exhibit 6-1 shows the proposed aerial plan and Exhibit 6-2 shows the proposed process flow diagram. It is also assumed that the process changes recommended in Section 5 to meet the phosphorus effluent limit of 0.5 mg/L would not be implemented prior to the 0.1 mg/L limit, so the content of this section is irrespective of the content in Section 5.

6.1.1 Aeration System Modifications – As noted in Section 4, both Evoqua Orbal oxidation ditches (No. 1 and 3) at the East WWTF have two rings and the Lakeside oxidation ditch (No. 2) is a closed loop reactor (CLR). Both Orbal ditches at the East WWTF lack the flexibility to be converted to three ring Orbal ditches. The improvements noted in Section 4 include adding DO probes and VFDs to all aerator drives in each oxidation ditch to optimize DO levels. The 0.5 mg/L limit requires additional modifications in the CLR. It is recommended to add mixers to each CLR tank, to better allow the creation of anaerobic conditions while maintaining proper solids suspension. Adding mixers to the Orbal oxidation ditches is not practical because the aerators in each ring are driven by common motors. Therefore, you cannot shut off the aerators in the outer rings without also shutting them off for the inner rings.

6.1.2 Add RAS Fermenters – Table No. 6-1 includes the ratios of parameters key to Bio-P performance to the influent phosphorus concentrations at the East WWTF over the recent years, and compares them to the desired ratios conducive for Bio-P removal. In each case, the observed ratio was greater than the desired minimum ratio. This indicates that Bio-P removal to 1.0 mg/L is possible given the proper physical and operational treatment mechanisms. Adding fermenters will enhance VFA production and subsequent Bio-P removal performance with the goal of biologically meeting the 0.1 mg/L limit.

Table No. 6-1: East WWTF Influent Conditions for Bio-P Removal

Village of Huntley, IL

Parameter Ratio	Desired Ratio	Observed Ratio
BOD:TP	>20 :1	57.6 :1
rbCOD:TP	>10 :1	13.9 :1
VFA:TP	>4 :1	5.1 :1

G:\Publi Huntley\2015\HU1501216 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\Water Quality Sampling\[Phosphorus Ratios.xlsx]Sheet1

Notes:
-BOD values from DMR Averages 1/2014-12/2015
-rbCOD values from phosphorus testing 10/2014-2/2016
-During phosphorus testing 10/2014-2/2016, every VFA sample measured non-detect (<50 mg/L). An assumed value of half of the non-detect limit, 25 mg/L, was used

Exhibit 6-1: East WWTF Aerial View – Recommended Plan – 0.1 mg/L TP Limit

Village of Huntley, IL

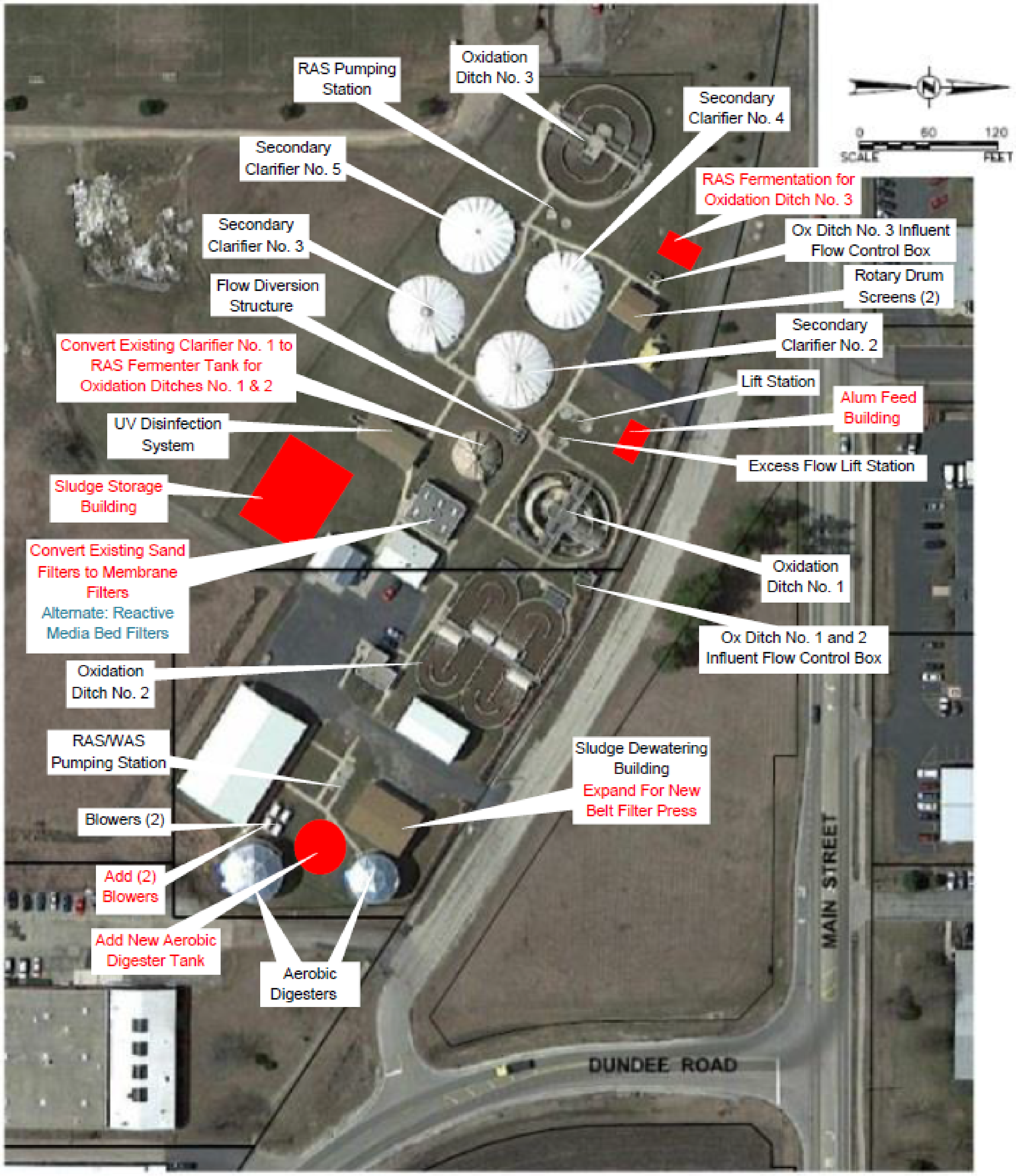
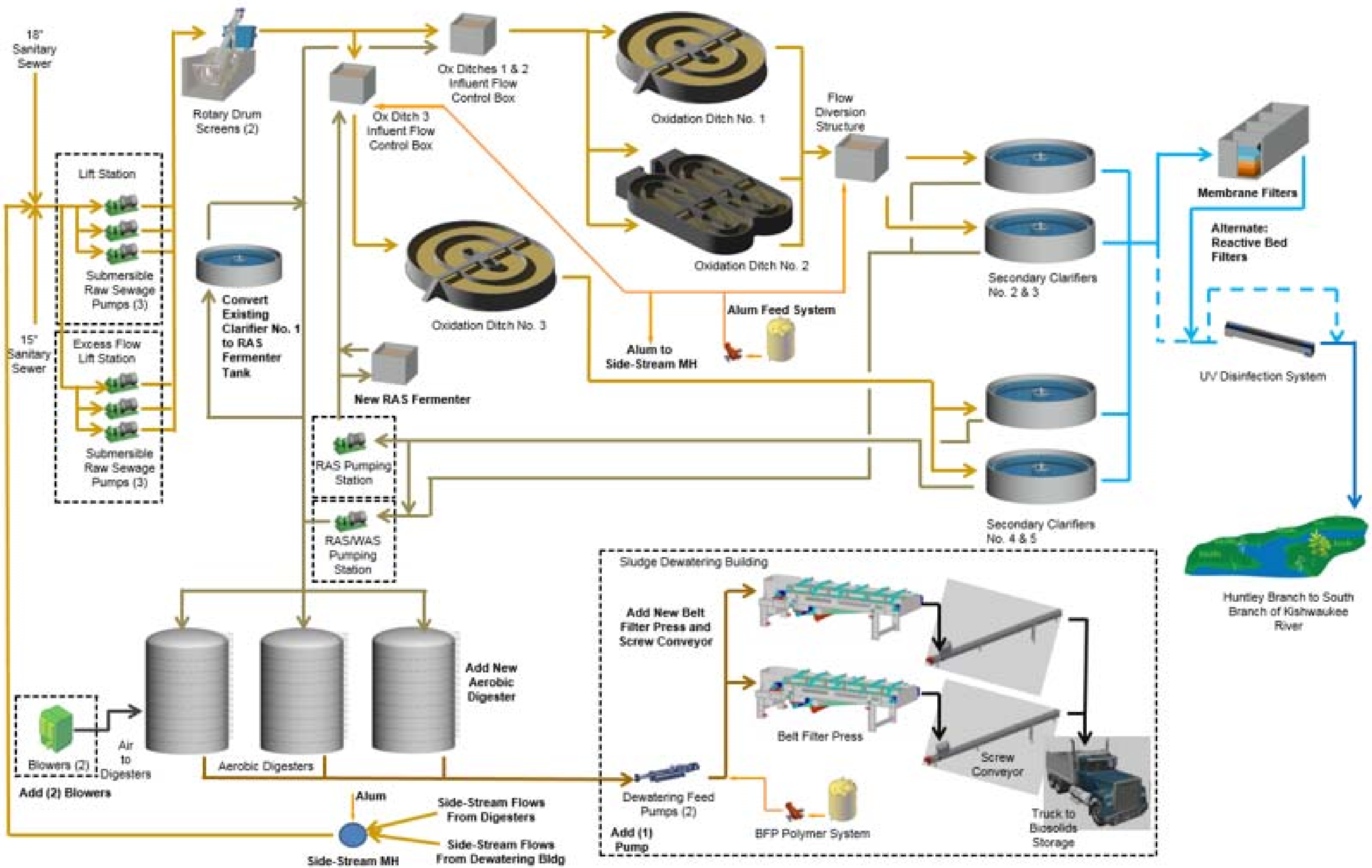


Exhibit 6-2: East WWTF Process Flow Diagram – Recommended Plan – 0.1 mg/L TP Limit

Village of Huntley, IL



Due to space constraints at the East WWTF, additional rings cannot be added to the existing oxidation ditches. Therefore, the oxidation ditches have limited ability to create anaerobic conditions necessary for creation of VFAs through fermentation. There are also hydraulic and space limitations for adding new raw sewage fermenter structures. However, there are opportunities to implement fermenter structures for the RAS flows. The RAS system at the East WWTF is split in two trains: one RAS system returns flows from Secondary Clarifier No. 2 and 3 to the Northwest Oxidation Ditch (No. 1) and Lakeside Oxidation Ditch (No.2); and the other RAS system returns flows from Secondary Clarifier No. 3 and 4 to the Western Oxidation Ditch (No. 3). Therefore, two separate RAS fermenters are required at the facility.

If the East WWTF was operating at the design capacity of 1.8 MGD DAF, Oxidation Ditch No. 1 and 2 would receive 1.26 MGD (70%) and Oxidation Ditch No. 3 would receive 0.54 MGD (30%) of the flow. The RAS fermenters would be sized for a minimum 2.0-Hours Hydraulic Retention Time (HRT) at 100% RAS flow (as a function of DAF). Mixers would be installed in the RAS fermenters for intermittent resuspension of solids in the tanks.

Existing Secondary Clarifier No. 1 can be remodeled as the RAS fermenter for Oxidation Ditch No. 1 and 2. This clarifier is not required to provide rated clarification, as the other four clarifiers provide sufficient clarification capacity to meet rated treatment requirements. Due to its current function as a clarifier, it could be retrofitted to incorporate mixing required for a fermenter. The tank is 40' in diameter and 12'-0" in height which equates a capacity of 112,740 gallons. The fermenter could provide 2.15 hours HRT at 100% RAS flow (1.26 MGD at DAF). In addition to retrofitting the tank, underground piping connections must be modified to appropriately divert flows to/from the tank.

In addition to the fermenter for Oxidation Ditches No. 1 and 2, a new fermenter would be required for Oxidation Ditch No. 3. This new fermenter would be west of the existing Influent Flow Control Box for Oxidation Ditch No. 3 and would allow the RAS from Clarifier No. 3 and 4 to flow from the fermenter to the Influent Flow Control Box before reaching the Oxidation Ditch. In order to accommodate a 2-Hour HRT under the DAF assuming the same flow ratios described above, and assuming a 100% RAS rate (0.54 MGD at DAF), the tank size requirement is 45,000 gallons. If a 15-foot depth is assumed and the tank is assumed to be a square, each side would be 20-feet long.

<u>6.1.3 Replace Existing Sand Filters with Membrane Filters</u> – The existing sand filtration equipment is beyond its useful life, particularly for meeting a more stringent 0.1 mg/L limit. Therefore, alternate filtration methods should be analyzed. The filtration method most applicable for this application is membrane filtration, which is a system more fully described in Section 3.1.3.3.

It is suggested to utilize ultrafiltration at the East WWTF. These membrane filters should be designed to maintain a hydraulic surface loading less than 40.0 gallons per square foot per day (gfd) at the facility's DMF of 4.6 MGD with all skids in operation. The proposed design uses a total of three (3) membrane skids to remove phosphorus with 60 modules per skid. During scenarios where the plant is operating at the 1.8 MGD DAF, two of the skids will be operational and the water recovery rate will be 93.8%. During scenarios where the facility is operating at the 4.5 MGD DMF, three of the skids will be operational and the water recovery rate will be 95.3%. The design for the ultrafiltration skids assumes that the filters will be able to accommodate the entirety of the flow coming into the facility. The skids will be able to fit into the existing sand filter building. Significant piping and electrical modifications would be required to accommodate this filtration system. Feed pumps are included on the skid to provide the necessary feed pressure through the membranes. The membranes also require routine cleaning and a clean-in-place skid would be included in the scope.

6.1.3.1 ALTERNATE: Replace Existing Sand Filters with Reactive Media Bed Filters – A proposed alternate filtration scenario to reduce the effluent phosphorus to 0.1 mg/L would be to replace the sand filters with a reactive media bed filtration system, as described in Section 3.1.3.4.

The system proposed by Blue PRO® for the East WWTF would consist of three concrete cells with three filters per cell each for a total of nine continuous backwash filters. During design average flows, two of the cells would be online with the one on standby and during the design maximum flows, all three of the cells would be online. The filters would be sized for a hydraulic loading less than 5.0 gpm/ft^2 at DMF. The proposed reactive media bed filter system would be able to fit within the footprint of the sand filter buildings. However, it does not appear as though there would be sufficient hydraulic capacity available without pumping to the filters. Additional analysis must be performed regarding the specific hydraulics, as well as removal efficiencies. A pilot study is recommended for further analysis.

6.1.4 Alum Feed System Modifications – An Alum Feed System is planned to be implemented to assist with meeting the pending 1.0 mg/L limit, and it is assumed this would be constructed and operational prior to implementation of a potential 0.1 mg/L limit. An increase in Alum Feed System capacity is expected to consistently meet the lower limit. This would require upsizing the chemical feed pumps, storage tanks, and building. A polymer feed system would also be utilized to supplement and enhance the Alum system.

6.1.5 RAS/WAS System Improvements – Currently, there is no flow meter for the RAS system on the treatment train for Oxidation Ditches 1 and 2. Therefore, the operators cannot effectively measure and adjust the amount of RAS conveyed to these oxidation ditches, and this can affect the food to mass ratio while influent flows fluctuate. Installing flow meters and control valves in underground vaults and connecting them to the SCADA system will allow for better control of the RAS system for these oxidation ditches.

6.1.6 Biosolids Treatment Improvements – Due to additional solids wasting and subsequent biosolids treatment, it does not appear that the existing biosolids systems will be adequate to handle additional loading due to the 0.1 mg/L phosphorus limit. There would not be enough aerobic digester capacity, so one (1) additional above-ground aerobic digester tank and blowers would be required for the necessary treatment. It is recommended that another 230,000-gallon tank be installed, along with blowers to provide the required air for digestion. While space for the new tank is a concern, it is recommended that the new tank be constructed as closely as possible to the existing aerobic digester tanks, possibly at the location of the existing Gravity Sludge Thickener. Also, an additional belt filter press with associated feed pump, screw conveyor, and appurtenances would be required for the additional dewatering needs. Expanding the existing Dewatering

Building should be examined. Finally, additional dewatered sludge storage area would be required. A new building should be constructed southeast of the existing UV disinfection building. The improvements to the aerobic digesters, dewatering system, and dewatered sludge storage are referenced as “Biosolids Treatment Improvements” in the cost estimates included in Section 6.2 below.

6.1.7 Other Considerations – As part of the Phosphorus Discharge Optimization Plan and Phosphorus Removal Feasibility Study, the side streams were evaluated for phosphorus, total nitrogen, nitrite/nitrate, and TKN. Table No. 6-2 outlines the sampling that was completed for the East WWTF side-stream flows.

Table No. 6-2: East WWTF Decant and BFP Filtrate Nutrient Sampling (02/2016)

Village of Huntley, Illinois

Sampling Date	McHenry Analytical Water Laboratory, Inc. / PDC	Total Phosphorus (as P) (mg/L)	Total Nitrogen (mg/L)	Nitrate/Nitrite - N (mg/L)	Total Kjeldahl Nitrogen (TKN) (mg/L)
2/4/2016	16B0423 / 6021116	5.04	16.00	16.00	< 1.0

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\Water Quality Sampling\[Nutrient WQ Sampling Results.xlsm]Side Stream Samples

Most textbook phosphorus removal techniques have all anoxic and anaerobic zones in the mainstream processes. However, there has been some success treating just the side-stream flow as an anoxic zone before combining the side-stream flow with the influent in the anaerobic zone[1] similar to the Johannesburg process for phosphorus removal. The creation of anoxic side-stream treatment would allow more nitrate to be removed from the return flow, thus ensuring a more efficient anaerobic zone and better phosphorus uptake.

While Table No. 6-2 shows a relatively low phosphorus value from side-stream flows at that time, side-stream treatment should still be considered for meeting the 0.1 mg/L effluent limit. The East WWTF lacks the space and existing infrastructure to add anoxic/anaerobic treatment tanks for side-stream treatment. Therefore, chemical treatment of the side-stream flows with the Alum System is proposed. The Alum would be injected into a manhole that collects the side-stream flows prior to return of these flows to the raw sewage pump station. Costs for these improvements are incorporated into the Alum Feed System Modifications costs in Section 6.2 below.

6.2 Costs

6.2.1 Capital Costs – The estimated capital cost summary of the scope defined above is included in Table No. 6-3 below.

[1] References – Item 4 (pg 53)

TABLE NO. 6-3: CAPITAL COST SUMMARY
EAST WWTF UPGRADES (TP LIMIT = 0.1 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	EXISTING OXIDATION DITCH NO. 2 IMPROVEMENTS - EQUIPMENT	$537,500	20	$0
2	NEW RAS FERMENTER FOR OX DITCH NO. 3 - STRUCTURES	$309,800	50	$186,000
	NEW RAS FERMENTER FOR OX DITCH NO. 3 - EQUIPMENT	$303,300	20	$0
3	EXIST. FST NO. 1 CONVERSION TO RAS FERMENTER - STRUCTURES	$97,000	50	$59,000
	EXIST. FST NO. 1 CONVERSION TO RAS FERMENTER - EQUIPMENT	$314,000	20	$0
4	ALUM FEED SYSTEM MODIFICATIONS - EQUIPMENT	$76,500	20	$0
5	MEMBRANE FILTRATION - STRUCTURES	$151,800	50	$92,000
	MEMBRANE FILTRATION - EQUIPMENT	$2,456,700	20	$0
6	RAS/WAS PUMPING IMPROVEMENTS - STRUCTURES	$27,800	50	$17,000
	RAS/WAS PUMPING IMPROVEMENTS - EQUIPMENT	$118,300	20	$0
7	BIOSOLIDS TREATMENT IMPROVEMENTS - STRUCTURES	$1,448,500	50	$870,000
	BIOSOLIDS TREATMENT IMPROVEMENTS - EQUIPMENT	$1,368,500	20	$0
	SUBTOTAL	$7,209,700		$1,224,000
	CONTINGENCY (10%)	$721,000		
	BONDS AND INSURANCE @ 2%	$158,700		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$1,031,000		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$9,120,400		
	ENGINEERING	$1,368,100		
	TOTAL ESTIMATED CAPITAL COST	**$10,488,500**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

Comparatively, the capital cost utilizing the alternate reactive media bed filters is estimated at $10,120,300. While the reactive media bed filters are less expensive than membrane filters, the former would require an additional pump station prior to the reactive media bed filters due to hydraulic considerations.

6.2.2 Operation, Maintenance, and Replacement Costs – The estimated O,M&R cost summary of the scope defined above is included in Table 6-4 below. A significant majority of these costs is required to meet the limit and equipment replacement costs of equipment over a 20-year period. Additional chemical cost is also a key consideration.

TABLE NO. 6-4: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY

EAST WWTF UPGRADES (TP LIMIT = 0.10 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$43,700
2	ADDITIONAL CHEMICALS REQUIRED	$180,000
3	ADDITIONAL LABOR REQUIRED	$75,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$20,000
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$437,100
	ANNUAL TOTAL	$755,800
	20 YEAR PRESENT WORTH AT 6%	**$8,669,000**

NOTES:
1) BASED ON 2016 DOLLARS

Comparatively, the O,M&R cost utilizing the alternate reactive media bed filters is estimated at $7,637,900, which is due to nominal electrical and chemical savings with this treatment method.

6.2.3 Total Cost Summary – The estimated 20-Year Present Worth Cost Summary is included in Table No. 6-5 below. This includes Capital Costs, Present Worth of Salvage Values, and Present Worth of Annual O&M Costs.

TABLE NO. 6-5: PRESENT WORTH COST SUMMARY

EAST WWTF UPGRADES (TP LIMIT = 0.10 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$10,488,500
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($281,600)
3	ANNUAL O, M, & R (20 YEARS)	$8,669,000
	TOTAL PRESENT WORTH	**$18,875,900**

NOTES:
1) BASED ON 2016 DOLLARS

Comparatively, the present worth cost utilizing the alternate reactive media bed filters is estimated at $17,450,400. Although this is a lower cost than the comparable estimate with membrane filters, utilizing membrane filters is the recommendation of this report due to the higher degree of confidence with that system. Membrane filtration is a known commodity with many similar installations. Reactive media bed filtration would require further analysis, including pilot testing, prior to implementation.

6.2.4 Cost Considerations for Application of Limit on Monthly, Seasonal, and Annual Average Basis – Bio-P removal efficiency will fluctuate slightly during the months of the year based on seasonal temperatures, as described in Section 3.1.7. The estimated costs detailed above are reflective of a monthly average limit. The biggest cost benefits of seasonal and annual average limits would be seen via chemical usage and biosolids production reduction at certain times of the year.

6.2.4.1 Cost Considerations for Seasonal Average Limit – The estimated capital, O,M,&R, and 20-year present worth costs for a seasonal average limit are listed below in Tables No. 6-6, 6-7, and 6-8. The capital cost savings compared to a monthly average limit can be attributed to a slight reduction in the required chemical feed system modifications as well as a reduction in dewatered sludge storage capacity. The O,M,&R cost reduction is primarily due to savings in chemical and sludge hauling costs.

TABLE NO. 6-6: CAPITAL COST SUMMARY - SEASONAL LIMIT
EAST WWTF UPGRADES (TP LIMIT = 0.1 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	EXISTING OXIDATION DITCH NO. 2 IMPROVEMENTS - EQUIPMENT	$537,500	20	$0
2	NEW RAS FERMENTER FOR OX DITCH NO. 3 - STRUCTURES	$309,800	50	$186,000
	NEW RAS FERMENTER FOR OX DITCH NO. 3 - EQUIPMENT	$303,300	20	$0
3	EXIST. FST NO. 1 CONVERSION TO RAS FERMENTER - STRUCTURES	$97,000	50	$59,000
	EXIST. FST NO. 1 CONVERSION TO RAS FERMENTER - EQUIPMENT	$314,000	20	$0
4	ALUM FEED SYSTEM MODIFICATIONS - EQUIPMENT	$69,200	20	$0
5	MEMBRANE FILTRATION - STRUCTURES	$151,800	50	$92,000
	MEMBRANE FILTRATION - EQUIPMENT	$2,456,700	20	$0
6	RAS/WAS PUMPING IMPROVEMENTS - STRUCTURES	$27,800	50	$17,000
	RAS/WAS PUMPING IMPROVEMENTS - EQUIPMENT	$118,300	20	$0
7	BIOSOLIDS TREATMENT IMPROVEMENTS - STRUCTURES	$1,373,500	50	$825,000
	BIOSOLIDS TREATMENT IMPROVEMENTS - EQUIPMENT	$1,368,500	20	$0
	SUBTOTAL	$7,127,400		$1,179,000
	CONTINGENCY (10%)	$712,800		
	BONDS AND INSURANCE @ 2%	$156,900		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$1,019,300		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$9,016,400		
	ENGINEERING	$1,352,500		
	TOTAL ESTIMATED CAPITAL COST	**$10,368,900**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

TABLE NO. 6-7: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY - SESASONAL LIMIT

EAST WWTF UPGRADES (TP LIMIT = 0.10 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$43,700
2	ADDITIONAL CHEMICALS REQUIRED	$150,000
3	ADDITIONAL LABOR REQUIRED	$60,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$15,000
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$436,400
	ANNUAL TOTAL	$705,100
	20 YEAR PRESENT WORTH AT 6%	**$8,087,500**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 6-8: PRESENT WORTH COST SUMMARY - SEASONAL LIMIT

EAST WWTF UPGRADES (TP LIMIT = 0.10 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$10,368,900
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($271,200)
3	ANNUAL O, M, & R (20 YEARS)	$8,087,500
	TOTAL PRESENT WORTH	**$18,185,200**

NOTES:
1) BASED ON 2016 DOLLARS

6.2.4.2 Cost Considerations for Annual Average Limit – The estimated capital, O,M,&R, and 20-year present worth costs for an annual average limit are listed below in Tables No. 6-9, 6-10, and 6-11. The capital cost savings compared to a monthly average limit can be attributed to a greater reduction in the required chemical feed system modifications as well as a reduction in dewatered sludge storage capacity. The O,M,&R cost reduction is primarily due to savings in chemical and sludge hauling costs.

TABLE NO. 6-9 - CAPITAL COST SUMMARY - ANNUAL LIMIT
EAST WWTF UPGRADES (TP LIMIT = 0.1 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	EXISTING OXIDATION DITCH NO. 2 IMPROVEMENTS - EQUIPMENT	$537,500	20	$0
2	NEW RAS FERMENTER FOR OX DITCH NO. 3 - STRUCTURES	$309,800	50	$186,000
	NEW RAS FERMENTER FOR OX DITCH NO. 3 - EQUIPMENT	$303,300	20	$0
3	EXIST. FST NO. 1 CONVERSION TO RAS FERMENTER - STRUCTURES	$97,000	50	$59,000
	EXIST. FST NO. 1 CONVERSION TO RAS FERMENTER - EQUIPMENT	$314,000	20	$0
4	ALUM FEED SYSTEM MODIFICATIONS - EQUIPMENT	$61,800	20	$0
5	MEMBRANE FILTRATION - STRUCTURES	$151,800	50	$92,000
	MEMBRANE FILTRATION - EQUIPMENT	$2,456,700	20	$0
6	RAS/WAS PUMPING IMPROVEMENTS - STRUCTURES	$27,800	50	$17,000
	RAS/WAS PUMPING IMPROVEMENTS - EQUIPMENT	$118,300	20	$0
7	BIOSOLIDS TREATMENT IMPROVEMENTS - STRUCTURES	$1,298,500	50	$780,000
	BIOSOLIDS TREATMENT IMPROVEMENTS - EQUIPMENT	$1,368,500	20	$0
	SUBTOTAL	$7,045,000		$1,134,000
	CONTINGENCY (10%)	$704,500		
	BONDS AND INSURANCE @ 2%	$155,000		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$1,007,500		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$8,912,000		
	ENGINEERING	$1,336,800		
	TOTAL ESTIMATED CAPITAL COST	**$10,248,800**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

TABLE NO. 6-10: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY - ANNUAL LIMIT

EAST WWTF UPGRADES (TP LIMIT = 0.10 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$43,700
2	ADDITIONAL CHEMICALS REQUIRED	$125,000
3	ADDITIONAL LABOR REQUIRED	$50,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$12,000
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$435,800
	ANNUAL TOTAL	$666,500
	20 YEAR PRESENT WORTH AT 6%	**$7,644,800**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 6-11: PRESENT WORTH COST SUMMARY - ANNUAL LIMIT

EAST WWTF UPGRADES (TP LIMIT = 0.10 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$10,248,800
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($260,900)
3	ANNUAL O, M, & R (20 YEARS)	$7,644,800
	TOTAL PRESENT WORTH	**$17,632,700**

NOTES:
1) BASED ON 2016 DOLLARS

6.3 Timeframe

It is assumed that this potential requirement would not be established until after the November 2018 deadline for the East WWTF to meet the pending 1.0 mg/L limit. Work scope for the 0.1 mg/L phosphorus limit would include a Facilities Plan (assuming funding through a SRF loan), loan approval, design, and construction. These work scope items would require a minimum of five (5) years to accomplish. It is also expected that an optimization period would follow construction to allow for operational adjustments to enhance Bio-P removal, prior to the start of the 0.1 mg/L limit requirements. A one (1) year optimization period is reasonable to account for seasonal variations in Bio-P removal performance. Therefore, a minimum of six (6) years is needed to meet NPDES Permit limit of 0.1 mg/L after establishment of the requirement.

Section 7: West WWTF Phosphorus Removal Feasibility Study – 0.5 mg/L Effluent

7.1 Overview

The West WWTF's options to reduce the phosphorus effluent concentration down to 0.5 mg/L were evaluated based on cost, land availability, existing operating conditions, forecasted operating conditions, and the expected removal efficiency of each existing process at the facility. It was determined that modifications should be made to Oxidation Ditch No. 1, 2, and 3, the existing sand filters should be modified to be disk filters, and modifications are required to the biosolids treatment system to accommodate the additional solids. This section outlines all proposed changes for the 0.5 mg/L effluent concentration plan. Exhibit 7-1 shows the proposed aerial plan and Exhibit 7-2 shows the proposed process flow diagram.

7.1.1 Oxidation Ditches Modifications – At the West WWTF, Oxidation Ditches No. 1 and 2 are both three ring Orbal (Evoqua) ditches, and Oxidation Ditch No. 3 currently has two rings but was designed with a potential to add an outer third ring. As previously mentioned in this report, three ring oxidation ditches can be used to create an environment where the sludge undergoes an anaerobic, aerobic, and buffer environment which can be used to optimize the environment for PAOs. Therefore, it is recommended to add an outer third ring in Oxidation Ditch No. 3 to allow for better Bio-P removal performance. The new aerators on the third ring would be equipped with VFDs, and ORP probes would be utilized with programming to control the aeration in the ring.

Furthermore, existing Oxidation Ditch No. 1 and 2 are not fully equipped with VFDs for their aerators. Oxidation Ditch No. 1 does have VFDs for the aerators in the outer (3rd) ring, but not the aerators in the middle or inner rings. Oxidation Ditch No. 2 does not have VFDs for any of its aerators. Each of these oxidation ditches has DO/ORP probes. It is recommended to add VFDs for the remaining aerators in these oxidation ditches and modify control programming to enhance the Bio-P removal performance.

The modifications to each of the oxidation ditches noted above would allow for a moderate fermentation zone in the outer ring of each ditch. The Village performed some influent sampling to better determine whether the conditions are optimal for creating VFAs and PAOs through fermentation. Table No. 7-1 includes the ratios of these parameters to the influent phosphorus concentrations at the West WWTF over the recent years, and compares them to the desired ratios conducive for Bio-P removal. In each case, the observed ratio was greater than the desired minimum ratio. This indicates that Bio-P removal to 1.0 mg/L is possible given the proper physical and operational treatment mechanisms. The noted modifications to the oxidation ditches will enhance VFA production and subsequent Bio-P removal performance with the goal of biologically meeting the 0.5 mg/L limit.

Exhibit 7-1: West WWTF Aerial View – Recommended Plan – 0.5 mg/L TP Limit

Village of Huntley, IL

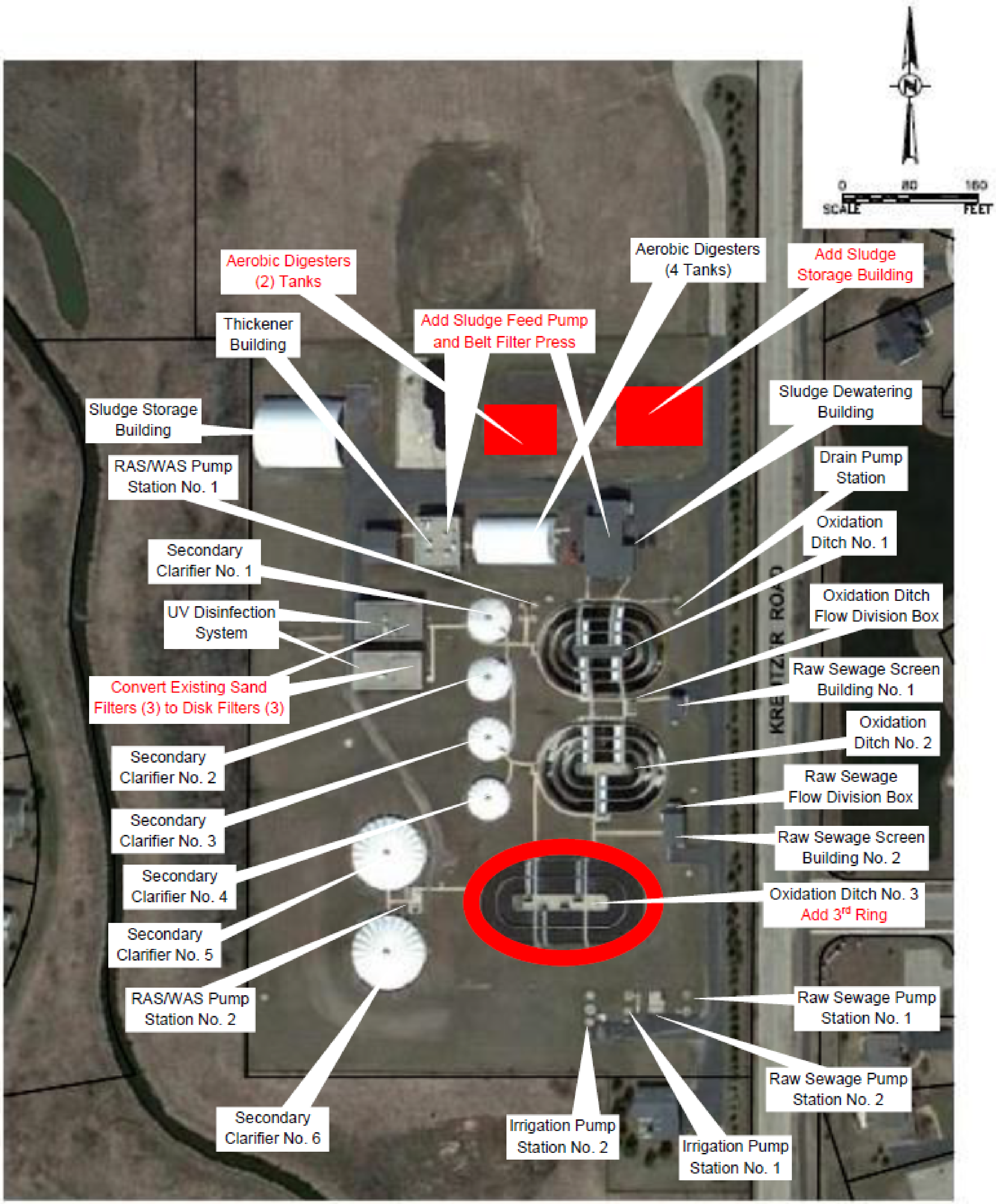


Exhibit 7-2: West WWTF Process Flow Diagram – Recommended Plan – 0.5 mg/L TP Limit

Village of Huntley, IL

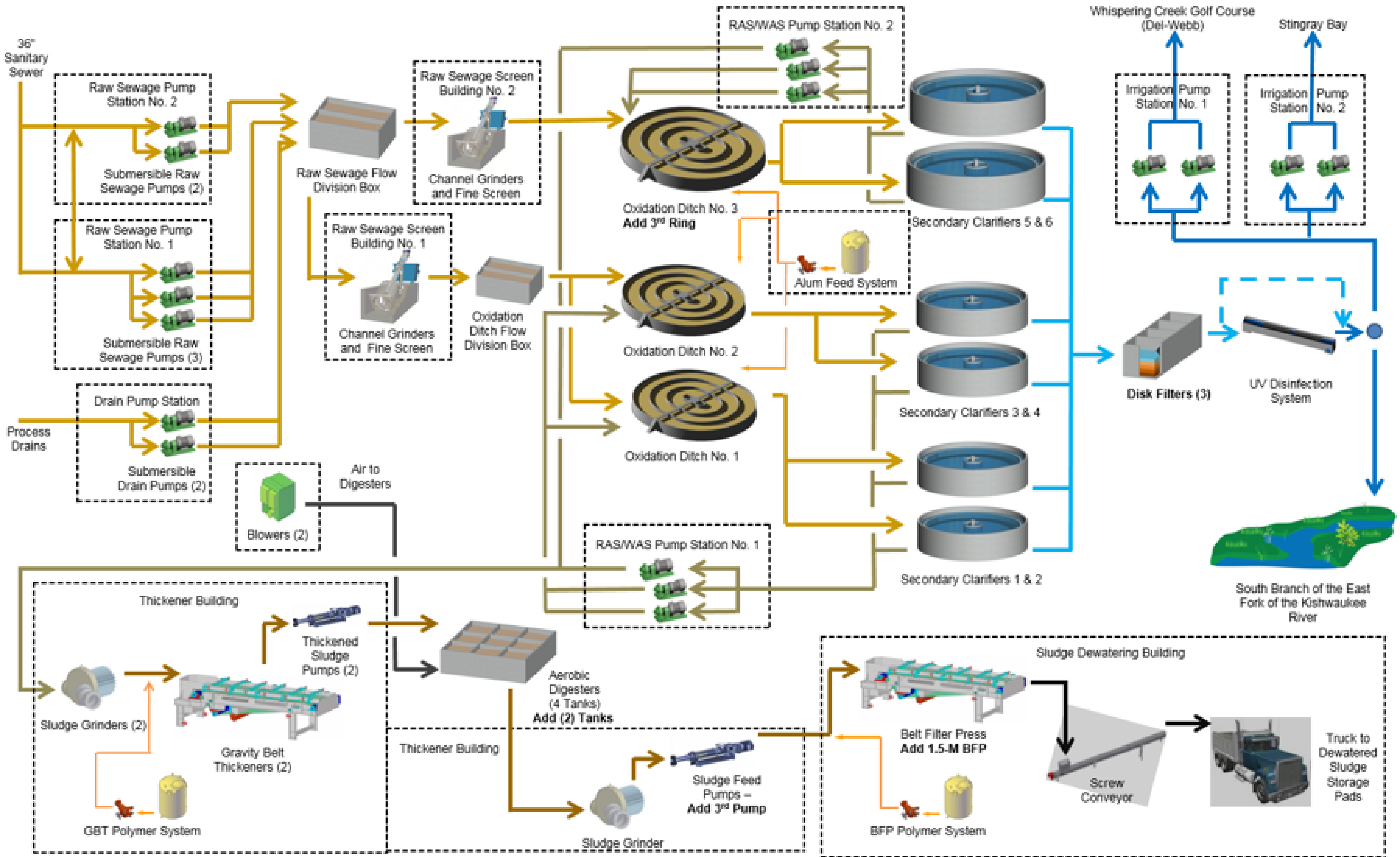


Table No. 7-1: West WWTF Influent Conditions for Bio-P Removal

Village of Huntley, IL

Parameter Ratio	Desired Ratio	Observed Ratio
BOD:TP	>20 :1	34.5 :1
rbCOD:TP	>10 :1	13.8 :1
VFA:TP	>4 :1	5.4 :1

G:\Public\Huntley\2015\HU15012016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\Water Quality Sampling\[Phosphorus Ratios.xlsx]Sheet1

Notes:
-BOD values from DMR Averages 1/2014-12/2015
-rbCOD values from phosphorus testing 10/2014-2/2016
-During phosphorus testing 10/2014-2/2016, 11 of 13 VFA samples measured non-detect (<50 mg/L). An assumed value of half of the non-detect limit, 25 mg/L, was assumed for all non-detect samples

7.1.2 Convert Existing Sand Filters to Disk Filters – The existing sand filtration equipment does not provide the level of consistent filtration required for meeting a more stringent 0.5 mg/L limit. Therefore, alternate filtration methods should be analyzed. The filtration method most applicable for this application is disk filtration, which is a system more fully described in Section 3.1.3.2. These filters should be designed to maintain a hydraulic surface loading less than 5.0 gpm/ft^2 at the facility's DMF of 6.5 MGD with one unit (group of disks) out of service.

A total filter area of 1,296.0 ft^2 with six (6) filter units is recommended. This would result in a hydraulic loading rate of 3.48 gpm/ft^2 at 6.5 MGD with one unit out of service (or in a backwash). The existing sand filter concrete basins would house the new disk filter units, and each of the three (3) existing concrete basins has an internal dimension of 12.5-feet by 46-feet. Two (2) disk filter units would go in each concrete basin. There would be 20 disks per unit for a total of 120 disks, and each disk would have a surface area of 10.8 ft^2. Preliminary analysis of the hydraulics indicates that the disk filtration system would fit within the hydraulic profile at this location, although more detailed analysis would be required prior to implementation.

7.1.3 Biosolids Treatment Improvements – Due to additional solids wasting and subsequent biosolids treatment, it does not appear that the existing biosolids systems will be adequate to handle additional loading due to the 0.5 mg/L phosphorus limit. There would not be enough aerobic digester capacity, so two (2) additional in-ground aerobic digester tanks and associated blowers would be required for the necessary treatment. It is recommended that each new digester tank size be equal to each of the existing four (4) digester tanks. Also, an additional 1.5-meter belt filter press with associated feed pump, screw conveyor, and appurtenances would be required for the dewatering needs. There is dedicated space in the existing dewatering area for a new 1.5-meter belt filter press. Finally, additional dewatered sludge storage area would be required. A new building should be constructed east of the existing dewatered sludge storage building. The improvements to the aerobic digesters, dewatering system, and dewatered sludge storage are referenced as "Biosolids Treatment Improvements" in the cost estimates included in Section 7.2 below.

7.1.4 Other Considerations – As part of the Phosphorus Discharge Optimization Plan and Phosphorus Removal Feasibility Study, the side streams were evaluated for phosphorus, total nitrogen, nitrite/nitrate, and TKN. Table No. 7-2 outlines the sampling that was completed for the West WWTF side-stream flows.

Table No. 7-2: West WWTF GBT and BFP Filtrate Nutrient Sampling (02/2016)
Village of Huntley, Illinois

Sampling Date	McHenry Analytical Water Laboratory, Inc. / PDC	Total Phosphorus (as P) (mg/L)	Total Nitrogen (mg/L)	Nitrate/Nitrite - N (mg/L)	Total Kjeldahl Nitrogen (TKN) (mg/L)
2/4/2016	16B0424 / 6021125	0.92	4.80	3.70	1.10

G:\Public\Huntley\2015\HU15012016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\Water Quality Sampling\[Nutrient WQ Sampling Results.xlsm]Side Stream Samples

Most textbook phosphorus removal techniques have all anoxic and anaerobic zones in the mainstream processes. However, there has been some success treating just the side-stream flow as an anoxic zone before combining the side-stream flow with the influent in the anaerobic zone[1] similar to the Johannesburg process for phosphorus removal. The creation of anoxic side-stream treatment would allow more nitrate to be removed from the return flow, thus ensuring a more efficient anaerobic zone and better phosphorus uptake. Given the relatively low side-stream nutrient content at the West WWTF, as shown in Table No. 7-2, it is assumed in this study that side-stream treatment would not provide a cost-effective benefit to the facility.

7.2 Costs

7.2.1 Capital Costs – The estimated capital cost summary of the scope defined above is included in Table No. 7-3 below.

7.2.2 Operation, Maintenance, and Replacement Costs – The estimated O,M&R cost summary of the scope defined above is included in Table No. 7-4 below. A significant majority of these costs is split between the additional chemicals required to meet the limit and equipment replacement costs of equipment over a 20-year period.

7.2.3 Total Cost Summary – The estimated 20-Year Present Worth Cost Summary is included in Table No. 7-5 below. This includes Capital Costs, Present Worth of Salvage Values, and Present Worth of Annual O&M Costs.

[1] References – Item 4 (pg 53)

TABLE NO. 7-3: CAPITAL COST SUMMARY
WEST WWTF UPGRADES (TP LIMIT = 0.5 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	OXIDATION DITCHES IMPROVEMENTS - STRUCTURES	$1,380,600	50	$878,000
	OXIDATION DITCHES IMPROVEMENTS - EQUIPMENT	$1,462,300	20	$0
2	TERTIARY DISK FILTRATION - STRUCTURES	$203,900	50	$123,000
	TERTIARY DISK FILTRATION - EQUIPMENT	$1,335,600	20	$0
3	BIOSOLIDS TREATMENT IMPROVEMENTS - STRUCTURES	$1,089,700	50	$654,000
	BIOSOLIDS TREATMENT IMPROVEMENTS - EQUIPMENT	$1,294,500	20	$0
	SUBTOTAL	$6,766,600		$1,655,000
	CONTINGENCY (10%)	$676,700		
	BONDS AND INSURANCE @ 2%	$148,900		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$967,700		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$8,559,900		
	ENGINEERING	$1,284,000		
	TOTAL ESTIMATED CAPITAL COST	**$9,843,900**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

TABLE NO. 7-4: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY
WEST WWTF UPGRADES (TP LIMIT = 0.50 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$24,400
2	ADDITIONAL CHEMICALS REQUIRED	$80,000
3	ADDITIONAL LABOR REQUIRED	$50,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$18,000
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$369,600
	ANNUAL TOTAL	$542,000
	20 YEAR PRESENT WORTH AT 6%	**$6,216,700**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 7-5: PRESENT WORTH COST SUMMARY

WEST WWTF UPGRADES (TP LIMIT = 0.50 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$9,843,900
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($380,700)
3	ANNUAL O, M, & R (20 YEARS)	$6,216,700
	TOTAL PRESENT WORTH	**$15,679,900**

NOTES:
1) BASED ON 2016 DOLLARS

7.2.4 Cost Considerations for Application of Limit on Monthly, Seasonal, and Annual Average Basis – Bio-P removal efficiency will fluctuate slightly during the months of the year based on seasonal temperatures, as described in Section 3.1.7. The estimated costs detailed above are reflective of a monthly average limit. The biggest cost benefits of seasonal and annual average limits would be seen via chemical usage and biosolids production reduction at certain times of the year.

7.2.4.1 Cost Considerations for Seasonal Average Limit – The estimated capital, O,M,&R, and 20-year present worth costs for a seasonal average limit are listed below in Tables No. 7-6, 7-7, and 7-8. The capital cost savings compared to a monthly average limit can be attributed to a slight reduction in the required dewatered sludge storage capacity. The O,M,&R cost reduction is primarily due to savings in chemical and sludge hauling costs.

TABLE NO. 7-6: CAPITAL COST SUMMARY - SEASONAL LIMIT
WEST WWTF UPGRADES (TP LIMIT = 0.5 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	OXIDATION DITCHES IMPROVEMENTS - STRUCTURES	$1,380,600	50	$878,000
	OXIDATION DITCHES IMPROVEMENTS - EQUIPMENT	$1,462,300	20	$0
2	TERTIARY DISK FILTRATION - STRUCTURES	$203,900	50	$123,000
	TERTIARY DISK FILTRATION - EQUIPMENT	$1,335,600	20	$0
3	BIOSOLIDS TREATMENT IMPROVEMENTS - STRUCTURES	$1,014,700	50	$609,000
	BIOSOLIDS TREATMENT IMPROVEMENTS - EQUIPMENT	$1,294,500	20	$0
	SUBTOTAL	$6,691,600		$1,610,000
	CONTINGENCY (10%)	$669,200		
	BONDS AND INSURANCE @ 2%	$147,300		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$957,000		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$8,465,100		
	ENGINEERING	$1,269,800		
	TOTAL ESTIMATED CAPITAL COST	**$9,734,900**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

TABLE NO. 7-7: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY - SEASONAL LIMIT
WEST WWTF UPGRADES (TP LIMIT = 0.50 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$24,400
2	ADDITIONAL CHEMICALS REQUIRED	$60,000
3	ADDITIONAL LABOR REQUIRED	$40,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$15,000
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$369,600
	ANNUAL TOTAL	$509,000
	20 YEAR PRESENT WORTH AT 6%	**$5,838,200**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 7-8: PRESENT WORTH COST SUMMARY - SEASONAL LIMIT

WEST WWTF UPGRADES (TP LIMIT = 0.50 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$9,734,900
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($370,300)
3	ANNUAL O, M, & R (20 YEARS)	$5,838,200
	TOTAL PRESENT WORTH	**$15,202,800**

NOTES:
1) BASED ON 2016 DOLLARS

7.2.4.2 Cost Considerations for Annual Average Limit – The estimated capital, O,M,&R, and 20-year present worth costs for an annual average limit are listed below in Tables No. 7-9, 7-10, and 7-11. The capital cost savings compared to a monthly average limit can be attributed to a greater reduction in the required dewatered sludge storage capacity. The O,M,&R cost reduction is primarily due to savings in chemical and sludge hauling costs.

TABLE NO. 7-9: CAPITAL COST SUMMARY - ANNUAL LIMIT
WEST WWTF UPGRADES (TP LIMIT = 0.5 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	OXIDATION DITCHES IMPROVEMENTS - STRUCTURES	$1,380,600	50	$878,000
	OXIDATION DITCHES IMPROVEMENTS - EQUIPMENT	$1,462,300	20	$0
2	TERTIARY DISK FILTRATION - STRUCTURES	$203,900	50	$123,000
	TERTIARY DISK FILTRATION - EQUIPMENT	$1,335,600	20	$0
3	BIOSOLIDS TREATMENT IMPROVEMENTS - STRUCTURES	$939,700	50	$564,000
	BIOSOLIDS TREATMENT IMPROVEMENTS - EQUIPMENT	$1,294,500	20	$0
	SUBTOTAL	$6,616,600		$1,565,000
	CONTINGENCY (10%)	$661,700		
	BONDS AND INSURANCE @ 2%	$145,600		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$946,200		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$8,370,100		
	ENGINEERING	$1,255,600		
	TOTAL ESTIMATED CAPITAL COST	**$9,625,700**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

TABLE NO. 7-10: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY - ANNUAL LIMIT
WEST WWTF UPGRADES (TP LIMIT = 0.50 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$24,400
2	ADDITIONAL CHEMICALS REQUIRED	$40,000
3	ADDITIONAL LABOR REQUIRED	$30,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$12,000
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$369,600
	ANNUAL TOTAL	$476,000
	20 YEAR PRESENT WORTH AT 6%	**$5,459,700**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 7-11: PRESENT WORTH COST SUMMARY - ANNUAL LIMIT

WEST WWTF UPGRADES (TP LIMIT = 0.50 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$9,625,700
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($360,000)
3	ANNUAL O, M, & R (20 YEARS)	$5,459,700
	TOTAL PRESENT WORTH	**$14,725,400**

NOTES:
1) BASED ON 2016 DOLLARS

7.3 Timeframe

It is assumed that this potential requirement would not be established until after the renewed NPDES permit is issued by the IEPA. Work scope for the 0.5 mg/L phosphorus limit would include a Facilities Plan (assuming funding through a SRF loan), loan approval, design, and construction. These work scope items would require a minimum of five (5) years to accomplish. It is also expected that an optimization period would follow construction to allow for operational adjustments to enhance Bio-P removal, prior to the start of the 0.5 mg/L limit requirements. A one (1) year optimization period is reasonable to account for seasonal variations in Bio-P removal performance. Therefore, a minimum of six (6) years is needed to meet NPDES Permit limit of 0.5 mg/L after establishment of the requirement.

Section 8: West WWTF Phosphorus Removal Feasibility Study – 0.1 mg/L Effluent

8.1 Overview

The West WWTF's options to reduce the phosphorus effluent concentration down to 0.1 mg/L were evaluated based on cost, land availability, existing operating conditions, forecasted operating conditions, and the expected removal efficiency of each process at the facility. It was determined that modifications should be made to Oxidation Ditch No. 1, 2, and 3, the existing sand filters should be modified to be disk filters, and modifications are required to the biosolids treatment system to accommodate the additional solids. This section outlines all proposed changes for the 0.1 mg/L effluent concentration plan. Exhibit 8-1 shows the proposed aerial plan and Exhibit 8-2 shows the proposed process flow diagram. It is also assumed that the process changes recommended in Section 7 to meet the phosphorus effluent limit of 0.5 mg/L would not be implemented prior to the 0.1 mg/L limit, so the content of this section is irrespective of the content in Section 7.

8.1.1 Oxidation Ditches Modifications – At the West WWTF, Oxidation Ditches No. 1 and 2 are both three ring Orbal (Evoqua) ditches. and Oxidation Ditch No. 3 currently has two rings but was designed with a potential to add an outer third ring. As previously mentioned in this report, three ring oxidation ditches can be used to create an environment where the sludge undergoes an anaerobic, aerobic, and buffer environment which can be used to optimize the environment for PAOs. Therefore, it is recommended to add an outer third ring in Oxidation Ditch No. 3 to allow for better Bio-P removal performance. The new aerators on the third ring would be equipped with VFDs, and ORP probes would be utilized with programming to control the aeration in the ring.

Furthermore, existing Oxidation Ditch No. 1 and 2 are not fully equipped with VFDs for their aerators. Oxidation Ditch No. 1 does have VFDs for the aerators in the outer (3^{rd}) ring, but not the aerators in the middle or inner rings. Oxidation Ditch No. 2 does not have VFDs for any of its aerators. Each of these oxidation ditches has DO/ORP probes. It is recommended to add VFDs for the remaining aerators in these oxidation ditches and modify control programming to enhance the Bio-P removal performance.

The modifications to each of the oxidation ditches noted above would allow for a moderate fermentation zone in the outer ring of each ditch. The Village performed some influent sampling to better determine whether the conditions are optimal for creating VFAs and PAOs through fermentation. Table No. 8-1 includes the ratios of these parameters to the influent phosphorus concentrations at the West WWTF over the recent years, and compares them to the desired ratios conducive for Bio-P removal. In each case, the observed ratio was greater than the desired minimum ratio. This indicates that Bio-P removal to 1.0 mg/L is possible given the proper physical and operational treatment mechanisms. The noted modifications to the oxidation ditches will enhance VFA production and subsequent Bio-P removal performance with the goal of biologically meeting the 0.1 mg/L limit.

Exhibit 8-1: West WWTF Aerial View – Recommended Plan – 0.1 mg/L TP Limit

Village of Huntley, IL

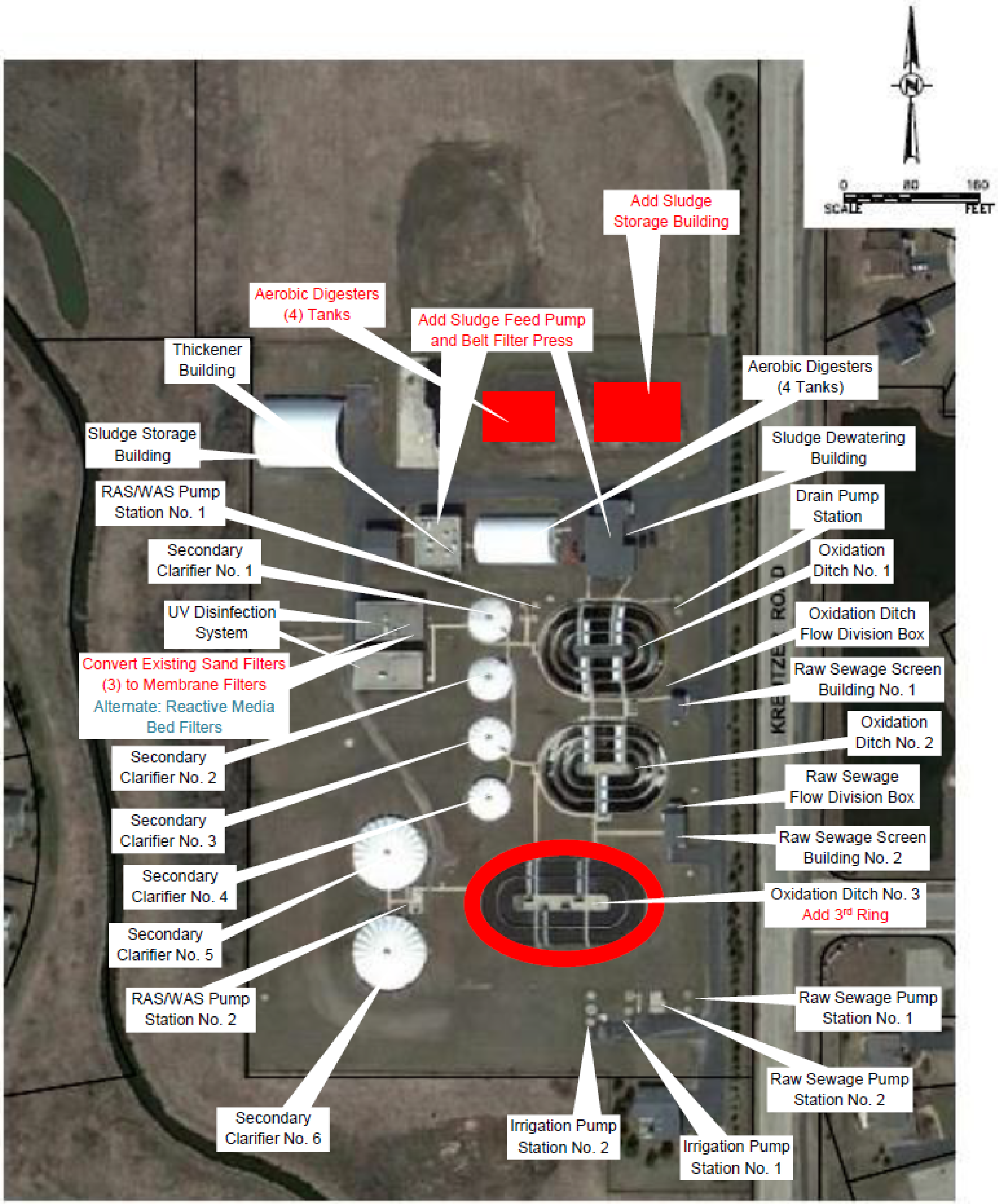


Exhibit 8-2: West WWTF Process Flow Diagram – Recommended Plan – 0.1 mg/L TP Limit

Village of Huntley, IL

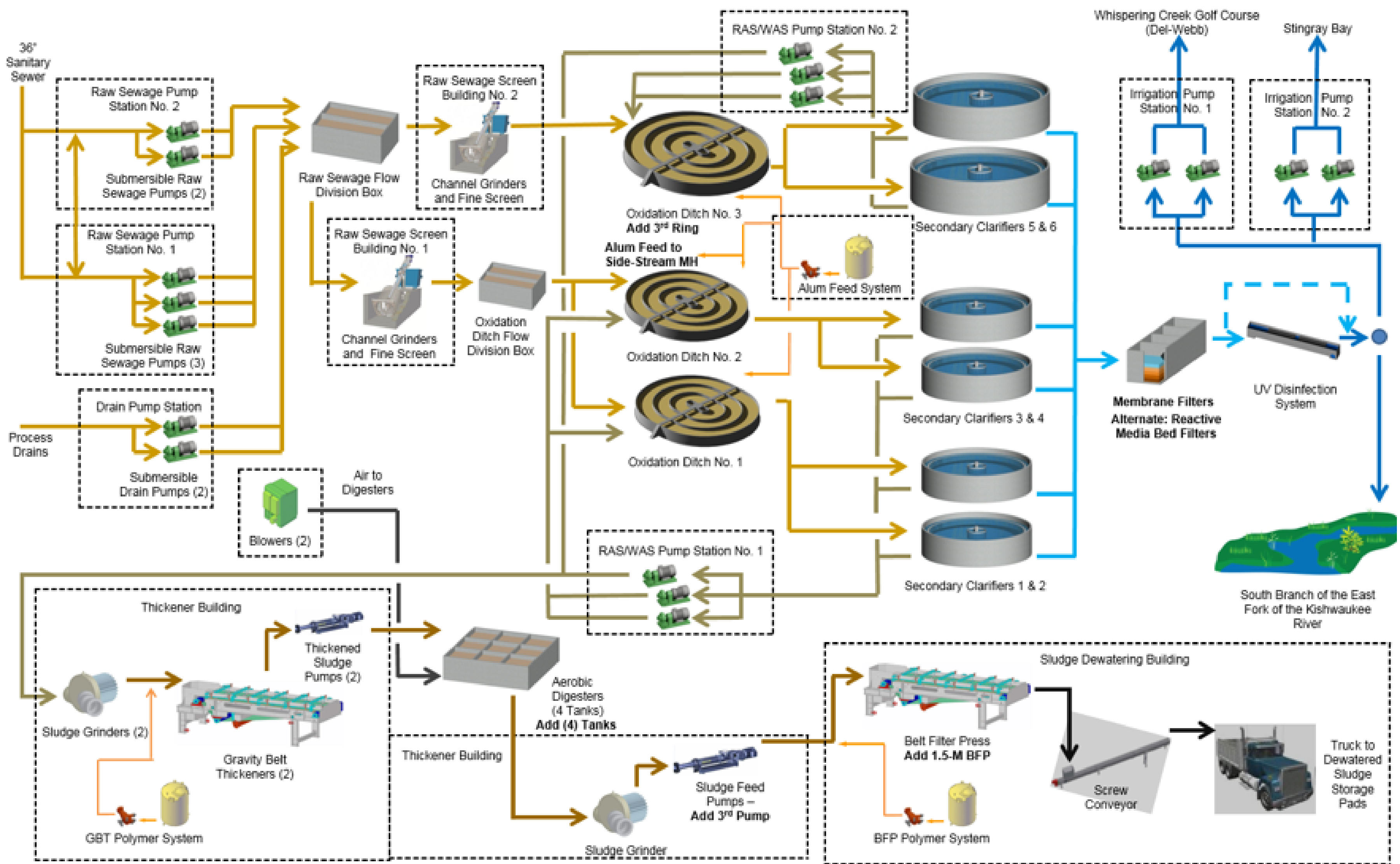


Table No. 8-1: West WWTF Influent Conditions for Bio-P Removal

Village of Huntley, IL

Parameter Ratio	Desired Ratio	Observed Ratio
BOD:TP	>20 :1	34.5 :1
rbCOD:TP	>10 :1	13.8 :1
VFA:TP	>4 :1	5.4 :1

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\Water Quality Sampling\[Phosphorus Ratios.xlsx]Sheet1

Notes:
-BOD values from DMR Averages 1/2014-12/2015
-rbCOD values from phosphorus testing 10/2014-2/2016
-During phosphorus testing 10/2014-2/2016, 11 of 13 VFA samples measured non-detect (<50 mg/L). An assumed value of half of the non-detect limit, 25 mg/L, was assumed for all non-detect samples

8.1.2 Convert Existing Sand Filters to Membrane Filters – The existing sand filtration equipment does not provide the level of consistent filtration required for meeting a more stringent 0.1 mg/L limit. Therefore, alternate filtration methods should be analyzed. The filtration method most applicable for this application is membrane filtration, which is a system more fully described in Section 3.1.3.3.

It is suggested to utilize ultrafiltration at the West WWTF. These membrane filters should be designed to maintain a hydraulic surface loading less than 40.0 gfd at the facility's DMF of 6.5 MGD with all skids in operation. The proposed design uses a total of four (4) membrane skids to remove phosphorus with 60 modules per skid. During scenarios where the plant is operating at the 2.6 MGD DAF, three of the skids will be operational and the water recovery rate will be 93.6%. During scenarios where the facility is operating at the 6.5 MGD DMF, four of the skids will be operational and the water recovery rate will be 95.4%. The design for the ultrafiltration skids assumes that the filters will be able to accommodate the entirety of the flow coming into the facility. The skids will be able to fit into the existing sand filter building. Significant piping and electrical modifications would be required to accommodate this filtration system. Feed pumps are included on the skid to provide the necessary feed pressure through the membranes. The membranes also require routine cleaning and a clean-in-place skid would be included in the scope.

8.1.2.1 ALTERNATE: Replace Existing Sand Filters with Reactive Media Bed Filters – A proposed alternate filtration scenario to reduce the effluent phosphorus to 0.1 mg/L would be to replace the sand filters with a reactive media bed filtration system, as described in Section 3.1.3.4.

The system proposed by Blue PRO® for the West WWTF would consist of five concrete cells with three filters per cell each for a total of fifteen continuous backwash filters. During design average flows, three of the cells would be online with the two on standby and during the design maximum flows, all five of the cells would be online. The filters would be sized for a hydraulic loading less than 5.0 gpm/ft^2 at DMF. The proposed reactive media bed filter system would be able to fit within the footprint of the sand filter buildings. However, additional analysis must be performed regarding the specific hydraulics, as well as removal efficiencies. A pilot study is recommended for further analysis.

8.1.3 Biosolids Treatment Improvements – Due to additional solids wasting and subsequent biosolids treatment, it does not appear that the existing biosolids systems will be adequate to handle additional loading due to the 0.1 mg/L phosphorus limit. There would not be enough aerobic digester capacity, so four (4) additional in-ground aerobic digester tanks and associated blowers would be required for the necessary treatment. It is recommended that each new tank size be equal to each of the existing four (4) digester tanks. Also, an additional 1.5-meter belt filter press with associated feed pump, screw conveyor, and appurtenances would be required for the dewatering needs. There is dedicated space in the existing dewatering area for a new 1.5-meter belt filter press. Finally, additional dewatered sludge storage area would be required. A new building should be constructed east of the existing dewatered sludge storage building. The improvements to the aerobic digesters, dewatering system, and dewatered sludge storage are referenced as "Biosolids Treatment Improvements" in the cost estimates included in Section 8.2 below.

8.1.4 Other Considerations – As part of the Phosphorus Discharge Optimization Plan and Phosphorus Removal Feasibility Study, the side streams were evaluated for phosphorus, total nitrogen, nitrite/nitrate, and TKN. Table No. 8-2 outlines the sampling that was completed for the West WWTF side-stream flows.

Table No. 8-2: West WWTF GBT and BFP Filtrate Nutrient Sampling (02/2016)

Village of Huntley, Illinois

Sampling Date	McHenry Analytical Water Laboratory, Inc. / PDC	Total Phosphorus (as P) (mg/L)	Total Nitrogen (mg/L)	Nitrate/Nitrite - N (mg/L)	Total Kjeldahl Nitrogen (TKN) (mg/L)
2/4/2016	16B0424 / 6021125	0.92	4.80	3.70	1.10

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\Water Quality Sampling\[Nutrient WQ Sampling Results.xlsm]Side Stream Samples

Most textbook phosphorus removal techniques have all anoxic and anaerobic zones in the mainstream processes. However, there has been some success treating just the side-stream flow as an anoxic zone before combining the side-stream flow with the influent in the anaerobic zone[1] similar to the Johannesburg process for phosphorus removal. The creation of anoxic side-stream treatment would allow more nitrate to be removed from the return flow, thus ensuring a more efficient anaerobic zone and better phosphorus uptake.

While Table No. 8-2 shows a relatively low phosphorus value from side-stream flows at that time, side-stream treatment should still be considered for meeting the 0.1 mg/L effluent limit. The most cost effective method for treating side-stream flows at the West WWTF is to chemically treat the flows using the existing Alum Chemical Feed System. The Alum would be injected into a manhole that collects the side-stream flows prior to return of these flows to the raw sewage pump station. Costs for these improvements are incorporated into the Biosolids Treatment Improvements costs in Section 8.2 below.

8.2 Costs

8.2.1 Capital Costs – The estimated capital cost summary of the scope defined above is included in Table No. 8-3 below.

[1] References – Item 4 (pg 53)

TABLE NO. 8-3: CAPITAL COST SUMMARY
WEST WWTF UPGRADES (TP LIMIT = 0.1 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	ADD 3RD RING TO OXIDATION DITCH NO. 3 - STRUCTURES	$1,380,600	50	$878,000
	ADD 3RD RING TO OXIDATION DITCH NO. 3 - EQUIPMENT	$1,462,300	20	$0
2	MEMBRANE FILTRATION - STRUCTURES	$203,900	50	$123,000
	MEMBRANE FILTRATION - EQUIPMENT	$2,762,300	20	$0
3	BIOSOLIDS TREATMENT IMPROVEMENTS - STRUCTURES	$1,353,800	50	$813,000
	BIOSOLIDS TREATMENT IMPROVEMENTS - EQUIPMENT	$1,549,700	20	$0
	SUBTOTAL	$8,712,600		$1,814,000
	CONTINGENCY (10%)	$871,300		
	BONDS AND INSURANCE @ 2%	$191,700		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$1,246,000		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$11,021,600		
	ENGINEERING	$1,653,300		
	TOTAL ESTIMATED CAPITAL COST	**$12,674,900**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

Comparatively, the capital cost utilizing the alternate reactive media bed filters is estimated at $11,038,300.

8.2.2 Operation, Maintenance, and Replacement Costs – The estimated O,M&R cost summary of the scope defined above is included in Table No. 8-4 below. A significant majority of these costs is split between the additional chemicals required to meet the limit and equipment replacement costs of equipment over a 20-year period.

TABLE NO. 8-4: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY
WEST WWTF UPGRADES (TP LIMIT = 0.10 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$45,800
2	ADDITIONAL CHEMICALS REQUIRED	$190,000
3	ADDITIONAL LABOR REQUIRED	$80,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$30,000
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$521,500
	ANNUAL TOTAL	$867,300
	20 YEAR PRESENT WORTH AT 6%	**$9,947,900**

NOTES:
1) BASED ON 2016 DOLLARS

Comparatively, the O,M&R cost utilizing the alternate reactive media bed filters is estimated at $8,454,500, which is due to nominal electrical and chemical savings with this treatment method.

8.2.3 Total Cost Summary – The estimated 20-Year Present Worth Cost Summary is included in Table No. 8-5 below. This includes Capital Costs, Present Worth of Salvage Values, and Present Worth of Annual O&M Costs.

TABLE NO. 8-5: PRESENT WORTH COST SUMMARY

WEST WWTF UPGRADES (TP LIMIT = 0.10 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$12,674,900
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($417,300)
3	ANNUAL O, M, & R (20 YEARS)	$9,947,900
	TOTAL PRESENT WORTH	**$22,205,500**

NOTES:
1) BASED ON 2016 DOLLARS

Comparatively, the present worth cost utilizing the alternate reactive media bed filters is estimated at $19,075,500. Although this is a lower cost than the comparable estimate with membrane filters, utilizing membrane filters is the recommendation of this report due to the higher degree of confidence with that system. Membrane filtration is a known commodity with many similar installations. Reactive media bed filtration would require further analysis, including pilot testing, prior to implementation.

8.2.4 Cost Considerations for Application of Limit on Monthly, Seasonal, and Annual Average Basis – Bio-P removal efficiency will fluctuate slightly during the months of the year based on seasonal temperatures, as described in Section 3.1.7. The estimated costs detailed above are reflective of a monthly average limit. The biggest cost benefits of seasonal and annual average limits would be seen via chemical usage and biosolids production reduction at certain times of the year.

8.2.4.1 Cost Considerations for Seasonal Average Limit – The estimated capital, O,M,&R, and 20-year present worth costs for a seasonal average limit are listed below in Tables No. 8-6, 8-7, and 8-8. The capital cost savings compared to a monthly average limit can be attributed to a slight reduction in the required chemical feed system modifications as well as a reduction in dewatered sludge storage capacity. The O,M,&R cost reduction is primarily due to savings in chemical and sludge hauling costs.

TABLE NO. 8-6: CAPITAL COST SUMMARY - SEASONAL LIMIT
WEST WWTF UPGRADES (TP LIMIT = 0.1 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	ADD 3RD RING TO OXIDATION DITCH NO. 3 - STRUCTURES	$1,380,600	50	$878,000
	ADD 3RD RING TO OXIDATION DITCH NO. 3 - EQUIPMENT	$1,462,300	20	$0
2	MEMBRANE FILTRATION - STRUCTURES	$203,900	50	$123,000
	MEMBRANE FILTRATION - EQUIPMENT	$2,762,300	20	$0
3	BIOSOLIDS TREATMENT IMPROVEMENTS - STRUCTURES	$1,256,300	50	$754,000
	BIOSOLIDS TREATMENT IMPROVEMENTS - EQUIPMENT	$1,549,700	20	$0
	SUBTOTAL	$8,615,100		$1,755,000
	CONTINGENCY (10%)	$861,600		
	BONDS AND INSURANCE @ 2%	$189,600		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$1,232,000		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$10,898,300		
	ENGINEERING	$1,634,800		
	TOTAL ESTIMATED CAPITAL COST	**$12,533,100**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

TABLE NO. 8-7: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY - SEASONAL LIMIT
WEST WWTF UPGRADES (TP LIMIT = 0.10 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$45,800
2	ADDITIONAL CHEMICALS REQUIRED	$150,000
3	ADDITIONAL LABOR REQUIRED	$60,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$22,000
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$521,500
	ANNUAL TOTAL	$799,300
	20 YEAR PRESENT WORTH AT 6%	**$9,168,000**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 8-8: PRESENT WORTH COST SUMMARY - SEASONAL LIMIT
WEST WWTF UPGRADES (TP LIMIT = 0.10 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$12,533,100
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($403,700)
3	ANNUAL O, M, & R (20 YEARS)	$9,168,000
	TOTAL PRESENT WORTH	**$21,297,400**

NOTES:
1) BASED ON 2016 DOLLARS

8.2.4.2 Cost Considerations for Annual Average Limit – The estimated capital, O,M,&R, and 20-year present worth costs for an annual average limit are listed below in Tables No. 8-9, 8-10, and 8-11. The capital cost savings compared to a monthly average limit can be attributed to a greater reduction in the required chemical feed system modifications as well as a reduction in dewatered sludge storage capacity. The O,M,&R cost reduction is primarily due to savings in chemical and sludge hauling costs.

TABLE NO. 8-9: CAPITAL COST SUMMARY - ANNUAL LIMIT
WEST WWTF UPGRADES (TP LIMIT = 0.1 MG/L)
Village of Huntley, IL

ITEM NO.	ITEM DESCRIPTION	CAPITAL COST	SERVICE LIFE (YEARS)	SALVAGE VALUE
1	ADD 3RD RING TO OXIDATION DITCH NO. 3 - STRUCTURES	$1,380,600	50	$878,000
	ADD 3RD RING TO OXIDATION DITCH NO. 3 - EQUIPMENT	$1,462,300	20	$0
2	MEMBRANE FILTRATION - STRUCTURES	$203,900	50	$123,000
	MEMBRANE FILTRATION - EQUIPMENT	$2,762,300	20	$0
3	BIOSOLIDS TREATMENT IMPROVEMENTS - STRUCTURES	$1,196,300	50	$718,000
	BIOSOLIDS TREATMENT IMPROVEMENTS - EQUIPMENT	$1,549,700	20	$0
	SUBTOTAL	$8,555,100		$1,719,000
	CONTINGENCY (10%)	$855,600		
	BONDS AND INSURANCE @ 2%	$188,300		
	CONTRACTOR OVERHEAD AND PROFIT AT 13%	$1,223,400		
	TOTAL ESTIMATED COST OF CONSTRUCTION	$10,822,400		
	ENGINEERING	$1,623,400		
	TOTAL ESTIMATED CAPITAL COST	**$12,445,800**		

NOTES:
1) BASED ON 2016 DOLLARS
2) EQUIPMENT INCLUDES PROCESS EQUIPMENT, PIPING, ELECTRICAL, AND INSTRUMENTATION

TABLE NO. 8-10: ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COST SUMMARY - ANNUAL LIMIT

WEST WWTF UPGRADES (TP LIMIT = 0.10 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	ESTIMATED O M & R COSTS
1	ADDITIONAL ELECTRICITY REQUIRED	$45,800
2	ADDITIONAL CHEMICALS REQUIRED	$130,000
3	ADDITIONAL LABOR REQUIRED	$50,000
4	ADDITIONAL SLUDGE HAULING REQUIRED	$18,000
5	ADDITIONAL MAINTENANCE / REPLACEMENT / MISCELLANEOUS REQUIRED	$521,500
	ANNUAL TOTAL	$765,300
	20 YEAR PRESENT WORTH AT 6%	**$8,778,000**

NOTES:
1) BASED ON 2016 DOLLARS

TABLE NO. 8-11: PRESENT WORTH COST SUMMARY - ANNUAL LIMIT

WEST WWTF UPGRADES (TP LIMIT = 0.10 MG/L)

Village of Huntley, IL

ITEM NO.	ITEM	PRESENT WORTH COSTS
1	CAPITAL COSTS	$12,445,800
2	SALVAGE VALUE (MULTIPLIER = 0.2300)	($395,400)
3	ANNUAL O, M, & R (20 YEARS)	$8,778,000
	TOTAL PRESENT WORTH	**$20,828,400**

NOTES:
1) BASED ON 2016 DOLLARS

8.3 Timeframe

It is assumed that this potential requirement would not be established until after the renewed NPDES permit is issued by the IEPA. Work scope for the 0.1 mg/L phosphorus limit would include a Facilities Plan (assuming funding through a SRF loan), loan approval, design, and construction. These work scope items would require a minimum of five (5) years to accomplish. It is also expected that an optimization period would follow construction to allow for operational adjustments to enhance Bio-P removal, prior to the start of the 0.1 mg/L limit requirements. A one (1) year optimization period is reasonable to account for seasonal variations in Bio-P removal performance. Therefore, a minimum of six (6) years is needed to meet NPDES Permit limit of 0.1 mg/L after establishment of the requirement.

References

1) **2015 Gulf of Mexico Dead Zone 'Above Average' -** http://www.noaanews.noaa.gov/stories2015/080415-gulf-of-mexico-dead-zone-above-average.html
2) **Potential Nutrient Reduction by Treatment Optimization and Treatment Upgrades -** http://bacwa.org/wp-content/uploads/2015/05/BACWA_ScopingEvalPlan_Final.pdf
3) **Nutrient Removal – Total Phosphorus –** http://dnr.wi.gov/regulations/opcert/documents/StudyGuidePhosphorus.pdf
4) **Case Studies on Implementing Low-Cost Modifications to Improve Nutrient Reduction at Wastewater Treatment Plants** - https://www.epa.gov/sites/production/files/2015-08/documents/case_studies_on_implementing_low-cost_modification_to_improve_potw_nutrient_reduction-combined_508_-_august.pdf
5) **What Everyone Should Know About Enhanced Biological Phosphorus Removal** - http://www.wateronline.com/doc/what-everyone-should-know-about-enhanced-biological-phosphorus-removal-0001
6) **Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, 2003**
7) **Ostara** - http://ostara.com/about/
8) **Stickney Water Reclamation Plant, United States of America -** http://www.water-technology.net/projects/stickney-water-reclamation-plant/
9) **Chicago Turning River Pollutants Into Fertilizer** - http://www.chicagotribune.com/news/watchdog/ct-chicago-phosphorus-pollution-met-20160525-story.html
10) **Blue Water Technologies, Blue Pro® -** https://www.bluewater-technologies.com/products/bluepro.html
11) **Wastewater Technology Fact Sheet, Ballasted Flocculation -** http://nepis.epa.gov/Exe/ZyPDF.cgi/P100IL67.PDF?Dockey=P100IL67.PDF
12) **Treatment and Fate of Various Phosphorus Fractions in Different Wastewater Treatment Processes** - http://www.ncbi.nlm.nih.gov/pubmed/21330731
13) **Membrane Filtration for Wastewater Reuse Current -** http://www.waterworld.com/articles/wwi/print/volume-25/issue-5/regional-spotlight/north-american-caribbean/membrane-filtration-for-wastewater-reuse-current.html
14) **Koch Membrane Systems** - http://www.kochmembrane.com/Learning-Center/Configurations/What-are-Spiral-Membranes.aspx
15) **Koch Membrane Systems -** http://www.kochmembrane.com/Learning-Center/Configurations/What-are-Tubular-Membranes.aspx
16) **Snyder Filtration -** http://synderfiltration.com/learning-center/articles/module-configurations-process/hollow-fiber-membranes/
17) **Water Online -** http://www.wateronline.com/doc/nutrient-removal-is-bardenpho-right-for-you-0001

Appendix A

East WWTF NPDES Permit

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-2829
BRUCE RAUNER, GOVERNOR LISA BONNETT, DIRECTOR

217/782-0610

May 28, 2015

Village of Huntley
10987 Main Street
Huntley, Illinois 60142

Re: Village of Huntley - East WWTP
NPDES Permit No. IL0029238
Final Permit

Gentlemen:

Attached is the final NPDES Permit for your discharge. The Permit as issued covers discharge limitations, monitoring, and reporting requirements. Failure to meet any portion of the Permit could result in civil and/or criminal penalties. The Illinois Environmental Protection Agency is ready and willing to assist you in interpreting any of the conditions of the Permit as they relate specifically to your discharge.

The Agency has begun a program allowing the submittal of electronic Discharge Monitoring Reports (NetDMRs) instead of paper Discharge Monitoring Reports (DMRs). If you are interested in NetDMRs, more information can be found on the Agency website, http://epa.state.il.us/water/net-dmr/index.html. If your facility is not registered in the NetDMR program, a supply of preprinted paper DMR Forms for your facility will be sent to you prior to the initiation of DMR reporting under the reissued permit. Additional information and instructions will accompany the preprinted DMRs upon their arrival.

The attached Permit is effective as of the date indicated on the first page of the Permit. Until the effective date of any re-issued Permit, the limitations and conditions of the previously-issued Permit remain in full effect. You have the right to appeal any condition of the Permit to the Illinois Pollution Control Board within a 35 day period following the issuance date.

Should you have questions concerning the Permit, please contact Kaushal Desai at 217/782-0610.

Sincerely,

Alan Keller

Alan Keller, P.E.
Manager, Permit Section
Division of Water Pollution Control

SAK:KKD:14060901.bah

Attachment: Final Permit
cc: Records
Compliance Assurance Section
Des Plaines Region
Billing
CMAP
Facility
US EPA

NPDES Permit No. IL0029238

Illinois Environmental Protection Agency

Division of Water Pollution Control

1021 North Grand Avenue East

Post Office Box 19276

Springfield, Illinois 62794-9276

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

Reissued (NPDES) Permit

Expiration Date: May 31, 2020

Issue Date: May 28, 2015
Effective Date: June 1, 2015

Name and Address of Permittee:

Village of Huntley
10987 Main Street
Huntley, Illinois 60142

Facility Name and Address:

Village of Huntley - East WWTP
11313 Dundee Road
Huntley, Illinois 60142
(McHenry County)

Receiving Waters: Huntley Branch

In compliance with the provisions of the Illinois Environmental Protection Act, Title 35 of the Ill. Adm. Code, Subtitle C, Chapter I, and the Clean Water Act (CWA), the above-named Permittee is hereby authorized to discharge at the above location to the above-named receiving stream in accordance with the standard conditions and attachments herein.

Permittee is not authorized to discharge after the above expiration date. In order to receive authorization to discharge beyond the expiration date, the Permittee shall submit the proper application as required by the Illinois Environmental Protection Agency (IEPA) not later than 180 days prior to the expiration date.

Alan Keller

Alan Keller, P.E.
Manager, Permit Section
Division of Water Pollution Control

SAK:KKD:14060901.bah

NPDES Permit No. IL0029238

Effluent Limitations, Monitoring, and Reporting

FINAL

Discharge Number(s) and Name(s): 001 STP Outfall

Load limits computed based on a design average flow (DAF) of 1.8 MGD (design maximum flow (DMF) of 4.5 MGD).

From the effective date of this Permit until the expiration date, the effluent of the above discharge(s) shall be monitored and limited at all times as follows:

	LOAD LIMITS lbs/day DAF (DMF)*			CONCENTRATION LIMITS mg/L				
Parameter	Monthly Average	Weekly Average	Daily Maximum	Monthly Average	Weekly Average	Daily Maximum	Sample Frequency	Sample Type
Flow (MGD)							Continuous	
CBOD$_5$**[1]	150 (375)		300 (751)	10		20	3 Days/Week	Composite
Suspended Solids[1]	180 (450)		360 (901)	12		24	3 Days/Week	Composite
pH	Shall be in the range of 6 to 9 Standard Units						3 Days/Week	Grab
Fecal Coliform***	Daily Maximum shall not exceed 400 per 100 mL (May through October)						3 Days/Week	Grab
Chlorine Residual****						0.05	****	Grab
Ammonia Nitrogen: As (N) April-May/Sept.-Oct.	17 (41)	57 (143)	71 (176)	1.1	3.8	4.7	3 Days/Week	Composite
June-August	17 (41)	50 (124)	74 (184)	1.1	3.3	4.9	3 Days/Week	Composite
Nov.-Feb.	21 (53)		75 (188)	1.4		5.0	3 Days/Week	Composite
March	21 (53)	57 (143)	71 (176)	1.4	3.8	4.7	3 Days/Week	Composite
Total Phosphorus (as P)*****	15 (38)			1.0			1 Day/Week	Composite
Total Nitrogen	Monitor only						1 Day/Month	Composite
Barium	30 (75)		60 (150)	2.0		4.0	1 Day/Month	Composite
				Monthly Average not less than	Weekly Average not less than	Daily Minimum		
Dissolved Oxygen March-July				N/A	6.0	5.0	3 Days/Week	Grab
August-February				5.5	4.0	3.5	3 Days/Week	Grab

*Load limits based on design maximum flow shall apply only when flow exceeds design average flow.
**Carbonaceous BOD$_5$ (CBOD$_5$) testing shall be in accordance with 40 CFR 136.
***See Special Condition 11.
****See Special Condition 10.
***** See Special Condition 18

Flow shall be reported on the Discharge Monitoring Report (DMR) as monthly average and daily maximum.
Fecal Coliform shall be reported on the DMR as a daily maximum value.
pH shall be reported on the DMR as minimum and maximum value.
Chlorine Residual shall be reported on DMR as daily maximum value.
Dissolved oxygen shall be reported on the DMR as a minimum value.
Total Phosphorus shall be reported on the DMR as a monthly average and daily maximum value.
Total Nitrogen shall be reported on the DMR as a daily maximum value.

Effluent Limitations, Monitoring, and Reporting

FINAL

Discharge Number(s) and Name(s): 001 STP Outfall (Continued from previous page)

[1]BOD_5 and Suspended Solids (85% removal required): In accordance with 40 CFR 133, the 30-day average percent removal shall not be less than 85 percent except as provided in Sections 133.103 and 133.105. The percent removal need not be reported to the IEPA on DMR's but influent and effluent data must be available, as required elsewhere in this Permit, for IEPA inspection and review. For measuring compliance with this requirement, 5 mg/L shall be added to the effluent $CBOD_5$ concentration to determine the effluent BOD_5 concentration.

Percent removal is a percentage expression of the removal efficiency across a treatment plant for a given pollutant parameter, as determined from the 30-day average values of the raw wastewater influent concentrations to the facility and the 30-day average values of the effluent pollutant concentrations for a given time period.

Influent Monitoring, and Reporting

The influent to the plant shall be monitored as follows:

Parameter	Sample Frequency	Sample Type
Flow (MGD)	Continuous	
BOD_5	3 Days/Week	Composite
Suspended Solids	3 Days/Week	Composite

Influent samples shall be taken at a point representative of the influent.

Flow (MGD) shall be reported on the Discharge Monitoring Report (DMR) as monthly average and daily maximum.

BOD_5 and Suspended Solids shall be reported on the DMR as a monthly average concentration.

Special Conditions

SPECIAL CONDITION 1. This Permit may be modified to include different final effluent limitations or requirements which are consistent with applicable laws and regulations. The IEPA will public notice the permit modification.

SPECIAL CONDITION 2. The use or operation of this facility shall be by or under the supervision of a Certified Class 1 operator.

SPECIAL CONDITION 3. The IEPA may request in writing submittal of operational information in a specified form and at a required frequency at any time during the effective period of this Permit.

SPECIAL CONDITION 4. The IEPA may request more frequent monitoring by permit modification pursuant to 40 CFR § 122.63 and Without Public Notice.

SPECIAL CONDITION 5. The effluent, alone or in combination with other sources, shall not cause a violation of any applicable water quality standard outlined in 35 Ill. Adm. Code 302.

SPECIAL CONDITION 6. The Permittee shall record monitoring results on Discharge Monitoring Report (DMR) Forms using one such form for each outfall each month.

In the event that an outfall does not discharge during a monthly reporting period, the DMR Form shall be submitted with no discharge indicated.

The Permittee may choose to submit electronic DMRs (NetDMRs) instead of mailing paper DMRs to the IEPA. More information, including registration information for the NetDMR program, can be obtained on the IEPA website, http://www.epa.state.il.us/water/net-dmr/index.html.

The completed Discharge Monitoring Report forms shall be submitted to IEPA no later than the 25th day of the following month, unless otherwise specified by the permitting authority.

Permittees not using NetDMRs shall mail Discharge Monitoring Reports with an original signature to the IEPA at the following address:

Illinois Environmental Protection Agency
Division of Water Pollution Control
Attention: Compliance Assurance Section, Mail Code # 19
1021 North Grand Avenue East
Post Office Box 19276
Springfield, Illinois 62794-9276

SPECIAL CONDITION 7. The provisions of 40 CFR Section 122.41(m) & (n) are incorporated herein by reference.

SPECIAL CONDITION 8. Samples taken in compliance with the effluent monitoring requirements shall be taken at a point representative of the discharge, but prior to entry into the receiving stream.

SPECIAL CONDITION 9. This Permit may be modified to include requirements for the Permittee on a continuing basis to evaluate and detail its efforts to effectively control sources of infiltration and inflow into the sewer system and to submit reports to the IEPA if necessary.

SPECIAL CONDITION 10. For Discharge No. 001, any use of chlorine to control slime growths, odors or as an operational control, etc. shall not exceed the limit of 0.05 mg/L (daily maximum) total residual chlorine in the effluent. Sampling is required on a daily grab basis during the chlorination process. Reporting shall be submitted on the DMR's on a monthly basis.

SPECIAL CONDITION 11. Fecal Coliform limits for Discharge Number 001 are effective May thru October. Sampling of Fecal Coliform is only required during this time period.

SPECIAL CONDITION 12. The Permittee shall conduct semi-annual monitoring of the effluent and report concentrations (in mg/l) of the following listed parameters. Monitoring shall begin three (3) months from the effective date of this permit. The sample shall be a 24-hour effluent composite except as otherwise specifically provided below and the results shall be submitted on Discharge Monitoring Report Forms to IEPA unless otherwise specified by the IEPA. The parameters to be sampled and the minimum reporting limits to be attained are as follows:

STORET CODE	PARAMETER	Minimum reporting limit
01002	Arsenic	0.05 mg/L
01007	Barium	0.5 mg/L
01027	Cadmium	0.001 mg/L

Special Conditions

STORET CODE	PARAMETER	Minimum reporting limit
01032	Chromium (hexavalent) (grab)	0.01 mg/L
01034	Chromium (total)	0.05 mg/L
01042	Copper	0.005 mg/L
00718	Cyanide (grab)(available *** or amenable to chlorination)	5.0 ug/L
00720	Cyanide (total) (grab not to exceed 24 hours)	5.0 ug/L
00951	Fluoride	0.1 mg/L
01045	Iron (total)	0.5 mg/L
01046	Iron (Dissolved)	0.5 mg/L
01051	Lead	0.05 mg/L
01055	Manganese	0.5 mg/L
71900	Mercury (grab)**	1.0 ng/L*
01067	Nickel	0.005 mg/L
00556	Oil (hexane soluble or equivalent) (Grab Sample only)	5.0 mg/L
32730	Phenols (grab)	0.005 mg/L
01147	Selenium	0.005 mg/L
01077	Silver (total)	0.003 mg/L
01092	Zinc	0.025 mg/L

Minimum reporting limits are defined as – (1) The minimum value below which data are documented as non-detects. (2) Three to ten times the method detection limit. (3) The minimum value of the calibration range.

All sample containers, preservatives, holding time, analyses, method detection limit determinations and quality assurance/quality control requirements shall be in accordance with 40 CFR 136.

Unless otherwise indicated, concentrations refer to the total amount of the constituent present in all phases, whether solid, suspended or dissolved, elemental or combined, including all oxidation states.

*1.0 ng/L = 1 part per trillion.
**Utilize USEPA Method 1631E and the digestion procedure described in Section 11.1.1.2 of 1631E.
***USEPA Method OIA-1677.

The Permittee shall provide a report briefly describing the permittee's pretreatment activities and an updated listing of the Permittee's significant industrial users. The list should specify which categorical pretreatment standards, if any, are applicable to each Industrial User. Permittees who operate multiple plants may provide a single report. Such report shall be submitted within six (6) months of the effective date of this Permit to the following addresses:

U.S. Environmental Protection Agency
Region 5
77 West Jackson Blvd.
Chicago, Illinois 60604
Attention: Water Enforcement and Compliance Assurance Branch

Illinois Environmental Protection Agency
Division of Water Pollution Control
Attention: Compliance Assurance Section, Mail Code #19
1021 North Grand Avenue East
Post Office Box 19276
Springfield, Illinois 62794-9276

SPECIAL CONDITION 13. During January of each year the Permittee shall submit annual fiscal data regarding sewerage system operations to the Illinois Environmental Protection Agency/Division of Water Pollution Control/Compliance Assurance Section. The Permittee may use any fiscal year period provided the period ends within twelve (12) months of the submission date.

Submission shall be on forms provided by IEPA titled "Fiscal Report Form For NPDES Permittees".

SPECIAL CONDITION 14. The Permittee shall conduct biomonitoring of the effluent from Discharge Number(s) 001.

Biomonitoring

A. Acute Toxicity - Standard definitive acute toxicity tests shall be run on at least two trophic levels of aquatic species (fish, invertebrate) representative of the aquatic community of the receiving stream. Testing must be consistent with Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (Fifth Ed.) EPA/821-R-02-012. Unless substitute tests are pre-approved; the following tests are required:

    1. Fish - 96 hour static LC_{50} Bioassay using fathead minnows (Pimephales promelas).

Special Conditions

2. Invertebrate 48-hour static LC_{50} Bioassay using Ceriodaphnia.

B. Testing Frequency - The above tests shall be conducted using 24-hour composite samples unless otherwise authorized by the IEPA. Samples must be collected in the 18th, 15th, 12th, and 9th month prior to the expiration date of this Permit.

C. Reporting - Results shall be reported according to EPA/821-R-02-012, Section 12, Report Preparation, and shall be submitted to IEPA, Bureau of Water, Compliance Assurance Section within one week of receipt from the laboratory. Reports are due to the IEPA no later than the 16th, 13th, 10th, and 7th month prior to the expiration date of this Permit.

D. Toxicity - Should a bioassay result in toxicity to >20% of organisms test in the 100% effluent treatment, the IEPA may require, upon notification, six (6) additional rounds of monthly testing on the affected organism(s) to be initiated within 30 days of the toxic bioassay. Results shall be submitted to IEPA within (1) week of becoming available to the Permittee. Should any of the additional bioassays result in toxicity to ≥50% of organisms tested in the 100% effluent treatments, the Permittee shall immediately notify IEPA in writing of the test results.

E. Toxicity Reduction Evaluation and Identification - Should the biomonitoring program identify toxicity and result in notification by IEPA, the Permittee shall develop a plan for toxicity reduction evaluation and identification. The plan shall be developed and implemented in accordance with Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants, EPA/833B-99/002, and shall include an evaluation to determine which chemicals have a potential for being discharged in the plant wastewater, a monitoring program to determine their presence or absence and to identify other compounds which are not being removed by treatment, and other measures as appropriate. The Permittee shall submit to the IEPA its plan within ninety (90) days following notification by the IEPA. The Permittee shall implement the plan within ninety (90) days of notification of the permittee above or other such date as is received by letter from IEPA.

The IEPA may modify this Permit during its term to incorporate additional requirements or limitations based on the results of the biomonitoring. In addition, after review of the monitoring results and toxicity reduction evaluation, the IEPA may modify this Permit to include numerical limitations for specific toxic pollutants and additional whole effluent toxicity monitoring to confirm the results of the evaluation. Modifications under this condition shall follow public notice and opportunity for hearing.

SPECIAL CONDITION 15. For the duration of this Permit, the Permittee shall determine the quantity of sludge produced by the treatment facility in dry tons or gallons with average percent total solids analysis. The Permittee shall maintain adequate records of the quantities of sludge produced and have said records available for IEPA inspection. The Permittee shall submit to the IEPA, at a minimum, a semi-annual summary report of the quantities of sludge generated and disposed of, in units of dry tons or gallons (average total percent solids) by different disposal methods including but not limited to application on farmland, application on reclamation land, landfilling, public distribution, dedicated land disposal, sod farms, storage lagoons or any other specified disposal method. Said reports shall be submitted to the IEPA by January 31 and July 31 of each year reporting the preceding January thru June and July thru December interval of sludge disposal operations.

Duty to Mitigate. The Permittee shall take all reasonable steps to minimize any sludge use or disposal in violation of this Permit.

Sludge monitoring must be conducted according to test procedures approved under 40 CFR 136 unless otherwise specified in 40 CFR 503, unless other test procedures have been specified in this Permit.

Planned Changes. The Permittee shall give notice to the IEPA on the semi-annual report of any changes in sludge use and disposal.

The Permittee shall retain records of all sludge monitoring, and reports required by the Sludge Permit as referenced in Standard Condition 23 for a period of at least five (5) years from the date of this Permit.

If the Permittee monitors any pollutant more frequently than required by the Sludge Permit, the results of this monitoring shall be included in the reporting of data submitted to the IEPA.

The Permittee shall comply with existing federal regulations governing sewage sludge use or disposal and shall comply with all existing applicable regulations in any jurisdiction in which sewage sludge is actually used or disposed.

The Permittee shall comply with standards for sewage sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish the standards for sewage sludge use or disposal even if the permit has not been modified to incorporate the requirement.

The Permittee shall ensure that the applicable requirements in 40 CFR Part 503 are met when the sewage sludge is applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator.

Monitoring reports for sludge shall be reported on the form titled "Sludge Management Reports" to the following address:

Illinois Environmental Protection Agency
Bureau of Water
Compliance Assurance Section
Mail Code #19
1021 North Grand Avenue East
Post Office Box 19276
Springfield, Illinois 62794-9276

SPECIAL CONDITION 16. The Permittee shall, within eighteen (18) months of the effective date of this permit, prepare and submit to the Agency a feasibility study that identifies the method, timeframe, and costs of reducing phosphorus levels in its discharge to a level consistently meeting a potential future effluent limit of 0.5 mg/L and 0.1 mg/L. The study shall evaluate the construction and O & M costs of the application of these limits on a monthly, seasonal and annual average basis.

SPECIAL CONDITION 17. This Permit may be modified to include alternative or additional final effluent limitations pursuant to an approved Total Maximum Daily Load (TMDL) study or upon completion of an alternate water quality study.

SPECIAL CONDITION 18. A phosphorus limit of 1.0 mg/L (Monthly Average) shall become effective three and one-half (3 1/2) years from the effective date of this Permit.

In order for the Permittee to achieve the above limit, it will be necessary to modify existing treatment facilities to include phosphorus removal, reduce phosphorus sources or explore other ways to prevent discharges that exceed the limit. The Permittee must implement the following compliance measures consistent with the schedule below:

A.	Interim Report on Phosphorus Removal Feasibility Report	6 months from the effective date of this Permit
B.	Interim Report on Phosphorus Removal Feasibility Report	12 months from the effective date of this Permit
C.	Phosphorus Removal Feasibility Report Submitted	18 Months from the effective date of this Permit
D.	Plans and specifications submitted	24 months from the effective date of this Permit
E.	Progress Report on Construction	30 months from the effective date of this Permit
F.	Progress Report on Construction	36 months from the effective date of this Permit
G.	Achieve Monthly Concentration and Loading Effluent Limitations for Total Phosphorus	42 months from the effective date of this Permit

Compliance dates may be modified based on the results of the Phosphorus Removal Feasibility Report required by Special Condition 16 of this Permit. All modifications of this Permit must be in accordance with 40 CFR 122.62 or 40 CFR 122.63.

Reporting shall be submitted on the DMR's on a monthly basis.

REPORTING

The Permittee shall submit progress reports for items A, B, C, D, E, F, and G of the compliance schedule indicating: a) the date the item was completed, or b) that the item was not completed, the reasons for non-completion and the anticipated completion date to the Agency Compliance Section.

SPECIAL CONDITION 19. The Permittee shall develop and submit to the Agency a Phosphorus Discharge Optimization Plan within eighteen (18) months of the effective date of this permit. The plan shall include a schedule for the implementation of these optimization measures. Annual progress reports on the optimization of the existing treatment facilities shall be submitted to the Agency by March 31 of each year. In developing the plan, the Permittee shall evaluate a range of measures for reducing phosphorus discharges from the treatment plant, including possible source reduction measures, operational improvements, and minor facility modifications that will optimize reductions in phosphorus discharges from the wastewater treatment facility. The Permittee's evaluation shall include, but not be limited to, an evaluation of the following optimization measures:

A. WWTF influent reduction measures.

1. Evaluate the phosphorus reduction potential of users.
2. Determine which sources have the greatest opportunity for reducing phosphorus (i.e., industrial, commercial, institutional, municipal and others).
   a. Determine whether known sources (i.e., restaurant and food preparation) can adopt phosphorus minimization and water conservation plans.
   b. Evaluate and implement local limits on influent sources of excessive phosphorus.

B. WWTF effluent reduction measures.

1. Reduce phosphorus discharges by optimizing existing treatment processes.
   a. Adjust the solids retention time for nitrification, denitrification, or biological phosphorus removal.
   b. Adjust aeration rates to reduce dissolved oxygen and promote simultaneous nitrification-denitrification.
   c. Add baffles to existing units to improve microorganism conditions by creating divided anaerobic, anoxic, and aerobic zones.
   d. Change aeration settings in plug flow basins by turning off air or mixers at the inlet side of the basin system.
   e. Minimize impact on recycle streams by improving aeration within holding tanks.
   f. Reconfigure flow through existing basins to enhance biological nutrient removal.
   g. Increase volatile fatty acids for biological phosphorus removal.

SPECIAL CONDITION 20. The Permittee shall work towards the goals of achieving no discharges from sanitary sewer overflows or basement back-ups and ensuring that overflows or back-ups, when they do occur do not cause or contribute to violations of applicable standards or cause impairment in any adjacent receiving water. Overflows from sanitary sewers are expressly prohibited by Ill. Adm. Code 306.304. In order to accomplish these goals, the Permittee shall develop, implement and submit to the IEPA a Capacity, Management, Operations, and Maintenance (CMOM) plan which includes an Asset Management strategy within eighteen (18) months of the effective date of this Permit or review and revise any existing plan accordingly. The permittee shall modify the Plan to incorporate any comments that it receives from IEPA and shall implement the modified plan as soon as possible. The Permittee should work as appropriate, in consultation with affected authorities at the local, county, and/or state level to develop the plan components involving third party notification of overflow events. The Permittee may be required to construct additional sewage transport and/or treatment facilities in future permits or other enforceable documents should the implemented CMOM plan indicate that the Permittee's facilities are not capable of conveying and treating the flow for which they were designed.

The CMOM plan shall include the following elements:

A. Measures and Activities:

1. A complete map and system inventory for the collection system owned and operated by the Permittee;
2. Organizational structure; budgeting; training of personnel; legal authorities; schedules for maintenance, sewer system cleaning, and preventative rehabilitation; checklists, and mechanisms to ensure that preventative maintenance is performed on equipment owned and operated by the Permittee;
3. Documentation of unplanned maintenance;
4. An assessment of the capacity of the collection and treatment system owned and operated by the Permittee at critical junctions and immediately upstream of locations where overflows and back-ups occur or are likely to occur; use flow monitoring as necessary;
5. Identification and prioritization of structural deficiencies in the system owned and operated by the Permittee;
6. Scheduled inspections and testing;
7. The Permittee shall develop and implement an Asset Management strategy to ensure the long-term sustainability of the collection system. Asset management shall be used to assist the Permittee in making decisions on when it is most appropriate to repair, replace or rehabilitate particular assets and develop long-term funding strategies; and
8. Asset management shall include but is not limited to the following elements:
   a. Asset Inventory and State of the Asset;
   b. Level of Service;
   c. Critical Asset Identification;
   d. Life Cycle Cost; and
   e. Long-Term Funding Strategy.

Special Conditions

B. Design and Performance Provisions:

1. Monitor the effectiveness of CMOM;
2. Upgrade the elements of the CMOM plan as necessary; and
3. Maintain a summary of CMOM activities.

C. Overflow Response Plan:

1. Know where overflows and back-ups within the facilities owned and operated by the Permittee occur;
2. Respond to each overflow or back-up to determine additional actions such as clean up; and
3. Locations where basement back-ups and/or sanitary sewer overflows occur shall be evaluated as soon as practicable for excessive inflow /infiltration, obstructions or other causes of overflows or back-ups as set forth in the System Evaluation Plan.

D. System Evaluation Plan:

1. Summary of existing SSO and Excessive I/I areas in the system and sources of contribution;
2. Evaluate plans to reduce I/I and eliminate SSOs;
3. Special provisions for Pump Stations and force mains and other unique system components; and
4. Construction plans and schedules for correction.

E. Reporting and Monitoring Requirements:

1. Program for SSO detection and reporting; and
2. Program for tracking and reporting basement back-ups, including general public complaints.

F. Third Party Notice Plan:

1. Describes how, under various overflow scenarios, the public, as well as other entities, would be notified of overflows within the Permittee's system that may endanger public health, safety or welfare;
2. Identifies overflows within the Permittee's system that would be reported, giving consideration to various types of events including events with potential widespread impacts;
3. Identifies who shall receive the notification;
4. Identifies the specific information that would be reported including actions that will be taken to respond to the overflow;
5. Includes a description of the lines of communication; and
6. Includes the identities and contact information of responsible POTW officials and local, county, and/or state level officials.

For additional information concerning USEPA CMOM guidance and Asset Management please refer to the following web site addresses.
http://www.epa.gov/npdes/pubs/cmom_guide_for_collection_systems.pdf and
http://water.epa.gov/type/watersheds/wastewater/upload/guide_smallsystems_assetmanagement_bestpractices.pdf

Attachment H

Standard Conditions

Definitions

Act means the Illinois Environmental Protection Act, 415 ILCS 5 as Amended.

Agency means the Illinois Environmental Protection Agency.

Board means the Illinois Pollution Control Board.

Clean Water Act (formerly referred to as the Federal Water Pollution Control Act) means Pub. L 92-500, as amended. 33 U.S.C. 1251 et seq.

NPDES (National Pollutant Discharge Elimination System) means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318 and 405 of the Clean Water Act.

USEPA means the United States Environmental Protection Agency.

Daily Discharge means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

Maximum Daily Discharge Limitation (daily maximum) means the highest allowable daily discharge.

Average Monthly Discharge Limitation (30 day average) means the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

Average Weekly Discharge Limitation (7 day average) means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Aliquot means a sample of specified volume used to make up a total composite sample.

Grab Sample means an individual sample of at least 100 milliliters collected at a randomly-selected time over a period not exceeding 15 minutes.

24-Hour Composite Sample means a combination of at least 8 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over a 24-hour period.

8-Hour Composite Sample means a combination of at least 3 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over an 8-hour period.

Flow Proportional Composite Sample means a combination of sample aliquots of at least 100 milliliters collected at periodic intervals such that either the time interval between each aliquot or the volume of each aliquot is proportional to either the stream flow at the time of sampling or the total stream flow since the collection of the previous aliquot.

(1) **Duty to comply.** The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or for denial of a permit renewal application. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirements.

(2) **Duty to reapply.** If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. If the permittee submits a proper application as required by the Agency no later than 180 days prior to the expiration date, this permit shall continue in full force and effect until the final Agency decision on the application has been made.

(3) **Need to halt or reduce activity not a defense.** It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

(4) **Duty to mitigate.** The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

(5) **Proper operation and maintenance.** The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up, or auxiliary facilities, or similar systems only when necessary to achieve compliance with the conditions of the permit.

(6) **Permit actions.** This permit may be modified, revoked and reissued, or terminated for cause by the Agency pursuant to 40 CFR 122.62 and 40 CFR 122.63. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

(7) **Property rights.** This permit does not convey any property rights of any sort, or any exclusive privilege.

(8) **Duty to provide information.** The permittee shall furnish to the Agency within a reasonable time, any information which the Agency may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with the permit. The permittee shall also furnish to the Agency upon request, copies of records required to be kept by this permit.

(9) **Inspection and entry**. The permittee shall allow an authorized representative of the Agency or USEPA (including an authorized contractor acting as a representative of the Agency or USEPA), upon the presentation of credentials and other documents as may be required by law, to:
- (a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
- (b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
- (c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
- (d) Sample or monitor at reasonable times, for the purpose of assuring permit compliance, or as otherwise authorized by the Act, any substances or parameters at any location.

(10) **Monitoring and records.**
- (a) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
- (b) The permittee shall retain records of all monitoring information, including all calibration and maintenance records, and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of this permit, measurement, report or application. Records related to the permittee's sewage sludge use and disposal activities shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503). This period may be extended by request of the Agency or USEPA at any time.
- (c) Records of monitoring information shall include:
  - (1) The date, exact place, and time of sampling or measurements;
  - (2) The individual(s) who performed the sampling or measurements;
  - (3) The date(s) analyses were performed;
  - (4) The individual(s) who performed the analyses;
  - (5) The analytical techniques or methods used; and
  - (6) The results of such analyses.
- (d) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit. Where no test procedure under 40 CFR Part 136 has been approved, the permittee must submit to the Agency a test method for approval. The permittee shall calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals to ensure accuracy of measurements.

(11) **Signatory requirement**. All applications, reports or information submitted to the Agency shall be signed and certified.
- (a) **Application**. All permit applications shall be signed as follows:
  - (1) For a corporation: by a principal executive officer of at least the level of vice president or a person or position having overall responsibility for environmental matters for the corporation:
  - (2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or
  - (3) For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.
- (b) **Reports**. All reports required by permits, or other information requested by the Agency shall be signed by a person described in paragraph (a) or by a duly authorized representative of that person. A person is a duly authorized representative only if:
  - (1) The authorization is made in writing by a person described in paragraph (a); and
  - (2) The authorization specifies either an individual or a position responsible for the overall operation of the facility, from which the discharge originates, such as a plant manager, superintendent or person of equivalent responsibility; and
  - (3) The written authorization is submitted to the Agency.
- (c) **Changes of Authorization**. If an authorization under (b) is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of (b) must be submitted to the Agency prior to or together with any reports, information, or applications to be signed by an authorized representative.
- (d) **Certification**. Any person signing a document under paragraph (a) or (b) of this section shall make the following certification:

  I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

(12) **Reporting requirements.**
- (a) **Planned changes**. The permittee shall give notice to the Agency as soon as possible of any planned physical alterations or additions to the permitted facility.
  Notice is required when:
  - (1) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source pursuant to 40 CFR 122.29 (b); or
  - (2) The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements pursuant to 40 CFR 122.42 (a)(1).
  - (3) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.
- (b) **Anticipated noncompliance**. The permittee shall give advance notice to the Agency of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- (c) **Transfers**. This permit is not transferable to any person except after notice to the Agency.
- (d) **Compliance schedules**. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.
- (e) **Monitoring reports**. Monitoring results shall be reported at the intervals specified elsewhere in this permit.
  - (1) Monitoring results must be reported on a Discharge Monitoring Report (DMR).

(2) If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40 CFR 136 or as specified in the permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.

(3) Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Agency in the permit.

(f) **Twenty-four hour reporting**. The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24-hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and time; and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. The following shall be included as information which must be reported within 24-hours:

(1) Any unanticipated bypass which exceeds any effluent limitation in the permit.

(2) Any upset which exceeds any effluent limitation in the permit.

(3) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Agency in the permit or any pollutant which may endanger health or the environment.

The Agency may waive the written report on a case-by-case basis if the oral report has been received within 24-hours.

(g) **Other noncompliance**. The permittee shall report all instances of noncompliance not reported under paragraphs (12) (d), (e), or (f), at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph (12) (f).

(h) **Other information**. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to the Agency, it shall promptly submit such facts or information.

(13) **Bypass.**

(a) Definitions.

(1) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

(2) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

(b) Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs (13)(c) and (13)(d).

(c) Notice.

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.

(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in paragraph (12)(f) (24-hour notice).

(d) Prohibition of bypass.

(1) Bypass is prohibited, and the Agency may take enforcement action against a permittee for bypass, unless:

(i) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(ii) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(iii) The permittee submitted notices as required under paragraph (13)(c).

(2) The Agency may approve an anticipated bypass, after considering its adverse effects, if the Agency determines that it will meet the three conditions listed above in paragraph (13)(d)(1).

(14) **Upset.**

(a) Definition. Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

(b) Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph (14)(c) are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

(c) Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the cause(s) of the upset;

(2) The permitted facility was at the time being properly operated; and

(3) The permittee submitted notice of the upset as required in paragraph (12)(f)(2) (24-hour notice).

(4) The permittee complied with any remedial measures required under paragraph (4).

(d) Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

(15) **Transfer of permits.** Permits may be transferred by modification or automatic transfer as described below:

(a) Transfers by modification. Except as provided in paragraph (b), a permit may be transferred by the permittee to a new owner or operator only if the permit has been modified or revoked and reissued pursuant to 40 CFR 122.62 (b) (2), or a minor modification made pursuant to 40 CFR 122.63 (d), to identify the new permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

(b) Automatic transfers. As an alternative to transfers under paragraph (a), any NPDES permit may be automatically transferred to a new permittee if:

(1) The current permittee notifies the Agency at least 30 days in advance of the proposed transfer date;

(2) The notice includes a written agreement between the existing and new permittees containing a specified date for transfer of permit responsibility, coverage and liability between the existing and new permittees; and

(3) The Agency does not notify the existing permittee and the proposed new permittee of its intent to modify or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement.

(16) All manufacturing, commercial, mining, and silvicultural dischargers must notify the Agency as soon as they know or have reason to believe:

(a) That any activity has occurred or will occur which would result in the discharge of any toxic pollutant identified under Section 307 of the Clean Water Act which is not limited in the permit, if that discharge will exceed the highest of the following notification levels:

(1) One hundred micrograms per liter (100 ug/l);

(2) Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6 dinitrophenol; and one milligram per liter (1 mg/l) for antimony.

(3) Five (5) times the maximum concentration value reported for that pollutant in the NPDES permit application; or

(4) The level established by the Agency in this permit.

(b) That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the NPDES permit application.

(17) All Publicly Owned Treatment Works (POTWs) must provide adequate notice to the Agency of the following:

(a) Any new introduction of pollutants into that POTW from an indirect discharge which would be subject to Sections 301 or 306 of the Clean Water Act if it were directly discharging those pollutants; and

(b) Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

(c) For purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

(18) If the permit is issued to a publicly owned or publicly regulated treatment works, the permittee shall require any industrial user of such treatment works to comply with federal requirements concerning:

(a) User charges pursuant to Section 204 (b) of the Clean Water Act, and applicable regulations appearing in 40 CFR 35;

(b) Toxic pollutant effluent standards and pretreatment standards pursuant to Section 307 of the Clean Water Act; and

(c) Inspection, monitoring and entry pursuant to Section 308 of the Clean Water Act.

(Rev. 7-9-2010 bah)

(19) If an applicable standard or limitation is promulgated under Section 301(b)(2)(C) and (D), 304(b)(2), or 307(a)(2) and that effluent standard or limitation is more stringent than any effluent limitation in the permit, or controls a pollutant not limited in the permit, the permit shall be promptly modified or revoked, and reissued to conform to that effluent standard or limitation.

(20) Any authorization to construct issued to the permittee pursuant to 35 Ill. Adm. Code 309.154 is hereby incorporated by reference as a condition of this permit.

(21) The permittee shall not make any false statement, representation or certification in any application, record, report, plan or other document submitted to the Agency or the USEPA, or required to be maintained under this permit.

(22) The Clean Water Act provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Clean Water Act is subject to a civil penalty not to exceed $25,000 per day of such violation. Any person who willfully or negligently violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318 or 405 of the Clean Water Act is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than one year, or both.
Additional penalties for violating these sections of the Clean Water Act are identified in 40 CFR 122.41 (a)(2) and (3).

(23) The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

(24) The Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

(25) Collected screening, slurries, sludges, and other solids shall be disposed of in such a manner as to prevent entry of those wastes (or runoff from the wastes) into waters of the State. The proper authorization for such disposal shall be obtained from the Agency and is incorporated as part hereof by reference.

(26) In case of conflict between these standard conditions and any other condition(s) included in this permit, the other condition(s) shall govern.

(27) The permittee shall comply with, in addition to the requirements of the permit, all applicable provisions of 35 Ill. Adm. Code, Subtitle C, Subtitle D, Subtitle E, and all applicable orders of the Board or any court with jurisdiction.

(28) The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit is held invalid, the remaining provisions of this permit shall continue in full force and effect.

Appendix B

West WWTF NPDES Permit

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 North Grand Avenue East, P.O. Box 19276, Springfield, Illinois 62794-9276 • (217) 782-2829
James R. Thompson Center, 100 West Randolph, Suite 11-300, Chicago, IL 60601 • (312) 814-6026

PAT QUINN, GOVERNOR DOUGLAS P. SCOTT, DIRECTOR

217/782-0610

July 9, 2010

Village of Huntley
10987 Main Street
Huntley, Illinois 60142

Re: Village of Huntley
Huntley West WWTP
NPDES Permit No. IL0070688
Final Permit

Gentlemen:

Attached is the final NPDES Permit for your discharge. The Permit as issued covers discharge limitations, monitoring, and reporting requirements. Failure to meet any portion of the Permit could result in civil and/or criminal penalties. The Illinois Environmental Protection Agency is ready and willing to assist you in interpreting any of the conditions of the Permit as they relate specifically to your discharge.

The Agency has completed our review of your comments on the draft NPDES Permit and have the following comments:

1. Effluent limits for the 1.6 MGD facility have been removed from the Permit, since the 2.6 MGD facility is operational.

2. The compliance schedule for dissolved oxygen (Special Condition 19) has been removed from the permit, since the facility has completed installation of an aeration system to ensure compliance.

3. Barium limits have been included in the Permit for both the Phase 3 and Phase 4 expansions. 35 IAC Section 304.103 indicates that users are not required to clean up contamination caused essentially by upstream sources. Background refers to substances present in the receiving stream, not substances present in the effluent. In Huntley's case, the South Branch Kishwaukee does not contain barium and therefore, they are not removing stream water with barium from the South Branch Kishwaukee River. The Agency became aware of the barium levels while conducting the Water Quality Based Effluent Limitation analysis for the renewal of the Permit. There is a reasonable potential for untreated effluent to exceed the effluent standard at 35 IAC Section 304.124 for barium. Since treatment must be applied for this standard to be met, the prescribed effluent standard must be included as a permit limit. Special Condition 19 has been replaced with a 3 year compliance schedule for the existing facility to come into

compliance with the barium effluent limits. The sample frequency for the Phase 3 expansion has also been reduced to 1 day/week.

Please note that we have revised the Permit to include monitoring for Total Nitrogen for the Phase 3 and Phase 4 expansions (see Pages 2 and 3 of the Permit). Special Condition 20 has also been added to the Permit based on comments received during the Public Comment period.

The Agency has begun a program allowing the submittal of electronic Discharge Monitoring Reports (eDMRs) instead of paper Discharge Monitoring Reports (DMRs). If you are interested in eDMRs, more information can be found on the Agency website, http://epa.state.il.us/water/edmr/index.html. If your facility is not registered in the eDMR program, a supply of preprinted paper DMR Forms for your facility will be sent to you prior to the initiation of DMR reporting under the reissued permit. Additional information and instructions will accompany the preprinted DMRs upon their arrival.

The attached Permit is effective as of the date indicated on the first page of the Permit. Until the effective date of any re-issued Permit, the limitations and conditions of the previously-issued Permit remain in full effect. You have the right to appeal any condition of the Permit to the Illinois Pollution Control Board within a 35 day period following the issuance date.

Should you have questions concerning the Permit, please contact Amy Dragovich at the telephone number indicated above.

Sincerely,

Alan Keller, P.E.
Manager, Permit Section
Division of Water Pollution Control

SAK:ALD:DGN:07053001.bah

Attachment: Final Permit

cc: Records
Compliance Assurance Section
Des Plaines Region
Baxter & Woodman, Inc.
CMAP
Billing

NPDES Permit No. IL0070688

Illinois Environmental Protection Agency

Division of Water Pollution Control

1021 North Grand Avenue East

Post Office Box 19276

Springfield, Illinois 62794-9276

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

Reissued (NPDES) Permit

Expiration Date: July 31, 2015

Issue Date: July 9, 2010
Effective Date: August 1, 2010

Name and Address of Discharger:
Village of Huntley
10987 Main Street
Huntley, Illinois 60142

Name and Address of Facility:
Huntley West WWTP
12601 West Main Street
Huntley, Illinois
(McHenry County)

Receiving Waters: South Branch Kishwaukee River (East)

In compliance with the provisions of the Illinois Environmental Protection Act, Title 35 of the Ill. Adm. Code, Subtitle C, Chapter I, and the Clean Water Act (CWA), the above-named Permittee is hereby authorized to discharge at the above location to the above-named receiving stream in accordance with the standard conditions and attachments herein.

Permittee is not authorized to discharge after the above expiration date. In order to receive authorization beyond the expiration date, the Permittee shall submit the proper authorization as required by the Illinois Environmental Protection Agency (IEPA) not later than 180 days prior to the expiration date.

Alan Keller

Alan Keller, P.E.
Manager, Permit Section
Division of Water Pollution Control

SAK:DGN:07053001.bah

NPDES Permit No. IL0070688

Effluent Limitations, Monitoring, and Reporting

FINAL

Discharge Number(s) and Name(s): 001 STP Outfall

Load Limits computed based on a design average flow (DAF) of 2.6 MGD [1](design maximum flow (DMF) of 6.5 MGD).

Excess flow facilities (if applicable) shall not be utilized until the main treatment facility is receiving its maximum practical flow.

From the effective date of this Permit until the operational date of the Phase 4 expansion, the effluent of the above discharge(s) shall be monitored and limited at all times as follows:

	LOAD LIMITS lbs/day* DAF (DMF)			CONCENTRATION LIMITS mg/L				
Parameter	Monthly Avg.	Weekly Avg.	Daily Maximum	Monthly Avg.	Weekly Avg.	Daily Maximum	Sample Frequency	Sample Type
Flow (MGD)							Continuous	
$CBOD_5$**	217 (542)		434 (1084)	10		20	3 days/week	Composite
Suspended Solids	260 (651)		520 (1301)	12		24	3 days/week	Composite
Dissolved Oxygen	Shall not be less than 6 mg/L						3 days/week	Grab
pH	Shall be in the range of 6 to 9 Standard Units						3 days/week	Grab
Fecal Coliform***	Daily Maximum shall not exceed 400 per 100 mL (May through October)						3 days/week	Grab
Ammonia Nitrogen as (N)								
March	33 (81)	98 (244)	111 (276)	1.5	4.5	5.1	3 days/week	Composite
April-May/Sept.-Oct.	26 (65)	98 (244)	111 (276)	1.2	4.5	5.1	3 days/week	Composite
June-August	26 (65)	76 (190)	111 (276)	1.2	3.5	5.1	3 days/week	Composite
Nov.-Feb.	33 (81)	----	111 (276)	1.5	----	5.1	3 days/week	Composite
Phosphorus	22 (54)			1.0			3 days/week	Composite
Barium****	43(108)		87(217)	2.0		4.0	1 day/week	Composite
Total Nitrogen	Monitor Only						3 days/week	Composite

*Load limits based on design maximum flow shall apply only when flow exceeds design average flow.
**Carbonaceous BOD_5 $(CBOD)_5$ testing shall be in accordance with 40 CFR 136.
***See Special Condition 8.
****See Special Condition 19.

Flow shall be reported on the Discharge Monitoring Report (DMR) as monthly average and daily maximum.

Fecal Coliform shall be reported on the DMR as daily maximum.

pH shall be reported on the DMR as a minimum and a maximum.

Dissolved oxygen shall be reported on DMR as minimum.

[1]See Special Condition 16.

NPDES Permit No. IL0070688

Effluent Limitations, Monitoring, and Reporting

FINAL

Discharge Number(s) and Name(s): 001 STP Outfall

Load Limits computed based on a design average flow (DAF) of 4.9 MGD [1](design maximum flow (DMF) of 11.0 MGD).

Excess flow facilities (if applicable) shall not be utilized until the main treatment facility is receiving its maximum practical flow.

From the operational date of the Phase 4 expansion until the expiration date, the effluent of the above discharge(s) shall be monitored and limited at all times as follows:

	LOAD LIMITS lbs/day* DAF (DMF)			CONCENTRATION LIMITS mg/L				
Parameter	Monthly Avg.	Weekly Avg.	Daily Maximum	Monthly Avg.	Weekly Avg.	Daily Maximum	Sample Frequency	Sample Type
Flow (MGD)							Continuous	
$CBOD_5$**	409 (917)		817 (1835)	10		20	3 days/week	Composite
Suspended Solids	490 (1101)		981 (2202)	12		24	3 days/week	Composite
Dissolved Oxygen	Shall not be less than 6 mg/L						3 days/week	Grab
pH	Shall be in the range of 6 to 9 Standard Units						3 days/week	Grab
Fecal Coliform***	Daily Maximum shall not exceed 400 per 100 mL (May through October)						3 days/week	Grab
Ammonia Nitrogen as (N)								
March	61 (138)	184 (413)	208 (468)	1.5	4.5	5.1	3 days/week	Composite
April-May/Sept.-Oct.	49 (110)	184 (413)	208 (468)	1.2	4.5	5.1	3 days/week	Composite
June-August	49 (110)	143 (321)	208 (468)	1.2	3.5	5.1	3 days/week	Composite
Nov.-Feb.	61 (138)	----	208 (468)	1.5	----	5.1	3 days/week	Composite
Phosphorus	41 (92)			1.0			3 days/week	Composite
Copper****	1.3 (2.9)		2.2 (5.0)	0.032		0.054	3 days/week	Composite
Silver			0.20 (0.46)			0.005	3 days/week	Composite
Barium	82 (183)		163 (367)	2.0		4.0	3 days/week	Composite
Total Nitrogen*****	Monitor Only						3 days/week	Composite

*Load limits based on design maximum flow shall apply only when flow exceeds design average flow.
**Carbonaceous BOD_5 $(CBOD)_5$ testing shall be in accordance with 40 CFR 136.
***See Special Condition 8.
****See Special Condition 15.
*****See Special Condition 20.

Flow shall be reported on the Discharge Monitoring Report (DMR) as monthly average and daily maximum.

Fecal Coliform shall be reported on the DMR as daily maximum.

pH shall be reported on the DMR as a minimum and a maximum.

Dissolved oxygen shall be reported on DMR as minimum.

[1]See Special Condition 16.

NPDES Permit No. IL0070688

Effluent Limitations, Monitoring, and Reporting

FINAL

The influent to the plant shall be monitored as follows:

Parameter	Sample Frequency	Sample Type
Flow (MGD)	Continuous	IRT*
BOD_5	3 days/week	Composite
Suspended Solids	3 days/week	Composite

Influent samples shall be taken at a point representative of the influent.

Flow (MGD) shall be reported on the Discharge Monitoring Report (DMR) as monthly average and daily maximum.

BOD_5 and Suspended Solids shall be reported on the DMR as a monthly average concentration.

*Indicating, Recording, Totalizing.

Special Conditions

SPECIAL CONDITION 1. This Permit may be modified to include different final effluent limitations or requirements, which are consistent with applicable laws, regulations, or judicial orders. The IEPA will public notice the permit modification.

SPECIAL CONDITION 2. The use or operation of this facility shall be by or under the supervision of a Certified Class 1 operator.

SPECIAL CONDITION 3. The IEPA may request in writing submittal of operational information in a specified form and at a required frequency at any time during the effective period of the Permit.

SPECIAL CONDITION 4. The IEPA may request more frequent monitoring by permit modification pursuant to 40 CFR § 122.63 and Without Public Notice in the event of operational, maintenance or other problems resulting in possible effluent deterioration.

SPECIAL CONDITION 5. The effluent, alone or in combination with other sources, shall not cause a violation of any applicable water quality standard outlined in 35 Ill. Adm. Code 302.

SPECIAL CONDITION 6. Samples taken in compliance with the effluent monitoring requirements shall be taken at a point representative of the discharge, but prior to entry into the receiving stream.

SPECIAL CONDITION 7. For Discharge No. 001 any use of chlorine to control slime growths odors or as an operational control, etc. shall not exceed the limit of 0.05 mg/l (daily maximum) total residual chlorine in the effluent. Sampling is required on a daily grab basis during the chlorination process. Reporting shall be submitted on the DMR's on a monthly basis.

SPECIAL CONDITION 8. Fecal Coliform limits for Discharge Number 001 are effective May thru October. Sampling of Fecal Coliform is only required during this time period.

SPECIAL CONDITION 9. The permittee shall conduct semi-annual monitoring of the effluent and report concentrations (in mg/l) of the following listed parameters. Monitoring shall begin three (3) months from the effective date of this permit. The sample shall be a 24-hour effluent composite except as otherwise specifically provided below and the results shall be submitted on Discharge Monitoring Report Forms to IEPA unless otherwise specified by the IEPA. The parameters to be sampled and the minimum detection limits to be attained are as follows:

November 1, 2010

Storet Code	Parameter	Minimum Detection Limit
01002	Arsenic	0.05 mg/l
01007	Barium	0.5 mg/
01027	Cadmium	0.001 mg/l
01032	Chromium (hexavalent) (grab)	0.01 mg/l
01034	Chromium (total)	0.05 mg/l
01042	Copper	0.005 mg/l
00718	Cyanide (grab) (weak acid dissociable)	5.0 ug/l
00720	Cyanide (grab not to exceed 24 hours) (total)	5.0 ug/l
00951	Fluoride	0.1 mg/l
01045	Iron (total)	0.5 mg/l
01046	Iron (Dissolved)	0.5 mg/l
01051	Lead	0.05 mg/l
01055	Manganese	0.5 mg/
71900	Mercury (grab)**	1.0 ng/l*
01067	Nickel	0.005 mg/l
00550	Oil (hexane soluble or equivalent) (grab sample only)	5.0 mg/l
32730	Phenols (grab)	0.005 mg/l
01147	Selenium	0.005 mg/l
01077	Silver (total)	0.003 mg/l
01092	Zinc	0.025 mg/l

Unless otherwise indicated, concentrations refer to the total amount of the constituent present in all phases, whether solid, suspended or dissolved, elemental or combined, including all oxidation states.

*1.0 ng/l = 1 part per trillion.
**Utilize USEPA Method 1631E and the digestion procedure described in Section 11.1.1.2 of 1631E.

Special Conditions

SPECIAL CONDITION 10. During January of each year the Permittee shall submit annual fiscal data regarding sewerage system operations to the Illinois Environmental Protection Agency/Division of Water Pollution Control/Compliance Assurance Section. The Permittee may use any fiscal year period provided the period ends within twelve (12) months of the submission date:.

Submission shall be on forms provided by IEPA titled "Fiscal Report Form For NPDES Permittees"

SPECIAL CONDITION 11. The Permittee shall conduct biomonitoring of the effluent from Discharge Number(s) 001

Biomonitoring

1. Acute Toxicity - Standard definitive acute toxicity tests shall be run on at least two trophic levels of aquatic species (fish, invertebrate) representative of the aquatic community of the receiving stream. Testing must be consistent with Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (Fifth Ed.) EPA/821-R-02-012. Unless substitute tests are pre-approved; the following tests are required:

   a. Fish - 96 hour static LC_{50} Bioassay using fathead minnows (Pimephales promelas).

   B. Invertebrate 48-hour static LC_{50} Bioassay using Ceriodaphnia.

2. Testing Frequency - The above tests shall be conducted using 24-hour composite samples unless otherwise authorized by the IEPA. Samples must be collected in the 18th, 15th, 12th, and 9th month prior to the expiration date of this Permit.

3. Reporting - Results shall be reported according to EPA/821-R-02-012, Section 12, Report Preparation, and shall be submitted to IEPA, Bureau of Water, Compliance Assurance Section within one week of receipt from the laboratory. Reports are due to the IEPA no later than the 16th, 13th, 10th, and 7th month prior to the expiration date of this Permit.

4. Toxicity Reduction Evaluation - Should the results of the biomonitoring program identify toxicity, the IEPA may require that the Permittee prepare a plan for toxicity reduction evaluation and identification. This plan shall be developed in accordance with Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants, EPA/833B-99/002, and shall include an evaluation to determine which chemicals have a potential for being discharged in the plant wastewater, a monitoring program to determine their presence or absence and to identify other compounds which are not being removed by treatment, and other measures as appropriate. The Permittee shall submit to the IEPA its plan for toxicity reduction evaluation within ninety (90) days following notification by the IEPA. The Permittee shall implement the plan within ninety (90) days or other such date as contained in a notification letter received from the IEPA.

   The IEPA may modify this Permit during its term to incorporate additional requirements or limitations based on the results of the biomonitoring. In addition, after review of the monitoring results, the IEPA may modify this Permit to include numerical limitations for specific toxic pollutants. Modifications under this condition shall follow public notice and opportunity for hearing.

SPECIAL CONDITION 12. For the duration of this Permit, the Permittee shall determine the quantity of sludge produced by the treatment facility in dry tons or gallons with average percent total solids analysis. The Permittee shall maintain adequate records of the quantities of sludge produced and have said records available for Agency inspection. The permittee shall submit to the IEPA, at a minimum, a semi-annual summary report of the quantities of sludge generated and disposed of, in units of dry tons or gallons (average total percent solids) by different disposal methods including but not limited to application on farmland, application on reclamation land, landfilling, public distribution, dedicated land disposal, sod farms, storage lagoons or any other specified disposal method. Said reports shall be submitted to the IEPA by January 31 and July 31 of each year reporting the preceding January thru June and July thru December interval of sludge disposal operations.

Duty to Mitigate. The Permittee shall take all reasonable steps to minimize any sludge use or disposal in violation of this Permit.

Sludge monitoring must be conducted according to test procedures approved under 40 CFR 136 unless otherwise specified in 40 CFR 503, unless other test procedures have been specified in this Permit.

Planned Changes. The Permittee shall give notice to the IEPA on the semi-annual report of any changes in sludge use and disposal.

The Permittee shall retain records of all sludge monitoring, and reports required by the Sludge Permit as referenced in Standard Condition 23 for a period of at least five (5) years from the date of this Permit.

If the Permittee monitors any pollutant more frequently than required by the Sludge Permit, the results of this monitoring shall be included in the reporting of data submitted to the IEPA.

Special Conditions

Monitoring reports for sludge shall be reported on the form titled "Sludge Management Reports" to the following address:

Illinois Environmental Protection Agency
Division of Water Pollution Control
Compliance Assurance Section
Mail Code #19
1021 N. Grand Ave. E.
Post Office Box 19276
Springfield, Illinois 62794-9276

SPECIAL CONDITION 13. The Permittee shall record monitoring results on Discharge Monitoring Report (DMR) Forms using one such form for each outfall each month.

In the event that an outfall does not discharge during a monthly reporting period, the DMR Form shall be submitted with no discharge indicated.

The Permittee may choose to submit electronic DMRs (eDMRs) instead of mailing paper DMRs to the IEPA. More information, including registration information for the eDMR program, can be obtained on the IEPA website, http://www.epa.state.il.us/water/edmr/index.html.

The completed Discharge Monitoring Report forms shall be submitted to IEPA no later than the 25th day of the following month, unless otherwise specified by the permitting authority.

Permittees not using eDMRs shall mail Discharge Monitoring Reports with an original signature to the IEPA at the following address:

Illinois Environmental Protection Agency
Division of Water Pollution Control
1021 N. Grand Ave. E.
Post Office Box 19276
Springfield, Illinois 62794-9276

Attention: Compliance Assurance Section, Mail Code #19

SPECIAL CONDITION 14. The permittees shall notify the Agency in writing once each treatment plant expansion has been completed. A letter stating the date that the expansion was completed should be sent to the following address:

Illinois Environmental Protection Agency
Division of Water Pollution Control
1021 North Grand Avenue East
Post Office Box 19276
Springfield, Illinois 62794-9276

Attention: Compliance Assurance Section

SPECIAL CONDITION 15. The Permittee may collect data in support of developing a site-specific metals translator for copper. Total and dissolved metals for a minimum of twelve weekly samples need to be collected from the effluent and at a downstream location indicative of complete mixing between the effluent and the receiving water to determine a metal translator for these parameters. The IEPA will review submitted sample data and may reopen and modify this Permit to eliminate or include revised effluent limitations for these parameters based on the metal translator determined from the collected data.

SPECIAL CONDITION 16. The Permittee shall land apply 34% of the total flow that would have otherwise been discharged through Outfall 001 during the period of the months of April through October. In November of each year, the Permittee shall report the quantities discharged during the months of April through October and the amount diverted on the Discharge Monitoring Reports in accordance with Special Condition 13. The permittee shall obtain a state operating permit for the land application of wastewater effluent and shall be subject to the applicable requirements of 35 Illinois Administrative Code part 372 and said permit issued by this Agency.

Special Conditions

SPECIAL CONDITION 17. The Permittee shall conduct biosurveys in the receiving stream that repeat the investigations contained in a study report entitled Biological Assessment of South Branch Kishwaukee River (East) McHenry County, Illinois. November 2005. Huff & Huff, Inc. Added to the mussel and macroinvertebrate sampling will be fish surveys conducted at each of the sampling stations utilized in the above study using methods identical to those explained in another study report entitled Biological Assessment of the South Branch Kishwaukee River. July 2002. Huff & Huff, Inc. Water quality data consisting of temperature, pH, dissolved oxygen, conductivity, BOD_5, total phosphorus and ammonia nitrogen must be collected on each day that biological sampling occurs. Two such studies are required. The first study must take place during the first complete July through October period following completion of the 2.6 MGD plant. The second study must take place during the first complete July through October period following the completion of the 4.9 MGD plant. Reports for each biosurvey must be submitted to the Agency by the end of the calendar year in which they were conducted.

SPECIAL CONDITION 18.

Schedule for Implementing the POTW Pretreatment Program

Under the authority of Sections 307(b) and 402(b)(8) of the Clean Water Act, and implementing regulations 40 CFR 403, the Permittee may be required to develop a Pretreatment Program. If it is necessary to develop a Pretreatment Program, the Permittee will be notified in writing by the Approval Authority after submittal of the industrial inventory discussed in the schedule below. This program, if required, shall enable the Permittee to detect and enforce against violations of Pretreatment Standards promulgated under Sections 307(b) and 307(c) of the Clean Water Act, prohibitive discharge standards as set forth in 40 CFR § 403.5, and state and local limits.

The Permittee should submit a copy of each activity to the IEPA and to USEPA, Region 5.

The schedule for the development of this Pretreatment Program is as follows:

ITEM	COMPLETION DATE
1. Develop an industrial user inventory pursuant to 40 CFR § 403.8(f)(2)(i-iii), including identification of industrial users and the character and volume of pollutants contributed to the publicly owned treatment works (POTW) by the industrial users. The inventory shall include a list of all industrial users (Ius) discharging to the Permittee that are subject to categorical pretreatment standards under 40 CFR § 403.6 and 40 CFR Chapter I, Subchapter N, or would otherwise be considered significant under 40 CFR § 403.3(t).	9 months from the effective date of this Permit
2. Submit a proposed Pretreatment Program consistent with 40 CFR §§ 403.8 and 403.9(f). The proposed Pretreatment Program shall contain the following elements: a. A statement from an official representative of the Permittee or their legal counsel regarding the adequacy of the Permittee's legal authority; b. A sewer use ordinance or other authorities to be relied upon by the POTW for administration of the Pretreatment Program; c. An Enforcement Response Plan (with monitoring and inspection program procedures); d. Local limitations developed pursuant to 40 CFR 403.5(c) and USEPA guidance; e. A description of the Permittee's organization which will administer the Pretreatment Program; and f. A description of funding and resources available to implement the Pretreatment Program.	24 months from the date of notification by the Approval Authority that development of a Pretreatment Program is necessary

Special Conditions

Upon approval by the Regional Administrator or the Director, when appropriate, of the Pretreatment Program, this Permit will be modified or, alternatively, upon request, revoked and reissued to incorporate the conditions of that Pretreatment Program.

This Permit may be modified to eliminate the requirement to develop a Pretreatment Program should further developments during the preparation of the program warrant its discontinuance.

All items in the schedule shall be sent to IEPA and USEPA at the following addresses:

Illinois Environmental Protection Agency
Division of Water Pollution Control
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Attention: Compliance Assurance Section

United States Environmental Protection Agency
Region 5
NPDES Support and Technical Assistance Branch
77 West Jackson Boulevard
Chicago, Illinois 60604-3950

Attention: Pretreatment Coordinator WN-16J

Removal Allowances

Any application for authority to revise categorical pretreatment standards to reflect POTW removal of pollutants must be submitted to the Approval Authority in accordance with 40 CFR § 403.7(c).

SPECIAL CONDITION 19. A barium limit of 2.0 mg/L (Monthly Average) and 4.0 mg/L (Daily Maximum) shall become effective three (3) years from the effective date of this Permit.

In order for the Permittee to achieve the above limit, it will be necessary to modify existing treatment facilities to include barium removal, reduce barium sources, or explore other ways to prevent discharges that exceed the above limit in accordance with the following schedule:

1.	Interim Report on barium reductions to date and what measures are necessary to comply with Final Barium Effluent Limitations	6 months from effective date of permit
2.	Preliminary Report on construction of barium reduction facilities	12 months from effective date of permit
3.	Plans and Specifications submitted to IEPA	18 months from effective date of permit
4.	Commence Construction	24 months from effective date of permit
5.	Progress Report	30 months from effective date of permit
6.	Obtain Operational Compliance	36 months from effective date of permit

Compliance dates set out in this Permit may be superseded or supplemented by compliance dates in judicial orders, Illinois Pollution Control Board orders. This Permit may be modified with Public Notice, to include such revised compliance dates.

REPORTING

The Permittee shall submit progress reports for items 1, 2,4, 5 and 6 of the compliance schedule indicating: a) the date the item was completed, or b) that the item was not completed, the reasons for non-completion and the anticipated completion date to the Agency Compliance Section.

SPECIAL CONDITION 20. The Permittee shall operate the facilities designed for biological nutrient removal (BNR). Monitoring for Total Nitrogen is required to document the actual total nitrogen effluent concentration. The Permittee shall monitor the effluent for total nitrogen 3 day per week. The monitoring shall be a composite sample and the results reported as a daily maximum on the Permittee's Discharge Monitoring Forms.

ATTACHMENT H

Standard Conditions

Definitions

Act means the Illinois Environmental Protection Act, Ch. 111 1/2 Ill. Rev. Stat., Sec. 1001-1052 as Amended.

Agency means the Illinois Environmental Protection Agency.

Board means the Illinois Pollution Control Board.

Clean Water Act (formerly referred to as the Federal Water Pollution Control Act) means Pub. L. 92-500, as amended. 33 U.S.C. 1251 et seq.

NPDES (National Pollutant Discharge Elimination System) means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318 and 405 of the Clean Water Act.

USEPA means the United States Environmental Protection Agency.

Daily Discharge means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

Maximum Daily Discharge Limitation (daily maximum) means the highest allowable daily discharge.

Average Monthly Discharge Limitation (30 day average) means the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

Average Weekly Discharge Limitation (7 day average) means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Aliquot means a sample of specified volume used to make up a total composite sample.

Grab Sample means an individual sample of at least 100 milliliters collected at a randomly-selected time over a period not exceeding 15 minutes.

24 Hour Composite Sample means a combination of at least 8 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over a 24-hour period.

8 Hour Composite Sample means a combination of at least 3 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over an 8-hour period.

Flow Proportional Composite Sample means a combination of sample aliquots of at least 100 milliliters collected at periodic intervals such that either the time interval between each aliquot or the volume of each aliquot is proportional to either the stream flow at the time of sampling or the total stream flow since the collection of the previous aliquot.

(1) **Duty to comply.** The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or for denial of a permit renewal application. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

(2) **Duty to reapply.** If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. If the permittee submits a proper application as required by the Agency no later than 180 days prior to the expiration date, this permit shall continue in full force and effect until the final Agency decision on the application has been made.

(3) **Need to halt or reduce activity not a defense.** It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

(4) **Duty to mitigate.** The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

(5) **Proper operation and maintenance.** The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up, or auxiliary facilities, or similar systems only when necessary to achieve compliance with the conditions of the permit.

(6) **Permit actions.** This permit may be modified, revoked and reissued, or terminated for cause by the Agency pursuant to 40 CFR 122.62. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

(7) **Property rights.** This permit does not convey any property rights of any sort, or any exclusive privilege.

(8) **Duty to provide information.** The permittee shall furnish to the Agency within a reasonable time, any information which the Agency may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with the permit. The permittee shall also furnish to the Agency, upon request, copies of records required to be kept by this permit.

(9) **Inspection and entry.** The permittee shall allow an authorized representative of the Agency, upon the presentation of credentials and other documents as may be required by law, to:

- (a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
- (b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
- (c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
- (d) Sample or monitor at reasonable times, for the purpose of assuring permit compliance, or as otherwise authorized by the Act, any substances or parameters at any location.

(10) **Monitoring and records.**

- (a) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
- (b) The permittee shall retain records of all monitoring information, including all calibration and maintenance records, and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of this permit, measurement, report or application. This period may be extended by request of the Agency at any time.
- (c) Records of monitoring information shall include:
  - (1) The date, exact place, and time of sampling or measurements;
  - (2) The individual(s) who performed the sampling or measurements;
  - (3) The date(s) analyses were performed;
  - (4) The individual(s) who performed the analyses;
  - (5) The analytical techniques or methods used; and
  - (6) The results of such analyses.
- (d) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit. Where no test procedure under 40 CFR Part 136 has been approved, the permittee must submit to the Agency a test method for approval. The ~~permittee shall calibrate and perform~~ maintenance procedures on all monitoring and analytical instrumentation at intervals to ensure accuracy of measurements.

(11) **Signatory requirement.** All applications, reports or information submitted to the Agency shall be signed and certified.

- (a) **Application.** All permit applications shall be signed as follows:
  - (1) **For a corporation:** by a principal executive officer of at least the level of vice president or a person or position having overall responsibility for environmental matters for the corporation;
  - (2) **For a partnership or sole proprietorship:** by a general partner or the proprietor, respectively; or
  - (3) **For a municipality, State, Federal, or other public agency:** by either a principal executive officer or ranking elected official.
- (b) **Reports.** All reports required by permits, or other information requested by the Agency shall be signed by a person described in paragraph (a) or by a duly authorized representative of that person. A person is a duly authorized representative only if:
  - (1) The authorization is made in writing by a person described in paragraph (a); and
  - (2) The authorization specifies either an individual or a position responsible for the overall operation of the facility, from which the discharge originates, such as a plant manager, superintendent or person of equivalent responsibility; and
  - (3) The written authorization is submitted to the Agency.

Appendix C

East WWTF Analysis Nutrient Sampling (10/2014-02/2016)

Appendix C: East WWTF Influent Analysis Nutrient Sampling (10/2014-02/2016)

Village of Huntley, Illinois

Sampling Date	Suburban Labs Work Order No.	Influent (mg/L): Dissolved Fractions (as P) mg/L - Suburban Labs				Total Phosphorus (as P) mg/L - Suburban Labs				Analysis of Phosphorus Fractions (as percentages) - EEI					Other Constituents - Suburban Labs (mg/L)					
		Dissolved Organic Phosphorus	Dissolved Ortho-Phosphate	Dissolved Polyphosphate	Dissolved or Soluble Phosphorus	Organic Phosphorus	Ortho-Phosphate	Polyphosphate	Total Phosphorus	% of Dissolved/Total Organic	% of Dissolved/Total Ortho	% of Dissolved/Total Poly	% Difference for Dissolved Org+Ortho +Poly	% Difference for Total Org+Ortho +Poly	Nitrate & Nitrite	TKN	Total N	VFAs	Flocculated-Filtered COD (ffCOD)	Readily Biodegradable COD (rbCOD)
10/15/2014	1410841	0.020	3.200	0.780	4.000	0.000	2.900	1.800	4.11	-	1.10	0.43	0.000	0.14	**0.000**	27.800	27.800	**0.000**	-	-
10/22/2014	1410C73	1.900	2.500	**0.000**	4.400	0.690	2.500	0.820	4.01	2.75	1.00	0.00	0.000	0.00	**0.000**	29.700	29.700	**0.000**	-	-
10/29/2014	1410G11	0.000	5.300	**0.000**	5.300	1.580	5.300	1.300	8.18	0.00	1.00	0.00	0.000	0.00	0.278	74.900	75.178	**0.000**	-	-
11/5/2014	1411245	0.200	3.800	**0.000**	4.000	0.730	3.600	0.910	5.24	0.27	1.06	0.00	0.000	0.00	**0.000**	42.800	42.800	**0.000**	-	-
11/30/2015	1511I93	0.000	2.600	**0.000**	2.600	0.590	2.500	1.400	4.49	0.00	1.04	0.00	0.000	0.00	-	-	-	**0.000**	86.000	49.600
12/2/2015	1512161	0.100	1.600	0.200	1.900	0.150	1.700	1.600	3.45	0.67	0.94	0.13	0.000	0.00	-	-	-	-	-	-
12/4/2015	1512475	0.218	2.000	0.082	2.300	1.940	2.000	1.200	5.14	0.11	1.00	0.07	0.000	0.00	-	-	-	-	-	-
12/7/2015	1512557	1.200	2.200	**0.000**	3.400	1.520	2.300	0.810	4.63	0.79	0.96	0.00	0.000	0.00	-	-	-	**0.000**	100.000	80.000
12/9/2015	1512720	0.080	2.700	0.420	3.200	0.000	2.600	1.800	4.05	-	1.04	0.23	0.000	0.09	-	-	-	-	-	-
12/10/2015	1512848	0.000	4.000	1.300	4.300	0.830	2.200	1.500	4.53	0.00	1.82	0.87	0.233	0.00	-	-	-	-	-	-
12/14/2015	1512A49	0.000	2.100	0.640	2.300	0.900	2.000	1.600	4.50	0.00	1.05	0.40	0.191	0.00	-	-	-	**0.000**	95.000	60.900
12/18/2015	1512E75	0.280	2.100	0.420	2.800	0.210	2.100	1.300	3.61	1.33	1.00	0.32	0.000	0.00	-	-	-	-	-	-
12/21/2015	1512F51	0.770	2.200	0.730	3.700	0.860	2.200	1.400	4.46	0.90	1.00	0.52	0.000	0.00	-	-	-	**0.000**	110.000	83.000
12/22/2015	1512G28	0.270	1.200	0.430	1.900	0.880	1.500	1.200	3.58	0.31	0.80	0.36	0.000	0.00	-	-	-	-	-	-
12/23/2015	1512G79	0.080	1.800	0.420	2.300	2.230	1.700	5.500	9.43	0.04	1.06	0.08	0.000	0.00	-	-	-	-	-	-
12/28/2015	1512H40	0.050	1.700	0.250	2.000	0.480	1.600	0.890	2.97	0.10	1.06	0.28	0.000	0.00	-	-	-	**0.000**	67.000	37.600
1/4/2015	1601022	0.250	1.900	0.450	2.600	0.940	1.900	1.700	4.54	0.27	1.00	0.26	0.000	0.00	-	-	-	**0.000**	95.000	65.600
1/11/2015	1601485	0.260	1.700	0.740	2.700	1.880	1.900	**0.000**	3.78	0.14	0.89	-	0.000	0.00	-	-	-	**0.000**	86.000	59.000
1/20/2016	1601B31	0.200	3.900	1.000	5.100	1.390	3.800	2.200	7.49	0.14	1.03	0.45	0.000	-0.01	-	-	-	**0.000**	88.000	56.300
1/25/2016	1601D30	0.510	2.500	0.390	3.400	0.850	2.400	1.600	4.85	0.60	1.04	0.24	0.000	0.00	-	-	-	**0.000**	120.000	90.600
2/1/2016	1602032	0.000	2.700	1.100	3.800	1.250	2.800	2.700	6.75	0.00	0.96	0.41	0.000	0.00	-	-	-	**0.000**	140.000	103.600
Average		0.30	2.56	0.45	3.24	0.95	2.45	1.58	4.94						0.070	43.800	43.870	0.000	98.700	68.620
Maximum		1.90	5.30	1.30	5.30	2.23	5.30	5.50	9.43						0.278	74.900	75.178	0.000	140.000	103.600
Minimum		0.00	1.20	0.000	1.90	0.00	1.50	0.000	2.97						0.000	27.800	27.800	0.000	67.000	37.600

Notes:

Bolded values were measured as 'non-detect'

Sampling found phosphorus fractions that were mathematically impossible. For this reason, the body of the report lists the 'corrected' phosphorus samples and this appendix shows the raw data.

Appendix C: East WWTF Effluent Analysis Nutrient Sampling (10/2014-02/2016)

Village of Huntley, Illinois

Sampling Date	Suburban Labs Work Order No.	Effluent (mg/L)																
		Dissolved Fractions (as P) mg/L - Suburban Labs				Total Phosphorus (as P) mg/L - Suburban Labs				Analysis of Phosphorus Fractions (as percentages) - EEI					Other Constituents - Suburban Labs (mg/L)			
		Dissolved Organic Phosphorus	Dissolved Ortho-Phosphate	Dissolved Polyphosphate	Dissolved or Soluble Phosphorus	Organic Phosphorus	Ortho-Phosphate	Polyphosphate	Total Phosphorus	% of Dissolved/Total Organic	% of Dissolved/Total Ortho	% of Dissolved/Total Poly	% Difference for Dissolved Org+Ortho +Poly	% Difference for Total Org+Ortho +Poly	Nitrate & Nitrite	TKN	Total N	Soluble COD
10/15/2014	1410841	0.000	1.600	0.340	1.700	0.000	1.400	0.490	1.390	-	1.143	0.694	0.141	0.360	18.000	1.370	19.370	-
10/29/2014	1410G11	0.470	1.400	**0.000**	2.100	0.000	1.400	0.490	1.820	-	1.000	0.000	-0.110	0.038	19.100	2.330	21.430	-
11/5/2014	1411245	0.000	1.500	0.510	1.700	0.000	1.600	0.330	1.840	-	0.938	1.545	0.182	0.049	19.600	2.230	21.830	-
11/30/2015	1511I93	0.000	1.000	**0.000**	0.920	0.000	0.980	0.140	0.976	-	1.020	0.000	0.087	0.148	-	-	-	36.400
12/4/2015	1512475	0.000	0.200	0.860	1.000	0.090	0.200	0.940	1.230	0.000	1.000	0.915	0.060	0.000	-	-	-	-
12/7/2015	1512557	0.350	0.750	0.100	1.200	0.180	1.100	**0.000**	1.280	1.944	0.682	-	0.000	0.000	-	-	-	20.000
12/9/2015	1512720	0.000	1.300	0.280	1.300	0.140	1.300	0.250	1.690	0.000	1.000	1.120	0.215	0.000	-	-	-	-
12/10/2015	1512848	0.000	1.400	0.130	1.500	0.000	1.300	0.250	1.470	-	1.077	0.520	0.020	0.054	-	-	-	-
12/14/2015	1512A49	0.000	1.600	0.230	1.800	0.000	1.600	0.210	1.740	-	1.000	1.095	0.017	0.040	-	-	-	34.100
12/18/2015	1512E75	0.000	1.300	**0.000**	1.100	0.000	1.300	**0.000**	1.200	-	1.000	-	0.182	0.083	-	-	-	-
12/21/2015	1512F51	0.100	1.300	0.100	1.500	0.060	1.300	0.250	1.610	1.667	1.000	0.400	0.000	0.000	-	-	-	27.000
12/22/2015	1512G28	0.000	1.500	**0.000**	1.400	0.000	1.300	0.230	1.500	-	1.154	0.000	0.071	0.020	-	-	-	-
12/23/2015	1512G79	0.000	1.200	0.110	1.300	0.020	1.200	0.220	1.440	0.000	1.000	0.500	0.008	0.000	-	-	-	-
12/28/2015	1512H40	0.120	0.980	**0.000**	1.100	0.200	0.980	**0.000**	1.180	0.600	1.000	-	0.000	0.000	-	-	-	29.400
1/4/2015	1601022	0.020	0.900	**0.000**	0.920	0.000	0.900	0.160	1.060	-	1.000	0.000	0.000	0.000	-	-	-	29.400
1/11/2015	1601485	0.000	1.000	0.280	1.200	0.290	1.100	0.350	1.740	0.000	0.909	0.800	0.067	0.000	-	-	-	27.000
1/20/2016	1601B31	0.140	0.960	0.100	1.200	0.090	0.970	0.280	1.330	1.556	0.990	0.357	0.000	0.008	-	-	-	31.700
1/25/2016	1601D30	0.000	1.300	**0.000**	1.200	0.050	1.300	0.200	1.550	0.000	1.000	0.000	0.083	0.000	-	-	-	29.400
2/1/2016	1602032	0.100	1.700	**0.000**	1.800	0.040	1.400	0.190	1.630	2.500	1.214	0.000	0.000	0.000	-	-	-	36.400
Average		0.07	1.20	0.16	1.37	0.06	1.19	0.26	1.46						18.900	1.977	20.877	30.080
Maximum		0.47	1.70	0.86	2.10	0.29	1.60	0.94	1.84						19.600	2.330	21.830	36.400
Minimum		0.00	0.20	0.00	0.92	0.00	0.20	0.00	0.98						18.000	1.370	19.370	20.000

Notes:

Bolded values were measured as 'non-detect'

Sampling found phosphorus fractions that were mathematically impossible. For this reason, the body of the report lists the 'corrected' phosphorus samples and this appendix shows the raw data.

Appendix D

West WWTF Analysis Nutrient Sampling (10/2014-02/2016)

Appendix D: West WWTF Influent Analysis Nutrient Sampling (10/2014-02/2016)

Village of Huntley, Illinois

Sampling Date	Suburban Labs Work Order No.	Influent (mg/L)																			
		Dissolved Fractions (as P) mg/L - Suburban Labs				Total Phosphorus (as P) mg/L - Suburban Labs				Analysis of Phosphorus Fractions (as percentages) - EEI					Other Constituents - Suburban Labs (mg/L)						
		Dissolved Organic Phosphorus	Dissolved Ortho-Phosphate	Dissolved Polyphosphate	Dissolved or Soluble Phosphorus	Organic Phosphorus	Ortho-Phosphate	Polyphosphate	Total Phosphorus	% of Dissolved/Total Organic	% of Dissolved/ Total Ortho	% of Dissolved/ Total Poly	% Difference for Dissolved Org+Ortho +Poly	% Difference for Total Org+Ortho +Poly	Nitrate & Nitrite	TKN	Total N	VFAs	Flocculated-Filtered COD (ffCOD)	Readily Biodegradable COD (rbCOD)
10/15/2014	1410843	0.760	2.800	**0.000**	3.800	0.560	3.000	0.650	4.21	1.36	0.93	0.00	-0.063	0.00	0.577	32.400	32.977	**0.000**	-	-
10/22/2014	1410C72	1.540	3.200	**0.000**	4.900	1.810	3.100	1.100	6.01	0.85	1.03	0.00	-0.033	0.00	**0.000**	43.400	43.400	69.000	-	-
10/29/2014	1410G12	0.600	6.400	**0.000**	7.000	4.520	6.300	0.880	11.70	0.13	1.02	0.00	0.000	0.00	0.416	63.700	64.116	**0.000**	-	-
11/5/2014	1411356	0.000	3.500	1.200	3.300	2.290	3.600	0.570	6.46	0.00	0.97	2.11	0.424	0.00	0.226	48.900	49.126	**0.000**	-	-
11/30/2015	1511I95	0.000	2.600	**0.000**	2.600	1.430	2.600	1.900	5.93	0.00	1.00	0.00	0.000	0.00	-	-	-	**0.000**	130.000	95.900
12/4/2015	1512474	0.623	3.000	0.077	3.700	2.710	3.000	0.770	6.48	0.23	1.00	0.10	0.000	0.00	-	-	-	-	-	-
12/7/2015	1512554	0.320	2.800	0.980	4.100	3.140	2.900	0.660	6.70	0.10	0.97	1.48	0.000	0.00	-	-	-	**0.000**	160.000	130.600
12/9/2015	1512721	0.780	3.200	0.320	4.300	2.320	3.300	2.100	7.72	0.34	0.97	0.15	0.000	0.00	-	-	-	-	-	-
12/14/2015	1512A51	0.430	4.000	0.970	5.400	1.170	4.000	2.400	7.57	0.37	1.00	0.40	0.000	0.00	-	-	-	96.000	190.000	153.600
12/16/2015	1512D18	0.110	4.000	0.790	4.900	1.020	4.200	1.100	6.32	0.11	0.95	0.72	0.000	0.00	-	-	-	-	-	-
12/28/2015	1512H39	0.600	2.500	**0.000**	3.100	1.330	2.500	0.960	4.79	0.45	1.00	0.00	0.000	0.00	-	-	-	**0.000**	110.000	83.000
1/4/2016	1601023	0.250	2.400	0.350	3.000	1.440	2.400	1.300	5.14	0.17	1.00	0.27	0.000	0.00	-	-	-	**0.000**	140.000	103.600
1/11/2016	1601486	0.140	2.100	0.760	3.000	1.480	2.200	0.970	4.65	0.09	0.95	0.78	0.000	0.00	-	-	-	**0.000**	100.000	70.600
1/20/2016	1601B30	0.640	2.600	0.760	4.000	1.450	2.800	1.700	5.95	0.44	0.93	0.45	0.000	0.00	-	-	-	**0.000**	100.000	63.600
1/25/2016	1601D31	0.000	2.200	0.630	2.800	0.970	2.200	1.200	4.37	0.00	1.00	0.53	0.011	0.00	-	-	-	**0.000**	95.000	53.900
2/1/2016	1602031	0.200	3.100	1.100	4.400	0.920	2.800	3.300	7.02	0.22	1.11	0.33	0.000	0.00	-	-	-	**0.000**	76.000	27.900
Average		0.44	3.15	0.50	4.02	1.79	3.18	1.35	6.31						0.305	47.100	47.405	12.692	122.333	86.967
Maximum		1.54	6.40	1.20	7.00	4.52	6.30	3.30	11.70						0.577	63.700	64.116	96.000	190.000	153.600
Minimum		0.00	2.10	0.000	2.60	0.56	2.20	0.57	4.21						0.000	32.400	32.977	0.000	76.000	27.900

Notes:

Bolded values were measured as 'non-detect'

A grab sample from Dean's was collected on 1/6/2016 and anlyzed by PDC Labs. The sample was found to have a total phosphorus content of 28 mg/L (measured as P).

Appendix D: West WWTF Effluent Analysis Nutrient Sampling (10/2014-02/2016)

Village of Huntley, Illinois

Sampling Date	Suburban Labs Work Order No.	Effluent (mg/L)																
		Dissolved Fractions (as P) mg/L - Suburban Labs				Total Phosphorus (as P) mg/L - Suburban Labs				Analysis of Phosphorus Fractions (as percentages) - EEI					Other Constituents - Suburban Labs (mg/L)			
		Dissolved Organic Phosphorus	Dissolved Ortho-Phosphate	Dissolved Polyphosphate	Dissolved or Soluble Phosphorus	Organic Phosphorus	Ortho-Phosphate	Polyphosphate	Total Phosphorus	% of Dissolved/Total Organic	% of Dissolved/ Total Ortho	% of Dissolved/ Total Poly	% Difference for Dissolved Org+Ortho +Poly	% Difference for total Org+Ortho +Poly	Nitrate & Nitrite	TKN	Total N	Soluble COD
10/15/2014	1410843	0.000	0.800	0.083	0.800	0.000	0.810	**0.000**	0.792	-	0.99	-	0.104	0.02	6.160	1.630	7.790	-
10/22/2014	1410C72	0.051	0.099	**0.000**	0.150	0.000	0.110	0.072	0.169	-	0.90	0.00	0.000	0.08	8.330	1.930	10.260	-
10/29/2014	1410G12	0.030	0.110	**0.000**	0.140	0.065	0.140	**0.000**	0.205	0.46	0.79	-	0.000	0.00	6.070	2.580	8.650	-
11/5/2014	1411356	0.028	0.042	**0.000**	0.070	0.019	0.050	**0.000**	0.069	1.47	0.84	-	0.000	0.00	6.120	1.980	8.100	-
11/30/2015	1511I95	0.000	0.500	**0.000**	0.410	0.000	0.500	**0.000**	0.375	-	1.00	-	0.220	0.33	-	-	-	34.100
12/2/2015	1512164	0.090	0.130	**0.000**	0.220	0.114	0.140	0.063	0.317	0.79	0.93	0.00	0.000	0.00	-	-	-	-
12/4/2015	1512474	0.000	0.240	**0.000**	0.097	0.000	0.220	**0.000**	0.173	-	1.09	-	1.474	0.27	-	-	-	-
12/7/2015	1512554	0.026	0.300	0.024	0.350	0.063	0.074	0.052	0.189	0.41	4.05	0.46	-0.069	0.00	-	-	-	29.400
12/9/2015	1512721	0.045	0.085	**0.000**	0.130	0.071	0.072	0.049	0.192	0.63	1.18	0.00	0.000	0.00	-	-	-	-
12/10/2015	1512851	0.054	0.071	0.051	0.180	0.860	1.700	0.000	2.560	0.06	0.04	-	-0.022	0.00	-	-	-	-
12/14/2015	1512A51	0.050	0.120	**0.000**	0.170	0.079	0.130	0.049	0.258	0.63	0.92	0.00	0.000	0.00	-	-	-	36.400
12/16/2015	1512D18	0.047	0.063	**0.000**	0.110	0.050	0.069	0.034	0.153	0.94	0.91	0.00	0.000	0.00	-	-	-	-
12/18/2015	1512E74	0.044	0.050	**0.000**	0.094	0.056	0.058	0.074	0.188	0.79	0.86	0.00	0.000	0.00	-	-	-	-
12/21/2015	1512F49	0.034	0.043	**0.000**	0.077	0.057	0.061	0.051	0.169	0.60	0.70	0.00	0.000	0.00	-	-	-	31.700
12/22/2015	1512G27	0.033	0.052	**0.000**	0.085	0.045	0.052	0.054	0.151	0.73	1.00	0.00	0.000	0.00	-	-	-	-
12/23/2015	1512G78	0.001	0.028	0.037	0.066	0.059	0.033	0.071	0.163	0.02	0.85	0.52	0.000	0.00	-	-	-	-
12/28/2015	1512H39	0.041	0.049	0.200	0.290	0.000	0.240	**0.000**	0.159	-	0.20	-	0.000	0.51	-	-	-	27.000
1/4/2016	1601023	0.020	**0.000**	0.039	0.059	0.054	0.039	0.063	0.156	0.37	0.00	0.62	0.000	0.00	-	-	-	36.400
1/11/2016	1601486	0.058	**0.000**	**0.000**	0.058	0.067	**0.000**	0.061	0.128	0.87	-	0.00	0.000	0.00	-	-	-	29.400
1/20/2016	1601B30	0.030	0.260	**0.000**	0.290	0.089	**0.000**	0.055	1.440	0.34	-	0.00	0.000	-0.90	-	-	-	36.400
2/1/2016	1602031	0.000	**0.000**	0.078	0.042	0.025	**0.000**	0.078	0.103	0.00	-	1.00	0.857	0.00	-	-	-	48.100
Average		0.03	0.14	0.02	0.19	0.08	0.21	0.04	0.39						6.670	2.030	8.700	34.322
Maximum		0.09	0.80	0.20	0.80	0.86	1.70	0.08	2.56						8.330	2.580	10.260	48.100
Minimum		0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.07						6.070	1.630	7.790	27.000

Notes:

Bolded values were measured as 'non-detect'

Appendix E

East WWTF SRT Tracking Sheets (01/2016-09/2016)

East WWTF Monthly Wastewater SRT Tracking Program - 01/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,257.0	
CLARIFIER NO. 2 =	3,318.5	x
CLARIFIER NO. 3 =	3,318.5	x
CLARIFIER NO. 4 =	3,318.5	x
CLARIFIER NO. 5 =	3,318.5	x
TOTAL (ALL CLARIFIERS) =	14,531.0	
TOTAL (ONLINE-IN USE) =	**13,274.0**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
WEST OX DITCH - ENVIREX 2-RING ORBAL =	538,597.5	x
NORTHWEST OX DITCH - ENVIREX 2-RING ORBAL =	229,652.0	
NE OX DITCH NO. 1 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
NE OX DITCH NO. 2 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	1,821,506.5	
TOTAL VOLUME (LAKESIDE TREATMENT TRAIN) =	1,053,257.0	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,591,854.5**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	330,482.0	x
DIGESTER NO. 2 =	233,183.0	x
TOTAL (ALL DIGESTERS) =	563,665.0	
TOTAL (ONLINE-IN USE) =	**563,665.0**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	W ORBAL OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	W ORBAL OX DITCH TRAIN Solids Inventory (LBS)	LAKESIDE OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	LAKESIDE OX DITCH TRAIN Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
															x	x	x	x						
1			0	1.22		0	0		0		0	0			2.0	2.0	2.0	2.5	0	0		20	0	
2			0	1.05		0	0		0		0	0			3.0	3.0	2.0	2.0	0	0		20	0	
3			0	1.15		0	0		0		0	0			2.0	3.0	3.0	3.0	0	0		20	0	
4	57,476	7,384	3,540	1.09	4	36	3,576	2,586	11,623	4,302	37,812	49,435	7,384		2.0	3.0	4.0	3.0	58,096	107,531	**30.1**	20	5,340	86,714
5			0	0.99		0	0		0		0	0			2.0	1.5	2.5	2.5	0	0		20	0	
6	43,107	10,310	3,707	1.05	5	44	3,751	2,546	11,443	4,296	37,759	49,203	10,310		2.0	2.0	3.0	3.5	63,536	112,739	**30.1**	20	5,593	65,046
7			0	0.98		0	0		0		0	0			1.5	3.0	2.0	2.0	0	0		20	0	
8	28,738	9,206	2,206	1.07	4	36	2,242	2,918	13,115	4,226	37,144	50,259	9,206		2.0	4.0	2.5	3.0	63,994	114,253	**51.0**	20	5,677	73,938
9			0	1.19		0	0		0		0	0			2.0	2.0	2.0	3.0	0	0		20	0	
10			0	1.35		0	0		0		0	0			2.0	2.0	3.0	2.5	0	0		20	0	
11	28,738	8,980	2,152	1.24	3	31	2,183	3,016	13,556	3,826	33,628	47,184	8,980		2.0	2.0	2.0	2.0	42,443	89,627	**41.1**	20	4,450	59,424
12			0	1.07		0	0		0		0	0			2.0	2.5	2.5	2.5	0	0		20	0	
13		8,022	0	1.09	8	73	73	3,160	14,203	4,036	35,474	49,677	8,022		1.5	1.0	2.0	2.0	32,470	82,148		20	4,035	60,309
14	35,923		0	1.06		0	0		0		0	0			1.0	1.0	1.5	1.5	0	0		20	0	
15		7,818	0	1.04	11	95	95	3,520	15,821	4,184	36,775	52,596	7,818		1.0	1.0	1.5	1.5	24,861	77,457		20	3,778	57,937
16			0	1.17		0	0		0		0	0			2.0	1.0	2.0	3.0	0	0		20	0	
17			0	1.06		0	0		0		0	0			2.0	3.0	3.0	3.0	0	0		20	0	
18			0	1.01		0	0		0		0	0			2.0	2.0	2.0	3.0	0	0		20	0	
19	28,738	6,214	1,489	1.02	6	51	1,540	3,546	15,938	4,282	37,636	53,574	6,124		2.0	2.0	2.0	4.0	43,111	96,685	**62.8**	20	4,783	92,296
20		7,314	0	0.91	6	45	45	3,694	16,603	3,932	34,560	51,163	7,314		2.0	2.0	2.0	3.0	41,931	93,095		20	4,609	75,565
21			0	0.95		0	0		0		0	0			2.0	1.5	2.5	2.5	0	0		20	0	
22		7,928	0	0.97	5	40	40	3,456	15,533	4,280	37,619	53,152	7,928		2.5	3.0	2.0	2.5	50,576	103,728		20	5,146	77,827
23			0	0.97		0	0		0		0	0			2.5	3.0	3.0	3.0	0	0		20	0	
24			0	0.98		0	0		0		0	0			2.0	2.5	3.5	3.0	0	0		20	0	
25		7,774	0	1.01	4	34	34	3,422	15,381	4,508	39,623	55,003	7,774		2.0	3.0	3.0	3.5	58,515	113,518		20	5,642	87,025
26	28,738		0	0.96		0	0		0		0	0			3.0	3.0	3.0	2.5	0	0		20	0	
27	43,107	9,736	3,500	0.90	1	7	3,508	3,388	15,228	4,434	38,972	54,200	9,736		2.0	1.0	1.5	2.0	38,158	92,358	**26.3**	20	4,610	56,780
28			0	0.90		0	0		0		0	0			2.0	2.0	2.0	2.0	0	0		20	0	
29	43,107	7,908	2,843	0.90	3	22	2,866	3,494	15,704	4,448	39,095	54,800	7,908		2.0	2.0	2.0	2.0	40,951	95,751	**33.4**	20	4,765	72,249
30			0	0.93		0	0		0		0	0			2.0	2.0	3.0	2.0	0	0		20	0	
31			0	0.92		0	0		0		0	0			2.0	2.5	2.0	2.0	0	0		20	0	

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\SRT Tracking\For Report\[East WWTF SRT.xls]January :

Notes:

User input cells, all other cells are calculated

East WWTF Monthly Wastewater SRT (Digester) Tracking Program - 01/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO TARGET WASTE RATE (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *ACTUAL* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *TARGET* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1														
2														
3														
4	9.8	6.5	13.3	19.9	26.6	33.2	39.8	46.5	8.8	13.2	17.6	22.0	26.4	30.8
5														
6	13.1	8.7	12.7	19.0	25.4	31.7	38.0	44.4	8.4	12.6	16.8	21.0	25.2	29.4
7														
8	19.6	7.6	21.3	32.0	42.6	53.3	63.9	74.6	8.3	12.4	16.6	20.7	24.8	29.0
9														
10														
11	19.6	9.5	21.8	32.8	43.7	54.6	65.5	76.4	10.6	15.8	21.1	26.4	31.7	37.0
12														
13		9.3							11.7	17.5	23.3	29.1	35.0	40.8
14	15.7													
15		9.7							12.4	18.7	24.9	31.1	37.3	43.6
16														
17														
18														
19	19.6	6.1	31.6	47.3	63.1	78.9	94.7	110.5	9.8	14.7	19.7	24.6	29.5	34.4
20		7.5							10.2	15.3	20.4	25.5	30.6	35.7
21														
22		7.2							9.1	13.7	18.3	22.8	27.4	32.0
23														
24														
25		6.5							8.3	12.5	16.7	20.8	25.0	29.2
26	19.6													
27	13.1	9.9	13.4	20.1	26.9	33.6	40.3	47.0	10.2	15.3	20.4	25.5	30.6	35.7
28														
29	13.1	7.8	16.5	24.8	33.1	41.3	49.6	57.9	9.9	14.8	19.7	24.7	29.6	34.5
30														
31														

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East WWTF Monthly Wastewater SRT Tracking Program - 02/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,257.0	
CLARIFIER NO. 2 =	3,318.5	x
CLARIFIER NO. 3 =	3,318.5	x
CLARIFIER NO. 4 =	3,318.5	x
CLARIFIER NO. 5 =	3,318.5	x
TOTAL (ALL CLARIFIERS) =	14,531.0	
TOTAL (ONLINE-IN USE) =	**13,274.0**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
WEST OX DITCH - ENVIREX 2-RING ORBAL =	538,597.5	x
NORTHWEST OX DITCH - ENVIREX 2-RING ORBAL =	229,652.0	
NE OX DITCH NO. 1 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
NE OX DITCH NO. 2 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	1,821,506.5	
TOTAL VOLUME (LAKESIDE TREATMENT TRAIN) =	1,053,257.0	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,591,854.5**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	330,482.0	x
DIGESTER NO. 2 =	233,183.0	x
TOTAL (ALL DIGESTERS) =	563,665.0	
TOTAL (ONLINE-IN USE) =	**563,665.0**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	W ORBAL OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	W ORBAL OX DITCH TRAIN Solids Inventory (LBS)	LAKESIDE OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	LAKESIDE OX DITCH TRAIN Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
															x	x	x	x						
1	43,107	7,460	2,682	1.03	4	34	2,716	3,156	14,185	4,336	38,111	52,296	7,460		2.0	2.0	3.5	3.5	53,756	106,052	**39.0**	20	5,268	84,674
2	35,923	7,460	2,235	0.96	4	32	2,267	3,156	14,185	4,336	38,111	52,296	7,460		2.5	4.0	2.5	4.0	63,530	115,826	**51.1**	20	5,759	92,568
3	35,923	7,443	2,230	1.23	5	51	2,281	3,222	14,482	4,008	35,228	49,710	7,443		2.0	3.0	2.5	4.0	54,556	104,265	**45.7**	20	5,162	83,156
4			0			0	0		0		0	0							0	0		20	0	
5	107,768	4,877	4,383	1.18	4	39	4,423	3,214	14,446	4,212	37,021	51,467	4,877		2.0	3.0	3.0	4.0	45,185	96,652	**21.9**	20	4,793	117,843
6			0			0	0		0		0	0							0	0		20	0	
7			0			0	0		0		0	0							0	0		20	0	
8			0			0	0		0		0	0							0	0		20	0	
9	28,738	6,881	1,649	1.06	5	44	1,693	3,608	16,217	4,208	36,986	53,202			1.5	2.0	2.0	2.0	13,075	66,277	**39.1**	20	3,270	56,979
10	28,738	7,052	1,690	0.91	4	30	1,720	3,618	16,261	4,450	39,113	55,374	7,052		1.5	1.0	2.5	1.0	28,591	83,965	**48.8**	20	4,168	70,869
11	28,738	7,052	1,690	0.86	4	29	1,719	3,618	16,261	4,450	39,113	55,374	7,052		1.0	2.0	2.5	1.0	30,973	86,348	**50.2**	20	4,289	72,918
12	28,738	5,856	1,404	0.85	3	21	1,425	3,354	15,075	4,312	37,900	52,975	5,856		1.0	2.5	2.5	2.0	33,700	86,675	**60.8**	20	4,313	88,302
13			0			0	0		0		0	0							0	0		20	0	
14			0			0	0		0		0	0							0	0		20	0	
15			0			0	0		0		0	0							0	0		20	0	
16	28,738	7,019	1,682	0.93	8	62	1,745	3,362	15,111	4,094	35,984	51,095	7,019		3.0	2.0	1.5	3.0	43,738	94,832	**54.4**	20	4,679	79,937
17	43,107	6,961	2,503	0.82	5	34	2,537	3,092	13,897	4,362	38,339	52,237	6,961		1.0	1.0	1.0	1.0	18,764	71,001	**28.0**	20	3,516	60,559
18	107,768	6,961	6,256	0.78	5	33	6,289	3,092	13,897	4,362	38,339	52,237	6,961		1.5	1.0	1.5	1.0	23,455	75,692	**12.0**	20	3,752	64,629
19	43,107	5,375	1,932	0.90	7	52	1,985	3,116	14,005	4,150	36,476	50,481	5,375		1.5	1.0	1.5	1.0	19,730	70,212	**35.4**	20	3,458	77,145
20			0			0	0		0		0	0							0	0		20	0	
21			0			0	0		0		0	0							0	0		20	0	
22	50,292	6,617	2,775	1.61	3	40	2,816	3,890	17,484	3,918	34,437	51,921	6,617		2.5	2.0	2.5	2.5	41,463	93,384	**33.2**	20	4,629	83,880
23			0			0	0		0		0	0							0	0		20	0	
24	35,923	5,110	1,531	0.88	4	29	1,560	3,918	17,610	4,164	36,599	54,209	5,110		2.0	2.0	3.5	2.0	36,500	90,709	**58.1**	20	4,506	105,730
25	71,845	5,110	3,062	0.91	4	30	3,092	3,918	17,610	4,164	36,599	54,209	5,110		2.0	2.0	2.0	2.0	30,737	84,946	**27.5**	20	4,217	98,949
26	35,923	5,257	1,575	0.79	1	7	1,582	3,512	15,785	3,698	32,503	48,288	5,257		2.5	3.0	3.0	3.0	42,664	90,952	**57.5**	20	4,541	103,575
27			0			0	0		0		0	0							0	0		20	0	
28			0			0	0		0		0	0							0	0		20	0	
29	43,107	2,437	876	0.97	4	32	908	3,532	15,875	4,108	36,107	51,982	2,437		2.0	2.0	2.0	3.0	24,403	76,385	**84.1**	20	3,787	186,322
			0			0	0		0		0	0							0	0		20	0	
			0			0	0		0		0	0							0	0		20	0	

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Notes:

User input cells, all other cells are calculated

East WWTF Monthly Wastewater SRT (Digester) Tracking Program - 02/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO TARGET WASTE RATE (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *ACTUAL* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *TARGET* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1	13.1	6.7	17.5	26.3	35.1	43.8	52.6	61.3	8.9	13.4	17.8	22.3	26.8	31.2
2	15.7	6.1	21.0	31.6	42.1	52.6	63.1	73.6	8.2	12.2	16.3	20.4	24.5	28.6
3	15.7	6.8	21.1	31.6	42.2	52.7	63.2	73.8	9.1	13.7	18.2	22.8	27.3	31.9
4														
5	5.2	4.8	10.7	16.1	21.4	26.8	32.2	37.5	9.8	14.7	19.6	24.5	29.4	34.3
6														
7														
8														
9	19.6	9.9	28.5	42.8	57.0	71.3	85.5	99.8	14.4	21.6	28.8	35.9	43.1	50.3
10	19.6	8.0	27.8	41.7	55.6	69.5	83.4	97.3	11.3	16.9	22.6	28.2	33.8	39.5
11	19.6	7.7	27.8	41.7	55.6	69.5	83.4	97.3	11.0	16.4	21.9	27.4	32.9	38.4
12	19.6	6.4	33.5	50.2	67.0	83.7	100.5	117.2	10.9	16.4	21.8	27.3	32.7	38.2
13														
14														
15														
16	19.6	7.1	27.9	41.9	55.9	69.9	83.8	97.8	10.0	15.1	20.1	25.1	30.1	35.2
17	13.1	9.3	18.8	28.2	37.6	47.0	56.4	65.7	13.4	20.1	26.7	33.4	40.1	46.8
18	5.2	8.7	7.5	11.3	15.0	18.8	22.5	26.3	12.5	18.8	25.1	31.3	37.6	43.9
19	13.1	7.3	24.3	36.5	48.7	60.8	73.0	85.1	13.6	20.4	27.2	34.0	40.8	47.6
20														
21														
22	11.2	6.7	16.9	25.4	33.9	42.3	50.8	59.3	10.2	15.2	20.3	25.4	30.5	35.5
23														
24	15.7	5.3	30.7	46.1	61.4	76.8	92.1	107.5	10.4	15.6	20.9	26.1	31.3	36.5
25	7.8	5.7	15.4	23.0	30.7	38.4	46.1	53.7	11.1	16.7	22.3	27.9	33.4	39.0
26	15.7	5.4	29.8	44.8	59.7	74.6	89.5	104.5	10.4	15.5	20.7	25.9	31.1	36.2
27														
28														
29	13.1	3.0	53.7	80.5	107.3	134.1	161.0	187.8	12.4	18.6	24.8	31.0	37.2	43.4

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East WWTF Monthly Wastewater SRT Tracking Program - 03/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,257.0	
CLARIFIER NO. 2 =	3,318.5	x
CLARIFIER NO. 3 =	3,318.5	x
CLARIFIER NO. 4 =	3,318.5	x
CLARIFIER NO. 5 =	3,318.5	x
TOTAL (ALL CLARIFIERS) =	14,531.0	
TOTAL (ONLINE-IN USE) =	**13,274.0**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
WEST OX DITCH - ENVIREX 2-RING ORBAL =	538,597.5	x
NORTHWEST OX DITCH - ENVIREX 2-RING ORBAL =	229,652.0	
NE OX DITCH NO. 1 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
NE OX DITCH NO. 2 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	1,821,506.5	
TOTAL VOLUME (LAKESIDE TREATMENT TRAIN) =	1,053,257.0	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,591,854.5**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	330,482.0	x
DIGESTER NO. 2 =	233,183.0	x
TOTAL (ALL DIGESTERS) =	563,665.0	
TOTAL (ONLINE-IN USE) =	**563,665.0**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	W ORBAL OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	W ORBAL OX DITCH TRAIN Solids Inventory (LBS)	LAKESIDE OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	LAKESIDE OX DITCH TRAIN Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
															x	x	x	x						
1			0			0	0		0		0	0							0	0		20	0	
2	43,107	7,028	2,527	0.94	3	23	2,550	3,374	15,165	4,344	38,181	53,346	7,028		2.5	3.0	3.5	3.0	56,535	109,881	**43.1**	20	5,471	93,333
3	28,738	7,028	1,684	0.85	3	21	1,706	3,374	15,165	4,344	38,181	53,346	7,028		2.5	2.5	2.5	2.5	47,113	100,459	**58.9**	20	5,002	85,332
4	43,107	3,495	1,256	0.85	2	14	1,271	3,168	14,239	4,016	35,298	49,537	3,495		2.0	3.0	2.5	3.0	32,673	82,210	**64.7**	20	4,096	140,534
5			0			0	0		0		0	0							0	0		20	0	
6			0			0	0		0		0	0							0	0		20	0	
7	107,768	7,102	6,383	0.94	2	16	6,399	3,416	15,354	4,244	37,302	52,656	7,102		1.5	1.0	1.0	2.0	25,853	78,509	**12.3**	20	3,910	66,009
8	107,768	7,102	6,383	0.81	2	14	6,397	3,416	15,354	4,244	37,302	52,656	7,102		1.0	2.0	1.0	2.0	28,203	80,859	**12.6**	20	4,029	68,029
9	86,214	7,212	5,186	0.99	4	33	5,219	3,310	14,877	3,762	33,066	47,943	7,212		0.5	1.5	1.0	1.5	20,459	68,402	**13.1**	20	3,387	56,312
10	71,845	7,212	4,321	0.93	4	31	4,352	3,310	14,877	3,762	33,066	47,943	7,212		1.0	1.0	1.5	1.5	22,732	70,675	**16.2**	20	3,503	58,238
11	50,292	6,951	2,915	0.87	5	36	2,952	3,092	13,897	3,154	27,722	41,619	6,951		1.0	1.0	1.0	1.0	16,745	58,365	**19.8**	20	2,882	49,714
12			0			0	0		0		0	0							0	0		20	0	
13			0			0	0		0		0	0							0	0		20	0	
14	57,476	5,023	2,408	1.08	1	9	2,417	3,304	14,850	3,294	28,952	43,803	5,023		1.0	1.5	1.0	1.5	17,228	61,031	**25.3**	20	3,043	72,628
15			0			0	0		0		0	0							0	0		20	0	
16	43,107	7,269	2,613	1.17	3	29	2,643	3,292	14,796	3,640	31,994	46,790	7,269		1.5	1.5	1.5	1.0	24,857	71,647	**27.1**	20	3,553	58,608
17	43,107	7,269	2,613	1.10	3	28	2,641	3,292	14,796	3,640	31,994	46,790	7,269		1.0	1.0	1.5	1.0	20,337	67,127	**25.4**	20	3,329	54,910
18	43,107	5,265	1,893	1.02	1	9	1,901	3,358	15,093	3,448	30,306	45,399	5,265		1.5	1.0	1.5	1.5	19,853	65,252	**34.3**	20	3,254	74,107
19			0			0	0		0		0	0							0	0		20	0	
20			0			0	0		0		0	0							0	0		20	0	
21	35,923	7,438	2,228	0.98	5	41	2,269	2,684	12,063	3,098	27,230	39,293	7,438		2.0	3.0	3.0	3.0	48,014	87,307	**38.5**	20	4,325	69,715
22	35,923	7,438	2,228	1.02	5	42	2,271	2,684	12,063	3,098	27,230	39,293	7,438		2.0	2.5	3.0	3.0	45,832	85,125	**37.5**	20	4,214	67,930
23	35,923	7,015	2,102	0.97	6	49	2,150	3,404	15,300	3,172	27,880	43,180	7,015		2.0	2.0	3.0	3.0	42,203	85,383	**39.7**	20	4,220	72,138
24	43,107	5,474	1,968	0.91	2	15	1,983	3,200		3,300	29,005	29,005	5,474		2.0	2.5	3.0	3.0	38,167	67,172	**33.9**	20	3,343	73,236
25			0			0	0		0		0	0							0	0		20	0	
26			0			0	0		0		0	0							0	0		20	0	
27			0			0	0		0		0	0							0	0		20	0	
28	35,923	5,708	1,710	1.10	5	46	1,756	3,298	14,823	3,672	32,275	47,098	5,708		1.0	1.5	1.0	1.5	19,430	66,528	**37.9**	20	3,280	68,911
29	35,923	5,708	1,710	1.07	5	44	1,755	3,298	14,823	3,672	32,275	47,098	5,708		1.0	1.5	1.5	1.0	19,430	66,528	**37.9**	20	3,282	68,942
30	35,923	6,706	2,009	0.93	6	46	2,055	3,166	14,230	3,682	32,363	46,593	6,706		1.5	1.0	1.5	1.0	21,518	68,111	**33.1**	20	3,359	60,064
31	50,292	6,706	2,813	1.11	6	56	2,868	3,166	14,230	3,682	32,363	46,593	6,706		1.0	1.5	0.5	1.0	17,214	63,807	**22.2**	20	3,135	56,049

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Notes:

User input cells, all other cells are calculated

East WWTF Monthly Wastewater SRT (Digester) Tracking Program - 03/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO: ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO: TARGET WASTE RATE (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *ACTUAL* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *TARGET* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1														
2	13.1	6.0	18.6	27.9	37.2	46.5	55.8	65.1	8.6	12.9	17.2	21.5	25.8	30.1
3	19.6	6.6	27.9	41.9	55.8	69.8	83.7	97.7	9.4	14.1	18.8	23.5	28.2	32.9
4	13.1	4.0	37.4	56.1	74.8	93.5	112.2	130.9	11.5	17.2	23.0	28.7	34.4	40.2
5														
6														
7	5.2	8.5	7.4	11.0	14.7	18.4	22.1	25.8	12.0	18.0	24.0	30.1	36.1	42.1
8	5.2	8.3	7.4	11.0	14.7	18.4	22.1	25.8	11.7	17.5	23.3	29.2	35.0	40.8
9	6.5	10.0	9.1	13.6	18.1	22.7	27.2	31.7	13.9	20.8	27.8	34.7	41.6	48.6
10	7.8	9.7	10.9	16.3	21.8	27.2	32.6	38.1	13.4	20.1	26.8	33.6	40.3	47.0
11	11.2	11.3	16.1	24.2	32.2	40.3	48.4	56.4	16.3	24.5	32.6	40.8	48.9	57.1
12														
13														
14	9.8	7.8	19.5	29.3	39.0	48.8	58.6	68.3	15.5	23.2	30.9	38.6	46.4	54.1
15														
16	13.1	9.6	18.0	27.0	36.0	45.0	54.0	63.0	13.2	19.8	26.5	33.1	39.7	46.3
17	13.1	10.3	18.0	27.0	36.0	45.0	54.0	63.0	14.1	21.2	28.2	35.3	42.4	49.4
18	13.1	7.6	24.8	37.3	49.7	62.1	74.5	86.9	14.4	21.7	28.9	36.1	43.3	50.6
19														
20														
21	15.7	8.1	21.1	31.6	42.2	52.7	63.3	73.8	10.9	16.3	21.7	27.2	32.6	38.0
22	15.7	8.3	21.1	31.6	42.2	52.7	63.3	73.8	11.2	16.7	22.3	27.9	33.5	39.0
23	15.7	7.8	22.4	33.6	44.7	55.9	67.1	78.3	11.1	16.7	22.3	27.8	33.4	39.0
24	13.1	7.7	23.9	35.8	47.8	59.7	71.7	83.6	14.1	21.1	28.1	35.2	42.2	49.2
25														
26														
27														
28	15.7	8.2	27.5	41.2	55.0	68.7	82.5	96.2	14.3	21.5	28.7	35.8	43.0	50.2
29	15.7	8.2	27.5	41.2	55.0	68.7	82.5	96.2	14.3	21.5	28.6	35.8	43.0	50.1
30	15.7	9.4	23.4	35.1	46.8	58.5	70.2	81.9	14.0	21.0	28.0	35.0	42.0	49.0
31	11.2	10.1	16.7	25.1	33.4	41.8	50.1	58.5	15.0	22.5	30.0	37.5	45.0	52.5

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East WWTF Monthly Wastewater SRT Tracking Program - 04/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,257.0	
CLARIFIER NO. 2 =	3,318.5	x
CLARIFIER NO. 3 =	3,318.5	x
CLARIFIER NO. 4 =	3,318.5	x
CLARIFIER NO. 5 =	3,318.5	x
TOTAL (ALL CLARIFIERS) =	14,531.0	
TOTAL (ONLINE-IN USE) =	**13,274.0**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
WEST OX DITCH - ENVIREX 2-RING ORBAL =	538,597.5	x
NORTHWEST OX DITCH - ENVIREX 2-RING ORBAL =	229,652.0	
NE OX DITCH NO. 1 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
NE OX DITCH NO. 2 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	1,821,506.5	
TOTAL VOLUME (LAKESIDE TREATMENT TRAIN) =	1,053,257.0	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,591,854.5**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	330,482.0	x
DIGESTER NO. 2 =	233,183.0	x
TOTAL (ALL DIGESTERS) =	563,665.0	
TOTAL (ONLINE-IN USE) =	**563,665.0**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	W ORBAL OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	W ORBAL OX DITCH TRAIN Solids Inventory (LBS)	LAKESIDE OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	LAKESIDE OX DITCH TRAIN Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
															x	x	x	x						
1			0			0	0		0		0	0							0	0		20	0	
2			0			0	0		0		0	0							0	0		20	0	
3			0			0	0		0		0	0							0	0		20	0	
4	28,738	6,325	1,516	1.04	1	9	1,525	3,570	16,046	3,366	29,585	45,631	6,325		1.5	2.0	2.5	3.0	36,134	81,764	**53.6**	20	4,080	77,337
5	35,923	6,325	1,895	0.97	1	8	1,903	3,570	16,046	3,366	29,585	45,631	6,325		2.0	2.5	2.0	2.5	36,134	81,764	**43.0**	20	4,080	77,348
6	28,738	7,464	1,789	1.01	1	8	1,797	3,292	14,796	2,400	21,095	35,891	7,464		2.0	2.0	2.0	2.5	34,735	70,626	**39.3**	20	3,523	56,592
7	43,107	7,464	2,683	1.38	1	12	2,695	3,292	14,796	2,400	21,095	35,891	7,464		1.0	1.5	1.0	1.5	20,433	56,323	**20.9**	20	2,805	45,055
8	35,923	7,852	2,352	1.11	1	9	2,362	1,472	6,616	3,390	29,796	36,412	7,852		2.5	2.5	2.0	2.5	44,245	80,657	**34.2**	20	4,024	61,443
9			0			0	0		0		0	0							0	0		20	0	
10			0			0	0		0		0	0							0	0		20	0	
11			0			0	0		0		0	0							0	0		20	0	
12	43,107	7,138	2,566	1.11	3	28	2,594	3,228	14,509	3,640	31,994	46,502	7,138		1.5	1.5	1.0	1.5	24,558	71,061	**27.4**	20	3,525	59,219
13	43,107	6,013	2,162	0.89	3	22	2,184	3,276	14,724	3,616	31,783	46,507	6,013		1.5	2.0	3.0	3.0	37,897	84,404	**38.6**	20	4,198	83,710
14	43,107	6,013	2,162	0.97	3	24	2,186	3,276	14,724	3,616	31,783	46,507	6,013		0.5	1.5	1.0	1.0	15,957	62,463	**28.6**	20	3,099	61,793
15	21,554	5,949	1,069	0.95	2	16	1,085	3,304	14,850	3,560	31,290	46,141	5,949		1.0	1.0	1.0	1.0	15,758	61,898	**57.0**	20	3,079	62,059
16			0			0	0		0		0	0							0	0		20	0	
17			0			0	0		0		0	0							0	0		20	0	
18			0	0.90		0	0		0		0	0			1.5	2.5	3.0	3.0	0	0		20	0	
19	43,107	7,868	2,829	0.98	5	41	2,870	3,152	14,167	3,874	34,050	48,217	7,868		1.5	2.0	2.0	2.0	36,484	84,701	**29.5**	20	4,194	63,916
20	57,476	6,358	3,048	0.97	3	24	3,072	3,224	14,491	3,680	32,345	46,836	6,358		1.5	2.0	2.5	2.0	33,269	80,104	**26.1**	20	3,981	75,075
21	43,107	6,358	2,286	0.92	3	23	2,309	3,224	14,491	3,680	32,345	46,836	6,358		1.5	2.0	3.0	2.0	35,348	82,184	**35.6**	20	4,086	77,063
22	43,107		0			0	0		0		0	0							0	0		20	0	
23			0			0	0		0		0	0							0	0		20	0	
24			0			0	0				0	0							0	0		20	0	
25	43,107	6,819	2,452	0.92	2	15	2,467	3,312	14,886	3,710	32,609	47,495	6,819		1.0	1.5	1.5	1.5	23,991	71,486	**29.0**	20	3,559	62,579
26			0			0	0		0		0	0							0	0		20	0	
27	35,923	5,703	1,709	0.99	1	8	1,717	3,204	14,401	3,714	32,644	47,045	5,703		1.5	1.0	1.0	1.5	19,507	66,551	**38.8**	20	3,319	69,788
28	35,923	5,703	1,709	1.01	1	8	1,717	3,204	14,401	3,714	32,644	47,045	5,703		1.0	1.5	2.0	1.0	21,457	68,502	**39.9**	20	3,417	71,835
29			0			0	0		0		0	0							0	0		20	0	
30			0			0	0		0		0	0							0	0		20	0	
			0			0	0		0		0	0							0	0		20	0	

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Notes:

User input cells, all other cells are calculated

East WWTF Monthly Wastewater SRT (Digester) Tracking Program - 04/2016

Village of Huntley, IL

	DIGESTER STORAGE TIME - NO		DIGESTER STORAGE TIME - THICKENING (USING *ACTUAL* WASTE RATE)						DIGESTER STORAGE TIME - THICKENING (USING *TARGET* WASTE RATE)					
	ACTUAL WASTE RATE	TARGET WASTE RATE	PERCENT THICKENING						PERCENT THICKENING					
DATE	(DAYS)	(DAYS)	1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1														
2														
3														
4	19.6	7.3	31.0	46.5	62.0	77.5	93.0	108.5	11.5	17.3	23.0	28.8	34.6	40.3
5	15.7	7.3	24.8	37.2	49.6	62.0	74.4	86.8	11.5	17.3	23.0	28.8	34.6	40.3
6	19.6	10.0	26.3	39.4	52.6	65.7	78.8	92.0	13.3	20.0	26.7	33.4	40.0	46.7
7	13.1	12.5	17.5	26.3	35.0	43.8	52.6	61.3	16.8	25.1	33.5	41.9	50.3	58.7
8	15.7	9.2	20.0	30.0	40.0	50.0	60.0	69.9	11.7	17.5	23.4	29.2	35.1	40.9
9														
10														
11														
12	13.1	9.5	18.3	27.5	36.6	45.8	55.0	64.1	13.3	20.0	26.7	33.3	40.0	46.7
13	13.1	6.7	21.7	32.6	43.5	54.4	65.2	76.1	11.2	16.8	22.4	28.0	33.6	39.2
14	13.1	9.1	21.7	32.6	43.5	54.4	65.2	76.1	15.2	22.8	30.3	37.9	45.5	53.1
15	26.2	9.1	44.0	65.9	87.9	109.9	131.9	153.9	15.3	22.9	30.5	38.2	45.8	53.4
16														
17														
18														
19	13.1	8.8	16.6	24.9	33.2	41.5	49.9	58.2	11.2	16.8	22.4	28.0	33.6	39.2
20	9.8	7.5	15.4	23.1	30.8	38.6	46.3	54.0	11.8	17.7	23.6	29.5	35.4	41.3
21	13.1	7.3	20.6	30.8	41.1	51.4	61.7	72.0	11.5	17.3	23.0	28.8	34.5	40.3
22	13.1													
23														
24														
25	13.1	9.0	19.2	28.8	38.4	47.9	57.5	67.1	13.2	19.8	26.4	33.0	39.6	46.2
26														
27	15.7	8.1	27.5	41.3	55.0	68.8	82.5	96.3	14.2	21.2	28.3	35.4	42.5	49.6
28	15.7	7.8	27.5	41.3	55.0	68.8	82.5	96.3	13.8	20.6	27.5	34.4	41.3	48.2
29														
30														

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East WWTF Monthly Wastewater SRT Tracking Program - 05/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
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CLARIFIER NO. 2 =	3,318.5	x
CLARIFIER NO. 3 =	3,318.5	x
CLARIFIER NO. 4 =	3,318.5	x
CLARIFIER NO. 5 =	3,318.5	x
TOTAL (ALL CLARIFIERS) =	14,531.0	
TOTAL (ONLINE-IN USE) =	**13,274.0**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
WEST OX DITCH - ENVIREX 2-RING ORBAL =	538,597.5	x
NORTHWEST OX DITCH - ENVIREX 2-RING ORBAL =	229,652.0	
NE OX DITCH NO. 1 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
NE OX DITCH NO. 2 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	1,821,506.5	
TOTAL VOLUME (LAKESIDE TREATMENT TRAIN) =	1,053,257.0	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,591,854.5**	

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DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	330,482.0	x
DIGESTER NO. 2 =	233,183.0	x
TOTAL (ALL DIGESTERS) =	563,665.0	
TOTAL (ONLINE-IN USE) =	**563,665.0**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	W ORBAL OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	W ORBAL OX DITCH TRAIN Solids Inventory (LBS)	LAKESIDE OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	LAKESIDE OX DITCH TRAIN Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
															x	x	x	x						
1			0			0	0		0		0	0							0	0		20	0	
2			0			0	0		0		0	0							0	0		20	0	
3	43,107	8,427	3,030	1.42	1	12	3,041	3,306	14,859	3,476	30,552	45,411	8,427		2.5	2.5	2.5	2.5	49,312	94,724	**31.1**	20	4,724	67,221
4	43,107	8,038	2,890	1.26	1	10	2,900	3,546	15,938	3,728	32,767	48,705	8,038		2.0	3.0	3.0	2.5	51,182	99,887	**34.4**	20	4,984	74,345
5	57,476	8,038	3,853	1.26	1	11	3,864	3,546	15,938	3,728	32,767	48,705	8,038		2.0	3.0	2.5	2.5	48,745	97,450	**25.2**	20	4,862	72,527
6	50,292	6,013	2,522	1.05	2	18	2,540	3,400	15,282	3,480	30,587	45,869	6,013		1.5	2.0	2.5	2.0	31,462	77,331	**30.4**	20	3,849	76,752
7			0			0	0		0		0	0							0	0		20	0	
8			0			0	0		0		0	0							0	0		20	0	
9			0			0	0		0		0	0							0	0		20	0	
10	57,476	7,550	3,619	1.13	1	9	3,629	3,296	14,814	3,642	32,011	46,825	7,550		1.0	1.0	1.5	1.0	20,865	67,690	**18.7**	20	3,375	53,600
11	57,476	7,956	3,814	1.34	1	11	3,825	3,504	15,749	3,564	31,326	47,075	7,956		1.0	1.0	1.0	1.0	19,090	66,165	**17.3**	20	3,297	49,690
12	43,107	7,956	2,860	1.19	1	10	2,870	3,504	15,749	3,564	31,326	47,075	7,956		1.0	1.0	1.0	1.0	19,090	66,165	**23.1**	20	3,298	49,709
13			0			0	0		0		0	0							0	0		20	0	
14			0			0	0		0		0	0							0	0		20	0	
15			0			0	0		0		0	0							0	0		20	0	
16	57,476	8,263	3,961	1.18	3	30	3,990	3,166	14,230	3,390	29,796	44,026	8,263		2.0	2.5	2.0	3.0	45,863	89,889	**22.5**	20	4,465	64,789
17			0			0	0		0		0	0							0	0		20	0	
18	57,476	4,283	2,053	1.31	4	44	2,097	3,316	14,904	3,264	28,689	43,593	4,283		2.0	3.0	3.0	3.0	34,393	77,986	**37.2**	20	3,856	107,937
19	57,476	4,283	2,053	0.98	4	33	2,086	3,316	14,904	3,264	28,689	43,593	4,283		2.0	3.0	3.0	3.5	35,956	79,549	**38.1**	20	3,945	110,439
20	57,476	6,781	3,250	0.91	2	15	3,266	3,252	14,616	2,954	25,964	40,580	6,781		2.0	3.0	3.0	3.0	44,364	84,944	**26.0**	20	4,232	74,834
21			0			0	0		0		0	0							0	0		20	0	
22			0			0	0		0		0	0							0	0		20	0	
23			0			0	0		0		0	0							0	0		20	0	
24	100,583	6,813	5,715	0.96	5	40	5,755	3,580		3,304	29,040	29,040	6,813		2.0	2.0	2.0	2.0	33,531	62,571	**10.9**	20	3,088	54,355
25	57,476	7,433	3,563	0.85	3	21	3,584	3,174	14,266	3,214	28,249	42,515	7,433		2.0	2.0	2.0	3.0	39,698	82,213	**22.9**	20	4,090	65,969
26	28,738	4,610	1,105	1.04	0	0	1,105	3,722	16,729	3,176	27,915	44,644	4,610		1.0	1.0	2.0	2.0	19,354	63,998	**57.9**	20	3,200	83,228
27			0			0	0		0		0	0							0	0		20	0	
28			0			0	0		0		0	0							0	0		20	0	
29			0			0	0		0		0	0							0	0		20	0	
30			0			0	0		0		0	0							0	0		20	0	
31			0			0	0		0		0	0							0	0		20	0	

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Notes:

User input cells, all other cells are calculated

East WWTF Monthly Wastewater SRT (Digester) Tracking Program - 05/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO: ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO: TARGET WASTE RATE (DAYS)	THICKENING (USING *ACTUAL* WASTE RATE) 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	THICKENING (USING *TARGET* WASTE RATE) 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1														
2														
3	13.1	8.4	15.5	23.3	31.0	38.8	46.6	54.3	10.0	14.9	19.9	24.9	29.9	34.8
4	13.1	7.6	16.3	24.4	32.5	40.7	48.8	56.9	9.4	14.1	18.9	23.6	28.3	33.0
5	9.8	7.8	12.2	18.3	24.4	30.5	36.6	42.7	9.7	14.5	19.3	24.2	29.0	33.8
6	11.2	7.3	18.6	28.0	37.3	46.6	55.9	65.2	12.2	18.3	24.4	30.5	36.6	42.7
7														
8														
9														
10	9.8	10.5	13.0	19.5	26.0	32.5	39.0	45.5	13.9	20.9	27.9	34.8	41.8	48.7
11	9.8	11.3	12.3	18.5	24.7	30.8	37.0	43.1	14.3	21.4	28.5	35.6	42.8	49.9
12	13.1	11.3	16.4	24.7	32.9	41.1	49.3	57.5	14.3	21.4	28.5	35.6	42.8	49.9
13														
14														
15														
16	9.8	8.7	11.9	17.8	23.7	29.7	35.6	41.5	10.5	15.8	21.1	26.3	31.6	36.9
17														
18	9.8	5.2	22.9	34.3	45.8	57.2	68.7	80.1	12.2	18.3	24.4	30.5	36.6	42.7
19	9.8	5.1	22.9	34.3	45.8	57.2	68.7	80.1	11.9	17.9	23.8	29.8	35.7	41.7
20	9.8	7.5	14.5	21.7	28.9	36.2	43.4	50.6	11.1	16.7	22.2	27.8	33.3	38.9
21														
22														
23														
24	5.6	10.4	8.2	12.3	16.5	20.6	24.7	28.8	15.2	22.8	30.4	38.1	45.7	53.3
25	9.8	8.5	13.2	19.8	26.4	33.0	39.6	46.2	11.5	17.2	23.0	28.7	34.5	40.2
26	19.6	6.8	42.5	63.8	85.1	106.4	127.6	148.9	14.7	22.0	29.4	36.7	44.1	51.4
27														
28														
29														
30														
31														

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East WWTF Monthly Wastewater SRT Tracking Program - 06/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,257.0	
CLARIFIER NO. 2 =	3,318.5	x
CLARIFIER NO. 3 =	3,318.5	x
CLARIFIER NO. 4 =	3,318.5	x
CLARIFIER NO. 5 =	3,318.5	x
TOTAL (ALL CLARIFIERS) =	14,531.0	
TOTAL (ONLINE-IN USE) =	**13,274.0**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
WEST OX DITCH - ENVIREX 2-RING ORBAL =	538,597.5	x
NORTHWEST OX DITCH - ENVIREX 2-RING ORBAL =	229,652.0	
NE OX DITCH NO. 1 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
NE OX DITCH NO. 2 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	1,821,506.5	
TOTAL VOLUME (LAKESIDE TREATMENT TRAIN) =	1,053,257.0	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,591,854.5**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	330,482.0	x
DIGESTER NO. 2 =	233,183.0	x
TOTAL (ALL DIGESTERS) =	563,665.0	
TOTAL (ONLINE-IN USE) =	**563,665.0**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	W ORBAL OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	W ORBAL OX DITCH TRAIN Solids Inventory (LBS)	LAKESIDE OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	LAKESIDE OX DITCH TRAIN Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
															x	x	x	x						
1	57,476	7,679	3,681	1.12	2	19	3,700	3,756	16,882	3,532	31,044	47,926	7,679		1.5	1.5	1.5	1.5	27,867	75,793	**20.5**	20	3,771	58,882
2	71,845	7,679	4,601	1.00	2	17	4,618	3,756	16,882	3,532	31,044	47,926	7,679		1.5	1.5	1.5	1.5	27,867	75,793	**16.4**	20	3,773	58,914
3	43,107	7,487	2,692	0.86	3	22	2,713	3,636	16,342	3,468	30,482	46,824	7,487		2.0	3.0	3.0	3.5	52,193	99,017	**36.5**	20	4,929	78,943
4			0			0	0		0		0	0							0	0		20	0	
5			0			0	0		0		0	0							0	0		20	0	
6	71,845	5,888	3,528	0.93	7	54	3,582	3,488	15,677	3,414	30,007	45,684	5,888		1.5	2.5	3.0	3.0	38,537	84,221	**23.5**	20	4,157	84,651
7	57,476	5,888	2,822	0.86	7	50	2,873	3,488	15,677	3,414	30,007	45,684	5,888		2.0	3.0	3.0	3.0	42,391	88,075	**30.7**	20	4,353	88,654
8	50,292	7,895	3,311	0.95	3	24	3,335	3,194	14,356	2,636	23,169	37,525	7,895		1.0	1.0	3.0	3.0	34,903	72,427	**21.7**	20	3,598	54,637
9	57,476	7,895	3,784	0.78	3	20	3,804	3,194	14,356	2,636	23,169	37,525	7,895		1.0	2.0	3.0	3.0	39,266	76,790	**20.2**	20	3,820	58,014
10	57,476	3,946	1,892	1.13	2	19	1,910	3,502	15,740	2,058	18,089	33,829	3,946		2.0	3.0	3.0	3.0	27,361	61,190	**32.0**	20	3,041	92,396
11			0			0	0		0		0	0							0	0		20	0	
12			0			0	0		0		0	0							0	0		20	0	
13	71,845	4,768	2,857	0.82	5	34	2,891	3,410	15,327	1,796	15,786	31,112	4,768		0.5	1.0	1.5	1.0	10,877	41,990	**14.5**	20	2,065	51,939
14			0			0	0		0		0	0							0	0		20	0	
15			0			0	0		0		0	0							0	0		20	0	
16			0			0	0		0		0	0							0	0		20	0	
17			0			0	0		0		0	0							0	0		20	0	
18			0			0	0		0		0	0							0	0		20	0	
19			0			0	0		0		0	0							0	0		20	0	
20			0			0	0		0		0	0							0	0		20	0	
21			0			0	0		0		0	0							0	0		20	0	
22			0			0	0		0		0	0							0	0		20	0	
23			0			0	0		0		0	0							0	0		20	0	
24			0			0	0				0	0							0	0		20	0	
25			0			0	0		0		0	0							0	0		20	0	
26			0			0	0		0		0	0							0	0		20	0	
27	43,107	6,135	2,206	0.92	1	8	2,213	3,950	17,754	3,870	34,015	51,769	6,135		0.5		1.5	1.5	14,507	66,276	**29.9**	20	3,306	64,616
28	35,923	6,135	1,838	0.85	1	7	1,845	3,950	17,754	3,870	34,015	51,769	6,135		2.0		1.0	1.0	16,580	68,348	**37.0**	20	3,410	66,652
29	35,923	7,226	2,165	0.84	0	0	2,165	3,694	16,603	3,702	32,538	49,142	7,226		1.0		1.0	1.0	13,582	62,723	**29.0**	20	3,136	52,040
30	35,923	7,226	2,165	0.82	0	0	2,165	3,694	16,603	3,702	32,538	49,142	7,226		1.0		1.5	1.5	18,109	67,251	**31.1**	20	3,363	55,796
			0			0	0		0		0	0							0	0		20	0	

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Notes:

User input cells, all other cells are calculated

East WWTF Monthly Wastewater SRT (Digester) Tracking Program - 06/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO: ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO: TARGET WASTE RATE (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *ACTUAL* WASTE RATE) PERCENT THICKENING: 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *TARGET* WASTE RATE) PERCENT THICKENING: 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1	9.8	9.6	12.8	19.2	25.5	31.9	38.3	44.7	12.5	18.7	24.9	31.2	37.4	43.6
2	7.8	9.6	10.2	15.3	20.4	25.5	30.7	35.8	12.5	18.7	24.9	31.1	37.4	43.6
3	13.1	7.1	17.5	26.2	34.9	43.7	52.4	61.1	9.5	14.3	19.1	23.8	28.6	33.4
4														
5														
6	7.8	6.7	13.3	20.0	26.6	33.3	40.0	46.6	11.3	17.0	22.6	28.3	33.9	39.6
7	9.8	6.4	16.7	25.0	33.3	41.6	50.0	58.3	10.8	16.2	21.6	27.0	32.4	37.8
8	11.2	10.3	14.2	21.3	28.4	35.5	42.6	49.7	13.1	19.6	26.1	32.7	39.2	45.7
9	9.8	9.7	12.4	18.6	24.8	31.1	37.3	43.5	12.3	18.5	24.6	30.8	36.9	43.1
10	9.8	6.1	24.9	37.3	49.7	62.1	74.6	87.0	15.5	23.2	30.9	38.7	46.4	54.1
11														
12														
13	7.8	10.9	16.5	24.7	32.9	41.1	49.4	57.6	22.8	34.1	45.5	56.9	68.3	79.7
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27	13.1	8.7	21.3	32.0	42.6	53.3	63.9	74.6	14.2	21.3	28.4	35.5	42.7	49.8
28	15.7	8.5	25.6	38.4	51.2	63.9	76.7	89.5	13.8	20.7	27.6	34.5	41.4	48.2
29	15.7	10.8	21.7	32.6	43.4	54.3	65.1	76.0	15.0	22.5	30.0	37.5	45.0	52.5
30	15.7	10.1	21.7	32.6	43.4	54.3	65.1	76.0	14.0	21.0	28.0	35.0	41.9	48.9

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East WWTF Monthly Wastewater SRT Tracking Program - 07/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,257.0	
CLARIFIER NO. 2 =	3,318.5	x
CLARIFIER NO. 3 =	3,318.5	
CLARIFIER NO. 4 =	3,318.5	x
CLARIFIER NO. 5 =	3,318.5	x
TOTAL (ALL CLARIFIERS) =	14,531.0	
TOTAL (ONLINE-IN USE) =	**9,955.5**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
WEST OX DITCH - ENVIREX 2-RING ORBAL =	538,597.5	x
NORTHWEST OX DITCH - ENVIREX 2-RING ORBAL =	229,652.0	
NE OX DITCH NO. 1 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
NE OX DITCH NO. 2 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	1,821,506.5	
TOTAL VOLUME (LAKESIDE TREATMENT TRAIN) =	1,053,257.0	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,591,854.5**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	330,482.0	x
DIGESTER NO. 2 =	233,183.0	x
TOTAL (ALL DIGESTERS) =	563,665.0	
TOTAL (ONLINE-IN USE) =	**563,665.0**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	W ORBAL OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	W ORBAL OX DITCH TRAIN Solids Inventory (LBS)	LAKESIDE OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	LAKESIDE OX DITCH TRAIN Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
															x		x	x						
1	35,923	9,018	2,702	0.86	2	14	2,716	3,282	14,751	3,708	32,591	47,342	9,018		1.0		2.0	1.5	17,794	65,136	**24.0**	20	3,243	43,113
2			0			0	0		0		0	0							0	0		20	0	
3			0			0	0		0		0	0							0	0		20	0	
4			0			0	0		0		0	0							0	0		20	0	
5	35,923	5,084	1,523	0.87	5	36	1,559	3,260	14,652	3,702	32,538	47,191	5,084		1.5		3.0	2.5	19,110	66,300	**42.5**	20	3,279	77,327
6	35,923	8,369	2,507	0.91	4	30	2,538	3,094	13,906	3,448	30,306	44,212	8,369		2.0		2.5	3.0	27,538	71,750	**28.3**	20	3,557	50,963
7	35,923	8,369	2,507	0.98	4	33	2,540	3,094	13,906	3,448	30,306	44,212	8,369		2.0		2.0	2.5	23,866	68,078	**26.8**	20	3,371	48,301
8	35,923	6,115	1,832	0.97	0	0	1,832	3,252	14,616	3,458	30,394	45,010	6,115		2.0		2.5	2.0	19,334	64,344	**35.1**	20	3,217	63,084
9			0			0	0		0		0	0							0	0		20	0	
10			0			0	0		0		0	0							0	0		20	0	
11	35,923	9,726	2,914	0.85	4	28	2,942	3,862	17,358	4,100	36,037	53,395	9,726		1.5		1.0	1.5	17,184	70,579	**24.0**	20	3,501	43,157
12	35,923	7,816	2,342	0.84	4	28	2,370	3,504	15,749	4,226	37,144	52,893	7,816		2.0		1.0	1.0	14,966	67,860	**28.6**	20	3,365	51,622
13	43,107	7,816	2,810	0.90	4	30	2,840	3,504	15,749	4,226	37,144	52,893	7,816		1.5		1.0	1.0	13,096	65,989	**23.2**	20	3,269	50,154
14	35,923	6,190	1,855	0.87	5	36	1,891	3,468	15,587	4,210	37,003	52,591	6,190		1.5		1.0	1.0	11,310	63,901	**33.8**	20	3,159	61,191
15	28,738	6,190	1,484	0.80	5	33	1,517	3,468	15,587	4,210	37,003	52,591	6,190		1.0		1.5	1.5	12,926	65,516	**43.2**	20	3,242	62,808
16			0			0	0		0		0	0							0	0		20	0	
17			0			0	0		0		0	0							0	0		20	0	
18	28,739	6,238	1,495	0.84	1	7	1,502	3,094		4,366	38,375	38,375	6,238		1.5		1.0	2.0	14,827	53,201	**35.4**	20	2,653	50,995
19	28,739	6,238	1,495	0.87	1	7	1,502	3,094	13,906	4,366	38,375	52,281	6,238		2.0		2.0	2.5	21,416	73,697	**49.1**	20	3,678	70,689
20	28,738	6,626	1,588	0.83	5	35	1,623	3,180	14,293	4,026	35,386	49,679	6,626		2.0		1.5	1.5	16,549	66,228	**40.8**	20	3,277	59,296
21	28,738	6,626	1,588	0.89	5	37	1,625	3,180	14,293	4,026	35,386	49,679	6,626		1.5		2.0	1.5	16,549	66,228	**40.8**	20	3,274	59,255
22	57,476	7,406	3,550	1.09	3	27	3,577	2,318	10,418	3,770	33,136	43,555	7,406		2.0		1.5	1.5	17,363	60,917	**17.0**	20	3,019	48,871
23			0			0	0		0		0	0							0	0		20	0	
24			0			0	0				0	0							0	0		20	0	
25	35,923	7,716	2,312	1.24	2	21	2,332	3,104	13,951	3,892	34,208	48,160	7,716		2.0		1.5	1.5	18,034	66,194	**28.4**	20	3,289	51,109
26	35,923	7,716	2,312	1.04	2	17	2,329	3,104	13,951	3,892	34,208	48,160	7,716		1.5		1.0	1.0	12,624	60,783	**26.1**	20	3,022	46,959
27	43,107	6,825	2,454	0.98	1	8	2,462	3,180	14,293	3,984	35,017	49,310	6,825		1.0		1.0	1.0	10,076	59,385	**24.1**	20	2,961	52,021
28	43,107	6,825	2,454	0.94	1	8	2,461	3,180	14,293	3,984	35,017	49,310	6,825		1.0		1.0	1.0	10,076	59,385	**24.1**	20	2,961	52,028
29	35,923	8,090	2,424	1.07	1	9	2,433	2,788	12,531	3,682	32,363	44,894	8,090		1.0		1.0	1.0	10,973	55,867	**23.0**	20	2,784	41,268
30			0			0	0		0		0	0							0	0		20	0	
31			0			0	0		0		0	0							0	0		20	0	

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Notes:

User input cells, all other cells are calculated

East WWTF Monthly Wastewater SRT (Digester) Tracking Program - 07/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO: ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO: TARGET WASTE RATE (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *ACTUAL* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *TARGET* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1	15.7	13.1	17.4	26.1	34.8	43.5	52.2	60.9	14.5	21.7	29.0	36.2	43.5	50.7
2														
3														
4														
5	15.7	7.3	30.9	46.3	61.7	77.2	92.6	108.0	14.3	21.5	28.7	35.8	43.0	50.2
6	15.7	11.1	18.7	28.1	37.5	46.9	56.2	65.6	13.2	19.8	26.4	33.0	39.6	46.3
7	15.7	11.7	18.7	28.1	37.5	46.9	56.2	65.6	13.9	20.9	27.9	34.9	41.8	48.8
8	15.7	8.9	25.7	38.5	51.3	64.1	77.0	89.8	14.6	21.9	29.2	36.5	43.8	51.1
9														
10														
11	15.7	13.1	16.1	24.2	32.3	40.3	48.4	56.5	13.4	20.1	26.9	33.6	40.3	47.0
12	15.7	10.9	20.1	30.1	40.2	50.2	60.2	70.3	14.0	21.0	27.9	34.9	41.9	48.9
13	13.1	11.2	16.7	25.1	33.5	41.8	50.2	58.6	14.4	21.6	28.8	35.9	43.1	50.3
14	15.7	9.2	25.3	38.0	50.7	63.4	76.0	88.7	14.9	22.3	29.8	37.2	44.6	52.1
15	19.6	9.0	31.7	47.5	63.4	79.2	95.1	110.9	14.5	21.7	29.0	36.2	43.5	50.7
16														
17														
18	19.6	11.1	31.4	47.2	62.9	78.6	94.3	110.0	17.7	26.6	35.4	44.3	53.2	62.0
19	19.6	8.0	31.4	47.2	62.9	78.6	94.3	110.0	12.8	19.2	25.6	32.0	38.3	44.7
20	19.6	9.5	29.6	44.4	59.2	74.0	88.8	103.6	14.3	21.5	28.7	35.9	43.0	50.2
21	19.6	9.5	29.6	44.4	59.2	74.0	88.8	103.6	14.4	21.5	28.7	35.9	43.1	50.2
22	9.8	11.5	13.2	19.9	26.5	33.1	39.7	46.3	15.6	23.4	31.1	38.9	46.7	54.5
23														
24														
25	15.7	11.0	20.3	30.5	40.7	50.8	61.0	71.2	14.3	21.4	28.6	35.7	42.9	50.0
26	15.7	12.0	20.3	30.5	40.7	50.8	61.0	71.2	15.6	23.3	31.1	38.9	46.7	54.4
27	13.1	10.8	19.2	28.7	38.3	47.9	57.5	67.1	15.9	23.8	31.8	39.7	47.6	55.6
28	13.1	10.8	19.2	28.7	38.3	47.9	57.5	67.1	15.9	23.8	31.7	39.7	47.6	55.6
29	15.7	13.7	19.4	29.1	38.8	48.5	58.2	67.9	16.9	25.3	33.8	42.2	50.7	59.1
30														
31														

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East WWTF Monthly Wastewater SRT Tracking Program - 08/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,257.0	
CLARIFIER NO. 2 =	3,318.5	x
CLARIFIER NO. 3 =	3,318.5	
CLARIFIER NO. 4 =	3,318.5	x
CLARIFIER NO. 5 =	3,318.5	x
TOTAL (ALL CLARIFIERS) =	14,531.0	
TOTAL (ONLINE-IN USE) =	**9,955.5**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
WEST OX DITCH - ENVIREX 2-RING ORBAL =	538,597.5	x
NORTHWEST OX DITCH - ENVIREX 2-RING ORBAL =	229,652.0	
NE OX DITCH NO. 1 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
NE OX DITCH NO. 2 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	1,821,506.5	
TOTAL VOLUME (LAKESIDE TREATMENT TRAIN) =	1,053,257.0	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,591,854.5**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	330,482.0	x
DIGESTER NO. 2 =	233,183.0	x
TOTAL (ALL DIGESTERS) =	563,665.0	
TOTAL (ONLINE-IN USE) =	**563,665.0**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	W ORBAL OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	W ORBAL OX DITCH TRAIN Solids Inventory (LBS)	LAKESIDE OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	LAKESIDE OX DITCH TRAIN Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
															x		x	x						
1	35,923	5,594	1,676	0.87	1	7	1,683	2,834	12,738	3,984	35,017	47,755	5,594		2.0		1.5	1.5	14,880	62,635	**37.2**	20	3,124	66,972
2	35,923	5,594	1,676	0.89	1	7	1,683	2,834	12,738	3,984	35,017	47,755	5,594		1.0		2.0	1.5	13,392	61,147	**36.3**	20	3,050	65,373
3	57,476	5,580	2,675	0.89	3	22	2,697	2,994	13,457	3,910	34,367	47,823	5,580		1.5		2.0	2.5	17,692	65,516	**24.3**	20	3,253	69,911
4	35,923	5,580	1,672	0.84	3	21	1,693	2,994	13,457	3,910	34,367	47,823	5,580		1.0		1.5	1.5	11,795	59,618	**35.2**	20	2,960	63,601
5	43,107	4,772	1,716	1.00	2	17	1,732	2,896	13,016	3,784	33,259	46,276	4,772		1.0		1.0	2.0	10,634	56,909	**32.9**	20	2,829	71,080
6			0			0	0		0		0	0							0	0		20	0	
7			0			0	0		0		0	0							0	0		20	0	
8	35,923	4,214	1,263	0.86	0	0	1,263	3,226	14,500	3,992	35,087	49,587	4,214		0.5		0.5	2.0	7,649	57,236	**45.3**	20	2,862	81,429
9	35,923	4,214	1,263	0.93	0	0	1,263	3,226	14,500	3,992	35,087	49,587	4,214		1.0		1.0	1.0	7,649	57,236	**45.3**	20	2,862	81,429
10	35,923	6,158	1,845	0.99	4	33	1,878	2,876	12,926	3,950	34,718	47,645	6,158		1.0		1.0	1.0	9,422	57,067	**30.4**	20	2,820	54,918
11	35,923	6,158	1,845	0.86	4	29	1,874	2,876	12,926	3,950	34,718	47,645	6,158		1.0		1.0	1.0	9,422	57,067	**30.5**	20	2,825	55,000
12	35,923	4,561	1,366	0.94	1	8	1,374	2,858	12,846	3,926	34,507	47,353	4,561		1.0		1.0	1.0	7,911	55,264	**40.2**	20	2,755	72,435
13			0			0	0		0		0	0							0	0		20	0	
14			0			0	0		0		0	0							0	0		20	0	
15	43,107	4,407	1,584	0.84	4	28	1,612	2,936	13,196	4,128	36,283	49,479	4,407		1.0		1.0	1.0	7,956	57,435	**35.6**	20	2,844	77,375
16	43,107	4,407	1,584	0.84	4	28	1,612	2,936	13,196	4,128	36,283	49,479	4,407		1.5		1.0	1.5	10,608	60,087	**37.3**	20	2,976	80,982
17	28,738	6,368	1,526	0.82	4	27	1,554	2,476	11,129	3,776	33,189	44,318	6,368		1.0		2.0	1.5	14,183	58,501	**37.7**	20	2,898	54,562
18	35,923	6,368	1,908	0.94	4	31	1,939	2,476	11,129	3,776	33,189	44,318	6,368		1.0		1.0	1.5	11,032	55,349	**28.5**	20	2,736	51,520
19	35,923	5,174	1,550	0.89	3	22	1,572	2,510	11,281	3,612	31,747	43,029	5,174		1.5		1.0	1.0	9,555	52,584	**33.4**	20	2,607	60,412
20			0			0	0		0		0	0							0	0		20	0	
21			0			0	0		0		0	0							0	0		20	0	
22	35,923	5,961	1,786	0.87	0	0	1,786	2,634	11,839	3,934	34,578	46,416	5,961		1.0		1.0	1.0	9,224	55,640	**31.2**	20	2,782	55,959
23	35,923	5,961	1,786	0.90	0	0	1,786	2,634	11,839	3,934	34,578	46,416	5,961		1.0		1.0	1.0	9,224	55,640	**31.2**	20	2,782	55,959
24	43,107	6,015	2,162	0.82	3	20	2,183	2,544	11,434	3,852	33,857	45,291	6,015		1.0		1.0	1.0	9,197	54,489	**25.0**	20	2,704	53,902
25	43,107	6,015	2,162	1.23	3	31	2,193	2,544	11,434	3,852	33,857	45,291	6,015		1.0		1.0	1.0	9,197	54,489	**24.8**	20	2,694	53,696
26	35,923	5,136	1,539	0.92	1	8	1,546	2,462	11,066	3,712	32,626	43,692	5,136		1.0		1.0	1.0	8,248	51,940	**33.6**	20	2,589	60,450
27			0			0	0		0		0	0							0	0		20	0	
28			0			0	0		0		0	0							0	0		20	0	
29	50,292	5,436	2,280	0.93	3	23	2,303	2,306	10,365	3,656	32,134	42,499	5,436		1.0		1.5	1.5	11,300	53,799	**23.4**	20	2,667	58,821
30	35,923	5,436	1,629	1.33	3	33	1,662	2,306	10,365	3,656	32,134	42,499	5,436		2.0		1.5	1.5	14,125	56,624	**34.1**	20	2,798	61,715
31	43,107	5,535	1,990	1.34	2	22	2,012	2,354	10,580	3,555	31,246	41,827	5,535		1.5		2.0	1.5	14,122	55,949	**27.8**	20	2,775	60,117

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Notes:

User input cells, all other cells are calculated

East WWTF Monthly Wastewater SRT (Digester) Tracking Program - 08/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO: ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO: TARGET WASTE RATE (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *ACTUAL* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *TARGET* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1	15.7	8.4	28.0	42.1	56.1	70.1	84.1	98.2	15.0	22.6	30.1	37.6	45.1	52.7
2	15.7	8.6	28.0	42.1	56.1	70.1	84.1	98.2	15.4	23.1	30.8	38.5	46.2	53.9
3	9.8	8.1	17.6	26.4	35.2	43.9	52.7	61.5	14.4	21.7	28.9	36.1	43.3	50.6
4	15.7	8.9	28.1	42.2	56.2	70.3	84.4	98.4	15.9	23.8	31.8	39.7	47.6	55.6
5	13.1	7.9	27.4	41.1	54.8	68.5	82.2	95.9	16.6	24.9	33.2	41.5	49.9	58.2
6														
7														
8	15.7	6.9	37.2	55.9	74.5	93.1	111.7	130.3	16.4	24.6	32.9	41.1	49.3	57.5
9	15.7	6.9	37.2	55.9	74.5	93.1	111.7	130.3	16.4	24.6	32.9	41.1	49.3	57.5
10	15.7	10.3	25.5	38.2	51.0	63.7	76.4	89.2	16.7	25.0	33.3	41.7	50.0	58.3
11	15.7	10.2	25.5	38.2	51.0	63.7	76.4	89.2	16.6	25.0	33.3	41.6	49.9	58.2
12	15.7	7.8	34.4	51.6	68.8	86.0	103.2	120.4	17.1	25.6	34.1	42.7	51.2	59.7
13														
14														
15	13.1	7.3	29.7	44.5	59.3	74.2	89.0	103.8	16.5	24.8	33.1	41.3	49.6	57.9
16	13.1	7.0	29.7	44.5	59.3	74.2	89.0	103.8	15.8	23.7	31.6	39.5	47.4	55.3
17	19.6	10.3	30.8	46.2	61.6	77.0	92.4	107.8	16.2	24.3	32.4	40.6	48.7	56.8
18	15.7	10.9	24.6	37.0	49.3	61.6	73.9	86.2	17.2	25.8	34.4	43.0	51.5	60.1
19	15.7	9.3	30.3	45.5	60.7	75.8	91.0	106.1	18.0	27.0	36.1	45.1	54.1	63.1
20														
21														
22	15.7	10.1	26.3	39.5	52.6	65.8	79.0	92.1	16.9	25.3	33.8	42.2	50.7	59.1
23	15.7	10.1	26.3	39.5	52.6	65.8	79.0	92.1	16.9	25.3	33.8	42.2	50.7	59.1
24	13.1	10.5	21.7	32.6	43.5	54.3	65.2	76.1	17.4	26.1	34.8	43.5	52.2	60.8
25	13.1	10.5	21.7	32.6	43.5	54.3	65.2	76.1	17.5	26.2	34.9	43.6	52.4	61.1
26	15.7	9.3	30.6	45.8	61.1	76.4	91.7	106.9	18.2	27.2	36.3	45.4	54.5	63.5
27														
28														
29	11.2	9.6	20.6	30.9	41.2	51.5	61.9	72.2	17.6	26.4	35.3	44.1	52.9	61.7
30	15.7	9.1	28.9	43.3	57.7	72.2	86.6	101.0	16.8	25.2	33.6	42.0	50.4	58.8
31	13.1	9.4	23.6	35.4	47.2	59.1	70.9	82.7	16.9	25.4	33.9	42.3	50.8	59.3

East WWTF Monthly Wastewater SRT Tracking Program - 09/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,257.0	
CLARIFIER NO. 2 =	3,318.5	x
CLARIFIER NO. 3 =	3,318.5	x
CLARIFIER NO. 4 =	3,318.5	x
CLARIFIER NO. 5 =	3,318.5	x
TOTAL (ALL CLARIFIERS) =	14,531.0	
TOTAL (ONLINE-IN USE) =	**13,274.0**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
WEST OX DITCH - ENVIREX 2-RING ORBAL =	538,597.5	x
NORTHWEST OX DITCH - ENVIREX 2-RING ORBAL =	229,652.0	
NE OX DITCH NO. 1 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
NE OX DITCH NO. 2 (LAKESIDE CLOSED LOOP REACTOR) =	526,628.5	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	1,821,506.5	
TOTAL VOLUME (LAKESIDE TREATMENT TRAIN) =	1,053,257.0	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,591,854.5**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	330,482.0	x
DIGESTER NO. 2 =	233,183.0	x
TOTAL (ALL DIGESTERS) =	563,665.0	
TOTAL (ONLINE-IN USE) =	**563,665.0**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	W ORBAL OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	W ORBAL OX DITCH TRAIN Solids Inventory (LBS)	LAKESIDE OX DITCH TRAIN Mixed Liquor Susp. Solids (mg/l)	LAKESIDE OX DITCH TRAIN Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)
1	35,923	4,700	1,408	1.02	2.5	21	1,429	1,866	8,387	3,608	31,712	40,099
2	28,738	4,700	1,126	0.93	2.5	19	1,146	1,866	8,387	3,608	31,712	40,099
3			0			0	0		0		0	0
4			0			0	0		0		0	0
5			0			0	0		0		0	0
6	35,923	6,444	1,931	1.00	4	33	1,964	2,498	11,228	3,840	33,751	44,979
7	35,923	5,066	1,518	1.05	0	0	1,518	2,464	11,075	3,634	31,941	43,015
8	35,923	5,066	1,518	0.98	0	0	1,518	2,464	11,075	3,634	31,941	43,015
9	35,923	5,938	1,779	0.92	3	23	1,802	2,360	10,607	3,626	31,870	42,478
10			0			0	0		0		0	0
11			0			0	0		0		0	0
12	35,923	5,947	1,782	0.90	1	8	1,789	2,150	9,663	3,420	30,060	39,723
13	35,923	5,947	1,782	0.61	1	5	1,787	2,150	9,663	3,420	30,060	39,723
14	35,923	5,622	1,684	0.94	6	47	1,731	2,264	10,176	3,158	27,757	37,933
15	35,923	5,622	1,684	0.84	6	42	1,727	2,264	10,176	3,158	27,757	37,933
16	35,923	5,091	1,525	0.83	5	35	1,560	2,154	9,681	3,122	27,441	37,122
17			0			0	0		0		0	0
18			0			0	0		0		0	0
19	35,923	6,142	1,840	0.86	2	14	1,854	2,218	9,969	3,108	27,318	37,287
20	35,923	6,142	1,840	0.82	2	14	1,854	2,218	9,969	3,108	27,318	37,287
21	35,923	6,099	1,827	0.80	3	20	1,847	2,214	9,951	3,114	27,370	37,321
22	35,923	6,099	1,827	1.05	3	26	1,853	2,214	9,951	3,114	27,370	37,321
23	35,923	4,018	1,204	0.97	3	24	1,228	2,216	9,960	2,942	25,859	35,819
24			0			0	0		0		0	0
25			0			0	0		0		0	0
26	35,923	4,619	1,384	0.93	6	46	1,430	2,024	9,097	2,972	26,122	35,219
27	35,923	4,619	1,384	0.84	6	42	1,426	2,024	9,097	2,972	26,122	35,219
28	35,923	4,564	1,367	0.92	2	15	1,383	2,188	9,834	2,892	25,419	35,253
29	35,923	4,118	1,234	0.80	1	7	1,240	2,410	10,832	3,004	26,403	37,235
30	35,923	4,118	1,234	0.85	1	7	1,241	2,410	10,832	3,004	26,403	37,235
			0			0	0		0		0	0

DATE	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
			x	x	x	x						
1	4,700		1.5		1.5	2.5	18,930	59,030	**41.3**	20	2,930	74,755
2	4,700		1.0		1.0	1.0	10,326	50,425	**44.0**	20	2,502	63,824
3							0	0		20	0	
4							0	0		20	0	
5							0	0		20	0	
6	6,444		1.0		1.0	1.0	12,782	57,760	**29.4**	20	2,855	53,115
7	5,066		1.0		1.0	1.0	10,813	53,828	**35.5**	20	2,691	63,701
8	5,066		1.0		1.0	1.0	10,813	53,828	**35.5**	20	2,691	63,701
9	5,938		1.0		1.0	1.0	11,887	54,364	**30.2**	20	2,695	54,426
10							0	0		20	0	
11							0	0		20	0	
12	5,947		2.0		2.0	1.5	21,343	61,067	**34.1**	20	3,046	61,410
13	5,947		1.5	1.5	1.5	1.5	23,284	63,007	**35.3**	20	3,145	63,415
14	5,622		1.5	1.0	1.0	2.0	20,006	57,939	**33.5**	20	2,850	60,786
15	5,622		1.5	2.0	1.5	1.5	23,643	61,576	**35.7**	20	3,037	64,763
16	5,091		1.5	2.0	1.5	2.0	23,818	60,940	**39.1**	20	3,012	70,946
17							0	0		20	0	
18							0	0		20	0	
19	6,142		1.0	1.0	1.0	1.0	15,329	52,615	**28.4**	20	2,616	51,078
20	6,142		1.0	1.0	1.0	1.0	15,329	52,615	**28.4**	20	2,617	51,091
21	6,099		1.0	1.0	1.0	1.0	15,267	52,589	**28.5**	20	2,610	51,303
22	6,099		1.5	1.0	1.5	1.0	19,084	56,405	**30.4**	20	2,794	54,930
23	4,018		1.0	1.0	1.0	1.0	11,534	47,352	**38.6**	20	2,343	69,929
24							0	0		20	0	
25							0	0		20	0	
26	4,619		2.0	2.0	1.5	1.5	22,014	57,233	**40.0**	20	2,815	73,081
27	4,619		1.5	2.0	1.5	1.0	18,869	54,088	**37.9**	20	2,662	69,115
28	4,564		1.5	2.0	1.5	2.0	21,622	56,876	**41.1**	20	2,828	74,306
29	4,188		1.5	3.0	1.5	2.0	23,836	61,072	**49.2**	20	3,047	88,717
30	4,188		1.0	2.0	1.0	1.5	16,387	53,623	**43.2**	20	2,674	77,861
							0	0		20	0	

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Notes:

User input cells, all other cells are calculated

East WWTF Monthly Wastewater SRT (Digester) Tracking Program - 09/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO TARGET WASTE RATE (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *ACTUAL* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *TARGET* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1	15.7	7.5	33.4	50.1	66.8	83.5	100.2	116.8	16.0	24.1	32.1	40.1	48.1	56.2
2	19.6	8.8	41.7	62.6	83.5	104.3	125.2	146.1	18.8	28.2	37.6	47.0	56.4	65.8
3														
4														
5														
6	15.7	10.6	24.3	36.5	48.7	60.9	73.0	85.2	16.5	24.7	32.9	41.2	49.4	57.6
7	15.7	8.8	31.0	46.5	61.9	77.4	92.9	108.4	17.5	26.2	34.9	43.7	52.4	61.1
8	15.7	8.8	31.0	46.5	61.9	77.4	92.9	108.4	17.5	26.2	34.9	43.7	52.4	61.1
9	15.7	10.4	26.4	39.6	52.8	66.1	79.3	92.5	17.4	26.2	34.9	43.6	52.3	61.0
10														
11														
12	15.7	9.2	26.4	39.6	52.8	66.0	79.2	92.3	15.4	23.2	30.9	38.6	46.3	54.0
13	15.7	8.9	26.4	39.6	52.8	66.0	79.2	92.3	14.9	22.4	29.9	37.4	44.8	52.3
14	15.7	9.3	27.9	41.9	55.8	69.8	83.7	97.7	16.5	24.7	33.0	41.2	49.5	57.7
15	15.7	8.7	27.9	41.9	55.8	69.8	83.7	97.7	15.5	23.2	31.0	38.7	46.4	54.2
16	15.7	7.9	30.8	46.2	61.6	77.1	92.5	107.9	15.6	23.4	31.2	39.0	46.8	54.6
17														
18														
19	15.7	11.0	25.5	38.3	51.1	63.9	76.6	89.4	18.0	27.0	35.9	44.9	53.9	62.9
20	15.7	11.0	25.5	38.3	51.1	63.9	76.6	89.4	18.0	26.9	35.9	44.9	53.9	62.9
21	15.7	11.0	25.7	38.6	51.5	64.3	77.2	90.0	18.0	27.0	36.0	45.0	54.0	63.1
22	15.7	10.3	25.7	38.6	51.5	64.3	77.2	90.0	16.8	25.2	33.6	42.1	50.5	58.9
23	15.7	8.1	39.1	58.6	78.1	97.6	117.2	136.7	20.1	30.1	40.1	50.2	60.2	70.2
24														
25														
26	15.7	7.7	34.0	51.0	67.9	84.9	101.9	118.9	16.7	25.0	33.4	41.7	50.1	58.4
27	15.7	8.2	34.0	51.0	67.9	84.9	101.9	118.9	17.7	26.5	35.3	44.1	53.0	61.8
28	15.7	7.6	34.4	51.6	68.8	85.9	103.1	120.3	16.6	24.9	33.2	41.6	49.9	58.2
29	15.7	6.4	38.1	57.2	76.2	95.3	114.3	133.4	15.4	23.1	30.9	38.6	46.3	54.0
30	15.7	7.2	38.1	57.2	76.2	95.3	114.3	133.4	17.6	26.4	35.2	43.9	52.7	61.5

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Appendix F

East WWTF DO Tracking Sheets
(02/2016-09/2016)

East WWTF Monthly Wastewater DO Tracking Program - 02/2016

Village of Huntley, IL

	West (Envirex)		Northeast (Lakeside)		Northwest (Envirex)	
	Inner Ring DO	Outer Ring DO	North Ditch DO	South Ditch DO	Inner Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/L)	(mg/L)	(mg/l)	(mg/L)	(mg/L)
1						
2						
3	7.14	1.39	3.15	5.37		
4	6.90	1.10	0.65	5.30		
5	6.90	0.70	0.57	5.30		
6						
7						
8	4.90	0.90	0.30	2.60		
9						
10	6.80	0.60	1.40	5.40		
11						
12	7.50	0.60	1.70	5.40		
13						
14						
15						
16	5.50	0.70	1.40	3.00		
17	4.50	0.80	1.34	4.50		
18						
19	1.70	0.70	0.47	4.90		
20						
21						
22	4.90	0.60	0.23	3.20		
23						
24	5.20	0.87	1.50	3.60		
25						
26	7.70	0.90	1.10	4.50		
27						
28						
29	6.50	0.80	0.40	2.40		
Monthly Average	5.86	0.82	1.09	4.27	-	-
Maximum	7.70	1.39	3.15	5.40	-	-
Minimum	1.70	0.60	0.23	2.40	-	-

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Notes:

The Northwest Oxidation Ditch was not in use during the time of sampling

East WWTF Monthly Wastewater DO Tracking Program - 03/2016

Village of Huntley, IL

	West (Envirex)		Northeast (Lakeside)		Northwest (Envirex)	
	Inner Ring DO	Outer Ring DO	North Ditch DO	South Ditch DO	Inner Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/L)	(mg/L)	(mg/l)	(mg/L)	(mg/L)
1						
2	7.97	0.85	0.39	3.55		
3						
4	8.75	1.25	0.31	3.85		
5						
6						
7	7.13	0.53	0.39	2.96		
8						
9	5.99	0.34	1.58	2.15		
10						
11	6.25	0.52	1.00	4.50		
12						
13						
14	4.92	0.42	1.35	3.03		
15						
16	5.98	0.78	1.98	4.15		
17						
18	6.61	0.58	0.48	4.58		
19						
20						
21	5.23	0.63	0.34	2.66		
22						
23	6.36	0.86	1.26	3.69		
24	7.60	1.58	1.25	3.90		
25						
26						
27						
28	6.52	0.62	1.30	4.08		
29						
30	5.12	0.61	0.34	3.10		
31						
Overall Average	6.49	0.74	0.92	3.55	-	-
Maximum	8.75	1.58	1.98	4.58	-	-
Minimum	4.92	0.34	0.31	2.15	-	-

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Notes:

The Northwest Oxidation Ditch was not in use during the time of sampling

East WWTF Monthly Wastewater DO Tracking Program - 04/2016

Village of Huntley, IL

	West (Envirex)		Northeast (Lakeside)		Northwest (Envirex)	
	Inner Ring DO	Outer Ring DO	North Ditch DO	South Ditch DO	Inner Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/L)	(mg/L)	(mg/l)	(mg/L)	(mg/L)
1	5.88	0.49	0.69	5.08		
2						
3						
4	4.18	0.61	0.48	3.54		
5						
6	4.25	0.75	1.26	2.60		
7						
8	5.45	0.68	1.11	4.25		
9						
10						
11	4.00	0.96	1.41	2.54		
12						
13	4.65	0.76	0.42	2.25		
14						
15	5.62	0.62	0.54	4.22		
16						
17						
18	2.42	0.64	0.60	1.45		
19						
20	4.25	0.68	1.06	1.74		
21						
22	5.02	0.97	1.50	3.93		
23						
24						
25	3.36	0.53	1.58	2.91		
26						
27	3.26	0.71	0.54	3.48		
28						
29	5.38	0.71	0.61	4.13		
30						
Overall Average	4.44	0.70	0.91	3.24	-	-
Maximum	5.88	0.97	1.58	5.08	-	-
Minimum	2.42	0.49	0.42	1.45	-	-

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Notes:

The Northwest Oxidation Ditch was not in use during the time of sampling

East WWTF Monthly Wastewater DO Tracking Program - 05/2016

Village of Huntley, IL

	West (Envirex)		Northeast (Lakeside)		Northwest (Envirex)	
	Inner Ring DO	Outer Ring DO	North Ditch DO	South Ditch DO	Inner Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/L)	(mg/L)	(mg/l)	(mg/L)	(mg/L)
1	4.39	0.83	0.57	4.30		
2						
3						
4	4.00	0.64	1.40	1.61		
5						
6	4.43	0.60	1.01	3.80		
7						
8						
9	3.05	0.61	1.47	2.91		
10						
11	3.69	0.80	0.46	3.63		
12						
13	3.49	0.71	0.61	3.52		
14						
15						
16	3.05	0.44	0.36	2.25		
17						
18	3.07	0.34	0.90	2.40		
19						
20	4.01	0.62	1.00	3.80		
21						
22						
23						
24	2.10	0.18	0.60	1.35		
25	0.87	0.16	0.12	0.85		
26	1.99	0.14	0.12	1.99		
27						
28						
29						
30						
31	0.78	0.19	0.17	0.30		
Overall Average	2.99	0.48	0.68	2.52	-	-
Maximum	4.43	0.83	1.47	4.30	-	-
Minimum	0.78	0.14	0.12	0.30	-	-

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Notes:

The Northwest Oxidation Ditch was not in use during the time of sampling

East WWTF Monthly Wastewater DO Tracking Program - 06/2016

Village of Huntley, IL

	West (Envirex)		Northeast (Lakeside)		Northwest (Envirex)	
	Inner Ring DO	Outer Ring DO	North Ditch DO	South Ditch DO	Inner Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/L)	(mg/L)	(mg/l)	(mg/L)	(mg/L)
1	0.18	0.16	0.14	0.90		
2						
3	2.55	0.25	2.14	2.79		
4						
5						
6	4.00	0.36	0.85	2.58		
7						
8	4.35	0.50	1.60	3.80		
9						
10	4.25	0.35	2.77	4.30		
11						
12						
13	3.14	0.27	1.60	4.05		
14						
15	3.59	0.18	4.40	4.14		
16						
17	3.74	0.14	2.22	4.01		
18						
19						
20	3.49	0.19	2.11	3.88		
21	3.72	0.28	0.60	2.20		
22	3.33	0.20	0.90	1.89		
23						
24	4.34	0.33	1.15	2.20		
25						
26						
27	4.00	0.31	1.17	1.79		
28						
29	5.20	0.51	1.50	3.16		
30						
Overall Average	3.56	0.29	1.65	2.98	-	-
Maximum	5.20	0.51	4.40	4.30	-	-
Minimum	0.18	0.14	0.14	0.90	-	-

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Notes:

The Northwest Oxidation Ditch was not in use during the time of sampling

East WWTF Monthly Wastewater DO Tracking Program - 07/2016

Village of Huntley, IL

	West (Envirex)		Northeast (Lakeside)		Northwest (Envirex)	
	Inner Ring DO	Outer Ring DO	North Ditch DO	South Ditch DO	Inner Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/L)	(mg/L)	(mg/l)	(mg/L)	(mg/L)
1	4.41	0.71	2.40	2.21		
2						
3						
4						
5	4.30	0.95	0.78	2.30		
6	4.35	0.36	0.70	2.25		
7						
8	3.69	0.39	0.85	1.17		
9						
10						
11	4.00	0.28	0.60	1.50		
12	3.21	0.40	0.65	1.38		
13						
14						
15	3.11	0.28	0.72	1.43		
16						
17						
18	4.38	0.36	0.80	1.50		
19						
20	4.23	0.40	0.65	1.73		
21						
22	4.00	0.32	0.84	2.05		
23						
24						
25	3.90	0.34	1.80	2.10		
26						
27	3.72	0.31	1.32	2.06		
28						
29	3.80	0.34	0.89	1.45		
30						
31						
Overall Average	3.93	0.42	1.00	1.78	-	-
Maximum	4.41	0.95	2.40	2.30	-	-
Minimum	3.11	0.28	0.60	1.17	-	-

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\DO Tracking\[East Plant D.O. For Report Appendices.xlsx]July 16

Notes:

The Northwest Oxidation Ditch was not in use during the time of sampling

East WWTF Monthly Wastewater DO Tracking Program - 08/2016

Village of Huntley, IL

	West (Envirex)		Northeast (Lakeside)		Northwest (Envirex)	
	Inner Ring DO	Outer Ring DO	North Ditch DO	South Ditch DO	Inner Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/L)	(mg/L)	(mg/l)	(mg/L)	(mg/L)
1	4.05	0.35	0.75	1.82		
2						
3	4.15	0.22	0.75	1.54		
4						
5	3.80	0.30	0.75	1.65		
6						
7						
8	4.38	0.30	1.15	2.19		
9						
10	3.74	0.30	0.89	1.79		
11						
12	3.21	0.32	0.98	1.41		
13						
14						
15	3.48	0.34	1.07	1.64		
16						
17	3.70	0.44	0.83	1.15		
18						
19	3.75	0.44	0.83	1.17		
20						
21						
22	3.43	0.31	1.10	2.33		
23						
24	3.47	0.29	2.98	2.34		
25						
26	3.68	0.31	1.13	2.26		
27						
28						
29	3.81	0.35	0.75	1.80		
30						
31	3.96	0.43	0.95	2.35		
Overall Average	3.76	0.34	1.07	1.82	-	-
Maximum	4.38	0.44	2.98	2.35	-	-
Minimum	3.21	0.22	0.75	1.15	-	-

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\DO Tracking\[East Plant D.O. For Report Appendices.xlsx]August 16

Notes:

The Northwest Oxidation Ditch was not in use during the time of sampling

East WWTF Monthly Wastewater DO Tracking Program - 09/2016

Village of Huntley, IL

	West (Envirex)		Northeast (Lakeside)		Northwest (Envirex)	
	Inner Ring DO	Outer Ring DO	North Ditch DO	South Ditch DO	Inner Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/L)	(mg/L)	(mg/l)	(mg/L)	(mg/L)
1						
2	3.18	0.58	0.87	2.73		
3						
4						
5						
6	4.00	0.45	1.28	2.70		
7	4.22	0.39	1.20	2.20		
8				2.46		
9	4.10	0.41	1.24			
10						
11						
12	4.85	0.60	0.55	3.15		
13						
14	4.95	0.24	1.10	3.36		
15						
16	3.85	0.50	1.30	2.30		
17						
18						
19	4.43	0.19	1.24	2.76		
20						
21	4.24	0.17	3.00	2.48		
22						
23	4.30	0.24	2.55	2.55		
24						
25						
26	4.49	0.45	2.76	3.15		
27	5.00	0.47	2.10	3.40		
28						
29						
30						
31						
Overall Average	4.30	0.39	1.60	2.77	-	-
Maximum	5.00	0.60	3.00	3.40	-	-
Minimum	3.18	0.17	0.55	2.20	-	-

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\DO Tracking\[East Plant D.O. For Report Appendices.xlsx]September 16

Notes:

The Northwest Oxidation Ditch was not in use during the time of sampling

Appendix G

West WWTF SRT Tracking Sheets (01/2016-09/2016)

West WWTF Monthly Wastewater SRT Tracking Program - 01/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,963	
CLARIFIER NO. 2 =	1,963	
CLARIFIER NO. 3 =	1,963	
CLARIFIER NO. 4 =	1,963	
CLARIFIER NO. 5 =	5,675	
CLARIFIER NO. 6 =	5,675	x
TOTAL (ALL CLARIFIERS) =	19,202	
TOTAL (ONLINE-IN USE) =	**5,675**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
OX DITCH NO. 1 (NORTHERN) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 2 (MIDDLE) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 3 (SOUTHERN) - ENVIREX 2-RING ORBAL =	1,537,995	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	3,901,839	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,537,995**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	123,429	x
DIGESTER NO. 2 =	123,429	x
DIGESTER NO. 3 =	123,429	x
DIGESTER NO. 4 =	123,429	x
TOTAL (ALL DIGESTERS) =	493,714	
TOTAL (ONLINE-IN USE) =	**493,714**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	OX DITCH 1 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 1 Solids Inventory (LBS)	OX DITCH 2 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 2 Solids Inventory (LBS)	OX DITCH 3 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 3 Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER NO. 6 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
																					x						
1			0			0	0.0		0		0		0	0								0	0		20	0	
2			0			0	0		0		0		0	0								0	0		20	0	
3			0			0	0		0		0		0	0								0	0		20	0	
4			0			0	0		0		0		0	0								0	0		20	0	
5			0			0	0		0		0		0	0								0	0		20	0	
6	77,000	12,046	7,736	1.24	4	41	7,777		0		0	6,586	84,528	84,528	12,046						3.5	7,467	91,996	**11.8**	20	4,558	45,374
7	72,000	12,046	7,233	1.22	4	41	7,274		0		0	6,586	84,528	84,528	12,046						3.0	6,401	90,929	**12.5**	20	4,506	44,850
8	52,000	14,562	6,315	1.40	2	23	6,339		0		0	6,038	77,495	77,495	14,562						3.0	7,738	85,233	**13.4**	20	4,238	34,898
9			0			0	0		0		0		0	0								0	0		20	0	
10			0			0	0		0		0		0	0								0	0		20	0	
11			0			0	0		0		0		0	0								0	0		20	0	
12	54,000	14,562	6,558	1.18	2	20	6,578		0		0	6,038	77,495	77,495	14,562						3.0	7,738	85,233	**13.0**	20	4,242	34,928
13	69,000	12,182	7,010	1.23	3	31	7,041		0		0	6,524	83,733	83,733	12,182						3.0	6,473	90,206	**12.8**	20	4,480	44,091
14			0			0	0		0		0		0	0								0	0		20	0	
15	49,000	8,266	3,378	1.26	1	11	3,388		0		0	6,472	83,065	83,065	8,266						2.5	3,660	86,725	**25.6**	20	4,326	62,748
16			0			0	0		0		0		0	0								0	0		20	0	
17			0			0	0		0		0		0	0								0	0		20	0	
18			0			0	0		0		0		0	0								0	0		20	0	
19	62,000	12,324	6,372	1.21	2	20	6,393		0		0	6,746	86,582	86,582	12,324						3.0	6,548	93,130	**14.6**	20	4,636	45,108
20			0			0	0		0		0		0	0								0	0		20	0	
21	61,000	12,324	6,270	1.19	2	20	6,290		0		0	6,746	86,582	86,582	12,324						2.5	5,457	92,039	**14.6**	20	4,582	44,581
22	57,000	12,282	5,839	1.24	4	41	5,880		0		0	6,346	81,448	81,448	12,282						2.5	5,438	86,887	**14.8**	20	4,303	42,008
23			0			0	0		0		0		0	0								0	0		20	0	
24			0			0	0		0		0		0	0								0	0		20	0	
25	39,000	13,626	4,432	1.14	5	48	4,480		0		0	6,222	79,857	79,857	13,626						3.0	7,240	87,097	**19.4**	20	4,307	37,903
26			0			0	0		0		0		0	0								0	0		20	0	
27	45,000	13,308	4,994	1.18	4	39	5,034		0		0	6,172	79,215	79,215	13,308						2.5	5,893	85,108	**16.9**	20	4,216	37,986
28			0			0	0		0		0		0	0								0	0		20	0	
29			0			0	0		0		0		0	0								0	0		20	0	
30			0			0	0		0		0		0	0								0	0		20	0	
31			0			0	0		0		0		0	0								0	0		20	0	

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Notes:

User input cells, all other cells are calculated

West WWTF Monthly Wastewater SRT (Digester) Tracking Program - 01/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO TARGET WASTE RATE (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *ACTUAL* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *TARGET* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1														
2														
3														
4														
5														
6	6.4	10.9	5.3	8.0	10.6	13.3	16.0	18.6	9.0	13.5	18.1	22.6	27.1	31.6
7	6.9	11.0	5.7	8.5	11.4	14.2	17.1	19.9	9.1	13.7	18.3	22.8	27.4	32.0
8	9.5	14.1	6.5	9.8	13.0	16.3	19.6	22.8	9.7	14.6	19.4	24.3	29.1	34.0
9														
10														
11														
12	9.1	14.1	6.3	9.4	12.6	15.7	18.8	22.0	9.7	14.6	19.4	24.3	29.1	34.0
13	7.2	11.2	5.9	8.8	11.7	14.7	17.6	20.6	9.2	13.8	18.4	23.0	27.6	32.2
14														
15	10.1	7.9	12.2	18.3	24.4	30.5	36.6	42.7	9.5	14.3	19.0	23.8	28.6	33.3
16														
17														
18														
19	8.0	10.9	6.5	9.7	12.9	16.2	19.4	22.6	8.9	13.3	17.8	22.2	26.6	31.1
20														
21	8.1	11.1	6.6	9.9	13.1	16.4	19.7	23.0	9.0	13.5	18.0	22.5	27.0	31.5
22	8.7	11.8	7.1	10.6	14.1	17.6	21.2	24.7	9.6	14.4	19.1	23.9	28.7	33.5
23														
24														
25	12.7	13.0	9.3	13.9	18.6	23.2	27.9	32.5	9.6	14.3	19.1	23.9	28.7	33.5
26														
27	11.0	13.0	8.2	12.4	16.5	20.6	24.7	28.9	9.8	14.6	19.5	24.4	29.3	34.2
28														
29														

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West WWTF Monthly Wastewater SRT Tracking Program - 02/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
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CLARIFIER NO. 3 =	1,963	
CLARIFIER NO. 4 =	1,963	
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CLARIFIER NO. 6 =	5,675	x
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OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
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OX DITCH NO. 2 (MIDDLE) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 3 (SOUTHERN) - ENVIREX 2-RING ORBAL =	1,537,995	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	3,901,839	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,537,995**	

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DIGESTER NO. 2 =	123,429	x
DIGESTER NO. 3 =	123,429	x
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***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	OX DITCH 1 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 1 Solids Inventory (LBS)	OX DITCH 2 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 2 Solids Inventory (LBS)	OX DITCH 3 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 3 Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER NO. 6 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
																					x						
1	57,000	13,512	6,423	1.21	1	10	6,433.4		0		0	6,700	85,992	85,992	13,512						3.0	7,180	93,171	**14.5**	20	4,648	41,250
2	60,000	13,512	6,761	1.40	1	12	6,773		0		0	6,700	85,992	85,992	13,512						3.0	7,180	93,171	**13.8**	20	4,647	41,236
3	48,000	16,306	6,528	1.21	1	10	6,538		0		0	5,990	76,879	76,879	16,306						3.0	8,664	85,543	**13.1**	20	4,267	31,377
4	61,000	16,306	8,296	1.22	1	10	8,306		0		0	5,990	76,879	76,879	16,306						2.5	7,220	84,099	**10.1**	20	4,195	30,846
5	60,000	13,084	6,547	1.12	6	56	6,603		0		0	6,344	81,423	81,423	13,084						2.0	4,635	86,057	**13.0**	20	4,247	38,919
6			0			0	0		0		0		0	0								0	0		20	0	
7			0			0	0		0		0		0	0								0	0		20	0	
8	66,000	12,474	6,866	1.18	4	39	6,906		0		0	6,270	80,473	80,473	12,474						2.5	5,523	85,996	**12.5**	20	4,260	40,953
9	50,000	12,474	5,202	1.11	4	37	5,239		0		0	6,270	80,473	80,473	12,474						3.0	6,628	87,101	**16.6**	20	4,318	41,506
10	74,000	10,330	6,375	1.10	3	28	6,403		0		0	6,298	80,832	80,832	10,330						3.0	5,489	86,321	**13.5**	20	4,289	49,779
11	46,000	10,330	3,963	1.13	3	28	3,991		0		0	6,298	80,832	80,832	10,330						3.0	5,489	86,321	**21.6**	20	4,288	49,770
12	39,000	13,594	4,422	1.04	3	26	4,448		0		0	5,768	74,030	74,030	13,594						2.5	6,019	80,049	**18.0**	20	3,976	35,074
13			0			0	0		0		0		0	0								0	0		20	0	
14			0			0	0		0		0		0	0								0	0		20	0	
15			0			0	0		0		0		0	0								0	0		20	0	
16	60,000	12,258	6,134	1.08	4	36	6,170		0		0	5,976	76,699	76,699	12,258						2.0	4,342	81,042	**13.1**	20	4,016	39,284
17	60,000	6,592	3,299	1.07	9	80	3,379		0		0	6,244	80,139	80,139	6,592						2.0	2,335	82,474	**24.4**	20	4,043	73,547
18	61,000	6,592	3,354	1.14	9	86	3,439		0		0	6,244	80,139	80,139	6,592						3.0	3,503	83,642	**24.3**	20	4,097	74,513
19	67,000	10,758	6,011	1.29	7	75	6,087		0		0	5,856	75,159	75,159	10,758						2.5	4,764	79,923	**13.1**	20	3,921	43,700
20			0			0	0		0		0		0	0								0	0		20	0	
21			0			0	0		0		0		0	0								0	0		20	0	
22	63,000	6,150	3,231	1.15	9	86	3,318		0		0	5,954	76,417	76,417	6,150						3.5	3,812	80,229	**24.2**	20	3,925	76,527
23	65,000	6,150	3,334	0.96	9	72	3,406		0		0	5,954	76,417	76,417	6,150						2.5	2,723	79,140	**23.2**	20	3,885	75,743
24	60,000	9,746	4,877	1.16	4	39	4,916		0		0	5,646	72,464	72,464	9,746						2.5	4,315	76,779	**15.6**	20	3,800	46,754
25	61,000	9,746	4,958	1.09	4	36	4,995		0		0	5,654	72,567	72,567	9,746						3.0	5,179	77,745	**15.6**	20	3,851	47,377
26	73,000	6,352	3,867	1.11	5	46	3,914		0		0	5,068	65,046	65,046	6,532						1.0	1,157	66,203	**16.9**	20	3,264	61,610
27			0			0	0		0		0		0	0								0	0		20	0	
28			0			0	0		0		0		0	0								0	0		20	0	
29	60,000	8,370	4,188	1.16	1	10	4,198		0		0	4,954	63,582	63,582	8,370						3.0	4,447	68,030	**16.2**	20	3,392	48,589
			0			0	0		0		0		0	0								0	0		20	0	
			0			0	0		0		0		0	0								0	0		20	0	

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Notes:

(yellow) User input cells, all other cells are calculated

West WWTF Monthly Wastewater SRT (Digester) Tracking Program - 02/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO TARGET WASTE RATE (DAYS)	THICKENING (USING *ACTUAL* WASTE RATE) 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	THICKENING (USING *TARGET* WASTE RATE) 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1	8.7	12.0	6.4	9.6	12.8	16.0	19.2	22.4	8.9	13.3	17.7	22.1	26.6	31.0
2	8.2	12.0	6.1	9.1	12.2	15.2	18.3	21.3	8.9	13.3	17.7	22.2	26.6	31.0
3	10.3	15.7	6.3	9.5	12.6	15.8	18.9	22.1	9.6	14.5	19.3	24.1	28.9	33.8
4	8.1	16.0	5.0	7.4	9.9	12.4	14.9	17.4	9.8	14.7	19.6	24.5	29.4	34.4
5	8.2	12.7	6.3	9.4	12.6	15.7	18.9	22.0	9.7	14.5	19.4	24.2	29.1	33.9
6														
7														
8	7.5	12.1	6.0	9.0	12.0	15.0	18.0	21.0	9.7	14.5	19.3	24.2	29.0	33.8
9	9.9	11.9	7.9	11.9	15.8	19.8	23.7	27.7	9.5	14.3	19.1	23.8	28.6	33.4
10	6.7	9.9	6.5	9.7	12.9	16.1	19.4	22.6	9.6	14.4	19.2	24.0	28.8	33.6
11	10.7	9.9	10.4	15.6	20.8	26.0	31.2	36.4	9.6	14.4	19.2	24.0	28.8	33.6
12	12.7	14.1	9.3	14.0	18.6	23.3	27.9	32.6	10.4	15.5	20.7	25.9	31.1	36.2
13														
14														
15														
16	8.2	12.6	6.7	10.1	13.4	16.8	20.1	23.5	10.3	15.4	20.5	25.6	30.8	35.9
17	8.2	6.7	12.5	18.7	25.0	31.2	37.4	43.7	10.2	15.3	20.4	25.5	30.6	35.6
18	8.1	6.6	12.3	18.4	24.6	30.7	36.8	43.0	10.1	15.1	20.1	25.1	30.2	35.2
19	7.4	11.3	6.8	10.3	13.7	17.1	20.5	24.0	10.5	15.8	21.0	26.3	31.5	36.8
20														
21														
22	7.8	6.5	12.7	19.1	25.5	31.9	38.2	44.6	10.5	15.7	21.0	26.2	31.5	36.7
23	7.6	6.5	12.4	18.5	24.7	30.9	37.1	43.2	10.6	15.9	21.2	26.5	31.8	37.1
24	8.2	10.6	8.4	12.7	16.9	21.1	25.3	29.6	10.8	16.3	21.7	27.1	32.5	37.9
25	8.1	10.4	8.3	12.5	16.6	20.8	24.9	29.1	10.7	16.0	21.4	26.7	32.1	37.4
26	6.8	8.0	10.6	16.0	21.3	26.6	31.9	37.3	12.6	18.9	25.2	31.5	37.8	44.2
27														
28														
29	8.2	10.2	9.8	14.7	19.7	24.6	29.5	34.4	12.1	18.2	24.3	30.3	36.4	42.5

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West WWTF Monthly Wastewater SRT Tracking Program - 03/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,963	
CLARIFIER NO. 2 =	1,963	
CLARIFIER NO. 3 =	1,963	
CLARIFIER NO. 4 =	1,963	
CLARIFIER NO. 5 =	5,675	
CLARIFIER NO. 6 =	5,675	x
TOTAL (ALL CLARIFIERS) =	19,202	
TOTAL (ONLINE-IN USE) =	**5,675**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
OX DITCH NO. 1 (NORTHERN) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 2 (MIDDLE) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 3 (SOUTHERN) - ENVIREX 2-RING ORBAL =	1,537,995	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	3,901,839	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,537,995**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	123,429	x
DIGESTER NO. 2 =	123,429	x
DIGESTER NO. 3 =	123,429	x
DIGESTER NO. 4 =	123,429	x
TOTAL (ALL DIGESTERS) =	493,714	
TOTAL (ONLINE-IN USE) =	**493,714**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	OX DITCH 1 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 1 Solids Inventory (LBS)	OX DITCH 2 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 2 Solids Inventory (LBS)	OX DITCH 3 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 3 Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER NO. 6 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
																					x						
1	61,000	8,370	4,258	1.15	1	10	4,267.7		0		0	4,954	63,582	63,582	8,370						2.0	2,965	66,547	**15.6**	20	3,318	47,529
2	64,000	10,026	5,351	1.11	0	0	5,351		0		0	4,842	62,145	62,145	10,026						2.5	4,439	66,584	**12.4**	20	3,329	39,815
3	41,000	10,026	3,428	1.05	0	0	3,428		0		0	4,842	62,145	62,145	10,026						1.5	2,664	64,809	**18.9**	20	3,240	38,753
4	59,000	9,622	4,735	1.04	3	26	4,761		0		0	4,344	55,753	55,753	9,622						1.5	2,556	58,310	**12.2**	20	2,889	36,007
5			0			0	0		0		0		0	0								0	0		20	0	
6			0			0	0		0		0		0	0								0	0		20	0	
7	67,000	13,466	7,525	1.14	3	29	7,553		0		0	4,616	59,244	59,244	13,466						2.0	4,770	64,015	**8.5**	20	3,172	28,246
8	40,000	13,466	4,492	1.16	3	29	4,521		0		0	4,616	59,244	59,244	13,466						2.0	4,770	64,015	**14.2**	20	3,172	28,242
9	60,000	6,866	3,436	1.15	1	10	3,445		0		0	4,462	57,268	57,268	6,866						2.0	2,432	59,700	**17.3**	20	2,975	51,961
10	21,000	6,866	1,203	1.18	1	10	1,212		0		0	4,462	57,268	57,268	6,866						2.5	3,040	60,308	**49.7**	20	3,006	52,488
11	47,000	9,638	3,778	1.15	4	38	3,816		0		0	4,458	57,217	57,217	9,638						2.0	3,414	60,631	**15.9**	20	2,993	37,237
12			0			0	0		0		0		0	0								0	0		20	0	
13			0			0	0		0		0		0	0								0	0		20	0	
14			0			0	0		0		0		0	0								0	0		20	0	
15	54,000	21,544	9,703	1.29	2	22	9,724		0		0	3,376	43,330	43,330	21,544						2.0	7,632	50,961	**5.2**	20	2,527	14,062
16	50,000	6,586	2,746	1.31	3	33	2,779		0		0	3,320	42,611	42,611	6,586						2.0	2,333	44,944	**16.2**	20	2,214	40,315
17	52,000	6,586	2,856	1.10	3	28	2,884		0		0	3,320	42,611	42,611	6,586						2.5	2,916	45,527	**15.8**	20	2,249	40,942
18	50,000	6,810	2,840	1.17	2	20	2,859		0		0	4,438	56,960	56,960	6,810						2.0	2,412	59,372	**20.8**	20	2,949	51,925
19			0			0	0		0		0		0	0								0	0		20	0	
20			0			0	0		0		0		0	0								0	0		20	0	
21	56,000	8,800	4,110	1.18	1	10	4,120		0		0	4,562	58,551	58,551	8,800						2.0	3,117	61,669	**15.0**	20	3,074	41,879
22	66,000	8,800	4,844	1.19	1	10	4,854		0		0	4,562	58,551	58,551	8,800						3.0	4,676	63,227	**13.0**	20	3,151	42,940
23	55,000	12,768	5,857	1.23	2	21	5,877		0		0	4,122	52,904	52,904	12,768						2.0	4,523	57,427	**9.8**	20	2,851	26,772
24	51,000	6,906	2,937	1.38	4	46	2,983		0		0	3,278	42,072	42,072	6,906						2.0	2,446	44,518	**14.9**	20	2,180	37,848
25			0			0	0		0		0		0	0								0	0		20	0	
26			0			0	0		0		0		0	0								0	0		20	0	
27			0			0	0		0		0		0	0								0	0		20	0	
28	52,000	10,650	4,619	1.15	1	10	4,628		0		0	4,386	56,292	56,292	10,650						2.5	4,716	61,008	**13.2**	20	3,041	34,235
29	54,000	10,650	4,796	1.14	1	10	4,806		0		0	4,386	56,292	56,292	10,650						2.0	3,773	60,065	**12.5**	20	2,994	33,705
30	52,000	2,630	1,141	1.23	2	21	1,161		0		0	3,740	48,001	48,001	2,630						3.0	1,397	49,399	**42.5**	20	2,449	111,671
31	50,000	2,630	1,097	1.25	2	21	1,118		0		0	3,740	48,001	48,001	2,630						2.0	932	48,933	**43.8**	20	2,426	110,594

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West WWTF Monthly Wastewater SRT (Digester) Tracking Program - 03/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO: ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO: TARGET WASTE RATE (DAYS)	THICKENING (USING *ACTUAL* WASTE RATE) 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	THICKENING (USING *TARGET* WASTE RATE) 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1	8.1	10.4	9.7	14.5	19.3	24.2	29.0	33.8	12.4	18.6	24.8	31.0	37.2	43.4
2	7.7	12.4	7.7	11.5	15.4	19.2	23.1	26.9	12.4	18.6	24.7	30.9	37.1	43.3
3	12.0	12.7	12.0	18.0	24.0	30.0	36.0	42.0	12.7	19.1	25.4	31.8	38.1	44.5
4	8.4	13.7	8.7	13.0	17.4	21.7	26.1	30.4	14.3	21.4	28.5	35.6	42.8	49.9
5														
6														
7	7.4	17.5	5.5	8.2	10.9	13.7	16.4	19.2	13.0	19.5	26.0	32.5	38.9	45.4
8	12.3	17.5	9.2	13.7	18.3	22.9	27.5	32.1	13.0	19.5	26.0	32.5	38.9	45.4
9	8.2	9.5	12.0	18.0	24.0	30.0	36.0	41.9	13.8	20.8	27.7	34.6	41.5	48.4
10	23.5	9.4	34.2	51.4	68.5	85.6	102.7	119.8	13.7	20.5	27.4	34.2	41.1	47.9
11	10.5	13.3	10.9	16.3	21.8	27.2	32.7	38.1	13.8	20.6	27.5	34.4	41.3	48.1
12														
13														
14														
15	9.1	35.1	4.2	6.4	8.5	10.6	12.7	14.9	16.3	24.4	32.6	40.7	48.9	57.0
16	9.9	12.2	15.0	22.5	30.0	37.5	45.0	52.5	18.6	27.9	37.2	46.5	55.8	65.1
17	9.5	12.1	14.4	21.6	28.8	36.0	43.2	50.5	18.3	27.5	36.6	45.8	54.9	64.1
18	9.9	9.5	14.5	21.7	29.0	36.2	43.5	50.7	14.0	20.9	27.9	34.9	41.9	48.9
19														
20														
21	8.8	11.8	10.0	15.0	20.0	25.0	30.1	35.1	13.4	20.1	26.8	33.5	40.2	46.9
22	7.5	11.5	8.5	12.8	17.0	21.3	25.5	29.8	13.1	19.6	26.1	32.7	39.2	45.7
23	9.0	18.4	7.0	10.5	14.1	17.6	21.1	24.6	14.4	21.7	28.9	36.1	43.3	50.6
24	9.7	13.0	14.0	21.0	28.0	35.0	42.1	49.1	18.9	28.3	37.8	47.2	56.7	66.1
25														
26														
27														
28	9.5	14.4	8.9	13.4	17.8	22.3	26.7	31.2	13.5	20.3	27.1	33.9	40.6	47.4
29	9.1	14.6	8.6	12.9	17.2	21.5	25.8	30.0	13.8	20.6	27.5	34.4	41.3	48.1
30	9.5	4.4	36.1	54.2	72.2	90.3	108.3	126.4	16.8	25.2	33.6	42.0	50.4	58.8
31	9.9	4.5	37.5	56.3	75.1	93.9	112.6	131.4	17.0	25.5	33.9	42.4	50.9	59.4

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West WWTF Monthly Wastewater SRT Tracking Program - 04/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,963	
CLARIFIER NO. 2 =	1,963	
CLARIFIER NO. 3 =	1,963	
CLARIFIER NO. 4 =	1,963	
CLARIFIER NO. 5 =	5,675	
CLARIFIER NO. 6 =	5,675	x
TOTAL (ALL CLARIFIERS) =	19,202	
TOTAL (ONLINE-IN USE) =	**5,675**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
OX DITCH NO. 1 (NORTHERN) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 2 (MIDDLE) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 3 (SOUTHERN) - ENVIREX 2-RING ORBAL =	1,537,995	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	3,901,839	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,537,995**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	123,429	x
DIGESTER NO. 2 =	123,429	x
DIGESTER NO. 3 =	123,429	x
DIGESTER NO. 4 =	123,429	x
TOTAL (ALL DIGESTERS) =	493,714	
TOTAL (ONLINE-IN USE) =	**493,714**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	OX DITCH 1 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 1 Solids Inventory (LBS)	OX DITCH 2 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 2 Solids Inventory (LBS)	OX DITCH 3 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 3 Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER NO. 6 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
																					x						
1	49,000	6,584	2,691	1.25	2	21	2,711.5		0		0	4,176	53,597	53,597	6,584						3.0	3,498	57,096	**21.1**	20	2,834	51,610
2			0			0	0		0		0		0	0								0	0		20	0	
3			0			0	0		0		0		0	0								0	0		20	0	
4	49,000	6,260	2,558	1.24	3	31	2,589		0		0	4,156	53,340	53,340	6,260						2.5	2,772	56,112	**21.7**	20	2,775	53,145
5	48,000	6,260	2,506	1.31	3	33	2,539		0		0	4,156	53,340	53,340	6,260						2.5	2,772	56,112	**22.1**	20	2,773	53,111
6	51,000	7,112	3,025	1.47	0	0	3,025		0		0	3,938	50,543	50,543	7,112						2.0	2,519	53,062	**17.5**	20	2,653	44,730
7	62,000	7,112	3,677	1.27	0	0	3,677		0		0	3,938	50,543	50,543	7,112						2.0	2,519	53,062	**14.4**	20	2,653	44,730
8	63,000	6,104	3,207	1.25	2	21	3,228		0		0	3,814	48,951	48,951	6,104						2.0	2,162	51,113	**15.8**	20	2,535	49,793
9			0			0	0		0		0		0	0								0	0		20	0	
10			0			0	0		0		0		0	0								0	0		20	0	
11	55,000	7,694	3,529	1.16	2	19	3,549		0		0	3,788	48,617	48,617	7,694						2.0	2,725	51,343	**14.5**	20	2,548	39,705
12	52,000	7,694	3,337	1.17	2	20	3,356		0		0	3,788	48,617	48,617	7,694						2.5	3,407	52,024	**15.5**	20	2,582	40,233
13	28,000	6,226	1,454	1.19	1	10	1,464		0		0	3,734	47,924	47,924	6,226						2.0	2,205	50,130	**34.2**	20	2,497	48,080
14	57,000	6,226	2,960	1.23	1	10	2,970		0		0	3,734	47,924	47,924	6,226						2.0	2,205	50,130	**16.9**	20	2,496	48,074
15	36,000	6,312	1,895	1.15	3	29	1,924		0		0	3,904	50,106	50,106	6,312						2.5	2,795	52,901	**27.5**	20	2,616	49,699
16			0			0	0		0		0		0	0								0	0		20	0	
17			0			0	0		0		0		0	0								0	0		20	0	
18	75,000	6,276	3,926	1.16	2	19	3,945		0		0	4,046	51,929	51,929	6,276						2.0	2,223	54,152	**13.7**	20	2,688	51,359
19	58,000	6,276	3,036	1.10	2	18	3,054		0		0	4,046	51,929	51,929	6,276						2.0	2,223	54,152	**17.7**	20	2,689	51,378
20			0			0	0		0		0		0	0								0	0		20	0	
21	61,000	6,808	3,464	1.16	1	10	3,473		0		0	3,712	47,642	47,642	6,808						2.5	3,015	50,656	**14.6**	20	2,523	44,438
22	44,000	7,328	2,689	1.16	3	29	2,718		0		0	3,838	49,259	49,259	7,328						2.0	2,596	51,855	**19.1**	20	2,564	41,949
23			0			0	0		0		0		0	0								0	0		20	0	
24			0			0	0		0		0		0	0								0	0		20	0	
25			0			0	0		0		0		0	0								0	0		20	0	
26	73,000	5,796	3,529	1.26	1	11	3,539		0		0	3,940	50,568	50,568	5,796						2.0	2,053	52,621	**14.9**	20	2,621	54,213
27	64,000	10,130	5,407	1.32	1	11	5,418		0		0	3,962	50,851	50,851	10,130						2.5	4,486	55,336	**10.2**	20	2,756	32,619
28	52,000	10,130	4,393	1.31	1	11	4,404		0		0	3,962	50,851	50,851	10,130						2.0	3,588	54,439	**12.4**	20	2,711	32,089
29	61,000	5,384	2,739	1.22	2	20	2,759		0		0	3,626	46,538	46,538	5,384						1.5	1,430	47,969	**17.4**	20	2,378	52,961
30			0			0	0		0		0		0	0								0	0		20	0	
			0			0	0		0		0		0	0								0	0		20	0	

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Notes:

User input cells, all other cells are calculated

West WWTF Monthly Wastewater SRT (Digester) Tracking Program - 04/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO TARGET WASTE RATE (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *ACTUAL* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *TARGET* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1	10.1	9.6	15.3	23.0	30.6	38.3	45.9	53.6	14.5	21.8	29.1	36.3	43.6	50.9
2														
3														
4	10.1	9.3	16.1	24.1	32.2	40.2	48.3	56.3	14.8	22.3	29.7	37.1	44.5	51.9
5	10.3	9.3	16.4	24.6	32.9	41.1	49.3	57.5	14.8	22.3	29.7	37.1	44.5	52.0
6	9.7	11.0	13.6	20.4	27.2	34.0	40.8	47.6	15.5	23.3	31.0	38.8	46.6	54.3
7	8.0	11.0	11.2	16.8	22.4	28.0	33.6	39.2	15.5	23.3	31.0	38.8	46.6	54.3
8	7.8	9.9	12.8	19.3	25.7	32.1	38.5	44.9	16.2	24.4	32.5	40.6	48.7	56.9
9														
10														
11	9.0	12.4	11.7	17.5	23.3	29.2	35.0	40.8	16.2	24.2	32.3	40.4	48.5	56.6
12	9.5	12.3	12.3	18.5	24.7	30.9	37.0	43.2	15.9	23.9	31.9	39.9	47.8	55.8
13	17.6	10.3	28.3	42.5	56.6	70.8	85.0	99.1	16.5	24.7	33.0	41.2	49.5	57.7
14	8.7	10.3	13.9	20.9	27.8	34.8	41.7	48.7	16.5	24.7	33.0	41.2	49.5	57.7
15	13.7	9.9	21.7	32.6	43.5	54.3	65.2	76.0	15.7	23.6	31.5	39.3	47.2	55.1
16														
17														
18	6.6	9.6	10.5	15.7	21.0	26.2	31.5	36.7	15.3	23.0	30.6	38.3	46.0	53.6
19	8.5	9.6	13.6	20.3	27.1	33.9	40.7	47.5	15.3	23.0	30.6	38.3	45.9	53.6
20														
21	8.1	11.1	11.9	17.8	23.8	29.7	35.7	41.6	16.3	24.5	32.6	40.8	49.0	57.1
22	11.2	11.8	15.3	23.0	30.6	38.3	45.9	53.6	16.1	24.1	32.1	40.2	48.2	56.2
23														
24														
25														
26	6.8	9.1	11.7	17.5	23.3	29.2	35.0	40.8	15.7	23.6	31.4	39.3	47.1	55.0
27	7.7	15.1	7.6	11.4	15.2	19.0	22.8	26.7	14.9	22.4	29.9	37.4	44.8	52.3
28	9.5	15.4	9.4	14.1	18.7	23.4	28.1	32.8	15.2	22.8	30.4	38.0	45.6	53.2
29	8.1	9.3	15.0	22.5	30.1	37.6	45.1	52.6	17.3	26.0	34.6	43.3	51.9	60.6
30														

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West WWTF Monthly Wastewater SRT Tracking Program - 06/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,963	
CLARIFIER NO. 2 =	1,963	
CLARIFIER NO. 3 =	1,963	
CLARIFIER NO. 4 =	1,963	
CLARIFIER NO. 5 =	5,675	
CLARIFIER NO. 6 =	5,675	x
TOTAL (ALL CLARIFIERS) =	19,202	
TOTAL (ONLINE-IN USE) =	**5,675**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
OX DITCH NO. 1 (NORTHERN) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 2 (MIDDLE) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 3 (SOUTHERN) - ENVIREX 2-RING ORBAL =	1,537,995	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	3,901,839	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,537,995**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	123,429	x
DIGESTER NO. 2 =	123,429	x
DIGESTER NO. 3 =	123,429	x
DIGESTER NO. 4 =	123,429	x
TOTAL (ALL DIGESTERS) =	493,714	
TOTAL (ONLINE-IN USE) =	**493,714**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	OX DITCH 1 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 1 Solids Inventory (LBS)	OX DITCH 2 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 2 Solids Inventory (LBS)	OX DITCH 3 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 3 Solids Inventory (LBS)
1	49,000	6,544	2,674	1.11	1	9	2,683.5		0		0	3,792	48,669
2	50,000	6,544	2,729	1.01	1	8	2,737		0		0	3,792	48,669
3			0			0	0		0		0		0
4			0			0	0		0		0		0
5			0			0	0		0		0		0
6	69,000	5,606	3,226	1.02	2	17	3,243		0		0	3,480	44,664
7	47,000	5,606	2,197	1.16	2	19	2,217		0		0	3,480	44,664
8	51,000	9,682	4,118	1.23	1	10	4,128		0		0	3,516	45,126
9	54,000	9,682	4,360	1.05	1	9	4,369		0		0	3,516	45,126
10	73,000	5,146	3,133	1.12	0	0	3,133		0		0	3,488	44,767
11			0			0	0		0		0		0
12			0			0	0		0		0		0
13			0			0	0		0		0		0
14	82,000	10,880	7,441	1.24	2	21	7,461		0		0	3,708	47,591
15			0			0	0		0		0		0
16	64,000	8,280	4,420	1.24	1	10	4,430		0		0	3,550	45,563
17	40,000	5,676	1,894	1.21	1	10	1,904		0		0	3,728	47,847
18			0			0	0		0		0		0
19			0			0	0		0		0		0
20	70,000	5,398	3,151	1.26	2	21	3,172		0		0	4,028	51,698
21	59,000	5,398	2,656	1.20	2	20	2,676		0		0	4,028	51,698
22	52,000	6,086	2,639	1.26	2	21	2,660		0		0	3,666	47,052
23	56,000	6,086	2,842	1.26	2	21	2,863		0		0	3,666	47,052
24	53,000	5,910	2,612	1.30	0	0	2,612		0		0	3,830	49,156
25			0			0	0		0		0		0
26			0			0	0		0		0		0
27	57,000	7,832	3,723	1.26	3	32	3,755		0		0	3,740	48,001
28	47,000	7,832	3,070	1.26	3	32	3,102		0		0	3,740	48,001
29	45,000	5,534	2,077	1.17	1	10	2,087		0		0	3,560	45,691
30	54,000	5,534	2,492	1.24	1	10	2,503		0		0	3,560	45,691
			0			0	0		0		0		0

DATE	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER NO. 6 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
								x						
1	48,669	6,544						2.0	2,318	50,987	**19.0**	20	2,540	46,541
2	48,669	6,544						1.5	1,739	50,407	**18.4**	20	2,512	46,026
3	0								0	0		20	0	
4	0								0	0		20	0	
5	0								0	0		20	0	
6	44,664	5,606						2.0	1,986	46,650	**14.4**	20	2,315	49,525
7	44,664	5,606						2.0	1,986	46,650	**21.0**	20	2,313	49,475
8	45,126	9,682						2.5	4,287	49,413	**12.0**	20	2,460	30,470
9	45,126	9,682						3.0	5,145	50,271	**11.5**	20	2,505	31,020
10	44,767	5,146						2.5	2,279	47,046	**15.0**	20	2,352	54,809
11	0								0	0		20	0	
12	0								0	0		20	0	
13	0								0	0		20	0	
14	47,591	10,880						2.0	3,854	51,445	**6.9**	20	2,552	28,120
15	0								0	0		20	0	
16	45,563	8,280						2.0	2,933	48,496	**10.9**	20	2,414	34,964
17	47,847	5,676						2.0	2,011	49,858	**26.2**	20	2,483	52,449
18	0								0	0		20	0	
19	0								0	0		20	0	
20	51,698	5,398						2.0	1,912	53,610	**16.9**	20	2,659	59,074
21	51,698	5,398						2.0	1,912	53,610	**20.0**	20	2,660	59,096
22	47,052	6,086						2.0	2,156	49,207	**18.5**	20	2,439	48,059
23	47,052	6,086						2.0	2,156	49,207	**17.2**	20	2,439	48,059
24	49,156	5,910						2.0	2,094	51,250	**19.6**	20	2,562	51,989
25	0								0	0		20	0	
26	0								0	0		20	0	
27	48,001	7,832						2.5	3,468	51,469	**13.7**	20	2,542	38,916
28	48,001	7,832						2.0	2,774	50,776	**16.4**	20	2,507	38,385
29	45,691	5,534						2.0	1,960	47,651	**22.8**	20	2,373	51,411
30	45,691	5,534						1.5	1,470	47,161	**18.8**	20	2,348	50,868
	0								0	0		20	0	

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Notes:

User input cells, all other cells are calculated

West WWTF Monthly Wastewater SRT (Digester) Tracking Program - 06/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO: ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO: TARGET WASTE RATE (DAYS)	THICKENING (USING *ACTUAL* WASTE RATE) 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	THICKENING (USING *TARGET* WASTE RATE) 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1	10.1	10.6	15.4	23.1	30.8	38.5	46.2	53.9	16.2	24.3	32.4	40.5	48.6	56.7
2	9.9	10.7	15.1	22.6	30.2	37.7	45.3	52.8	16.4	24.6	32.8	41.0	49.2	57.4
3														
4														
5														
6	7.2	10.0	12.8	19.1	25.5	31.9	38.3	44.7	17.8	26.7	35.6	44.5	53.3	62.2
7	10.5	10.0	18.7	28.1	37.5	46.8	56.2	65.6	17.8	26.7	35.6	44.5	53.4	62.3
8	9.7	16.2	10.0	15.0	20.0	25.0	30.0	35.0	16.7	25.1	33.5	41.8	50.2	58.6
9	9.1	15.9	9.4	14.2	18.9	23.6	28.3	33.1	16.4	24.7	32.9	41.1	49.3	57.5
10	6.8	9.0	13.1	19.7	26.3	32.9	39.4	46.0	17.5	26.3	35.0	43.8	52.5	61.3
11														
12														
13														
14	6.0	17.6	5.5	8.3	11.1	13.8	16.6	19.4	16.1	24.2	32.3	40.3	48.4	56.5
15														
16	7.7	14.1	9.3	14.0	18.6	23.3	28.0	32.6	17.1	25.6	34.1	42.6	51.2	59.7
17	12.3	9.4	21.7	32.6	43.5	54.4	65.2	76.1	16.6	24.9	33.2	41.5	49.8	58.0
18														
19														
20	7.1	8.4	13.1	19.6	26.1	32.7	39.2	45.7	15.5	23.2	31.0	38.7	46.4	54.2
21	8.4	8.4	15.5	23.3	31.0	38.8	46.5	54.3	15.5	23.2	31.0	38.7	46.4	54.2
22	9.5	10.3	15.6	23.4	31.2	39.0	46.8	54.6	16.9	25.3	33.8	42.2	50.6	59.1
23	8.8	10.3	14.5	21.7	29.0	36.2	43.5	50.7	16.9	25.3	33.8	42.2	50.6	59.1
24	9.3	9.5	15.8	23.6	31.5	39.4	47.3	55.2	16.1	24.1	32.1	40.2	48.2	56.2
25														
26														
27	8.7	12.7	11.1	16.6	22.1	27.6	33.2	38.7	16.2	24.3	32.4	40.5	48.6	56.7
28	10.5	12.9	13.4	20.1	26.8	33.5	40.2	46.9	16.4	24.6	32.8	41.1	49.3	57.5
29	11.0	9.6	19.8	29.7	39.7	49.6	59.5	69.4	17.4	26.0	34.7	43.4	52.1	60.7
30	9.1	9.7	16.5	24.8	33.0	41.3	49.6	57.8	17.5	26.3	35.1	43.8	52.6	61.4

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West WWTF Monthly Wastewater SRT Tracking Program - 07/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,963	
CLARIFIER NO. 2 =	1,963	
CLARIFIER NO. 3 =	1,963	
CLARIFIER NO. 4 =	1,963	
CLARIFIER NO. 5 =	5,675	
CLARIFIER NO. 6 =	5,675	x
TOTAL (ALL CLARIFIERS) =	19,202	
TOTAL (ONLINE-IN USE) =	**5,675**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
OX DITCH NO. 1 (NORTHERN) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 2 (MIDDLE) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 3 (SOUTHERN) - ENVIREX 2-RING ORBAL =	1,537,995	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	3,901,839	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,537,995**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	123,429	x
DIGESTER NO. 2 =	123,429	x
DIGESTER NO. 3 =	123,429	x
DIGESTER NO. 4 =	123,429	x
TOTAL (ALL DIGESTERS) =	493,714	
TOTAL (ONLINE-IN USE) =	**493,714**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	OX DITCH 1 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 1 Solids Inventory (LBS)	OX DITCH 2 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 2 Solids Inventory (LBS)	OX DITCH 3 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 3 Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER NO. 6 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
																					x						
1	54,000	4,924	2,218	1.21	2	20	2,237.8		0		0	3,514	45,101	45,101	4,924						1.5	1,308	46,409	**20.7**	20	2,300	56,014
2			0			0	0		0		0		0	0								0	0		20	0	
3			0			0	0		0		0		0	0								0	0		20	0	
4			0			0	0		0		0		0	0								0	0		20	0	
5	57,000	9,464	4,499	1.32	1	11	4,510		0		0	4,186	53,726	53,726	9,464						2.0	3,352	57,078	**12.7**	20	2,843	36,018
6	48,000	13,534	5,418	1.31	3	33	5,451		0		0	3,878	49,772	49,772	13,534						2.0	4,794	54,567	**10.0**	20	2,696	23,881
7	51,000	13,534	5,757	1.24	3	31	5,788		0		0	3,878	49,772	49,772	13,534						1.5	3,596	53,368	**9.2**	20	2,637	23,366
8	68,000	5,838	3,311	1.32	2	22	3,333		0		0	3,676	47,180	47,180	5,838						2.0	2,068	49,248	**14.8**	20	2,440	50,122
9			0			0	0		0		0		0	0								0	0		20	0	
10			0			0	0		0		0		0	0								0	0		20	0	
11	56,000	6,652	3,107	1.32	3	33	3,140		0		0	3,838	49,259	49,259	6,652						2.0	2,356	51,615	**16.4**	20	2,548	45,924
12	76,000	6,652	4,216	1.29	3	32	4,249		0		0	3,838	49,259	49,259	6,652						2.0	2,356	51,615	**12.1**	20	2,548	45,937
13	53,000	6,188	2,735	1.14	3	29	2,764		0		0	3,718	47,719	47,719	6,188						1.5	1,644	49,363	**17.9**	20	2,440	47,272
14			0			0	0		0		0		0	0							1.5	0	0		20	0	
15	50,000	5,916	2,467	1.01	2	17	2,484		0		0	3,750	48,130	48,130	5,916						2.0	2,096	50,225	**20.2**	20	2,494	50,556
16			0			0	0		0		0		0	0								0	0		20	0	
17			0			0	0		0		0		0	0								0	0		20	0	
18	54,000	6,026	2,714	1.22	2	20	2,734		0		0	3,896	50,003	50,003	6,026						2.0	2,135	52,138	**19.1**	20	2,587	51,467
19	52,000	6,026	2,613	1.21	2	20	2,634		0		0	3,896	50,003	50,003	6,026						2.0	2,135	52,138	**19.8**	20	2,587	51,470
20			0			0	0		0		0		0	0								0	0		20	0	
21	32,000	3,644	973	1.34	2	22	995		0		0	3,000	38,504	38,504	3,644						2.0	1,291	39,795	**40.0**	20	1,967	64,736
22	55,000	6,832	3,134	1.19	3	30	3,164		0		0	3,920	50,312	50,312	6,832						2.0	2,420	52,732	**16.7**	20	2,607	45,750
23			0			0	0		0		0		0	0								0	0		20	0	
24			0			0	0		0		0		0	0								0	0		20	0	
25	56,000	6,540	3,054	1.38	3	35	3,089		0		0	3,748	48,104	48,104	6,540						2.5	2,896	51,000	**16.5**	20	2,515	46,118
26	51,000	6,540	2,782	1.14	3	29	2,810		0		0	3,748	48,104	48,104	6,540						2.0	2,317	50,421	**17.9**	20	2,493	45,698
27	64,000	6,794	3,626	1.37	1	11	3,638		0		0	3,668	47,077	47,077	6,794						2.0	2,407	49,484	**13.6**	20	2,463	43,464
28	65,000	6,794	3,683	1.20	1	10	3,693		0		0	3,668	47,077	47,077	6,794						2.0	2,407	49,484	**13.4**	20	2,464	43,489
29	66,000	5,162	2,841	1.30	2	22	2,863		0		0	3,348	42,970	42,970	5,162						2.0	1,829	44,799	**15.6**	20	2,218	51,526
30			0			0	0		0		0		0	0								0	0		20	0	
31			0			0	0		0		0		0	0								0	0		20	0	

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Notes:

User input cells, all other cells are calculated

West WWTF Monthly Wastewater SRT (Digester) Tracking Program - 07/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO: ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO: TARGET WASTE RATE (DAYS)	THICKENING (USING *ACTUAL* WASTE RATE) 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	THICKENING (USING *TARGET* WASTE RATE) 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1	9.1	8.8	18.6	27.9	37.1	46.4	55.7	65.0	17.9	26.9	35.8	44.8	53.7	62.7
2														
3														
4														
5	8.7	13.7	9.2	13.7	18.3	22.9	27.5	32.0	14.5	21.7	29.0	36.2	43.5	50.7
6	10.3	20.7	7.6	11.4	15.2	19.0	22.8	26.6	15.3	22.9	30.6	38.2	45.8	53.5
7	9.7	21.1	7.2	10.7	14.3	17.9	21.5	25.0	15.6	23.4	31.2	39.0	46.8	54.6
8	7.3	9.9	12.4	18.7	24.9	31.1	37.3	43.5	16.9	25.3	33.7	42.2	50.6	59.1
9														
10														
11	8.8	10.8	13.3	19.9	26.5	33.1	39.8	46.4	16.2	24.2	32.3	40.4	48.5	56.6
12	6.5	10.7	9.8	14.6	19.5	24.4	29.3	34.2	16.2	24.2	32.3	40.4	48.5	56.5
13	9.3	10.4	15.1	22.6	30.1	37.6	45.2	52.7	16.9	25.3	33.8	42.2	50.6	59.1
14														
15	9.9	9.8	16.7	25.0	33.4	41.7	50.1	58.4	16.5	24.8	33.0	41.3	49.5	57.8
16														
17														
18	9.1	9.6	15.2	22.8	30.3	37.9	45.5	53.1	15.9	23.9	31.8	39.8	47.8	55.7
19	9.5	9.6	15.8	23.6	31.5	39.4	47.3	55.1	15.9	23.9	31.8	39.8	47.8	55.7
20														
21	15.4	7.6	42.3	63.5	84.7	105.8	127.0	148.2	20.9	31.4	41.9	52.3	62.8	73.3
22	9.0	10.8	13.1	19.7	26.3	32.8	39.4	46.0	15.8	23.7	31.6	39.5	47.4	55.3
23														
24														
25	8.8	10.7	13.5	20.2	27.0	33.7	40.4	47.2	16.4	24.6	32.7	40.9	49.1	57.3
26	9.7	10.8	14.8	22.2	29.6	37.0	44.4	51.8	16.5	24.8	33.0	41.3	49.6	57.8
27	7.7	11.4	11.4	17.0	22.7	28.4	34.1	39.7	16.7	25.1	33.4	41.8	50.2	58.5
28	7.6	11.4	11.2	16.8	22.4	27.9	33.5	39.1	16.7	25.1	33.4	41.8	50.1	58.5
29	7.5	9.6	14.5	21.7	29.0	36.2	43.5	50.7	18.6	27.8	37.1	46.4	55.7	65.0
30														
31														

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West WWTF Monthly Wastewater SRT Tracking Program - 08/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,963	
CLARIFIER NO. 2 =	1,963	
CLARIFIER NO. 3 =	1,963	
CLARIFIER NO. 4 =	1,963	
CLARIFIER NO. 5 =	5,675	
CLARIFIER NO. 6 =	5,675	x
TOTAL (ALL CLARIFIERS) =	19,202	
TOTAL (ONLINE-IN USE) =	**5,675**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
OX DITCH NO. 1 (NORTHERN) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 2 (MIDDLE) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 3 (SOUTHERN) - ENVIREX 2-RING ORBAL =	1,537,995	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	3,901,839	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,537,995**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	123,429	x
DIGESTER NO. 2 =	123,429	x
DIGESTER NO. 3 =	123,429	x
DIGESTER NO. 4 =	123,429	x
TOTAL (ALL DIGESTERS) =	493,714	
TOTAL (ONLINE-IN USE) =	**493,714**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	OX DITCH 1 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 1 Solids Inventory (LBS)	OX DITCH 2 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 2 Solids Inventory (LBS)	OX DITCH 3 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 3 Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER NO. 6 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
																					x						
1	50,000	7,830	3,265	1.35	2	23	3,287.6		0		0	2,966	38,067	38,067	7,830						3.0	4,161	42,228	**12.8**	20	2,089	31,988
2	75,000	7,830	4,898	1.35	2	23	4,920		0		0	2,966	38,067	38,067	7,830						2.5	3,467	41,534	**8.4**	20	2,054	31,457
3	72,000	6,960	4,179	1.26	5	53	4,232		0		0	3,038	38,991	38,991	6,960						2.0	2,465	41,457	**9.8**	20	2,020	34,805
4	64,000	6,960	3,715	1.39	5	58	3,773		0		0	3,038	38,991	38,991	6,960						2.0	2,465	41,457	**11.0**	20	2,015	34,712
5	50,000	6,954	2,900	1.30	5	54	2,954		0		0	3,036	38,966	38,966	6,954						2.0	2,463	41,429	**14.0**	20	2,017	34,782
6			0			0	0		0		0		0	0								0	0		20	0	
7			0			0	0		0		0		0	0								0	0		20	0	
8	53,000	7,200	3,183	1.35	1	11	3,194		0		0	3,456	44,356	44,356	7,200						2.0	2,551	46,907	**14.7**	20	2,334	38,870
9	49,000	7,200	2,942	1.19	1	10	2,952		0		0	3,456	44,356	44,356	7,200						3.0	3,826	48,182	**16.3**	20	2,399	39,954
10	49,000	5,696	2,328	1.29	2	22	2,349		0		0	3,616	46,410	46,410	5,696						2.5	2,522	48,932	**20.8**	20	2,425	51,049
11	51,000	5,696	2,423	1.23	2	21	2,443		0		0	3,616	46,410	46,410	5,696						2.0	2,018	48,428	**19.8**	20	2,401	50,539
12	54,000	5,130	2,310	1.22	3	31	2,341		0		0	3,602	46,230	46,230	5,130						2.0	1,817	48,047	**20.5**	20	2,372	55,437
13			0			0	0		0		0		0	0								0	0		20	0	
14			0			0	0		0		0		0	0								0	0		20	0	
15	56,000	6,878	3,212	1.27	2	21	3,233		0		0	3,528	45,280	45,280	6,878						2.5	3,046	48,326	**14.9**	20	2,395	41,754
16	54,000	6,878	3,098	1.26	2	21	3,119		0		0	3,528	45,280	45,280	6,878						2.0	2,436	47,717	**15.3**	20	2,365	41,226
17	50,000	5,896	2,459	1.27	2	21	2,480		0		0	3,546	45,511	45,511	5,896						2.5	2,611	48,122	**19.4**	20	2,385	48,501
18			0			0	0		0		0		0	0								0	0		20	0	
19	52,000	6,426	2,787	1.29	2	22	2,808		0		0	3,744	48,053	48,053	6,426						2.0	2,276	50,329	**17.9**	20	2,495	46,553
20			0			0	0		0		0		0	0								0	0		20	0	
21			0			0	0		0		0		0	0								0	0		20	0	
22	56,000	6,836	3,193	1.23	1	10	3,203		0		0	3,750	48,130	48,130	6,836						2.5	3,027	51,157	**16.0**	20	2,548	44,685
23	50,000	6,836	2,851	1.07	1	9	2,860		0		0	3,750	48,130	48,130	6,836						2.0	2,422	50,551	**17.7**	20	2,519	44,177
24	54,000	6,032	2,717	1.43	3	36	2,752		0		0	3,818	49,002	49,002	6,032						2.0	2,137	51,139	**18.6**	20	2,521	50,116
25	51,000	6,032	2,566	1.12	3	28	2,594		0		0	3,818	49,002	49,002	6,032						2.0	2,137	51,139	**19.7**	20	2,529	50,270
26	52,000	6,232	2,703	0.99	1	8	2,711		0		0	3,590	46,076	46,076	6,232						2.0	2,208	48,284	**17.8**	20	2,406	46,291
27			0			0	0		0		0		0	0								0	0		20	0	
28			0			0	0		0		0		0	0								0	0		20	0	
29	54,000	8,432	3,797	1.40	2	23	3,821		0		0	3,564	45,742	45,742	8,432						2.0	2,987	48,729	**12.8**	20	2,413	34,315
30	55,000	8,432	3,868	1.06	2	18	3,885		0		0	3,564	45,742	45,742	8,432						2.5	3,734	49,476	**12.7**	20	2,456	34,926
31	51,000	6,144	2,613	1.03	2	17	2,630		0		0	3,600	46,204	46,204	6,144						3.0	3,265	49,469	**18.8**	20	2,456	47,936

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Notes:

User input cells, all other cells are calculated

West WWTF Monthly Wastewater SRT (Digester) Tracking Program - 08/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO ACTUAL WASTE RATE (DAYS)	DIGESTER STORAGE TIME - NO TARGET WASTE RATE (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *ACTUAL* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	DIGESTER STORAGE TIME - THICKENING (USING *TARGET* WASTE RATE) PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1	9.9	15.4	12.6	18.9	25.2	31.5	37.8	44.1	19.7	29.6	39.4	49.3	59.1	69.0
2	6.6	15.7	8.4	12.6	16.8	21.0	25.2	29.4	20.0	30.1	40.1	50.1	60.1	70.2
3	6.9	14.2	9.9	14.8	19.7	24.6	29.6	34.5	20.4	30.6	40.8	51.0	61.1	71.3
4	7.7	14.2	11.1	16.6	22.2	27.7	33.3	38.8	20.4	30.7	40.9	51.1	61.3	71.5
5	9.9	14.2	14.2	21.3	28.4	35.5	42.6	49.7	20.4	30.6	40.8	51.0	61.2	71.4
6														
7														
8	9.3	12.7	12.9	19.4	25.9	32.3	38.8	45.3	17.6	26.5	35.3	44.1	52.9	61.7
9	10.1	12.4	14.0	21.0	28.0	35.0	42.0	49.0	17.2	25.7	34.3	42.9	51.5	60.1
10	10.1	9.7	17.7	26.5	35.4	44.2	53.1	61.9	17.0	25.5	34.0	42.4	50.9	59.4
11	9.7	9.8	17.0	25.5	34.0	42.5	51.0	59.5	17.2	25.7	34.3	42.9	51.5	60.0
12	9.1	8.9	17.8	26.7	35.6	44.6	53.5	62.4	17.4	26.0	34.7	43.4	52.1	60.8
13														
14														
15	8.8	11.8	12.8	19.2	25.6	32.0	38.5	44.9	17.2	25.8	34.4	43.0	51.6	60.2
16	9.1	12.0	13.3	19.9	26.6	33.2	39.9	46.5	17.4	26.1	34.8	43.5	52.2	60.9
17	9.9	10.2	16.7	25.1	33.5	41.9	50.2	58.6	17.3	25.9	34.5	43.2	51.8	60.4
18														
19	9.5	10.6	14.8	22.2	29.6	36.9	44.3	51.7	16.5	24.8	33.0	41.3	49.5	57.8
20														
21														
22	8.8	11.0	12.9	19.3	25.8	32.2	38.7	45.1	16.2	24.2	32.3	40.4	48.5	56.6
23	9.9	11.2	14.4	21.7	28.9	36.1	43.3	50.6	16.3	24.5	32.7	40.9	49.0	57.2
24	9.1	9.9	15.2	22.7	30.3	37.9	45.5	53.1	16.3	24.5	32.7	40.8	49.0	57.2
25	9.7	9.8	16.0	24.1	32.1	40.1	48.1	56.2	16.3	24.4	32.6	40.7	48.8	57.0
26	9.5	10.7	15.2	22.9	30.5	38.1	45.7	53.3	17.1	25.7	34.2	42.8	51.3	59.9
27														
28														
29	9.1	14.4	10.8	16.3	21.7	27.1	32.5	38.0	17.1	25.6	34.1	42.7	51.2	59.7
30	9.0	14.1	10.6	16.0	21.3	26.6	31.9	37.3	16.8	25.1	33.5	41.9	50.3	58.7
31	9.7	10.3	15.8	23.6	31.5	39.4	47.3	55.1	16.8	25.1	33.5	41.9	50.3	58.7

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West WWTF Monthly Wastewater SRT Tracking Program - 09/2016

Village of Huntley, IL

CLARIFIERS	SURFACE AREA(FT^2)	ONLINE*
CLARIFIER NO. 1 =	1,963	
CLARIFIER NO. 2 =	1,963	
CLARIFIER NO. 3 =	1,963	
CLARIFIER NO. 4 =	1,963	
CLARIFIER NO. 5 =	5,675	
CLARIFIER NO. 6 =	5,675	x
TOTAL (ALL CLARIFIERS) =	19,202	
TOTAL (ONLINE-IN USE) =	**5,675**	

***Type "x" in the green cell(s) to designate the corresponding Clarifier as In Use for the current month.**

OXIDATION DITCHES	VOLUME (GAL)	ONLINE*
OX DITCH NO. 1 (NORTHERN) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 2 (MIDDLE) - ENVIREX 3-RING ORBAL =	1,181,922	
OX DITCH NO. 3 (SOUTHERN) - ENVIREX 2-RING ORBAL =	1,537,995	x
TOTAL VOLUME (ALL OXIDATION DITCHES) =	3,901,839	
TOTAL OXIDATION DITCHES VOLUME (ONLINE-IN USE) =	**1,537,995**	

***Type "x" in the green cell(s) to designate the corresponding Oxidation Ditch as In Use for the current month.**

DIGESTERS	VOLUME (GAL)	ONLINE*
DIGESTER NO. 1 =	123,429	x
DIGESTER NO. 2 =	123,429	x
DIGESTER NO. 3 =	123,429	x
DIGESTER NO. 4 =	123,429	x
TOTAL (ALL DIGESTERS) =	493,714	
TOTAL (ONLINE-IN USE) =	**493,714**	

***Type "x" in the green cell(s) to designate the corresponding Digester as In Use for the current month.**

DATE	WAS FLOW RATE (GAL)	WASTE SLUDGE CONC (RAS - mg/l)	**WASTE SOLIDS (LBS)**	EFFLUENT FLOW (MGD)	EFF. S. SOL. SOLIDS (mg/l)	EFF. SOLIDS LOST (LBS)	**TOTAL SOLIDS WASTED (LBS)**	OX DITCH 1 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 1 Solids Inventory (LBS)	OX DITCH 2 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 2 Solids Inventory (LBS)	OX DITCH 3 Mixed Liquor Susp. Sol. (mg/l)	OX DITCH 3 Solids Inventory (LBS)	TOTAL OX DITCHES Solids Inventory (LBS)	RAS SOLIDS CONC. (mg/l)	CLARIFIER NO. 1 Sludge Blanket (feet)	CLARIFIER NO. 2 Sludge Blanket (feet)	CLARIFIER NO. 3 Sludge Blanket (feet)	CLARIFIER NO. 4 Sludge Blanket (feet)	CLARIFIER NO. 5 Sludge Blanket (feet)	CLARIFIER NO. 6 Sludge Blanket (feet)	CLARIFIER Solids Inventory (LBS)	TOTAL SOLIDS INVENTORY (LBS)	**SRT (DAYS)**	TARGET SRT (DAYS)	SOLIDS TO WASTE (LBS)	TARGET WASTE RATE (GPD)
																					x						
1	51,000	6,144	2,613	1.13	2	19	2,632.1		0		0	3,600	46,204	46,204	6,144						2.0	2,176	48,381	**18.4**	20	2,400	46,841
2	56,000	6,216	2,903	1.03	2	17	2,920		0		0	3,704	47,539	47,539	6,216						2.5	2,752	50,292	**17.2**	20	2,497	48,174
3			0			0	0		0		0		0	0								0	0		20	0	
4			0			0	0		0		0		0	0								0	0		20	0	
5			0			0	0		0		0		0	0								0	0		20	0	
6	64,000	6,880	3,672	1.11	4	37	3,709		0		0	3,906	50,132	50,132	6,880						2.0	2,437	52,569	**14.2**	20	2,591	45,163
7	49,000	13,918	5,688	1.03	1	9	5,696		0		0	3,640	46,718	46,718	13,918						2.0	4,930	51,648	**9.1**	20	2,574	22,174
8	50,000	13,918	5,804	0.86	1	7	5,811		0		0	3,640	46,718	46,718	13,918						2.0	4,930	51,648	**8.9**	20	2,575	22,186
9	65,000	6,344	3,439	0.93	4	31	3,470		0		0	3,724	47,796	47,796	6,344						1.5	1,685	49,481	**14.3**	20	2,443	46,175
10			0			0	0		0		0		0	0								0	0		20	0	
11			0			0	0		0		0		0	0								0	0		20	0	
12	52,000	6,664	2,890	0.53	3	13	2,903		0		0	3,810	48,900	48,900	6,664						2.5	2,951	51,850	**17.9**	20	2,579	46,410
13			0			0	0		0		0		0	0								0	0		20	0	
14	44,000	15,146	5,558	0.86	1	7	5,565		0		0	1,922	24,668	24,668	15,146						4.0	10,731	35,399	**6.4**	20	1,763	13,955
15	50,000	15,146	6,316	1.01	1	8	6,324		0		0	1,922	24,668	24,668	15,146						2.5	6,707	31,375	**5.0**	20	1,560	12,352
16	49,000	7,118	2,909	0.91	2	15	2,924		0		0	4,126	52,955	52,955	7,118						2.5	3,152	56,107	**19.2**	20	2,790	47,000
17			0			0	0		0		0		0	0								0	0		20	0	
18			0			0	0		0		0		0	0								0	0		20	0	
19	51,000	8,670	3,688	0.88	4	29	3,717		0		0	4,004	51,390	51,390	8,670						3.0	4,607	55,996	**15.1**	20	2,770	38,313
20	51,000	8,670	3,688	0.92	4	31	3,718		0		0	4,004	51,390	51,390	8,670						2.0	3,071	54,461	**14.6**	20	2,692	37,236
21	50,000	6,474	2,700	1.11	4	37	2,737		0		0	3,838	49,259	49,259	6,474						2.0	2,293	51,552	**18.8**	20	2,541	47,054
22	52,000	6,474	2,808	0.98	4	33	2,840		0		0	3,838	49,259	49,259	6,474						2.0	2,293	51,552	**18.1**	20	2,545	47,133
23	50,000	6,008	2,505	1.03	3	26	2,531		0		0	3,716	47,693	47,693	6,008						2.0	2,128	49,822	**19.7**	20	2,465	49,201
24			0			0	0		0		0		0	0								0	0		20	0	
25			0			0	0		0		0		0	0								0	0		20	0	
26	52,000	5,888	2,554	0.94	4	31	2,585		0		0	3,784	48,566	48,566	5,888						1.5	1,564	50,130	**19.4**	20	2,475	50,406
27	50,000	5,888	2,455	0.96	4	32	2,487		0		0	3,784	48,566	48,566	5,888						2.5	2,607	51,173	**20.6**	20	2,527	51,453
28	52,000	6,202	2,690	0.94	2	16	2,705		0		0	3,940	50,568	50,568	6,202						3.0	3,295	53,864	**19.9**	20	2,678	51,766
29	51,000	6,202	2,638	0.98	2	16	2,654		0		0	3,940	50,568	50,568	6,202						1.5	1,648	52,216	**19.7**	20	2,594	50,159
30	68,000	6,130	3,476	0.93	2	15	3,492		0		0	3,890	49,926	49,926	6,130						2.5	2,714	52,641	**15.1**	20	2,617	51,181
			0			0	0		0		0		0	0								0	0		20	0	

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\SRT Tracking\For Report\[West WWTF SRT.xls]September 16

Notes:

User input cells, all other cells are calculated

West WWTF Monthly Wastewater SRT (Digester) Tracking Program - 09/2016

Village of Huntley, IL

DATE	DIGESTER STORAGE TIME - NO		DIGESTER STORAGE TIME - THICKENING (USING *ACTUAL* WASTE RATE)						DIGESTER STORAGE TIME - THICKENING (USING *TARGET* WASTE RATE)					
	ACTUAL WASTE RATE (DAYS)	TARGET WASTE RATE (DAYS)	PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)	PERCENT THICKENING 1% (DAYS)	1.5% (DAYS)	2% (DAYS)	2.5% (DAYS)	3% (DAYS)	3.5% (DAYS)
1	9.7	10.5	15.8	23.6	31.5	39.4	47.3	55.1	17.2	25.7	34.3	42.9	51.5	60.0
2	8.8	10.2	14.2	21.3	28.4	35.5	42.5	49.6	16.5	24.7	33.0	41.2	49.5	57.7
3														
4														
5														
6	7.7	10.9	11.2	16.8	22.4	28.0	33.6	39.2	15.9	23.8	31.8	39.7	47.7	55.6
7	10.1	22.3	7.2	10.9	14.5	18.1	21.7	25.3	16.0	24.0	32.0	40.0	48.0	56.0
8	9.9	22.3	7.1	10.6	14.2	17.7	21.3	24.8	16.0	24.0	32.0	40.0	48.0	56.0
9	7.6	10.7	12.0	18.0	23.9	29.9	35.9	41.9	16.9	25.3	33.7	42.1	50.6	59.0
10														
11														
12	9.5	10.6	14.2	21.4	28.5	35.6	42.7	49.9	16.0	23.9	31.9	39.9	47.9	55.9
13														
14	11.2	35.4	7.4	11.1	14.8	18.5	22.2	25.9	23.4	35.0	46.7	58.4	70.1	81.8
15	9.9	40.0	6.5	9.8	13.0	16.3	19.6	22.8	26.4	39.6	52.8	66.0	79.2	92.4
16	10.1	10.5	14.2	21.2	28.3	35.4	42.5	49.5	14.8	22.1	29.5	36.9	44.3	51.7
17														
18														
19	9.7	12.9	11.2	16.7	22.3	27.9	33.5	39.1	14.9	22.3	29.7	37.2	44.6	52.0
20	9.7	13.3	11.2	16.7	22.3	27.9	33.5	39.1	15.3	22.9	30.6	38.2	45.9	53.5
21	9.9	10.5	15.3	22.9	30.5	38.1	45.8	53.4	16.2	24.3	32.4	40.5	48.6	56.7
22	9.5	10.5	14.7	22.0	29.3	36.7	44.0	51.3	16.2	24.3	32.4	40.4	48.5	56.6
23	9.9	10.0	16.4	24.7	32.9	41.1	49.3	57.5	16.7	25.1	33.4	41.8	50.1	58.5
24														
25														
26	9.5	9.8	16.1	24.2	32.3	40.3	48.4	56.4	16.6	25.0	33.3	41.6	49.9	58.2
27	9.9	9.6	16.8	25.2	33.5	41.9	50.3	58.7	16.3	24.4	32.6	40.7	48.9	57.0
28	9.5	9.5	15.3	23.0	30.6	38.3	45.9	53.6	15.4	23.1	30.8	38.4	46.1	53.8
29	9.7	9.8	15.6	23.4	31.2	39.0	46.8	54.6	15.9	23.8	31.7	39.7	47.6	55.5
30	7.3	9.6	11.8	17.8	23.7	29.6	35.5	41.5	15.7	23.6	31.5	39.3	47.2	55.1

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\SRT Tracking\For Report\[West WWTF SRT_Digester.xls]September 16

Appendix H

West WWTF DO Tracking Sheets (02/2016-09/2016)

West WWTF Monthly Wastewater DO Tracking Program - 02/2016

Village of Huntley, IL

	Southern Oxidation Ditch - No. 3		Middle Oxidation Ditch - No. 2			Northern Oxidation Ditch - No. 1		
	Inner Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/l)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1								
2								
3								
4								
5	2.05	0.55						
6								
7								
8	2.15	0.23						
9								
10	2.05	0.22						
11								
12	1.84	0.87						
13								
14								
15								
16	2.12	0.22						
17	1.94	0.63						
18								
19	1.76	0.78						
20								
21								
22	1.84	0.75						
23								
24	1.76	0.22						
25								
26	2.02	0.53						
27								
28								
29	2.08	0.61						
Monthly Average	1.96	0.51	-	-	-	-	-	-
Maximum	2.15	0.87	-	-	-	-	-	-
Minimum	1.76	0.22	-	-	-	-	-	-

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\DO Tracking\[West Plant D.O. For Report Appendices.xlsx]February 16

Notes:

- The Middle Oxidation Ditch (No. 2) was not in use during the time of sampling
- The Northern Oxidation Ditch (No. 1) was not in use during the time of sampling

West WWTF Monthly Wastewater DO Tracking Program - 03/2016

Village of Huntley, IL

	Southern Oxidation Ditch - No. 3		Middle Oxidation Ditch - No. 2			Northern Oxidation Ditch - No. 1		
	Inner Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/l)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1								
2	2.20	0.23						
3								
4	2.05	0.40						
5								
6								
7	2.16	0.23						
8								
9	2.12	0.24						
10								
11	1.95	0.53						
12								
13								
14	1.90	0.22						
15								
16	1.88	0.21						
17								
18	1.75	0.26						
19								
20								
21	1.94	0.22						
22								
23	2.15	0.22						
24	1.98	0.96						
25								
26								
27								
28	2.07	0.68						
29								
30	1.97	0.22						
31								
Monthly Average	2.01	0.36	-	-	-	-	-	-
Maximum	2.20	0.96	-	-	-	-	-	-
Minimum	1.75	0.21	-	-	-	-	-	-

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\DO Tracking\[West Plant D.O. For Report Appendices.xlsx]March 16

Notes:

- The Middle Oxidation Ditch (No. 2) was not in use during the time of sampling
- The Northern Oxidation Ditch (No. 1) was not in use during the time of sampling

West WWTF Monthly Wastewater DO Tracking Program - 04/2016

Village of Huntley, IL

	Southern Oxidation Ditch - No. 3		Middle Oxidation Ditch - No. 2			Northern Oxidation Ditch - No. 1		
	Inner Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/l)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1	1.79	0.79						
2								
3								
4	1.75	0.23						
5	1.95	0.73						
6	1.99	0.92						
7	2.15	0.22						
8	1.92	0.29						
9								
10								
11	1.74	0.49						
12	1.84	0.73						
13	2.00	0.69						
14	1.99	0.21						
15	1.88	0.71						
16								
17								
18	1.99	0.33						
19	1.94	0.55						
20	1.91	0.74						
21	2.05	0.45						
22	1.94	0.44						
23								
24								
25	1.81	0.53						
26	1.88	0.48						
27	2.03	0.21						
28	2.11	0.21						
29	1.96	0.56						
30								
Monthly Average	1.93	0.50	-	-	-	-	-	-
Maximum	2.15	0.92	-	-	-	-	-	-
Minimum	1.74	0.21	-	-	-	-	-	-

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\DO Tracking\[West Plant D.O. For Report Appendices.xlsx]April 16

Notes:

- The Middle Oxidation Ditch (No. 2) was not in use during the time of sampling
- The Northern Oxidation Ditch (No. 1) was not in use during the time of sampling

West WWTF Monthly Wastewater DO Tracking Program - 05/2016

Village of Huntley, IL

	Southern Oxidation Ditch - No. 3		Middle Oxidation Ditch - No. 2			Northern Oxidation Ditch - No. 1		
	Inner Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/l)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1								
2	1.96	0.22						
3	1.81	0.65						
4	1.88	0.71						
5	1.86	0.21						
6	2.04	0.72						
7								
8								
9	1.96	0.55						
10	2.07	0.20						
11	1.95	0.69						
12	2.10	0.20						
13	2.07	0.39						
14								
15								
16	1.93	0.21						
17	1.95	0.54						
18	1.99	0.21						
19	1.86	0.68						
20	1.95	0.20						
21								
22								
23	1.86	0.42						
24	2.02	0.19						
25	2.06	0.19						
26	2.09	0.22						
27	1.99	0.35						
28								
29								
30								
31	2.00	0.37						
Monthly Average	1.97	0.39	-	-	-	-	-	-
Maximum	2.10	0.72	-	-	-	-	-	-
Minimum	1.81	0.19	-	-	-	-	-	-

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\DO Tracking\[West Plant D.O. For Report Appendices.xlsx]May 2016

Notes:

- The Middle Oxidation Ditch (No. 2) was not in use during the time of sampling
- The Northern Oxidation Ditch (No. 1) was not in use during the time of sampling

West WWTF Monthly Wastewater DO Tracking Program - 06/2016

Village of Huntley, IL

	Southern Oxidation Ditch - No. 3		Middle Oxidation Ditch - No. 2			Northern Oxidation Ditch - No. 1		
DATE	Inner Ring DO (mg/L)	Outer Ring DO (mg/l)	Inner Ring DO (mg/L)	Middle Ring DO (mg/L)	Outer Ring DO (mg/L)	Inner Ring DO (mg/L)	Middle Ring DO (mg/L)	Outer Ring DO (mg/L)
1	2.02	0.22						
2	2.06	0.19						
3	1.99	0.20						
4								
5								
6	1.98	0.93						
7	2.00	0.18						
8	1.95	0.19						
9	2.01	0.19						
10	2.01	0.52						
11								
12								
13	2.07	0.21						
14	1.93	0.61						
15	2.04	0.18						
16	1.99	0.21						
17	2.01	0.48						
18								
19								
20	2.00	0.18						
21	1.92	0.23						
22	1.86	0.18						
23	1.83	0.31						
24	1.87	0.23						
25								
26								
27	1.99	0.28						
28	1.96	0.84						
29	1.93	0.19						
30	1.89	0.61						
Monthly Average	1.97	0.33	-	-	-	-	-	-
Maximum	2.07	0.93	-	-	-	-	-	-
Minimum	1.83	0.18	-	-	-	-	-	-

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\DO Tracking\[West Plant D.O. For Report Appendices.xlsx]June 2016

Notes:
- The Middle Oxidation Ditch (No. 2) was not in use during the time of sampling
- The Northern Oxidation Ditch (No. 1) was not in use during the time of sampling

West WWTF Monthly Wastewater DO Tracking Program - 07/2016

Village of Huntley, IL

	Southern Oxidation Ditch - No. 3		Middle Oxidation Ditch - No. 2			Northern Oxidation Ditch - No. 1		
	Inner Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/l)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1								
2								
3								
4								
5	1.94	0.27						
6	1.98	0.21						
7	2.01	0.26						
8	2.01	0.38						
9								
10								
11	2.02	0.59						
12	1.92	0.88						
13	1.96	0.19						
14	2.03	0.65						
15	1.93	0.64						
16								
17								
18	1.98	0.57						
19	1.94	0.55						
20	2.03	0.45						
21	1.94	0.95						
22	1.93	0.52						
23								
24								
25	2.00	0.44						
26	1.71	0.38						
27	1.69	0.57						
28	2.01	0.59						
29	1.77	0.55						
30								
31								
Monthly Average	1.94	0.51	-	-	-	-	-	-
Maximum	2.03	0.95	-	-	-	-	-	-
Minimum	1.69	0.19	-	-	-	-	-	-

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\DO Tracking\[West Plant D.O. For Report Appendices.xlsx]July 2016

Notes:

- The Middle Oxidation Ditch (No. 2) was not in use during the time of sampling
- The Northern Oxidation Ditch (No. 1) was not in use during the time of sampling

West WWTF Monthly Wastewater DO Tracking Program - 08/2016

Village of Huntley, IL

	Southern Oxidation Ditch - No. 3		Middle Oxidation Ditch - No. 2			Northern Oxidation Ditch - No. 1		
	Inner Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/l)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1	1.99	0.26						
2	1.82	0.45						
3	1.67	0.63						
4	1.48	0.89						
5	1.40	0.73						
6								
7								
8	1.99	0.60						
9	2.03	0.68						
10	2.05	0.73						
11	2.01	0.17						
12	2.01	0.63						
13								
14								
15	1.85	0.19						
16	2.03	0.30						
17	2.01	0.17						
18	2.07	0.18						
19	2.03	0.17						
20								
21								
22	1.91	0.32						
23	1.94	0.35						
24	2.04	0.19						
25	1.84	0.50						
26	1.97	0.40						
27								
28								
29	1.82	0.31						
30	1.94	0.44						
31	1.82	0.48						
Monthly Average	1.90	0.42	-	-	-	-	-	-
Maximum	2.07	0.89	-	-	-	-	-	-
Minimum	1.40	0.17	-	-	-	-	-	-

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\DO Tracking\[West Plant D.O. For Report Appendices.xlsx]August 2016

Notes:

- The Middle Oxidation Ditch (No. 2) was not in use during the time of sampling
- The Northern Oxidation Ditch (No. 1) was not in use during the time of sampling

West WWTF Monthly Wastewater DO Tracking Program - 09/2016

Village of Huntley, IL

	Southern Oxidation Ditch - No. 3		Middle Oxidation Ditch - No. 2			Northern Oxidation Ditch - No. 1		
	Inner Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO	Inner Ring DO	Middle Ring DO	Outer Ring DO
DATE	(mg/L)	(mg/l)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1	2.09	0.18						
2	2.00	0.17						
3								
4								
5								
6	1.89	0.46						
7	1.98	0.47						
8	1.93	0.54						
9	2.02	0.49						
10								
11								
12	1.80	0.19						
13	1.81	0.67						
14	1.89	0.18						
15	1.88	0.37						
16	1.43	0.31						
17								
18								
19	1.95	0.42						
20	1.23	0.30						
21	1.69	0.48						
22	1.98	0.40						
23	1.24	0.33						
24								
25								
26	1.06	0.27						
27	1.37	0.35						
28	1.84	0.45						
29	1.89	0.49						
30	1.87	0.43						
Monthly Average	1.75	0.38	-	-	-	-	-	-
Maximum	2.09	0.67	-	-	-	-	-	-
Minimum	1.06	0.17	-	-	-	-	-	-

G:\Public\Huntley\2015\HU1501 2016 Wastewater System Planning Documents\01B - Phosphorus Discharge Optimization Plan\Eng\DO Tracking\[West Plant D.O. For Report Appendices.xlsx]September 2016

Notes:

- The Middle Oxidation Ditch (No. 2) was not in use during the time of sampling
- The Northern Oxidation Ditch (No. 1) was not in use during the time of sampling

Appendix I

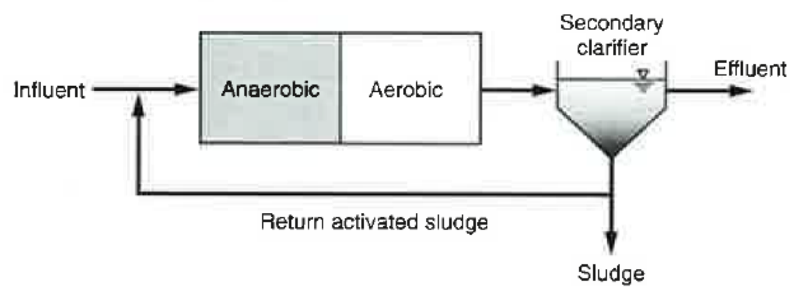
Phosphorus Reduction Techniques

Appendix I: Phosphorus Reduction Techniques

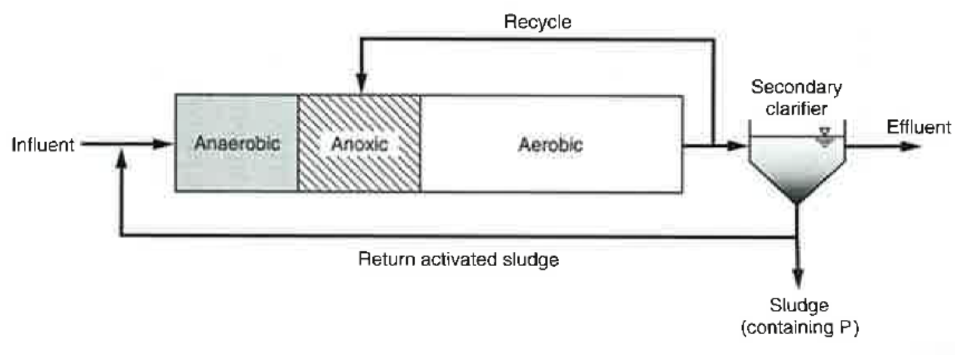
Village of Huntley, IL

Reference 6, pages 810-813 & Reference 17

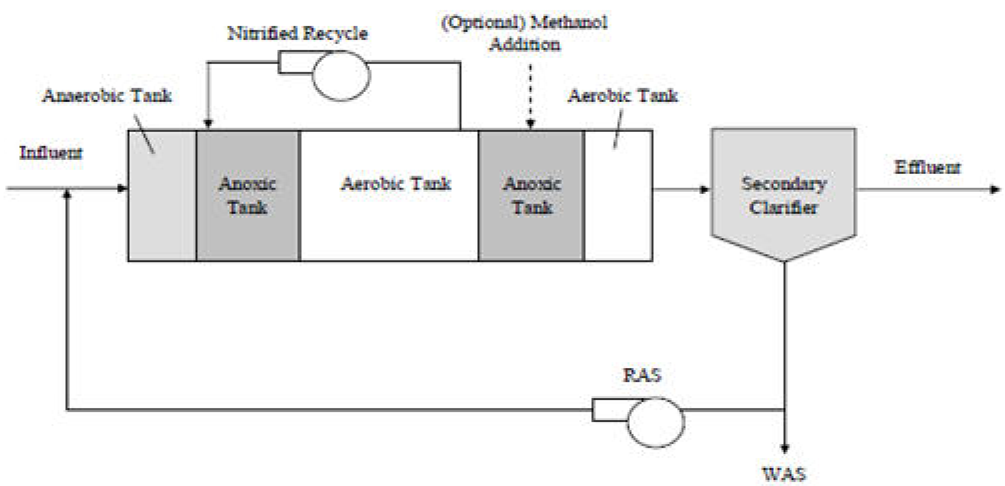
1) Phoredox (A/O)



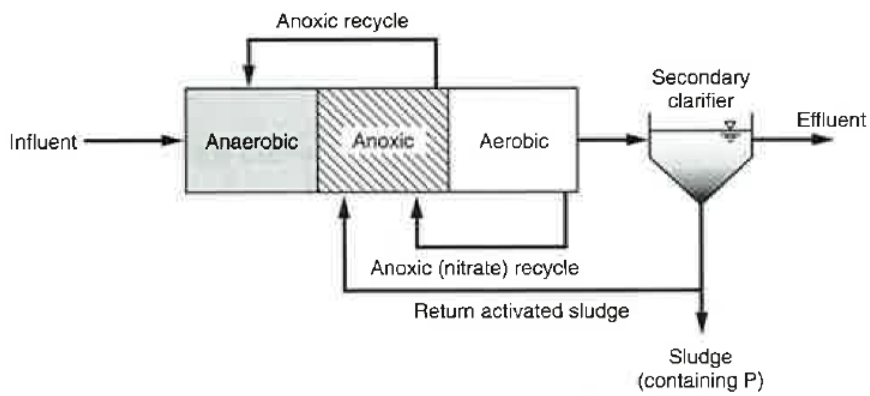
2) A^2/O

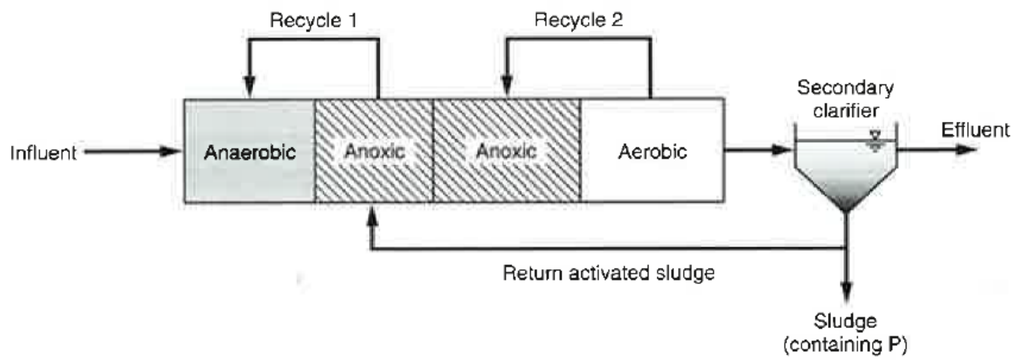


3) Modified Bardenpho (5-stage)

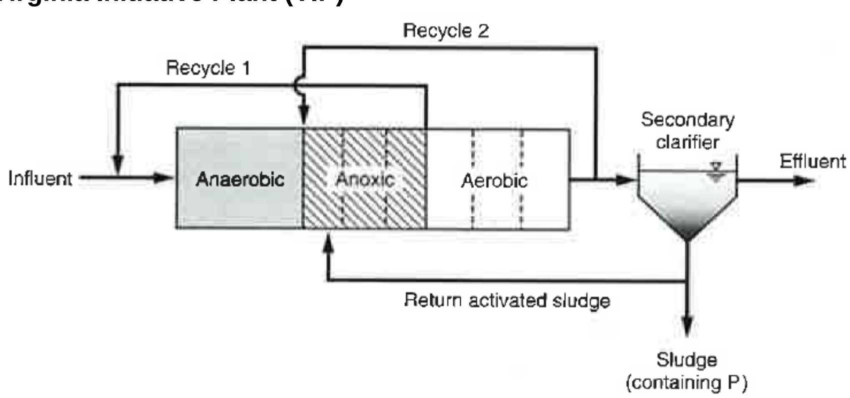


4) University of Cape Town (UCT) (Standard and Modified)

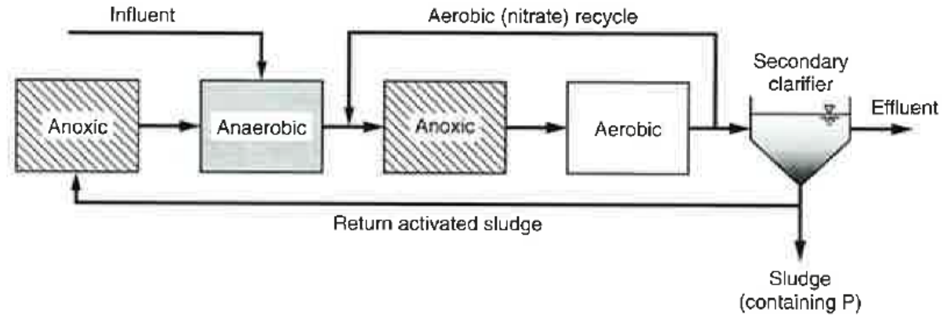




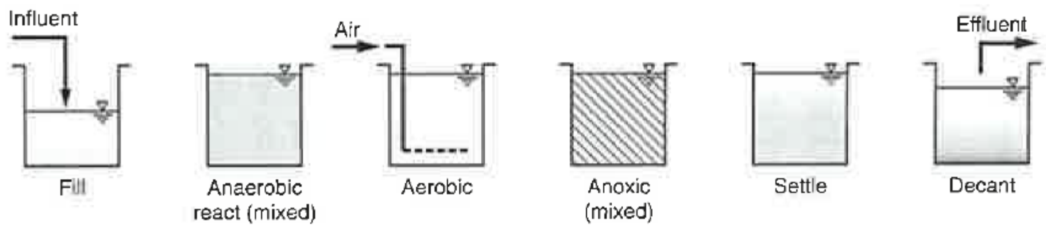
5) Virginia Initiative Plant (VIP)



6) Johannesburg Process



7) Sequencing Batch Reactor (SBR) with Biological Phosphorus Removal



8) PhoStrip