

WASTEWATER TREATMENT FACILITY FACILITIES PLAN AMENDMENT

Prepared for

VILLAGE OF HOWARDS GROVE, WISCONSIN

May 2015



**Wastewater Treatment Facility Evaluation
Village of Howards Grove, Wisconsin
May 2015**

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INTRODUCTION

The Village of Howards Grove, Wisconsin operates a 0.314 mgd wastewater treatment facility. Treatment processes include raw wastewater pumping, fine screening, vortex grit removal, aeration, secondary clarification, phosphorus removal, filtration, and ultraviolet disinfection. Sludge handling facilities consist of aerobic digesters and sludge thickening with a gravity belt thickener.

The treatment plant was constructed in 1965 and expanded in the early 1980's. The treatment plant has been well-maintained over the years, and meets its permit requirements consistently.

Some of the plant's process equipment has reached the end of useful life. Process equipment installed during the last plant expansion is aging, and replacement or rehabilitation must be considered. The plant recently had an effluent violation due to a malfunction of the aeration blowers. The Wisconsin Department of Natural Resources is encouraging the Village to address this issue.

The purpose of this study is to evaluate the existing treatment facility and determine the best approach for making improvements to improve reliability and treatment efficiency, update old technology, and address safety concerns. Flow and loading projections will be developed, and these estimates used to evaluate unit process capacity. The general condition and operating efficiency of treatment units will also be reviewed. The ability of the plant to handle future flows and loadings will also be evaluated, and recommendations for updating and upgrading the facility will be developed. Cost estimates for the improvements, a recommended implementation schedule, and user fee impacts will also be presented.

I. FLOWS AND LOADINGS

Figure I-1 shows the average day, average dry weather, and average wet weather flows for the Village for the years 2011-2014. Flows have not increased over this period

Table I-1 is a summary of historical population and flow trends for Howards Grove, and population and flow projections for Year 2035. Actual population data for 1990-2013 (provided by the Village) and population projections from the State of Wisconsin Department of Administration Demographic Services Center (*Municipal Civil Divisions and Municipal Population Projections 2010-2040, December 2013*) are included. Figure I-2 shows the actual population data and the population projection from Wisconsin DOA. The population projection agrees with the historical growth for the Village. The design year 2035 population estimate for Howards Grove is 4,035.

Table I-1 also includes historical flow data and projections for Howards Grove. The average daily flow for the facility was estimated based on the population projection and the historical flow per capita data. The flow per capita data is fairly consistent from 2010-2014. A per capita flow rate of 74 gpd/person was used to calculate a design year 2035 average day flow rate of 0.3000 mgd.

Table I-2 is a summary of the 2011-2014 operating data for the Village of Howards Grove, and includes flow, BOD, Total Suspended Solids (TSS), ammonia, and phosphorus data. Based on the operating data, peaking factors were developed for maximum month flow, maximum week flow, maximum day flow, and peak hourly flow. These peaking factors were then applied to the design year 2035 average day flow rate to estimate design year flows. This information is summarized in Table I-3 and Figure I-3. Peaking factors were also developed for BOD and TSS. The BOD peaking factor was used to calculate maximum day ammonia and phosphorus loadings since test data for these parameters was limited.

Table I-4 summarizes the population and BOD projections from 2011-2035. The Year 2020 Average Day BOD loading is 686 lb/day, with a Maximum Day loading of 1,605 lb/day.

Table I-5 presents the same information for TSS loadings. The Year 2035 TSS Average Day loading is 807 lb/day and a Maximum Day loading of 2,800 lb/day.

Average and Maximum Day loadings for phosphorus and ammonia are summarized in Table I-3.

Figure I-1
Average Dry Weather Wastewater Flow 2011-2014
Village of Howards Grove, Wisconsin

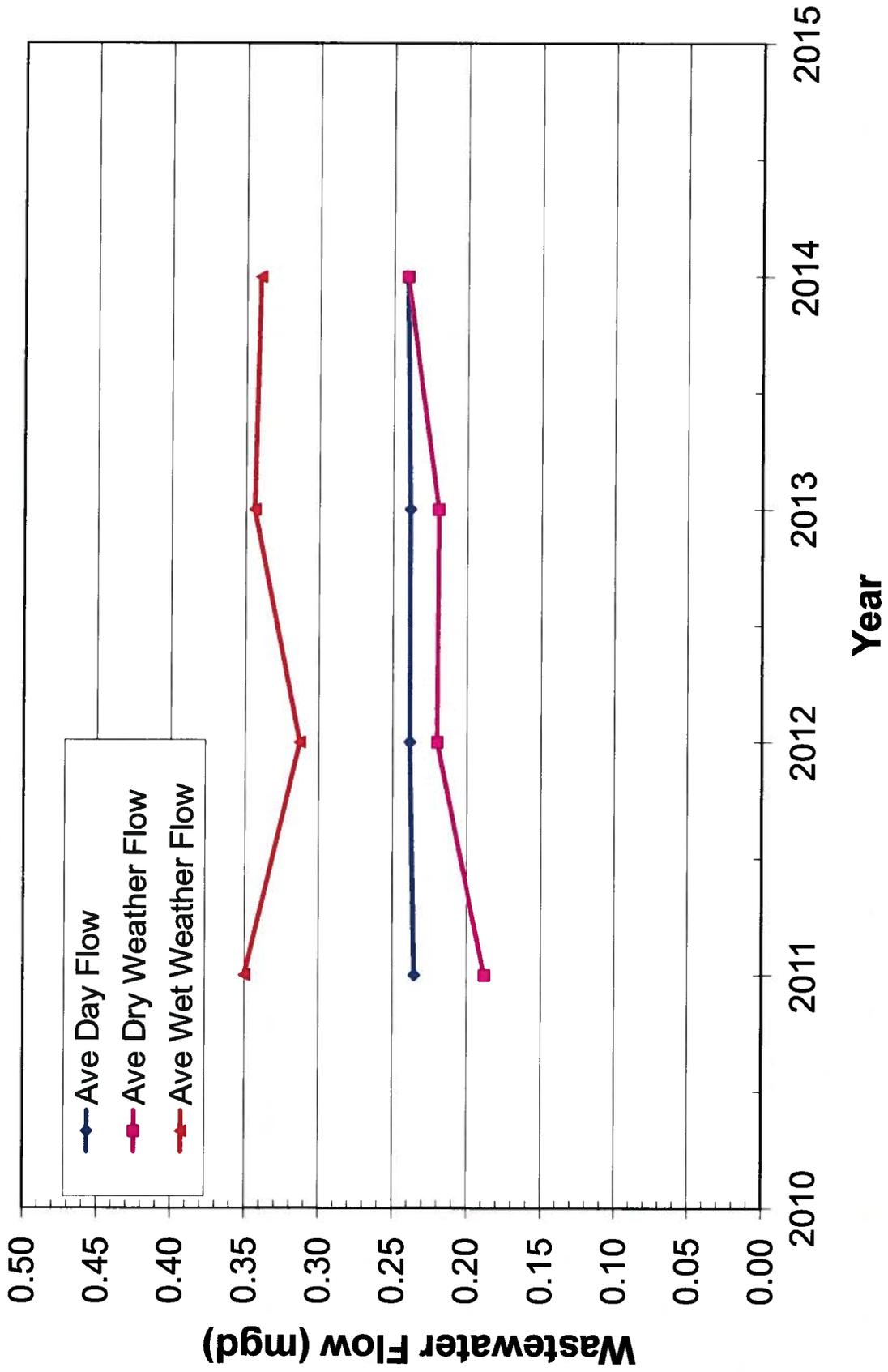


Table I-1
 Population and Flow Projections
 Wastewater Treatment Facility Evaluation
 Village of Howards Grove, Wisconsin

Year	Actual Population	Population Projection	Flow per Capita (gpd/person)	Average Day Flow (mgd)	Average Dry Weather Flow (mgd)	Average Wet Weather Flow (mgd)
1990	2,317					
1991	2,373					
1992	2,418					
1993	2,451					
1994	2,502					
1995	2,541					
1996	2,611					
1997	2,675					
1998	2,739					
2005	2,958					
2006	2,957					
2007	3056					
2008	3095					
2009	3096					
2010	3093					
2011	3,190		73.8	0.2354	0.1880	0.3502
2012	3,199		74.6	0.2386	0.2200	0.3130
2013	3,209		74.4	0.2387	0.2195	0.3442
2014		3,240	74.4	0.2410	0.2410	0.3407
2015		3,270	74.4	0.2433	0.2433	0.3439
2020		3,500	74.4	0.2604	0.2604	0.3681
2025		3,710	74.4	0.2760	0.2760	0.3902
2030		3,905	74.4	0.2905	0.2905	0.4107
2035		4,035	74.4	0.3002	0.3002	0.4244

**Figure I-2
Population Projections
for the Village of Howards Grove, Wisconsin**

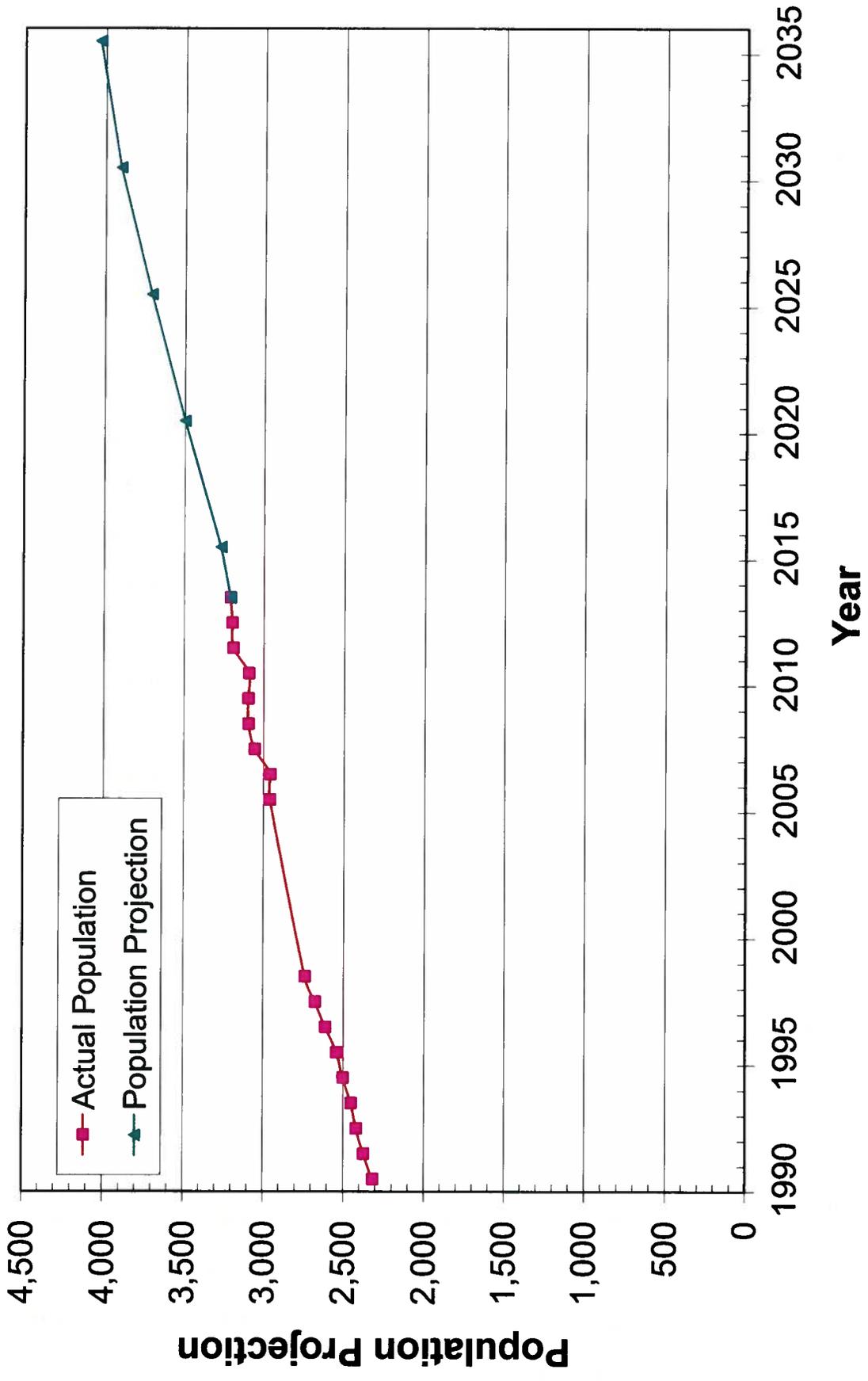


TABLE I-2

**SUMMARY OF EXISTING WASTEWATER FLOWS AND LOADINGS
Village of Howards Grove Wastewater Treatment Facility
Howards Grove, Wisconsin**

		Peaking Factor
Year	2011-2014	
Number of Residents	3,209 ⁽¹⁾	
Average Day Flow	0.238mgd	1.0
Maximum Month Flow	0.617 mgd	2.59
Maximum Week Flow	0.840 mgd	3.50
Maximum Day Flow	1.247 mgd	3.96
Peak Hourly Flow ⁽²⁾	1.430 mgd	5.40
Average Daily BOD	415 ppd	1.0
Maximum Month BOD	520 ppd	1.25
Maximum Day BOD ⁽³⁾	969 ppd	2.34
Average Day TSS	389 ppd	1.0
Maximum Month TSS	600 ppd	1.54
Maximum Day TSS ⁽³⁾	1,354 ppd	3.47
Average Day NH₃-N ⁽⁴⁾	60 ppd	1.0
Maximum Day NH₃-N	129 ppd	2.34
Average Day Phosphorus ⁽⁵⁾	20 ppd	1.0
Maximum Day Phosphorus	44 ppd	2.34

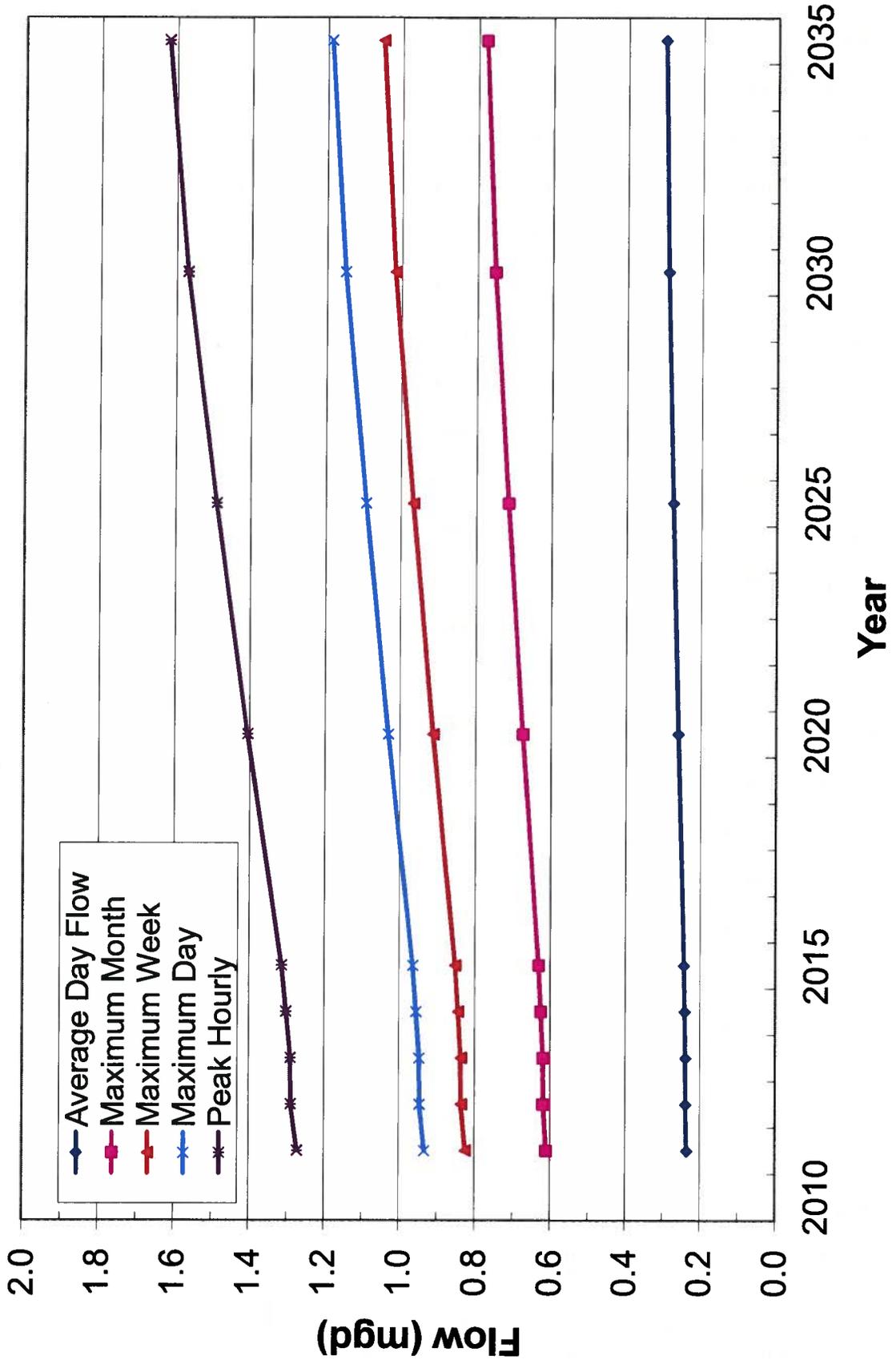
- (1) Estimate of 2013 resident population.
- (2) Peak hourly flow from plant operating data, August 6, 1998.
- (3) BOD and Suspended Solids are sampled three times/week.
- (4) Influent ammonia assumed to be 30 mg/L.
- (5) Influent phosphorus assumed to be 10 mg/L as P.

TABLE I-3**SUMMARY OF FUTURE WASTEWATER FLOWS AND LOADINGS
Village of Howards Grove Wastewater Treatment Facility
Howards Grove, Wisconsin**

Year	2035
Number of Residents	4,035
Average Day Flow	0.300 mgd
Maximum Month Flow	0.777 mgd
Maximum Week Flow	1.050 mgd
Maximum Day Flow	1.189 mgd
Peak Hourly Flow	1.625 mgd
Average Day BOD	686 ppd
Maximum Month BOD	857 ppd
Maximum Day BOD	1,605 ppd
Average Day TSS	807 ppd
Maximum Month TSS	1,243 ppd
Maximum Day TSS	2,800 ppd
Average Day NH₃-N ⁽¹⁾	75 ppd
Maximum Day NH₃-N	176 ppd
Average Day Phosphorus ⁽¹⁾	25 ppd
Maximum Day Phosphorus	59 ppd

⁽¹⁾ Assume future loadings continue to be domestic in nature, therefore, future Ammonia-Nitrogen and Phosphorus will remain the same concentration as existing.

**Figure I-3
Wastewater Flow Projections
for the Village of Howards Grove, Wisconsin**



**Table I-4
Population and BOD Projections
Wastewater Treatment Facility Evaluation
Village of Howards Grove, Wisconsin**

Year	Actual Population	Population Projection	BOD per Capita (lb/day/person)	Average Day BOD (lb/day)	Maximum Month BOD (lb/day)	Maximum Day BOD (lb/day)
1990	2,317					
1991	2,373					
1992	2,418					
1993	2,451					
1994	2,502		0.158	396	471	863
1995	2,541		0.156	396	471	863
1996	2,611		0.153	400	475	871
1997	2,675		0.151	405	482	882
1998	2,739		0.000	0	0	0
2005	2,958		0.000	0	0	0
2006	2,957		0.000	0	0	0
2007	3,056					
2008	3,095					
2009	3,096					
2010	3,093					
2011	3,190		0.124	396	495	927
2012	3,199		0.125	396	495	927
2013	3,209		0.126	400	499	935
2014		3,240	0.126	405	506	947
2015		3,270	0.126	410	512	959
2020		3,500	0.126	449	561	1,051
2025		3,710	0.126	485	606	1,134
2030		3,905	0.126	518	647	1,212
2035		4,035	0.126	540	675	1,264

Table I-5
Population and TSS Projections
Wastewater Treatment Facility Evaluation
Village of Howards Grove, Wisconsin

Year	Actual Population	Population Projection	TSS per Capita (lb/day/person)	Average Day TSS (lb/day)	Maximum Month TSS (lb/day)	Maximum Day TSS (lb/day)
1990	2,317					
1991	2,373					
1992	2,418					
1993	2,451					
1994	2,502					
1995	2,541					
1996	2,611					
1997	2,675					
1998	2,739					
2005	2,958					
2006	2,957					
2007	3,056					
2008	3,095					
2009	3,096					
2010	3,093					
2011	3,190		0.117	372	573	1,292
2012	3,199		0.118	378	581	1,310
2013	3,209		0.132	423	652	1,469
2014		3,240	0.133	429	661	1,490
2015		3,270	0.133	436	671	1,511
2020		3,500	0.138	482	742	1,671
2025		3,710	0.141	524	806	1,817
2030		3,905	0.144	563	866	1,952
2035		4,035	0.146	589	906	2,042

II. PERMIT LIMITS

The Village of Howards Grove was issued its current discharge permit on October 1, 2013 under the Wisconsin Pollutant Discharge Elimination System (WPDES). The permit will expire on September 20, 2018. The discharge sets requirements associated with the discharge of treated effluent from the Village's wastewater treatment facility to the Pigeon River. The permit contains effluent requirements based on a design flow of 0.315 mgd, average annual flow. The existing permit is included in Appendix A. The effluent limits are summarized in Table II-1.

The existing permit included changes that will require the Village to make improvements in order to continue to remain in compliance with permit limits. The changes included:

- The monthly and weekly average BOD limit was reduced to 5 mg/L for May through October.
- An interim weekly average chloride limit of 600 mg/L was added along with a target limit of 450 mg/L.
- An interim monthly average phosphorus limit of 1.0 mg/L was included along with final phosphorus effluent limits:
 - 0.075 mg/L, 6-month average
 - 0.225 mg/L, monthly average

The Village currently removes phosphorus to an average effluent concentration of 0.50 mg/L.

The permit also includes monitoring requirements for copper and maximum daily temperature. Copper must be tested quarterly, and maximum daily temperatures monitored 3 times/week during 2017. A future permit may include limits for copper or daily maximum temperature.

The new chloride limit has a compliance schedule for achieving the target effluent concentration. This includes annual progress reports and a final report documenting steps taken to reduce the chloride effluent concentration.

The WDNR is implementing new phosphorus limits at treatment facilities across the state. Howards Grove received new effluent limits based on the new regulations. There is also a compliance schedule for achieving the new effluent limits. The treatment facility improvements required for meeting the new phosphorus limits are not included in this plan. The new permit requires a series of evaluations regarding treatment alternatives, adaptive management programs in addition to the potential design and construction of new treatment facilities.

The permit also requires three whole effluent toxicity tests to be run during the course of the permit, in 2014, 2015, and 2017. It is likely that future permits will continue to require this testing.

**TABLE II-1
 WPDES PERMIT LIMITS
 WASTEWATER TREATMENT FACILITY FACILITIES PLAN AMENDMENT
 VILLAGE OF HOWARDS GROVE, WISCONSIN**

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Sample Frequency	Sample Type
Flow					Continuous	
BOD			10 mg/L Nov-Mar 5.0 mg/L Apr-Oct	10 mg/L Nov-Mar 5.0 mg/L Apr-Oct	3/week	24 hr comp
Suspended Solids			10 mg/L	10 mg/L	3/week	24 hr comp
Chlorine Residual	37 ug/L		7.4 ug/L		5/week	Grab
Fecal Coliform				400/100 ml May-Sept	1/week	Grab
Ammonia Nov-Apr Apr May-Sept Oct	34 mg/L		10 mg/L 4.5 mg/L 2.7 mg/L 9.2 mg/L	4.9 mg/L 2.1 mg/L 1.8 mg/L 4.3 mg/L	3/week	24 hr comp
Dissolved Oxygen		7.0 mg/L			Daily	Grab
PH	9.0	6.0			Daily	Grab
Chloride Interim Target			600 mg/L 450 mg/L		4/month	24 hr comp
Phosphorus Interim Final				1.0 mg/L 0.075 mg/L (6 month avg) 0.225 mg/L (monthly avg)	3/week	24 hr comp

Limits based on average annual flow of 0.315 mgd.

III. EXISTING WASTEWATER TREATMENT FACILITIES

The Village of Howards Grove Wastewater Treatment Facility was last expanded in the 2002. Treatment processes include the following:

- Raw wastewater pumping
- Fine screening
- Vortex grit removal
- Activated sludge process
- Secondary clarification
- Aeration Blowers
- Filtration
- Ultraviolet disinfection
- Post-Aeration
- Chemical feed facilities for alum, polymer, soda ash, and acid
- Aerobic Digestion
- Digested sludge storage
- Gravity Belt Thickening and Sludge Loadout

This section of the report will present an evaluation of all of the components of the treatment process, including condition of the equipment, code compliance, performance, reliability, and safety related issues. Recommendations for replacement of equipment due to age or increased flows and loadings will be developed in the next section.

A. Plant Performance

The Howards Grove treatment plant has consistently met its permit limits in recent years. Excursions above permit limits have occurred very infrequently. Figures III-1, III-2, and III-3 present plant performance data from 2011-2014 for BOD, suspended solids, and ammonia. Current and future permit limits are also included in each figure. The plant has consistently met its phosphorus limit since chemical phosphorus removal was placed into service in June 1999.

B. Unit Process Evaluation

Figure III-4 is a flow schematic of the liquid flow stream for the Howards Grove Wastewater Treatment Facility. Figure III-5 is the schematic for the RAS/WAS and other sidestream flows. Figure III-6 is a flow schematic for the solids handling processes. Table III-1 summarizes each unit process in terms of size, capacity, NR-110 sizing criteria, and general condition. The following discusses each unit process with regard to condition, code compliance, performance, reliability, and safety related issues.

Raw Wastewater Pumping Station. Wastewater from the Village of Howards Grove flows by gravity to the treatment plant. A raw wastewater pumping station pumps to the preliminary treatment process. The pump station was replaced in 2002, and was converted to a submersible pump station. The wetwell is an 8 ft diameter manhole, and the bottom of the wetwell is approximately 26 feet below grade.

Figure III-1
Wastewater Treatment Facility Performance
Effluent BOD 2011-2014
Village of Howards Grove, WI

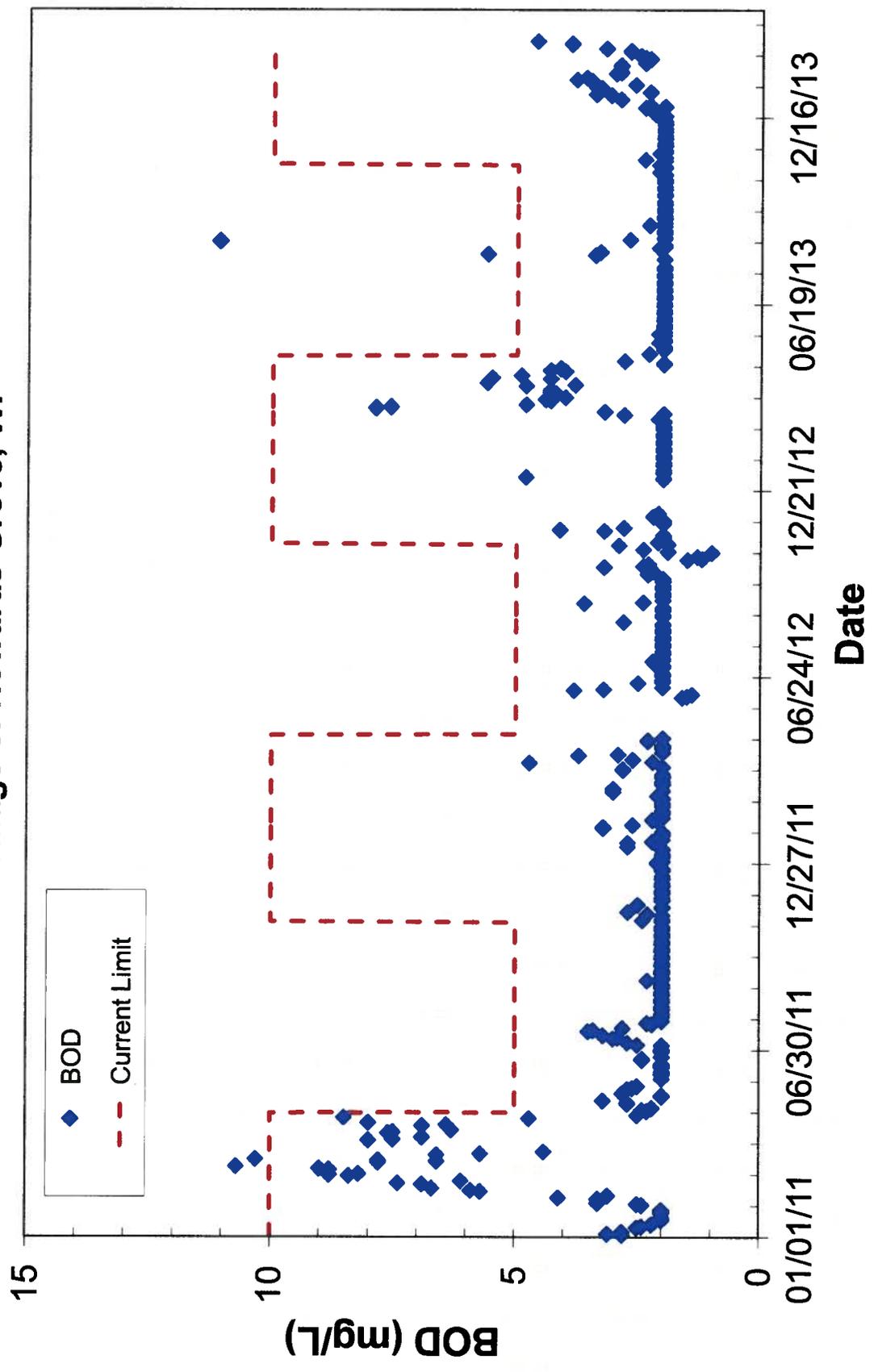


Figure III-2
Wastewater Treatment Facility Performance
Effluent Total Suspended Solids 2011-2014
Village of Howards Grove, WI

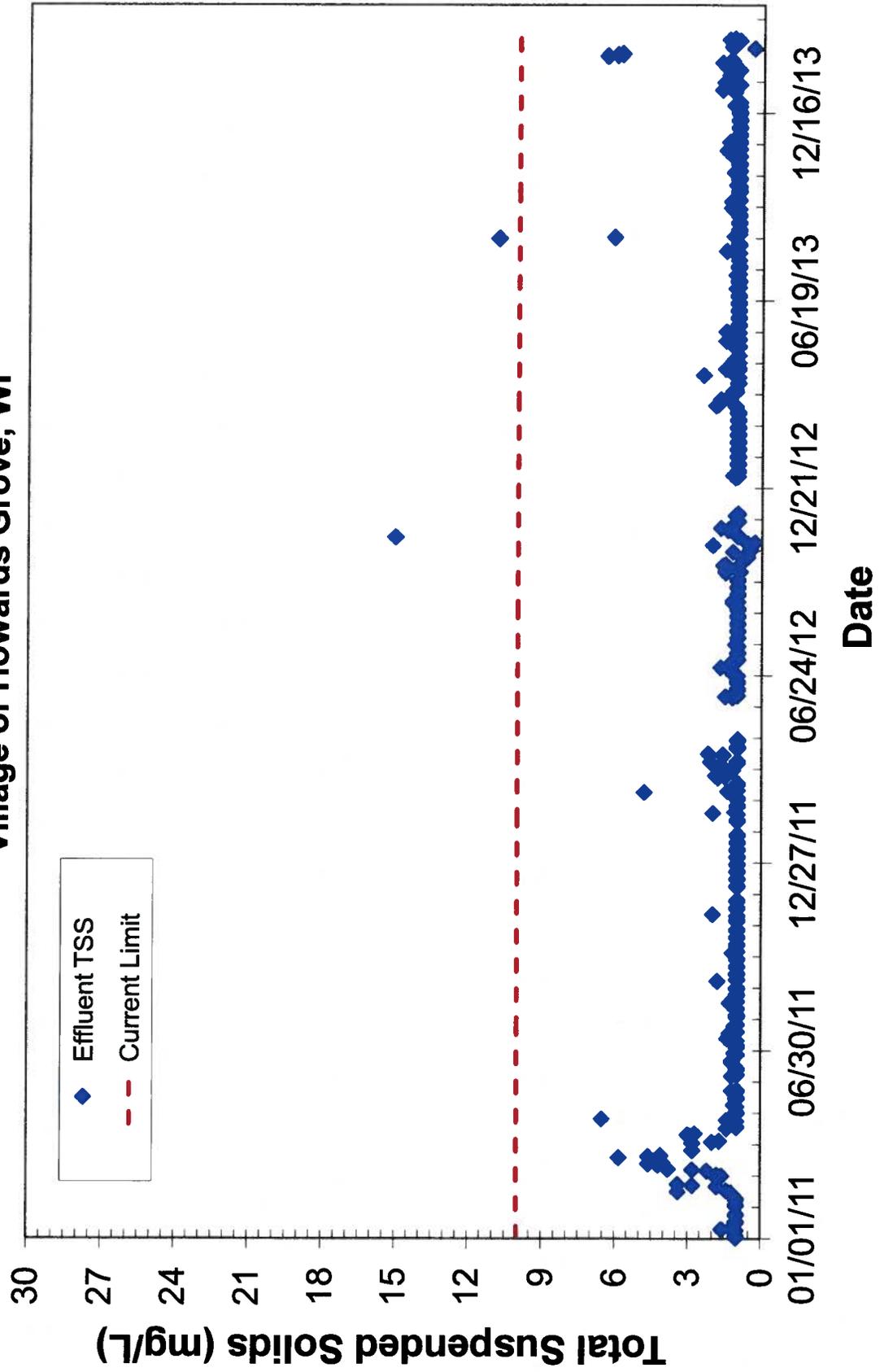
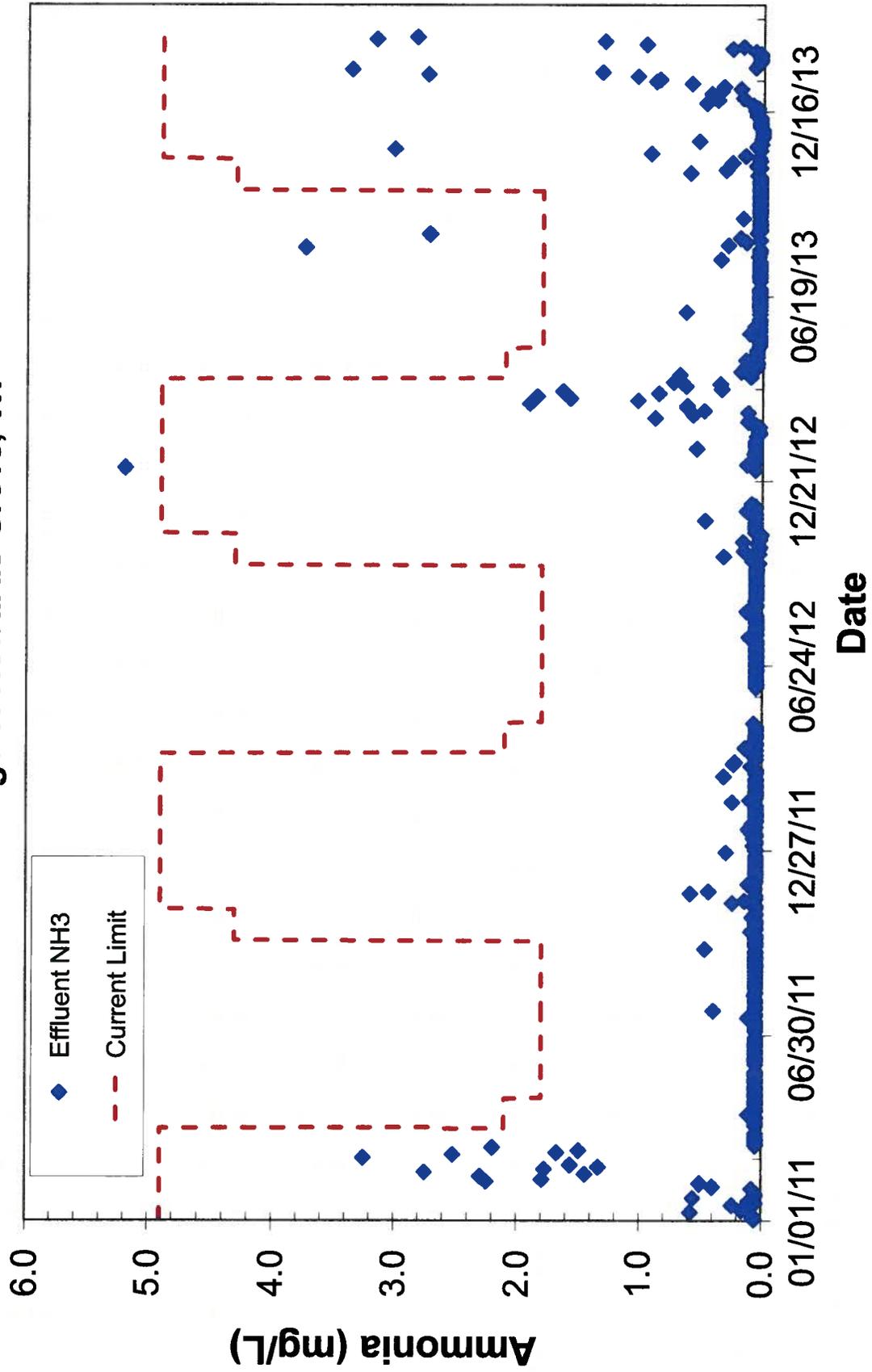


Figure III-3
Wastewater Treatment Facility Performance
Effluent Ammonia 2011-2014
Village of Howards Grove, WI



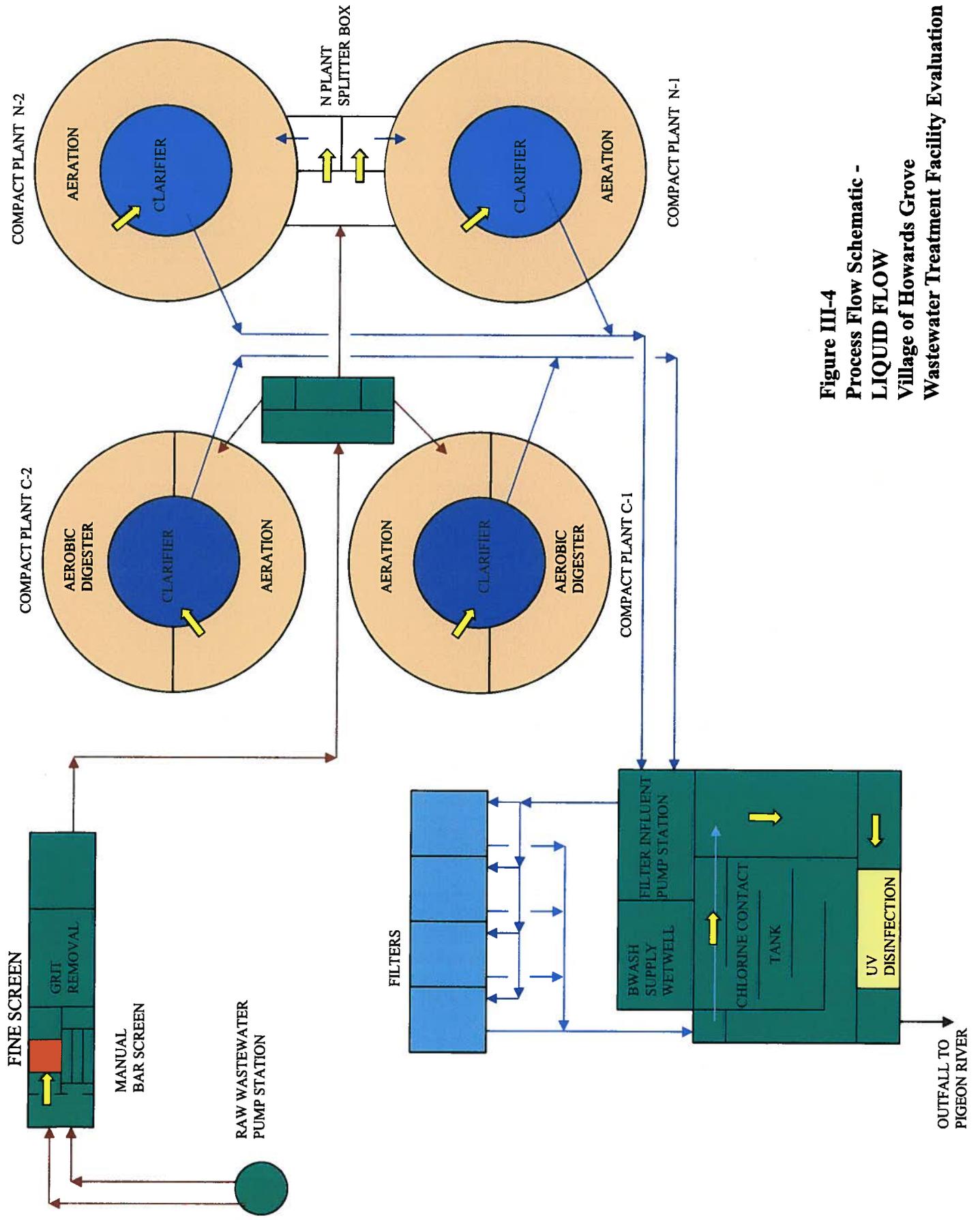


Figure III-4
Process Flow Schematic -
LIQUID FLOW
Village of Howards Grove
Wastewater Treatment Facility Evaluation

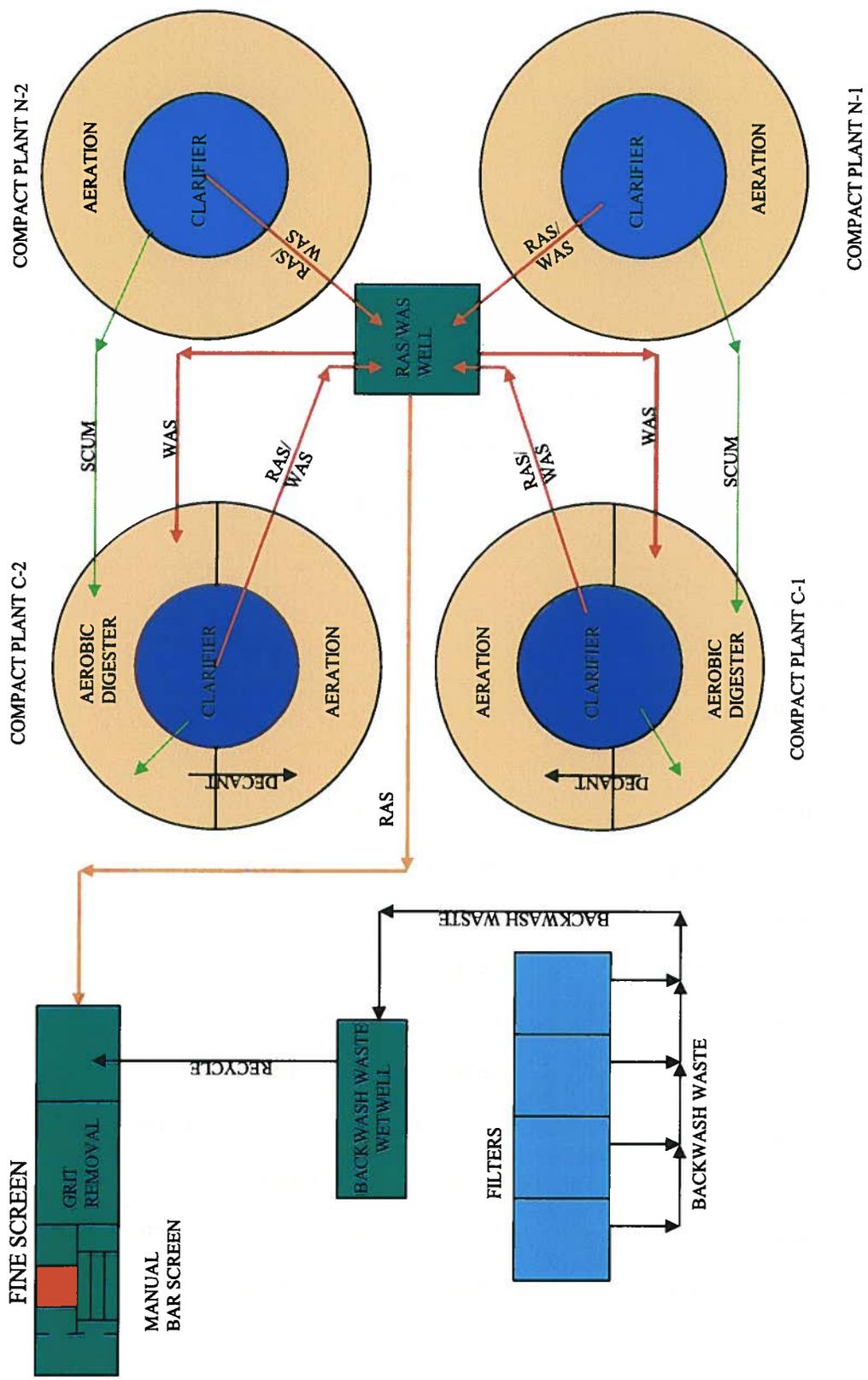


Figure III-5
Process Flow Schematic -
RAS/WAS and SIDESTREAM FLOWS
Village of Howards Grove
Wastewater Treatment Facility Evaluation

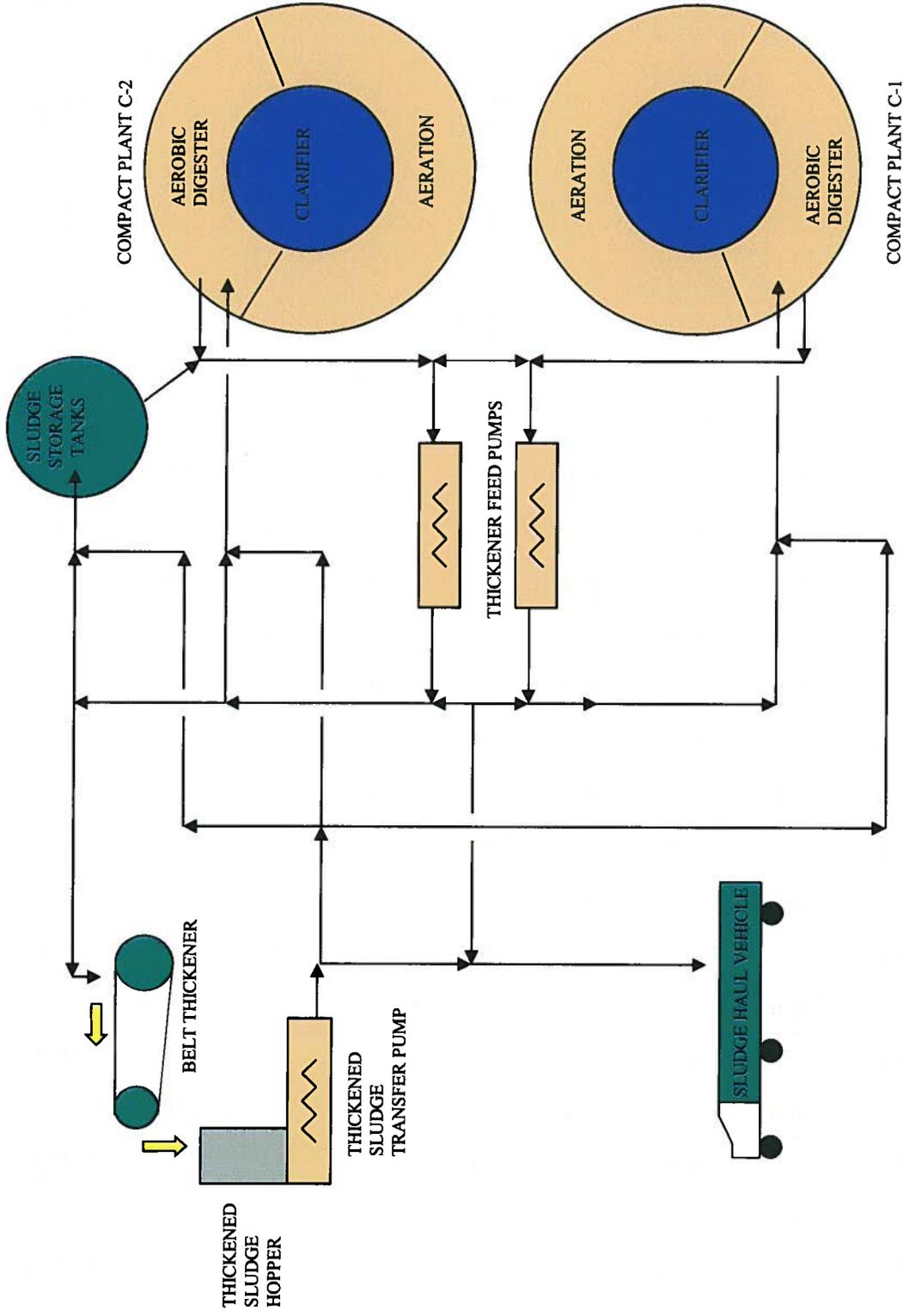


Figure III-6
Process Flow Schematic -
SLUDGE HANDLING
Village of Howards Grove
Wastewater Treatment Facility Evaluation

**TABLE III-1
PROCESS SUMMARY
WASTEWATER TREATMENT FACILITY EVALUATION
VILLAGE OF HOWARDS GROVE, WISCONSIN**

Process	Size/Capacity	HP	NR-110 Sizing Criteria	Rated Capacity per NR-110	Comments
Raw Wastewater Pumping	2 units, each 1,200 gpm @ 55 ft	35	Peak flow must be handled with one unit out of service	1.73 mgd	Pumps and wetwell replaced in 2002. Wetwell requires recoating and minor repairs. Pumps in good condition, but replacement in near future is recommended.
Fine Screen	1 unit, 1,130 gpm with manual bypass screen	2		1.62 mgd	Fine screen is at end of useful life, replacement recommended.
Grit Removal	Vortex Grit Basin with constant speed mixer	0.5		2.5 mgd	Installed in 2002. In good condition.
Grit Slurry Pump	Vortex Centrifugal Pump, 1 unit, 250 gpm	7.5			Installed in 2002. In good condition.
	Grit Dewatering Unit	2			Installed in 2002. System is in good condition. Replacement of wash water automatic valve is recommended.
Raw WW Sampler	Flow paced composite sampler				New unit 2013. In good condition.

Items shown in RED indicate that process does not have capacity for future flow and loadings

**TABLE III-1
PROCESS SUMMARY
WASTEWATER TREATMENT FACILITY EVALUATION
VILLAGE OF HOWARDS GROVE, WISCONSIN**

Process	Size/Capacity	HP	NR-110 Sizing Criteria	Rated Capacity per NR-110	Comments
Compact Plant No. 1 37.5 ft diameter	Aeration Volume 58,600 gal Depth 15 ft		15 lb/BOD/1,000 ft ³ /day F/M 0.05-0.15 3,000-5,000 mg/L MLSS	118 lb BOD/day	Original construction 1965. Internals replaced in 2002. Some structural deterioration, requires rehab/recoating. Aeration diffusers require replacement.
	Aerobic Digester Depth 15 ft Volume 35,200 gal		100 lb VSS/1,000 ft ³ /day; 15 days detention time; DO minimum 1.0 mg/L; 30 scfm/1,000 ft ³ mixing air	470 lb VSS/day (723 lb SS/day) 2,350 gal WAS/day 141 scfm	Digester capacity based on 0.7 lb SS/lb BOD removed in aeration process, 0.65 MLVSS:MLSS ratio. Digester volume will limit capacity to 2,350 gpd.
	Clarifier Diameter 18 ft Sidewater Depth 12.5 ft Surface Area 255 sq ft Volume 23,800 gal Weir Length 51 ft		Maximum Hourly Flow 1,000 gpd/ft ² Weir Overflow Rate 10,000 gpd/ft	0.255 mgd 0.510 mgd	Clarifier mechanism and all mechanical components replaced in 2002.
	RAS Pump No. 1	2		100 gpm	New in 2002. In good condition.
	WAS Pump No. 1			50 gpm	New in 2002. In good condition.
	Scum Pump		Airlift Pump	50 gpm	New in 2002. In good condition.
	Digester Decant		Airlift Pump	50 gpm	New in 2002. In good condition.
	Compact Plant No. 3 Scum Pump		Airlift Pump	50 gpm	New in 2002. In good condition.

Items shown in **RED** indicate that process does not have capacity for future flow and loadings

**TABLE III-1
PROCESS SUMMARY
WASTEWATER TREATMENT FACILITY EVALUATION
VILLAGE OF HOWARDS GROVE, WISCONSIN**

Process	Size/Capacity	HP	NR-110 Sizing Criteria	Rated Capacity per NR-110	Comments	
Compact Plant C-2 37.5 ft diameter	Aeration Volume 56,600 gal Depth 15 ft		15 lb/BOD/1,000 ft ³ /day F/M 0.05-0.15 3,000-5,000 mg/L MLSS	118 lb BOD/day	Aeration loading based on operating plant in extended air mode. Structure and equipment in good condition, sandblast/paint required. Aeration diffusers require replacement.	
	Aerobic Digester Depth 15 ft Volume 33,900 gal		100 lb VSS/1,000 ft ³ /day; 15 days detention time; DO minimum 1.0 mg/L; 30 scfm/1,000 ft ³ mixing air	470 lb VSS/day (723 lb SS/day) 2,350 gal WAS/day 141 scfm	Digester capacity based on 0.7 lb SS/lb BOD removed in aeration process, 0.65 MLVSS:MLSS ratio. Digester volume will limit capacity to 2,350 gpd.	
	Clarifier Diameter 18 ft Sidewater Depth 12.5 ft Surface Area 255 sq ft Volume 23,800 gal Weir Length 51 ft		Maximum Hourly Flow 1,000 gpd/ft ² Weir Overflow Rate 10,000 gpd/ft	0.255 mgd 0.510 mgd		
	RAS Pump			150 gpm	New in 2002. Good condition.	
	Scum Pump			50 gpm	Installed 1980. Good condition.	
	Digester Decant			50 gpm	New in 2002. Good condition.	
	N Plant WAS/Scum			50 gpm	New in 2002. Good condition.	

Items shown in **RED** indicate that process does not have capacity for future flow and loadings

**TABLE III-1
PROCESS SUMMARY
WASTEWATER TREATMENT FACILITY EVALUATION
VILLAGE OF HOWARDS GROVE, WISCONSIN**

Process	Size/Capacity	HP	NR-110 Sizing Criteria	Rated Capacity per NR-110	Comments
Compact Plant No. 3 32 ft diameter	Aeration Volume 56,600 gal Depth 15 ft		15 lb/BOD/1,000 ft ³ /day F/M 0.05-0.15 3,000-5,000 mg/L MLSS	114 lb BOD/day	Aeration loading based on operating plant in extended air mode. Sandblasted and painted in 2014, aeration diffusers replaced.
	Clarifier Diameter 22 ft Sidewater Depth 12.5 ft Surface Area 380 sq ft Volume 23,800 gal Weir Length 63 ft		Maximum Hourly Flow 1,000 gpd/ft ² Weir Overflow Rate 10,000 gpd/ft	0.380 mgd 0.63 mgd	Structure and equipment in good condition, sandblasted and painted in 2014, structural repairs completed.
	RAS Pump No. 3			100 gpm	New in 2002. Good condition.

Items shown in **RED** indicate that process does not have capacity for future flow and loadings

**TABLE III-1
PROCESS SUMMARY
WASTEWATER TREATMENT FACILITY EVALUATION
VILLAGE OF HOWARDS GROVE, WISCONSIN**

Process	Size/Capacity	HP	NR-110 Sizing Criteria	Rated Capacity per NR-110	Comments
Compact Plant No. 4 32 ft diameter	Aeration Volume 56,600 gal Depth 15 ft		15 lb/BOD/1,000 ft ³ /day F/M 0.05-0.15 3,000-5,000 mg/L MLSS	114 lb BOD/day	Aeration loading based on operating plant in extended air mode. Structure and equipment in good condition, sandblast/paint required. Aeration diffusers require replacement.
	Clarifier Diameter 22 ft Sidewater Depth 12.5 ft Surface Area 380 sq ft Volume 23,800 gal Weir Length 63 ft		Maximum Hourly Flow 1,000 gpd/ft ² Weir Overflow Rate 10,000 gpd/ft	0.380 mgd 0.63 mgd	Structure and equipment in good condition, sandblast and painting required.
Aeration Blowers	RAS Pump No. 4			100 gpm	New in 2002. Good condition.
	3 units 1,300 scfm	50		2,600 scfm	Installed in 1980. Equipment has reached end of useful life, and replacement is recommended.

Items shown in **RED** indicate that process does not have capacity for future flow and loadings

**TABLE III-1
PROCESS SUMMARY
WASTEWATER TREATMENT FACILITY EVALUATION
VILLAGE OF HOWARDS GROVE, WISCONSIN**

Process	Size/Capacity	HP	NR-110 Sizing Criteria	Rated Capacity per NR-110	Comments
Filtration Process	Filter Feed Wetwell 10 ft x 7 ft-8 in x 13 ft SWD				
	Volume 7,460 gal				
	Filter Feed Pumps	10	Peak flow must be handled with one unit out of service	1.625 mgd	New in 2002. Good condition.
	Filters 4 units 6 ft x 7 ft		5 gal/min/ft ² with one unit out of service	0.907 mgd firm 1.210 mgd total	Normal losses of anthracite media
	Total area 168 ft ²				
	Backwash Supply Pumps	5		1,050 gpm	
	Backwash Waste Pumps	1	Maximum return rate 15 percent of design flow	50 gpm	Both units in poor condition, scheduled for replacement in 2000
	Backwash Waste Wetwell 37 ft x 20 ft x 8 ft SWD		Capacity to hold two waste from two backwash cycles (approximately 10,000 gal per wash @ 15 gpm/ft ² , 15 minute cycle)		
	44,300 gal				
	Backwash Supply Wetwell 16 ft x 8 ft x 13 ft SWD				
	12,500 gal Chlorine Contact Tank Volume			Total Volume 29,400 gal	Includes volume of chlorine contact tank, which will be used for backwash supply storage
	16,900 gal				
	Air Scour Blower	10		125 scfm	Installed in 1978. In good condition.
Final Effluent Pumps	10			New in 2000. In good condition.	

Items shown in **RED** indicate that process does not have capacity for future flow and loadings

**TABLE III-1
PROCESS SUMMARY
WASTEWATER TREATMENT FACILITY EVALUATION
VILLAGE OF HOWARDS GROVE, WISCONSIN**

Process	Size/Capacity	HP	NR-110 Sizing Criteria	Rated Capacity per NR-110	Comments
Chemical Feed Systems					
Alum Storage and Feed System	Storage Tanks 2 @ 2,500 gal				Process started in May 1999. Storage tanks in good condition, north tank has leak.
	Alum Feed Pumps 2 units, positive displacement	0.25		5.5 gph	Installed in 1978. Pumps have reached end of useful life, and replacement is recommended.
Polymer Feed System for Sludge Thickening System	1 unit, 0.1 gph neat polymer				New in 2002. Good condition.
Polymer Feed System for Activated Sludge Process	2 units, 0.1 gph neat polymer				New in 2002. In good condition, never used.

Items shown in RED indicate that process does not have capacity for future flow and loadings

**TABLE III-1
PROCESS SUMMARY
WASTEWATER TREATMENT FACILITY EVALUATION
VILLAGE OF HOWARDS GROVE, WISCONSIN**

Process	Size/Capacity	HP	NR-110 Sizing Criteria	Rated Capacity per NR-110	Comments
Gravity Belt Thickener	¾ meter, 80 gpm	5			Installed in 2008. In good condition.
GBT Feed Pumps	2 units, 100 gpm	3			Installed in 1978. In poor condition, Village to replace as part of annual maintenance.
Thickened Sludge Transfer Pump	1 unit, 100 gpm	15			Installed in 2002. In good condition.
Sludge Loadout Pump	1 unit, 100 gpm	3			Installed in 1978. In poor condition, Village to replace as part of annual maintenance.

Items shown in RED indicate that process does not have capacity for future flow and loadings

Two submersible wastewater pumps are located in the wetwell. Each has a rated capacity of 1,200 gpm (1.73 mgd). The firm capacity of the station, then, is 1,200 gpm. When both pumps are operating, the maximum pump output is approximately 2,400 gpm (3.46 mgd). Plant bypasses have not been necessary since the pump station was upgraded.

The pump station was designed using two forcemains, each dedicated to one pump. This eliminated the need for check valves, isolation valves, and a valve vault. Each force main has a magnetic flow meter to measure plant influent flow rate.

The pumps are controlled by measuring the wetwell level and adjusting the pump speed to maintain a setpoint level.

The wetwell is in good condition except for the access hatch. The opening/closing hardware is rusted and pieces are falling apart. Replacement of the hatch or the hardware is recommended. The pump discharge piping is rusty and should be recoated.

The pumps have performed well. One pump was replaced in 2009, and the other pump rebuilt in 2013. The Village has a rebuilt pump in its inventory.

Operations staff noted that they experience solids buildup in the bottom of the wetwell due to the flat floor. The recommended solution for this is to install concrete fillets in the bottom so that solids are directed to the pump suction. In order to do this, the station would have to be removed from service and temporary pumping would have to be provided. This will not be difficult to set up since there are two manholes directly adjacent to the wetwell where temporary pumps could be installed. Temporary lines would then be run along the ground and connected to the forcemains next to the preliminary treatment structure.

The wetwell also experiences buildup of floating material, which occasionally causes ragging in the pump volute. We recommend modifying the pump controls so that the pumps will occasionally pump the wetwell all the way down. This will help to reduce solids buildup.

Preliminary Treatment. The raw wastewater is pumped from the pump station, metered with magnetic flow meters, and discharged to the preliminary treatment process.

The preliminary treatment process consists of a fine screen, manual bypass bar screen, and vortex grit removal. These components were installed during the 2002 plant upgrade. The screen is rated for a capacity of 1.62 mgd, which is about the firm capacity of the raw wastewater pumping station. The unit is reaching the end of its useful life, which is typically 12-15 years. Operations staff is experiencing problems with the screen's brushes wearing prematurely, and the screen basket is showing signs of wear. We are recommending that the fine screen be replaced with a step screen and screenings washer/compactor.

The vortex grit removal system has a rated capacity of 2.5 mgd. The system is in good condition and performing well. No improvements are recommended.

Grit is pumped from the grit basin using a centrifugal pump. The pump is in good condition and performing well. No improvements are recommended.

Grit slurry from the grit tank is discharged to a grit washer/dewatering unit. The unit is in good condition and is performing well. The automated valve which controls washwater flow to the unit is becoming unreliable and should be replaced in kind.

Activated Sludge Process. Effluent from the vortex grit removal process discharges to a Parshall flume, and then flows into a drop box. Return activated sludge from the secondary clarifiers is also discharged to this box and mixes with the wastewater. The mixed liquor then flows to the aeration splitter box. The splitter box splits the flow three ways, with half the flow going to Compact Plant Nos. 3 and 4 splitter box, and one quarter of the flow each going to Compact Plant Nos. 1 and 2.

Dimensions of the compact plants are summarized in Table III-1. The following discusses the general condition and performance of the plants:

Compact Plant No. 1 was installed in 1965 as part of the original plant construction. It is a Sanitaire compact plant. The compact plant also has an aerobic digester and a clarifier. The internal components of the plant were replaced during the 2002 upgrade.

The compact plant has a concrete lower wall (below grade) and a steel upper wall. The tank appears to be structurally sound, with minor deterioration of the steel wall components. The process equipment, clarifier mechanism, clarifier walls, and walkways are in good condition, but require sandblasting and painting. The fiberglass roof is in need of rehabilitation. The fine bubble diffusers in the aeration basin and aerobic digester require replacement.

Air lift pumps are used for aerobic digester decant and secondary scum pumping. The secondary scum pump for Compact Plant No. 3 is located in Compact Plant No. 1. These units were upgraded during the 2002 upgrade, and are in good condition.

Compact Plant No. 2 was installed during the early 1980's plant upgrade. It has the same dimensions as Compact Plant No. 1, except that the tank was constructed entirely of concrete. This plant also has an aerobic digester and a secondary clarifier. The fiberglass roof is in need of rehabilitation. The process equipment (pumps and aeration systems) is identical to that in Compact Plant No. 1. The mechanical components in Compact Plant No. 2 are from the 1980's upgrade. The metal components require sandblasting and painting, and some structural repair. The fine bubble diffusers in the aeration basin and aerobic digester require replacement.

Flow to Compact Plant Nos. 3 and 4 discharges to another splitter box and then discharges to each plant. The tank dimensions and NR-110 capacities for each plant are presented in Table III-1. The following discusses the general condition and operating characteristics for the plants:

Compact Plant Nos. 3 and 4 are of concrete construction, and are structurally sound. The fiberglass cover on each plant is in need of rehabilitation, similar to the other plants. Compact Plant No 3 was rehabilitated in 2014 with sand blasting, painting, structural repairs, and replacement of the fine bubble diffusers. The metal structures in Compact Plant No. 4 are in need of sandblasting and painting, otherwise they are in good condition. The fine bubble diffusers in Compact Plant No. 4 require replacement.

Aeration Blowers. The Howards Grove plant has three centrifugal blowers, each rated for 1,300 scfm. Each unit has a 50 hp electric drive. The blowers provide air for the aeration, aerobic digestion, sludge storage, and post-aeration processes.

Two of the blowers have constant speed drives, the third unit has a variable frequency drive. The soft starts are no longer functional, and Blower No. 3 currently operates without surge protection. The equipment was installed during the 1980's upgrade. The equipment is well-maintained. One blower is currently out of service. The blowers are operated manually, and require a manual reset to restart after a power failure. The Village recently had problems with blowers shutting down and not restarting. This resulted in an effluent violation, and WDNR encouraged the Village to update the operating procedures for the system.

The buried air headers at the plant were replaced in 1999 with above-ground, stainless steel air headers. The air headers are in good condition.

Filtration. Effluent from the compact plants is discharged to the filter feed wetwell. Two filter feed pumps, each rated for 1.625 mgd, pump the effluent to the filters. The Howards Grove plant has four dual media filters, each with about 42 square feet of surface area. The effluent from the filters is discharged to the post aeration basin.

The filter feed pumps were replaced as part of the 2002 upgrade. The units are in good condition. One unit was rebuilt in 2012.

The filters are a packaged system, installed during the early 1980's plant expansion. The filter boxes are steel tanks, and are in fair condition, showing some rusted areas along the outside. The control valves for the process have pneumatic operators, and all are well-maintained, and also in fair condition. The filter controls were automated in 2002.

The filter media consists of a layer of anthracite coal over a silica sand layer. The dual media design has performed well. The total suspended solids of the filter effluent is normally 5 mg/L or less. Backwash waste from the filtration process is discharged to a backwash waste wetwell. Submersible pumps transfer the backwash waste to the head of the plant. These pumps were last replaced in 2000. The pump discharge piping is beginning to experience intermittent leaks, and this piping should be replaced.

Backwash supply water comes from the former chlorine contact tank. A backwash supply wetwell is connected to the tank, and contains two vertical turbine backwash supply pumps. The pumps discharge to a head box which controls the backwash rate. A telescopic valve controls the water level in the headbox, and excess backwash water is returned to the backwash supply wetwell.

The backwash process includes air scour. Air is supplied by a positive displacement blower located in the plant's blower room. The blower is in good condition, and is well-maintained. High pressure air for the pneumatically-operated valves comes from the plant's compressed air system located in the blower room. The air scour blower and the compressed air system were installed during the 1980's upgrade. The air compressor system is nearing the end of its useful life, and should be replaced.

Two final effluent pumps are also part of the filtration process. These pumps take water from the backwash supply wetwell, and supply water for the fine screen, grit removal process, gravity belt

thickening, pump seals and yard hydrants. These pumps are inline vertical centrifugal pumps, and were installed in 2000.

Post-Aeration. Filter effluent is directed to the post-aeration basin. The post-aeration basin has a removable fine bubble aeration system that adds additional oxygen to the plant effluent to maintain a high DO level. Air for the process is provided by the aeration blowers. Howards Grove is able to maintain an effluent DO in excess of the 7.0 mg/L required in their current permit.

Disinfection. Flow from the post-aeration basin discharges to the UV disinfection channel. UV disinfection was installed in the year 2000 to replace a gas chlorination disinfection system. The UV process has a rated capacity of 1.625 mgd. Disinfected effluent is then discharged to the Pigeon River. The UV disinfection system is in good condition.

Chemical Feed Facilities for Alum, Polymer, Soda Ash, and Acid. Howards Grove has the capability to feed alum, soda ash, and polymer to the compact plants. The plant also has the capability to feed acid to the post-aeration basin for pH control. All of the chemical feed systems were installed during the 1980's plant upgrade.

Alum Storage and Feed Facilities. The alum storage and feed system consists of two liquid alum bulk storage tanks and two positive displacement alum feed pumps. The system was not placed into service until mid-1999 when the plant was required to remove phosphorus. The fiberglass alum storage tanks are in good condition, with the exception of a small leak in one tank. The ultrasonic level elements in each tank are from the original 1980's upgrade. The alum feed pumps were refurbished with new seals and diaphragms before being placed into service. The pumps have constant speed drives and each pump head has a variable stroke length controller. The controller were designed to modulate in response to the plant's raw wastewater flow signal. However, the Village currently operates the pumps in manual mode. The pumps were installed during the 1980's upgrade, and have reached the end of their useful lives.

Alum is fed downstream of the grit removal process where the return activated sludge mixes with the raw wastewater. Phosphorus removal efficiency has been very good, and the plant operator has been successful in optimizing the alum dosage applied.

Soda Ash and Acid Feed Systems. The soda ash and acid feed systems have never been placed into service. The chemical feed pumps have been used for spare parts for the plant's other chemical feed systems. It is recommended that the remaining equipment and piping be removed.

Polymer Feed Systems. There are three polymer feed systems at the Howards Grove plant. Two systems are for addition of polymer to the activated sludge process (one addition point in each compact plant) to aid in settling, and the other is used for the sludge thickening process. Each system is a liquid polymer blending unit.

Polymer is fed to the activated sludge process occasionally, when there are problems with sludge bulking and during high flow events. The system that feeds the sludge thickener is used on a frequent basis.

Aerobic Digestion. Howards Grove has two aerobic digesters, one located in each Compact Plant Nos. 1 and 2. The digesters have fine bubble aeration and airlift decant pumps. The diffusers and decant pumps were installed in 2002. The fine bubble diffusers require replacement. WAS and secondary scum from each of the compact plants is discharged to the digesters.

Gravity Belt Thickening and Sludge Loadout. Howards Grove replaced its original gravity belt thickener in the mid 2000's. The new unit is in very good condition and requires no improvements.

The thickener is fed with two positive displacement progressing cavity pumps. Polymer is added to the pump discharge. The thickened sludge is discharged to thickened sludge wetwell and is then pumped to the sludge storage tanks using a progressing cavity pump.

The plant has two thickened sludge storage tanks, each with a volume of 41,000 gallons. The tanks were constructed as part of the 2002 upgrade, and are in good condition. The tanks are equipped with fine bubble diffusion systems for mixing and keeping the sludge fresh. The fine bubble diffusers are in need of replacement.

Plant Monitoring and Control System. The plant control and monitoring system (SCADA) was upgraded during the 2002 construction. The system includes four PLC panels and associated components. Computers for monitoring, control, and reporting were also installed at that time. Most of the technology is dated, and parts for some of the PLC components are becoming difficult to find. The software technology is also dated, and new software versions are not able to operate on the existing computers.

It is recommended that the SCADA system be upgraded to utilize current technology and software.

Site and Building Services. The heating and ventilation system for the building was upgraded as part of the 2002 construction. The systems are in good condition, and no improvements are recommended.

Donohue performed an evaluation of the plant's electrical system as part of this project. In general, the system is in good condition. Parts of the system were upgraded as part of the 2002 construction. The plant still utilizes motor control centers that were installed in the 1980's expansion. The centers appear to be in good condition, however, Donohue is recommending that each motor control system be evaluated, maintained, and tested to ensure safety and reliability for current and future conditions.

The plant's emergency generator was installed during the 1980's expansion. The generator has adequate capacity to provide power for the entire plant. The generator is in good condition, and spare parts are readily available. There are no upgrade recommendations for this system.

The roof of the building will require replacement in the next 10 years.

Regarding site improvements, four items were identified that should be addressed:

- The storm sewer flood gates are in poor condition and need to be replaced.
- The main transformer for the electric service is not adequately flood protected. A berm or concrete wall should be installed to protect this equipment.
- The access road running around the northwest side of the building does not provide adequate flood protection. The road should be redone so it provides this protection.

- The Village cleans its streetsweeper utilizing a water source at the plant. Grit from the washdown is ending up in the storm sewer. The Village would like to construct a washdown pad to prevent grit from ending up in the storm sewer.

IV. DEVELOPMENT OF RECOMMENDED IMPROVEMENTS

The Howards Grove Wastewater Treatment facility was last upgraded in 2002. The evaluations performed as part of this study show that most of the plant's structures are sound and require only minor rehabilitation (sandblasting and painting, for example).

From a process standpoint, the Howards Grove plant will require a more substantial upgrade to meet future flows and loadings. The evaluation noted the following:

- Some unit processes are not sized for the projected future flows and loadings.
- Some process equipment is not functioning efficiently due to age.
- Reliability and redundancy issues associated with older equipment.

The fact that the physical plant itself is in good condition and will require few structural modifications to accommodate future flows and loadings makes it economically attractive to upgrade and expand the facility to meet future conditions. Construction of a new treatment facility adjacent to or remote from the existing plant would not be an economical solution.

This section of the report develops alternatives for upgrading the unit processes at Howards Grove for accommodating future flows and loadings, improving safety and reliability, and modernizing some of the dated technology at the plant. Some of the alternatives developed will be straight-forward, practical solutions that do not require an alternatives analysis to justify. Recommendations for implementing selected alternatives will also be developed in this section, and summarized along with an implementation schedule, in the next section.

A design basis memorandum summarizing the staged improvements is included in Appendix B.

A. Raw Wastewater Pump Station

The evaluation of the raw wastewater pump station showed the following:

- The raw wastewater pump station wetwell is in good structural condition. The access hatch requires repair or replacement.
- The pump discharge piping requires sandblasting and recoating.
- The raw wastewater pumps are in good condition, but can expect to be replaced in the near future.
- There is an issue with debris buildup on the bottom of the wetwell. Installation of fillets which will direct debris to the pumps as well as programming modifications to provide occasional wetwell pumpdowns are recommended.

The structural modifications and piping rehabilitation will require that the pump station be removed from service. This may easily be accomplished by installing temporary pumping equipment in two adjacent manholes which connect the station to the north and south sewer mains. Temporary piping may be installed and connected to the force mains on the north side of the preliminary treatment building. Tees and isolation valves would also be installed on the force mains. The conceptual cost estimate for the raw wastewater pump station recommended improvements is presented in Table IV-1. We are recommending that this alternative be implemented.

Table IV-1
 Village of Howards Grove Wastewater Treatment Facility Evaluation
 Raw Wastewater Pumping Station Improvements
 Conceptual Cost Estimate

Rehabilitate
 Pump Station

Raw Wastewater Pumping

Sitework (includes temporary pumping)	\$15,000
Structural	
Modifications to Wetwell	\$35,000
Electrical/Instrumentation	\$17,000
Process Piping	\$12,000
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Total	\$79,000
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SUBTOTAL	\$79,000
CONTINGENCY (30 percent)	\$23,700
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SUBTOTAL	\$102,700
CONTRACTOR OVERHEAD/PROFIT (25 percent)	\$25,675
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SUBTOTAL	\$128,375
ENGINEERING (15 percent)	\$19,256
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TOTAL	\$147,631

B. Preliminary Treatment

The evaluation of the preliminary treatment facilities showed the following:

- The fine screen has reached the end of its useful life and requires replacement.
- The grit removal system is in good condition and only requires replacement of an automated wash valve.

A conceptual cost estimate for replacing the fine screen and grit removal wash valve is presented in Table IV-2.

C. Activated Sludge Process

The evaluation of the activated sludge processes showed the following:

- Compact plant No. 1, installed in 1965, is in good condition structurally, and requires sandblasting, structural repair, and recoating of the process components. The fine bubble diffusers require replacement.
- Compact plant No. 2, installed in 1978, is in good condition structurally, and requires sandblasting, structural repair, and recoating of the process components. The fine bubble diffusers require replacement.
- Compact plant No. 3, installed in 1978, is in good condition structurally, underwent sandblasting, repair, and recoating of the process components in 2014. The fine bubble diffusers were also replaced.
- Compact plant No. 4, installed in 1978, is in good condition structurally, and requires sandblasting, structural repair, and recoating of the process components. The fine bubble diffusers require replacement.
- The fiberglass covers for each compact plant are in need of rehabilitation.
- The air supply for the aerobic digesters is supplied by the aeration blowers. Air flow directed to the digesters is difficult to control and often results in too little or too much air supplied to the process.
- The aeration system does not have dissolved oxygen control which often results in high DO levels in the aeration basins.
- The aeration capacity and the aerobic digestion capacity are not adequate for design year flows and loadings.
- The aeration blowers were installed in 1978, and while two of the units are in good condition, replacement of the units should be considered.

The capacity of the aeration and aerobic digestion processes was addressed in the Year 2000 engineering report, and the recommendations developed in that study still apply. At present, the digester volume is approximately one half of the aeration/digester volume in Compact Plant Nos. 1 and 2.

The design criteria shows design data for the existing condition, the Year 2022 condition, and the Design Year 2035 condition. The BOD loading for the aeration process is above the NR-110 criteria of 15 lb BOD/1,000 cubic feet/day. However, typical design guidelines for single stage nitrification are 15-20 lb BOD/1,000 cubic feet/day. The plant would meet this criteria until the Year 2022. At that time, it is proposed to convert the existing digester volume into aeration volume, and then construct new aerobic

Table IV-2
 Village of Howards Grove Wastewater Treatment Facility Evaluation
 Preliminary Treatment Improvements
 Conceptual Cost Estimate

Preliminary Treatment

Preliminary Treatment

Structural	\$10,000
Process	
Fine Screen	\$80,000
Screenings Washer/Compactor	\$75,000
Grit Removal Wash Valve	\$2,500
Electrical/Instrumentation	\$25,000
Process Piping	\$2,500
<hr/>	
Total	\$195,000
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SUBTOTAL	\$195,000
CONTINGENCY (30 percent)	\$58,500
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SUBTOTAL	\$253,500
CONTRACTOR OVERHEAD/PROFIT (25 percent)	\$63,375
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SUBTOTAL	\$316,875
ENGINEERING (15 percent)	\$47,531
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TOTAL	\$364,406

digesters (we would recommend that alternative sludge treatment options be evaluated at that time, however). After converting the digesters to aeration volume, the BOD loading to the aeration process will be within typical design values through Design Year 2035.

Compact Plant No. 3 has already had its process components rehabilitated. The other plants would undergo similar rehabilitation. The fine bubble aeration systems in the Compact Plant Nos. 1, 2, and 4 will be upgraded with new fine bubble membrane diffusers.

Phased replacement of the aeration blowers is proposed. The new aeration blowers will be high speed single stage centrifugal blowers. One new blower will be installed as part of the 2016 improvements, with the two existing blowers acting as backup. The old units will be replaced during future construction projects or when they are no longer servicable.

Dissolved oxygen control is proposed for both processes. Dissolved oxygen control will require installation of air flow meters, flow control valves, and dissolved oxygen monitoring equipment for each compact plant.

The capacity of the clarification process is adequate for the Year 2035 condition. The surface settling rate at peak hourly flow is 1,280 gpd/ft², which is slightly above the NR-110 criteria of 1,000 gpd/ft².

A construction cost estimate for rehabilitating the compact plants, new blowers, and installing dissolved oxygen control is presented in Table IV-3. The cost table shows the phased approach for making improvements to the compact plants, with routine sandblasting and painting scheduled for 2022 and 2035, and rehabilitation of the fiberglass covers in 2016. The cost estimated for conversion of the digester volume to aeration volume is also included for 2022.

D. Filtration Process

The evaluation of the filtration process showed the following:

- The filters do not have adequate surface area for current and future peak hourly flows.
- The backwash waste return piping requires replacement.
- The filter metal structure and the automated valves and piping are in fair condition.

The four filters have a total of 168 ft² of surface area. Applying the NR-110 criteria of 5.0 gpm/ft² with one unit out of service gives a firm filtration capacity of 630 gpm, or 0.907 mgd. With all units in service, the total filtration capacity is 1.210 mgd. This is still lower than the projected Design Year 2035 peak hourly flow of 1.625 mgd.

In order to meet the projected peak hourly flow, it would be necessary to add additional filters. Two filters could be constructed, each with an area of 64 ft². The firm filtration capacity, with the largest unit out of service, would be 1.670 mgd, and the total capacity with all units in service is 2.131 mgd. Given the condition of the existing filters, this may not be the most cost effective or optimum alternative.

Replacement of the existing filtration system with a new process was investigated as part of this study. Disc filtration has become a very popular alternative to conventional filtration. The disc filtration process offers the following advantages:

Table IV-3
Village of Howards Grove Wastewater Treatment Facility Evaluation
Compact Plant, Aeration and Aerobic Digestion Upgrades
Conceptual Cost Estimate

	Year 2016	Year 2022	Year 2035
Compact Plant No. 1			
Structural			
Sandblasting, repainting, structural repairs	\$25,000	\$25,000	\$25,000
Rehabilitate Fiberglass Cover	\$ 7,000		
Process			
Replace fine bubble diffusers	\$9,000	\$9,000	\$9,000
Dissolved Oxygen Control System			
Air Flow Meters	\$12,000		
Flow Control Valves	\$16,000		
Dissolved Oxygen Monitoring	\$11,000		
Conversion of Digester to Aeration			\$30,000
Electrical/Instrumentation	\$16,000		
Process Piping	\$14,400		
Total	\$110,400	\$34,000	\$64,000
Compact Plant No. 2			
Structural			
Sandblasting, repainting, structural repairs	\$25,000	\$25,000	\$25,000
Rehabilitate Fiberglass Cover	\$ 7,000		
Process			
Replace fine bubble diffusers	\$9,000	\$9,000	\$9,000
Dissolved Oxygen Control System			
Air Flow Meters	\$12,000		
Flow Control Valves	\$16,000		
Dissolved Oxygen Monitoring	\$11,000		
Conversion of Digester to Aeration			\$30,000
Electrical/Instrumentation	\$16,000		
Process Piping	\$14,400		
Total	\$110,400	\$34,000	\$64,000
Compact Plant No. 3			
Structural			
Sandblasting, repainting, structural repairs		\$25,000	\$25,000
Rehabilitate Fiberglass Cover	\$ 7,000		
Process			
Replace fine bubble diffusers		\$9,000	\$9,000
Dissolved Oxygen Control System			
Air Flow Meters	\$6,000		
Flow Control Valves	\$8,000		
Dissolved Oxygen Monitoring	\$5,500		
Electrical/Instrumentation	\$9,800		
Process Piping	\$8,800		
Total	\$38,100	\$34,000	\$9,000
Compact Plant No. 4			
Structural			
Sandblasting, repainting, structural repairs	\$25,000	\$25,000	\$25,000
Rehabilitate Fiberglass Cover	\$ 7,000		
Process			
Replace fine bubble diffusers	\$9,000	\$9,000	\$9,000
Dissolved Oxygen Control System			
Air Flow Meters	\$6,000		
Flow Control Valves	\$8,000		
Dissolved Oxygen Monitoring	\$5,500		
Electrical/Instrumentation	\$9,800		
Process Piping	\$8,800		
Total	\$79,100	\$34,000	\$34,000

Table IV-3
Village of Howards Grove Wastewater Treatment Facility Evaluation
Compact Plant, Aeration and Aerobic Digestion Upgrades
Conceptual Cost Estimate

	Year 2016	Year 2022	Year 2035
Aeration and Aerobic Digester Blowers			
Aeration Blowers			
Demolition	\$8,000	\$8,000	\$8,000
Structural	\$5,000	\$5,000	\$5,000
Process			
Aeration Blowers	\$100,000	\$100,000	\$100,000
Electrical/Instrumentation	\$22,600	\$22,600	\$22,600
HVAC	\$6,780	\$6,780	\$6,780
Process Piping	\$35,595	\$35,595	\$35,595
Total	\$177,975	\$177,975	\$177,975
Aerobic Digesters (to be constructed in 2022)			
Sitework		\$35,000	
Structural		\$220,000	
Process			
Covers		\$40,000	
Aeration System		\$72,000	
Electrical/Instrumentation		\$25,000	
Process Piping		\$50,000	
Total		\$442,000	\$0
SUBTOTAL	\$519,475	\$755,975	\$361,475
CONTINGENCY (30 percent)	\$155,843	\$226,793	\$108,443
SUBTOTAL	\$675,318	\$982,768	\$469,918
CONTRACTOR OVERHEAD/PROFIT (25 percent)	\$168,829	\$245,692	\$117,479
SUBTOTAL	\$844,147	\$1,228,459	\$587,397
ENGINEERING (15 percent)	\$126,622	\$184,269	\$88,110
TOTAL	\$970,769	\$1,412,728	\$675,506

- Hydraulic loading may be up to 6 gpm/ft², compared to 5 gpm/ft² for conventional filtration.
- Backwash waste is 1-2 percent of the total flow to the filter, compared to 3-5 percent for conventional filtration.
- Filtration is continuously maintained, even during a backwash cycle.
- Smaller footprint than conventional filtration.
- Low headloss, usually less than 1 foot, compared to 8-10 feet for conventional filtration.

These advantages would clearly help the Village to meet its new, stringent phosphorus limits, as well as improve treatment efficiency.

The low headloss may allow the Village to remove the filter feed pumps from service, saving electricity and maintenance costs. Donohue reviewed the plant hydraulics, and there is approximately 3 feet of head available between the secondary clarifier weirs and the flow measurement weir ahead of the UV disinfection system. Assuming that the headloss through the filtration system is about 1 foot, there may be adequate head available so the filter feed pumps could be bypassed and the disc filters fed by gravity flow.

The smaller footprint of the disc filter system would allow additional equipment (rapid mix and flocculation tanks, etc.) to be installed in the filter room for phosphorus removal. This eliminates the need for a building addition.

A conceptual cost estimate for replacing the existing filtration system with a disc filtration process is presented in Table IV-4. The conversion would be constructed as part of the Village's requirement to upgrade the plant to meet the new phosphorus limits. This alternative will be revisited and explored more in depth during the development of the phosphorus removal facilities plan, which is one of the compliance components of the Village's WPDES permit.

E. Disinfection

The UV disinfection system is in good condition, and sized for Year 2035 flows. No improvements are recommended, and the Village should continue to maintain the system for optimal performance.

F. Post-Aeration

The post aeration tank will continue to be utilized. The fine bubble diffusers should be replaced.

G. Chemical Feed Facilities for Alum, Polymer, Soda Ash, and Acid

The soda ash and acid feed systems have never been used, and it is not likely that they will be utilized in the future. Some of the equipment has been removed to provide spare parts for some of the other chemical feed systems. It is not recommended that any of these systems be brought back into service.

The alum storage and feed system was placed into service in 1999, and has been operating well since then. One of the storage tanks has a small leak which must be repaired. The alum feed pumps have reached the end of their useful lives and should be replaced.

The polymer feed systems are in good condition and require no upgrade. These systems should continue to be maintained to assure reliable performance.

Table IV-4
Village of Howards Grove Wastewater Treatment Facility Evaluation
Filtration Upgrade and Expansion
Conceptual Cost Estimate

	Year 2016	Year 2022	Year 2035
Filtration Process			
Structural		\$75,000	
Process			
Disc Filters	\$	650,000	
Plant Water/Backwash Supply Pumps		\$28,000	
Electrical/Instrumentation		\$150,600	
Process Piping		\$135,540	
Total		\$1,039,140	
<hr/>			
SUBTOTAL	\$0	\$1,039,140	\$0
CONTINGENCY (30 percent)	\$0	\$311,742	\$0
<hr/>			
SUBTOTAL	\$0	\$1,350,882	\$0
CONTRACTOR OVERHEAD/PROFIT (25 percent)	\$0	\$337,721	\$0
<hr/>			
SUBTOTAL	\$0	\$1,688,603	\$0
ENGINEERING (15 percent)	\$0	\$253,290	\$0
<hr/>			
TOTAL	\$0	\$1,941,893	\$0

Table IV-5
 Village of Howards Grove Wastewater Treatment Facility Evaluation
 Chemical Feed Systems
 Conceptual Cost Estimate

	Year 2016	Year 2022	Year 2035
<u>Alum Storage and Feed Facilities</u>			
Alum Feed Pumps	\$22,000		
Alum Storage Tank Repair	\$8,000		
Electrical/Instrumentation	\$9,000		
Process Piping	\$7,800		
Total	\$46,800		
SUBTOTAL	\$46,800	\$0	\$0
CONTINGENCY (30 percent)	\$14,040	\$0	\$0
SUBTOTAL	\$60,840	\$0	\$0
CONTRACTOR OVERHEAD/PROFIT (25 percent)	\$15,210	\$0	\$0
SUBTOTAL	\$76,050	\$0	\$0
ENGINEERING (15 percent)	\$11,408	\$0	\$0
TOTAL	\$87,458	\$0	\$0

A construction cost estimate for upgrading the alum storage and feed system is summarized in Table IV-5.

H. Sludge Handling

The evaluation of the solids handling systems at the Howards Grove Wastewater Treatment Facility showed the following:

- Use of a contract hauler for storage and disposal of the plant's sludge is working well for the Village.
- There will be limited digester volume and sludge storage capacity at the wastewater treatment facility as flows and loadings increase, which results in limited flexibility for digester operation and control.

New aerobic digesters would be constructed when plant flows and loadings require that the digester volume be converted to aeration volume. This will also be addressed as part of a future evaluation.

The existing gravity belt thickener, installed in the mid-2000's, is in very good condition, and does not require any improvements.

Three of the four sludge pumps which feed the gravity belt thickeners or pump to the sludge storage tanks are in good condition. One unit, installed in 1978, has reached the end of its useful life. The Village has already budgeted to replace this pump in 2015. The sludge loadout pump was replaced in 2008.

I. SCADA Upgrade

The plant control and monitoring system (SCADA) was upgraded during the 2002 construction. The system includes two PLC panels and associated components. Computers for monitoring, control, and reporting were also installed at that time. Most of the technology is dated, and parts for some of the PLC components are becoming difficult to find. The software technology is also dated, and new software versions are not able to operate on the existing computers.

It is recommended that the SCADA system be upgraded to utilize current technology and software.

A conceptual cost estimate for the new control and monitoring system is presented in Table IV-6.

J. Building Services

The heating and ventilation system for the building was upgraded as part of the 2002 construction. The systems are in good condition, and no improvements are recommended.

Donohue performed an evaluation of the plant's electrical system as part of this project. In general, the system is in good condition. Parts of the system were upgraded as part of the 2002 construction. The plant still utilizes motor control centers that were installed in the 1980's expansion. The centers appear to be in good condition, however. Donohue is recommending that each motor control system be evaluated, maintained, and tested to ensure safety and reliability for current and future conditions.

Four items were identified for site improvements:

Table IV-6
 Village of Howards Grove Wastewater Treatment Facility
 Building Services and Plant Monitoring Control Systems Improvements
 Conceptual Cost Estimate

	Year 2016	Year 2022	Year 2035
<u>Site and Building Services</u>			
Motor Control Center Evaluation	\$25,000		
Flood Gates Replacement	\$8,000		
Transformer Flood Protection	\$2,500		
Access Road Modification	\$6,000		
Washdown Pad for Village Vehicles	\$13,000		
<u>Instrumentation/Automation Upgrade</u>			
Plant SCADA Upgrade	\$ 80,000		
Total	\$134,500	\$0	
SUBTOTAL	\$134,500	\$0	\$0
CONTINGENCY (30 percent)	\$40,350	\$0	\$0
SUBTOTAL	\$174,850	\$0	\$0
CONTRACTOR OVERHEAD/PROFIT (25 percent)	\$43,713	\$0	\$0
SUBTOTAL	\$218,563	\$0	\$0
ENGINEERING (15 percent)	\$32,784	\$0	\$0
TOTAL	\$251,347	\$0	\$0

- The storm sewer flood gates are in poor condition and need to be replaced.
- The main transformer for the electric service is not adequately flood protected. A berm or concrete wall should be installed to protect this equipment.
- The access road running around the northwest side of the building was not properly constructed and does not provide adequate flood protection. The road should be redone so it provides this protection.
- The Village cleans its streetsweeper utilizing a water source at the plant. Grit from the washdown is ending up in the storm sewer. The Village would like to construct a washdown pad to prevent grit from ending up in the storm sewer.

A conceptual cost estimate for making these improvements is also included in Table IV-6.

V. SUMMARY OF RECOMMENDED IMPROVEMENTS AND IMPLEMENTATION SCHEDULE

The evaluation of the Howards Grove Wastewater Treatment Facility has shown that the plant will be able to meet future flows and loadings without having to construct a significant amount of additional treatment facilities. The existing facilities are in good structural condition and should last well into the future. Some of the process equipment is in need of immediate replacement due to failure or inefficient operation due to age. Other upgrades to process equipment will enable the plant to operate efficiently, reliably, and meet future flow and loading conditions.

Table V-1 summarizes the recommended improvements. The table is set up to show when the improvements would be necessary to ensure compliance with permit limits and meet the demands of future flows and loads.

Several pieces of process equipment are scheduled for replacement in Year 2016. This includes the raw wastewater pumps, fine screen, aeration blowers, fine bubble aeration membrane diffusers, and alum feed pumps.

2016 process upgrades include structural improvements and rehabilitation of the raw wastewater pump station, rehabilitation of Compact Plant Nos. 1, 2, and 4, installation of a dissolved oxygen control system for the aeration and aerobic digestion processes, and SCADA upgrade. The 2016 improvements do not include additional structures at the facility.

The following presents an overall implementation schedule for the improvements at Howards Grove. The schedule for the additional plant improvements shows that the design will be completed in late Year 2015, and the project bid and constructed during Year 2016, with final completion by the end of 2016.

Implementation Schedule for 2016 Improvements

Submit Facilities Plan Amendment to WDNR	May 2015
Begin Design	July 2015
Submit Design to WDNR for Approval	December 2015
WDNR Approval	March 2016
Avertisement for Bidding	March 2016
Execute Construction Contract	May 2016
Begin Construction	June 2016
Substantial Completion	November 2017
Final Completion	December 2017

Table V-1
 Summary of Improvements and Implementation Schedule
 Village of Howards Grove Wastewater Treatment Facility Evaluation

	Implementation/Cost Estimate		
	Year 2016	Year 2022	Year 2035
<u>Raw Wastewater Pumping</u>			
Sitework (includes temporary pumping)	\$15,000		
Structural			
Modifications to Wetwell	\$35,000		
Electrical/Instrumentation	\$17,000		
Process Piping	\$12,000		
Total	\$79,000		
<u>Preliminary Treatment</u>			
Structural	\$10,000		
Process			
Fine Screen	\$80,000		
Screenings Washer/Compactor	\$75,000		
Grit Removal Wash Valve	\$2,500		
Electrical/Instrumentation	\$25,000		
Process Piping	\$2,500		
Total	\$195,000		
<u>Compact Plant No. 1</u>			
Structural			
Sandblasting, repainting, structural repairs	\$25,000	\$25,000	\$25,000
Rehabilitate Fiberglass Cover	\$7,000		
Process			
Replace fine bubble diffusers	\$9,000	\$9,000	\$9,000
Dissolved Oxygen Control System			
Air Flow Meters	\$12,000		
Flow Control Valves	\$16,000		
Dissolved Oxygen Monitoring	\$11,000		
Conversion of Digester to Aeration			\$30,000
Electrical/Instrumentation	\$16,000		
Process Piping	\$14,400		
Total	\$110,400	\$34,000	\$64,000

Table V-1
 Summary of Improvements and Implementation Schedule
 Village of Howards Grove Wastewater Treatment Facility Evaluation

	Implementation/Cost Estimate		
	Year 2016	Year 2022	Year 2035
Compact Plant No. 2			
Structural			
Sandblasting, repainting, structural repairs	\$25,000	\$25,000	\$25,000
Rehabilitate Fiberglass Cover	\$ 7,000		
Process			
Replace fine bubble diffusers	\$9,000	\$9,000	\$9,000
Dissolved Oxygen Control System			
Air Flow Meters	\$12,000		
Flow Control Valves	\$16,000		
Dissolved Oxygen Monitoring	\$11,000		
Conversion of Digester to Aeration			\$30,000
Electrical/Instrumentation	\$16,000		
Process Piping	\$14,400		
Total	\$110,400	\$34,000	\$64,000
Compact Plant No. 3			
Structural			
Sandblasting, repainting, structural repairs		\$25,000	\$25,000
Rehabilitate Fiberglass Cover	\$ 7,000		
Process			
Replace fine bubble diffusers		\$9,000	\$9,000
Dissolved Oxygen Control System			
Air Flow Meters	\$6,000		
Flow Control Valves	\$8,000		
Dissolved Oxygen Monitoring	\$5,500		
Electrical/Instrumentation	\$9,800		
Process Piping	\$8,800		
Total	\$38,100	\$34,000	\$9,000
Compact Plant No. 4			
Structural			
Sandblasting, repainting, structural repairs	\$25,000	\$25,000	\$25,000
Rehabilitate Fiberglass Cover	\$ 7,000		
Process			
Replace fine bubble diffusers	\$9,000	\$9,000	\$9,000
Dissolved Oxygen Control System			
Air Flow Meters	\$6,000		
Flow Control Valves	\$8,000		
Dissolved Oxygen Monitoring	\$5,500		
Electrical/Instrumentation	\$9,800		
Process Piping	\$8,800		
Total	\$79,100	\$34,000	\$34,000
Aeration and Aerobic Digester Blowers			
Aeration Blowers			
Demolition	\$8,000	\$8,000	\$8,000
Structural	\$5,000	\$5,000	\$5,000
Process			
Aeration Blowers	\$100,000	\$100,000	\$100,000
Electrical/Instrumentation	\$22,600	\$22,600	\$22,600
HVAC	\$6,780	\$6,780	\$6,780
Process Piping	\$35,595	\$35,595	\$35,595
Total	\$177,975	\$177,975	\$177,975

Table V-1
 Summary of Improvements and Implementation Schedule
 Village of Howards Grove Wastewater Treatment Facility Evaluation

	Implementation/Cost Estimate		
	Year 2016	Year 2022	Year 2035
Aerobic Digesters (to be constructed in 2022)			
Sitework		\$35,000	
Structural		\$220,000	
Process			
Covers		\$40,000	
Aeration System		\$72,000	
Electrical/Instrumentation		\$25,000	
Process Piping		\$50,000	
Total		\$442,000	\$0
 <u>Filtration Process</u>			
Structural		\$75,000	
Process			
Disc Filters	\$	650,000	
Plant Water/Backwash Supply Pumps		\$28,000	
Electrical/Instrumentation		\$150,600	
Process Piping		\$135,540	
Total		\$1,039,140	
 <u>Alum Storage and Feed Facilities</u>			
Alum Feed Pumps		\$22,000	
Alum Storage Tank Repair		\$8,000	
Electrical/Instrumentation		\$9,000	
Process Piping		\$7,800	
Total		\$46,800	
 <u>Site and Building Services</u>			
Motor Control Center Evaluation		\$25,000	
Flood Gates Replacement		\$8,000	
Transformer Flood Protection		\$2,500	
Access Road Modification		\$6,000	
Washdown Pad for Village Vehicles		\$13,000	
 <u>Instrumentation/Automation Upgrade</u>			
Plant SCADA Upgrade	\$	80,000	
Total		\$134,500	\$0

Table V-1
 Summary of Improvements and Implementation Schedule
 Village of Howards Grove Wastewater Treatment Facility Evaluation

	Implementation/Cost Estimate		
	Year 2016	Year 2022	Year 2035
SUBTOTAL	\$974,775	\$1,795,115	\$361,475
CONTINGENCY (30 percent)	\$292,433	\$538,535	\$108,443
SUBTOTAL	\$1,267,208	\$2,333,650	\$469,918
CONTRACTOR OVERHEAD/PROFIT (25 percent)	\$316,802	\$583,412	\$117,479
SUBTOTAL	\$1,584,009	\$2,917,062	\$587,397
ENGINEERING (15 percent)	\$237,601	\$437,559	\$88,110
TOTAL	\$1,821,611	\$3,354,621	\$675,506

VI. IMPACT ON USER FEES

A. Funding Source

The State of Wisconsin has implemented the Clean Water Fund Loan program to aid communities in financing wastewater treatment plant projects. The Village of Howards Grove is eligible for low interest loans for this project.

B. Parallel Cost Estimate

The parallel cost estimate is a basic requirement of the Clean Water Fund Loan program. The purpose of the parallel cost estimate is to determine what percentage of the total project is eligible for financial assistance from the state. The state does not finance private enterprise of which industrial wastewater treatment is considered a part. The parallel cost estimate compares the cost of a proposed project with industrial flow to the estimated cost for a facility based only on domestic population requirements. If a facility has no industrial contributions, the parallel cost ratio would be 100 percent.

Howards Grove utilizes "residential units" to determine sewer fees. Each unit is equivalent to a typical household. Howards Grove's current user categories break down as follows:

	<u>No. Units</u>	<u>Percentage of User Charge</u>
Residential	1,274	87.2
Public	76	5.2
Commercial	108	7.4
Industrial	3	0.2

Public buildings include facilities such as local schools, village hall, fire department, public works building, and the wastewater treatment facility.

The single industrial user does not meet the definition of "industrial user" defined in NR-110. Based on this, the parallel cost ratio for the Village of Howards Grove is 100 percent.

C. User Charge Impact

The Village of Howards Grove utilizes a flat quarterly fee for its wastewater treatment services. Currently the rate is \$ 90/quarter for residential customers. Commercial and industrial customer fees are based on residential equivalents.

All debt retirement is amortized over a 20-year period with a Clean Water Loan from the State of Wisconsin. Assuming the current loan rate of 3.0 percent, the Clean Water Loan Fund loan rate would be reduced by 25 percent, equaling 2.25 percent. With a parallel cost ratio of 100 percent, 100 percent of the debt retirement may be funded at the reduced rate. Assuming a capital cost of \$ 1,821,611 for the Year 2016 improvements, the annual loan repayment would be \$114,109.

The Village's current Clean Water Fund Loan is scheduled to be paid off in 2022.

Annual operation and maintenance costs for the Year 2016 improvements are not expected to be significantly higher than current costs associated with treatment plant operation. The Clean Water Fund

Loan Program does require that deposits be made to the Village's equipment replacement fund for all new process equipment. The annual deposit amounts to \$40,300.

Table VI-1 summarizes the impacts of loan repayment for the Year 2016 improvements. The quarterly user fee for a residential customer will increase by 29 percent, from \$ 90.00 to \$ 116.42.

Table VI-1
User Charge Impact
Village of Howards Grove, Wisconsin

Number of Residential Units	1,461		
CWF Loan Interest Rate	2.25 percent		
Term	20 years		
Total Project Cost	\$1,821,611		
Loan Amount	\$1,821,611		
"Down Payment"	\$0		
		<u>Annual</u>	<u>Quarterly</u>
Loan Payment	\$114,109 per year	\$78.10	\$19.53
Payment/\$1000 borrowed	\$62.64 per \$1000 borrowed/yr		
 <u>Operation and Maintenance</u>			
Interest Rate	2.25 percent		
Replacement Fund	\$40,303 per year	\$27.59	\$6.90
Current User Fee		\$360.00	\$90.00
TOTAL		\$465.69	\$116.42

APPENDIX A

CURRENT
WPDES PERMIT
FOR
THE VILLAGE OF HOWARDS GROVE



WPDES PERMIT

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
**PERMIT TO DISCHARGE UNDER THE WISCONSIN POLLUTANT DISCHARGE
ELIMINATION SYSTEM**

Howards Grove Village

is permitted, under the authority of Chapter 283, Wisconsin Statutes, to discharge from a facility
located at
1111 Alcott Ave
to
Pigeon River

in accordance with the effluent limitations, monitoring requirements and other conditions set
forth in this permit.

The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit, according to Chapter NR 200, Wis. Adm. Code, at least 180 days prior to the expiration date given below.

State of Wisconsin Department of Natural Resources
For the Secretary

By _____
Lloyd L. Eagan
Southern District Water Leader

Date Permit Signed/Issued

PERMIT TERM: EFFECTIVE DATE – October 1, 2013

EXPIRATION DATE – September 30, 2018

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1 Influent Requirements

1.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)
701	Prior to screening and grit removal.

1.2 Monitoring Requirements

The permittee shall comply with the following monitoring requirements.

1.2.1 Sampling Point 701 - INFLUENT TO PLANT

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Continuous	Continuous	
BOD ₅ , Total		mg/L	3/Week	24-Hr Comp	
Suspended Solids, Total		mg/L	3/Week	24-Hr Comp	
Phosphorus, Total		mg/L	Weekly	24-Hr Comp	

2 Surface Water Requirements

2.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	Sampling Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)
001	Composite samples taken prior to post aeration. Grab samples taken after post aeration.

2.2 Monitoring Requirements and Effluent Limitations

The permittee shall comply with the following monitoring requirements and limitations.

2.2.1 Sampling Point (Outfall) 001 - EFFLUENT

Monitoring Requirements and Effluent Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Continuous	Continuous	
BOD ₅ , Total	Monthly Avg	10 mg/L	3/Week	24-Hr Comp	Limit applies November through March.
BOD ₅ , Total	Monthly Avg	5.0 mg/L	3/Week	24-Hr Comp	Limit applies May through October.
BOD ₅ , Total	Weekly Avg	10 mg/L	3/Week	24-Hr Comp	Limit applies November through March.
BOD ₅ , Total	Weekly Avg	5.0 mg/L	3/Week	24-Hr Comp	Limit applies May through October.
Suspended Solids, Total	Monthly Avg	10 mg/L	3/Week	24-Hr Comp	
Fecal Coliform	Geometric Mean	400 #/100 ml	Weekly	Grab	Limit applies May through September.
Nitrogen, Ammonia (NH ₃ -N) Total	Daily Max	34 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies November through April.
Nitrogen, Ammonia (NH ₃ -N) Total	Monthly Avg	4.9 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies November through March.
Nitrogen, Ammonia (NH ₃ -N) Total	Monthly Avg	2.1 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies in April.
Nitrogen, Ammonia (NH ₃ -N) Total	Monthly Avg	1.8 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies May through September.
Nitrogen, Ammonia (NH ₃ -N) Total	Monthly Avg	4.3 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies in October.
Nitrogen, Ammonia (NH ₃ -N) Total	Weekly Avg	2.7 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies May through September.
Nitrogen, Ammonia (NH ₃ -N) Total	Weekly Avg	9.2 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies in October.

Monitoring Requirements and Effluent Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Nitrogen, Ammonia (NH ₃ -N) Total	Weekly Avg	4.5 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies in April.
Nitrogen, Ammonia (NH ₃ -N) Total	Weekly Avg	10 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies November through March.
Dissolved Oxygen	Daily Min	7.0 mg/L	Daily	Grab	
pH Field	Daily Max	9.0 su	Daily	Grab	
pH Field	Daily Min	6.0 su	Daily	Grab	
Phosphorus, Total	Monthly Avg	1.0 mg/L	3/Week	24-Hr Comp	Interim limit. See sections 2.2.1.2 and 4.2 for additional details. Final effluent limits; 0.075mg/L, 6 month avg; 0.225mg/L, monthly avg.
Chloride	Weekly Avg	600 mg/L	4/Month	24-Hr Comp	Interim Limit. See sections 2.2.1.5 and 4.1 for additional details. Samples should be taken on four consecutive days.
Temperature Maximum		deg F	3/Week	Continuous	Monitor only during calendar year 2017.
Copper, Total Recoverable		µg/L	Quarterly	24-Hr Comp	Monitor only.
Chronic WET		rTU _c	See Listed Qtr(s)	24-Hr Flow Prop Comp	See section 2.2.1.4 for additional details.

2.2.1.1 Average Annual Design Flow

The average annual design flow of the permittee's wastewater treatment facility is 0.315 MGD.

2.2.1.2 Phosphorus Limitation(s) Compliance

The final water quality based phosphorus limits are 0.075mg/L, as a six month average from May – October and December – April; 0.225mg/L, as a monthly average unless:

- (A) As part of the application for the next reissuance, or prior to filing the application, the permittee submits either: 1.) a watershed adaptive management plan and a completed Watershed Adaptive Management Request Form 3200-139; or 2.) an application for water quality trading; or 3.) an application for a variance; or 4.) new information or additional data that supports a recalculation of the numeric limitation; and
- (B) The Department modifies, revokes and reissues, or reissues the permit to incorporate a revised limitation before the expiration of the compliance schedule*.

If Adaptive Management or Water Quality Trading is approved as part of the permit application for the next reissuance or as part of an application for a modification or revocation and reissuance, the plan and specifications submittal, construction, and final effective dates for compliance with the total phosphorus WQBEL may change in the reissued or modified permit. In addition, the numeric value of the water quality based effluent limit may change based on new information (e.g. a TMDL) or additional data. If a variance is approved for the next reissuance, interim limits and conditions will be imposed in the reissued permit in accordance with s. 283.15, Stats., and applicable regulations.

A permittee may apply for a variance to the phosphorus WQBEL at the next reissuance even if the permittee did not apply for a phosphorus variance as part of this permit reissuance.

Additional Requirements: If a water quality based effluent limit has taken effect in a permit, any increase in the limit is subject to s. NR 102.05(1) and ch. NR 207, Wis. Adm. Code. When a six-month average effluent limit is specified for Total Phosphorus the applicable averaging periods are May through October and November through April.

*Note: The Department will prioritize reissuances and revocations, modifications, and reissuances of permits to allow permittees the opportunity to implement adaptive management or nutrient trading in a timely and effective manner.

2.2.1.3 Alternative Approaches to Phosphorus WQBEL Compliance

Rather than upgrading its wastewater treatment facility to comply with the water quality-based phosphorus limits and TMDL-derived limits for phosphorus, the permittee may use Water Quality Trading or the Watershed Adaptive Management Option, to achieve compliance under ch. NR 217, Wis. Adm. Code, provided that the permit is modified, revoked and reissued, or reissued to incorporate any such alternative approach. The permittee may also implement an upgrade to its wastewater treatment facility in combination with Water Quality Trading or the Watershed Adaptive Management Option to achieve compliance, provided that the permit is modified, revoked and reissued, or reissued to incorporate any such alternative approach. If the Final Compliance Alternatives Plan concludes that a variance will be pursued, the Plan shall provide information regarding the basis for the variance.

2.2.1.4 Submittal of Permit Application for Next Reissuance and Adaptive Management or Pollutant Trading Plan or Variance Application

The permittee shall submit the permit application for the next reissuance at least 6 months prior to expiration of this permit. If the permittee intends to pursue adaptive management to achieve compliance with the phosphorus water quality based effluent limitation, the permittee shall submit with the application for the next reissuance: a completed Watershed Adaptive Management Request Form 3200-139, the completed Adaptive Management Plan and final plans for any system upgrades necessary to meet interim limits pursuant to s. NR 217.18, Wis. Adm. Code. If the permittee intends to pursue pollutant trading to achieve compliance, the permittee shall submit an application for water quality trading with the application for the next reissuance. If system upgrades will be used in combination with pollutant trading to achieve compliance with the final water quality-based limit, the reissued permit will specify a schedule for the necessary upgrades. If the permittee intends to seek a variance, the permittee shall submit an application for a variance with the application for the next reissuance.

2.2.1.1 Effluent Temperature Monitoring

For manually measuring effluent temperature, grab samples should be collected at 6 evenly spaced intervals during the 24-hour period. Alternative sampling intervals may be approved if the permittee can show that the maximum effluent temperature is captured during the sampling interval. For monitoring temperature continuously, collect measurements in accordance with s. NR 218.04(13). This means that discrete measurements shall be recorded at intervals of not more than 15 minutes during the 24-hour period. In either case, report the maximum temperature measured during the day on the DMR.

2.2.1.2 Whole Effluent Toxicity (WET) Testing

Primary Control Water: Pigeon River

Instream Waste Concentration (IWC): 98%

Dilution series: At least five effluent concentrations and dual controls must be included in each test.

- **Chronic:** 100, 75, 50, 25, 12.5, and 6.25% and any additional selected by the permittee.

WET Testing Frequency: Tests are required during the following quarters.

- **Chronic:** July 1, 2014 through September 30, 2014
January 1, 2015 through March 31, 2015
April 1, 2017 through June 30, 2017

Reporting: The permittee shall report test results on the Discharge Monitoring Report form, and also complete the "Whole Effluent Toxicity Test Report Form" (Section 6, "*State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition*"), for each test. The original, complete, signed version of the Whole Effluent Toxicity Test Report Form shall be sent to the Biomonitoring Coordinator, Bureau of Water Quality, 101 S. Webster St., P.O. Box 7921, Madison, WI 53707-7921, within 45 days of test completion. The original Discharge Monitoring Report (DMR) form and one copy shall be sent to the contact and location provided on the DMR by the required deadline.

Determination of Positive Results: An acute toxicity test shall be considered positive if the Toxic Unit - Acute (TU_a) is greater than 1.0 for either species. The TU_a shall be calculated as follows: If $LC_{50} \geq 100$, then $TU_a = 1.0$. If LC_{50} is < 100 , then $TU_a = 100 \div LC_{50}$. A chronic toxicity test shall be considered positive if the Relative Toxic Unit - Chronic (rTU_c) is greater than 1.0 for either species. The rTU_c shall be calculated as follows: If $IC_{25} \geq IWC$, then $rTU_c = 1.0$. If $IC_{25} < IWC$, then $rTU_c = IWC \div IC_{25}$.

Additional Testing Requirements: Within 90 days of a test which showed positive results, the permittee shall submit the results of at least 2 retests to the Biomonitoring Coordinator on "Whole Effluent Toxicity Test Report Forms". The 90 day reporting period shall begin the day after the test which showed a positive result. The retests shall be completed using the same species and test methods specified for the original test (see the Standard Requirements section herein).

2.2.1.3 Chloride Variance – Implement Source Reduction Measures

This permit contains a variance to the water quality-based effluent limit (WQBEL) for chloride granted in accordance with s. NR 106.83(2), Wis. Adm. Code. As conditions of this variance the permittee shall (a) maintain effluent quality at or below the interim effluent limitation specified in the table above, (b) implement the chloride source reduction measures specified below, and (c) perform the actions listed in the compliance schedule. (See the Schedules of Compliance section herein.): Tier 2 source reduction measures are those activities that improve and optimize plant process, encourage users to restrict their chloride use, eliminate wasteful practices, and encourage recycling practices where practicable, and other similar activities. Chloride Source reduction measures may include, but not be restricted to, any of the following:

1. Require significant industrial and commercial contributors of chlorides to evaluate their water treatment systems with regard to softened water requirements. Evaluate the possibility of restricting chloride inputs to the sanitary system.
2. Mandate a DIR and high salt efficiency standard for new residential softeners.
3. Mandate participation in a residential softener tune-up program, which involves qualified periodic servicing to ensure proper control settings and adjustments.
4. Continue to identify sources of chlorides to the sewer system.
5. Continue to educate homeowners and installers on the impact of chlorides and the option of hard water for outside faucets.

3 Land Application Requirements

3.1 Sampling Point(s)

The discharge(s) shall be limited to land application of the waste type(s) designated for the listed sampling point(s) on Department approved land spreading sites or by hauling to another facility.

Sampling Point Designation	
Sampling Point Number	Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)
002	Prior to land application.

3.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

3.2.1 Sampling Point (Outfall) 002 - Prior To Land Application

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Phosphorus, Total		Percent	Annual	Grab Comp	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Grab Comp	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Grab Comp	
Phosphorus, Water Extractable		Percent	Annual	Grab Comp	
Potassium, Total Recoverable		Percent	Annual	Grab Comp	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Grab Comp	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Grab Comp	
Nitrogen, Ammonium (NH ₄ -N) Total		Percent	Annual	Grab Comp	
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Grab Comp	
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Grab Comp	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Grab Comp	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Grab Comp	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Grab Comp	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Grab Comp	
Solids, Total		Percent	Annual	Grab Comp	
Nitrogen, Total Kjeldahl		Percent	Annual	Grab Comp	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Grab Comp	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Grab Comp	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Grab Comp	
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Grab Comp	
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Grab Comp	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Grab Comp	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Grab Comp	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Sample once in 2015.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Sample once in 2015.

Other Sludge Requirements	
Sludge Requirements	Sample Frequency
List 3 Requirements – Pathogen Control: The requirements in List 3 shall be met prior to land application of sludge.	Annual
List 4 Requirements – Vector Attraction Reduction: The vector attraction reduction shall be satisfied prior to, or at the time of land application as specified in List 4.	Annual

3.2.1.1 List 2 Analysis

If the monitoring frequency for List 2 parameters is more frequent than "Annual" then the sludge may be analyzed for the List 2 parameters just prior to each land application season rather than at the more frequent interval specified.

3.2.1.2 Changes in Feed Sludge Characteristics

If a change in feed sludge characteristics, treatment process, or operational procedures occurs which may result in a significant shift in sludge characteristics, the permittee shall reanalyze the sludge for List 1, 2, 3 and 4 parameters each time such change occurs.

3.2.1.3 Multiple Sludge Sample Points (Outfalls)

If there are multiple sludge sample points (outfalls), but the sludges are not subject to different sludge treatment processes, then a separate List 2 analysis shall be conducted for each sludge type which is land applied, just prior to land application, and the application rate shall be calculated for each sludge type. In this case, List 1, 3, and 4 and PCBs need only be analyzed on a single sludge type, at the specified frequency. If there are multiple sludge sample points (outfalls), due to multiple treatment processes, List 1, 2, 3 and 4 and PCBs shall be analyzed for each sludge type at the specified frequency.

3.2.1.4 Sludge Which Exceeds the High Quality Limit

Cumulative pollutant loading records shall be kept for all bulk land application of sludge which does not meet the high quality limit for any parameter. This requirement applies for the entire calendar year in which any exceedance of Table 3 of s. NR 204.07(5)(c), is experienced. Such loading records shall be kept for all List 1 parameters for each site land applied in that calendar year. The formula to be used for calculating cumulative loading is as follows:

$$[(\text{Pollutant concentration (mg/kg)} \times \text{dry tons applied/ac}) \div 500] + \text{previous loading (lbs/acre)} = \text{cumulative lbs pollutant per acre}$$

When a site reaches 90% of the allowable cumulative loading for any metal established in Table 2 of s. NR 204.07(5)(b), the Department shall be so notified through letter or in the comment section of the annual land application report (3400-55).

3.2.1.5 Sludge Analysis for PCBs

The permittee shall analyze the sludge for Total PCBs one time during 2015. The results shall be reported as "PCB Total Dry Wt". Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with Table EM in s. NR 219.04, Wis. Adm. Code and the conditions specified in Standard Requirements of this permit. PCB results shall be submitted by January 31, following the specified year of analysis.

3.2.1.6 Lists 1, 2, 3, and 4

List 1 TOTAL SOLIDS AND METALS
See the Monitoring Requirements and Limitations table above for monitoring frequency and limitations for the List 1 parameters
Solids, Total (percent)
Arsenic, mg/kg (dry weight)
Cadmium, mg/kg (dry weight)
Copper, mg/kg (dry weight)
Lead, mg/kg (dry weight)
Mercury, mg/kg (dry weight)
Molybdenum, mg/kg (dry weight)
Nickel, mg/kg (dry weight)
Selenium, mg/kg (dry weight)
Zinc, mg/kg (dry weight)

List 2 NUTRIENTS
See the Monitoring Requirements and Limitations table above for monitoring frequency for the List 2 parameters
Solids, Total (percent)
Nitrogen Total Kjeldahl (percent)
Nitrogen Ammonium (NH ₄ -N) Total (percent)
Phosphorus Total as P (percent)
Phosphorus, Water Extractable (as percent of Total P)
Potassium Total Recoverable (percent)

List 3

PATHOGEN CONTROL FOR CLASS B SLUDGE

The permittee shall implement pathogen control as listed in List 3. The Department shall be notified of the pathogen control utilized and shall be notified when the permittee decides to utilize alternative pathogen control.

The following requirements shall be met prior to land application of sludge.

Parameter	Unit	Limit
Fecal Coliform*	MPN/gTS or CFU/gTS	2,000,000
OR, ONE OF THE FOLLOWING PROCESS OPTIONS		
Aerobic Digestion		Air Drying
Anaerobic Digestion		Composting
Alkaline Stabilization		PSRP Equivalent Process

* The Fecal Coliform limit shall be reported as the geometric mean of 7 discrete samples on a dry weight basis.

List 4

VECTOR ATTRACTION REDUCTION

The permittee shall implement any one of the vector attraction reduction options specified in List 4. The Department shall be notified of the option utilized and shall be notified when the permittee decides to utilize an alternative option.

One of the following shall be satisfied prior to, or at the time of land application as specified in List 4.

Option	Limit	Where/When it Shall be Met
Volatile Solids Reduction	≥38%	Across the process
Specific Oxygen Uptake Rate	≤1.5 mg O ₂ /hr/g TS	On aerobic stabilized sludge
Anaerobic bench-scale test	<17 % VS reduction	On anaerobic digested sludge
Aerobic bench-scale test	<15 % VS reduction	On aerobic digested sludge
Aerobic Process	>14 days, Temp >40°C and Avg. Temp > 45°C	On composted sludge
pH adjustment	>12 S.U. (for 2 hours) and >11.5 (for an additional 22 hours)	During the process
Drying without primary solids	>75 % TS	When applied or bagged
Drying with primary solids	>90 % TS	When applied or bagged
Equivalent Process	Approved by the Department	Varies with process
Injection	-	When applied
Incorporation	-	Within 6 hours of application

3.2.1.7 Daily Land Application Log

Daily Land Application Log		
Discharge Monitoring Requirements and Limitations		
The permittee shall maintain a daily land application log for biosolids land applied each day when land application occurs. The following minimum records must be kept, in addition to all analytical results for the biosolids land applied. The log book records shall form the basis for the annual land application report requirements.		
Parameters	Units	Sample Frequency
DNR Site Number(s)	Number	Daily as used
Outfall number applied	Number	Daily as used
Acres applied	Acres	Daily as used
Amount applied	As appropriate * /day	Daily as used
Application rate per acre	unit */acre	Daily as used
Nitrogen applied per acre	lb/acre	Daily as used
Method of Application	Injection, Incorporation, or surface applied	Daily as used

* gallons, cubic yards, dry US Tons or dry Metric Tons

4 Schedules

4.1 Chloride Target Value

As a condition of the variance to the water quality based effluent limitation(s) for chloride granted in accordance with s. NR 106.83(2), Wis. Adm. Code, the permittee shall perform the following actions.

Required Action	Due Date
Annual Chloride Progress Report: Submit an annual progress report, that shall indicate which chloride source reduction measures have been implemented. The report shall also include a calculated annual mass discharge of chloride based on chloride sampling and flow data. After the first progress report is submitted, the permittee may submit a written request to the department to waive further annual progress reports. If after evaluating the progress of the source reduction measures, the department decides to accommodate the request, the department shall notify the permittee in writing that the subsequent annual reports are waived. The Final Chloride Report cannot be waived and shall be submitted by the Date Due. Note that the interim limitation(s) of 600mg/L remain enforceable until new enforceable limits are established in the next permit issuance. The first annual chloride progress report is to be submitted by the Date Due.	09/30/2014
Annual Chloride Progress Report #2: Submit a chloride progress report.	09/30/2015
Annual Chloride Progress Report #3: Submit a chloride progress report.	09/30/2016
Annual Chloride Progress Report #4: Submit a chloride progress report.	09/30/2017
Final Chloride Report: Submit a final report documenting the success in meeting the chloride target value of 450mg/L, as well as the anticipated future reduction in chloride sources and chloride effluent concentrations. This report shall also include proposed target values and source reduction measures for negotiations with the department if the permittee intends to seek a renewed chloride variance per s. NR 106.83, Wis. Adm. Code, for the reissued permit. Note that the target value is the benchmark for evaluating the effectiveness of the chloride source reduction measures, but is not an enforceable limitation under the terms of this permit.	03/31/2018

4.2 Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus

The permittee shall comply with the WQBELs for Phosphorus as specified. No later than 30 days following each compliance date, the permittee shall notify the Department in writing of its compliance or noncompliance. If a submittal is required, a timely submittal fulfills the notification requirement.

Required Action	Due Date
Operational Evaluation Report: The permittee shall prepare and submit to the Department for approval an operational evaluation report. The report shall include an evaluation of collected effluent data, possible source reduction measures, operational improvements or other minor facility modifications that will optimize reductions in phosphorus discharges from the treatment plant during the period prior to complying with final phosphorus WQBELs and, where possible, enable compliance with final phosphorus WQBELs by 09/30/2016. The report shall provide a plan and schedule for implementation of the measures, improvements, and modifications as soon as possible, but not later than 09/30/2016 and state whether the measures, improvements, and modifications will enable compliance with final phosphorus WQBELs. Regardless of whether they are expected to result in compliance, the permittee shall implement the measures, improvements, and modifications in accordance with the plan and schedule specified in the operational evaluation report. If the operational evaluation report concludes that the facility can achieve final phosphorus WQBELs	09/30/2014

<p>using the existing treatment system with only source reduction measures, operational improvements, and minor facility modifications, the permittee shall comply with the final phosphorus WQBEL by 09/30/2016 and is not required to comply with the milestones identified below for years 3 through 9 of this compliance schedule ('Preliminary Compliance Alternatives Plan', 'Final Compliance Alternatives Plan', 'Final Plans and Specifications' 'Treatment Plant Upgrade to Meet WQBELs', 'Complete Construction, 'Achieve Compliance').</p>	
<p>Study of Feasible Alternatives: If the Operational Evaluation Report concludes that the permittee cannot achieve final phosphorus WQBELs with source reduction measures, operational improvements and other minor facility modifications, the permittee shall initiate a study of feasible alternatives for meeting final phosphorus WQBELs and comply with the remaining required actions of this schedule of compliance. If the Department disagrees with the conclusion of the report, and determines that the permittee can achieve final phosphorus WQBELs using the existing treatment system with only source reduction measures, operational improvements, and minor facility modifications, the Department may reopen and modify the permit to include an implementation schedule for achieving the final phosphorus WQBELs sooner than 09/30/2022.</p>	09/30/2014
<p>Compliance Alternatives, Source Reduction, Improvements and Modifications Status: The permittee shall submit a 'Compliance Alternatives, Source Reduction, Operational Improvements and Minor Facility Modification' status report to the Department. The report shall provide an update on the permittee's: (1) progress implementing source reduction measures, operational improvements, and minor facility modifications to optimize reductions in phosphorus discharges and, to the extent that such measures, improvements, and modifications will not enable compliance with the WQBELs, (2) status evaluating feasible alternatives for meeting phosphorus WQBELs.</p>	09/30/2015
<p>Preliminary Compliance Alternatives Plan: The permittee shall submit a preliminary compliance alternatives plan to the Department.</p> <p>If the plan concludes upgrading of the permittee's wastewater treatment facility is necessary to achieve final phosphorus WQBELs, the submittal shall include a preliminary engineering design report.</p> <p>If the plan concludes Adaptive Management will be used, the submittal shall include a completed Watershed Adaptive Management Request Form 3200-139 without the Adaptive Management Plan.</p> <p>If water quality trading will be undertaken, the plan must state that trading will be pursued.</p>	09/30/2016
<p>Final Compliance Alternatives Plan: The permittee shall submit a final compliance alternatives plan to the Department.</p> <p>If the plan concludes upgrading of the permittee's wastewater treatment is necessary to meet final phosphorus WQBELs, the submittal shall include a final engineering design report addressing the treatment plant upgrades, and a facility plan if required pursuant to ch. NR 110, Wis. Adm. Code.</p> <p>If the plan concludes Adaptive Management will be implemented, the submittal shall include a completed Watershed Adaptive Management Request Form 3200-139 and an engineering report addressing any treatment system upgrades necessary to meet interim limits pursuant to s. NR 217.18, Wis. Adm. Code.</p> <p>If the plan concludes water quality trading will be used, the submittal shall identify potential trading partners.</p> <p>Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.</p>	09/30/2017
<p>Progress Report on Plans & Specifications: Submit progress report regarding the progress of preparing final plans and specifications. Note: See 'Alternative Approaches to Phosphorus WQBEL</p>	09/30/2018

Compliance' in the Surface Water section of this permit.	
<p>Final Plans and Specifications: Unless the permit has been modified, revoked and reissued, or reissued to include Adaptive Management or Water Quality Trading measures or to include a revised schedule based on factors in s. NR 217.17, Wis. Adm. Code, the permittee shall submit final construction plans to the Department for approval pursuant to s. 281.41, Stats., specifying treatment plant upgrades that must be constructed to achieve compliance with final phosphorus WQBELs, and a schedule for completing construction of the upgrades by the complete construction date specified below. (Note: Permit modification, revocation and reissuance, and reissuance are subject to s. 283.53(2), Stats.)</p> <p>Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.</p>	09/30/2019
<p>Treatment Plant Upgrade to Meet WQBELs: The permittee shall initiate construction of the upgrades. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41, Stats. Upon approval of the final construction plans and schedule by the Department pursuant to s. 281.41, Stats., the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.</p>	12/31/2019
<p>Construction Upgrade Progress Report #1: The permittee shall submit a progress report on construction upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.</p>	12/31/2020
<p>Construction Upgrade Progress Report #2: The permittee shall submit a progress report on construction upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.</p>	06/30/2021
<p>Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.</p>	09/30/2021
<p>Achieve Compliance: The permittee shall achieve compliance with final phosphorus WQBELs. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.</p>	09/30/2022

5 Standard Requirements

NR 205, Wisconsin Administrative Code: The conditions in ss. NR 205.07(1) and NR 205.07(2), Wis. Adm. Code, are included by reference in this permit. The permittee shall comply with all of these requirements. Some of these requirements are outlined in the Standard Requirements section of this permit. Requirements not specifically outlined in the Standard Requirement section of this permit can be found in ss. NR 205.07(1) and NR 205.07(2).

5.1 Reporting and Monitoring Requirements

5.1.1 Monitoring Results

Monitoring results obtained during the previous month shall be summarized and reported on a Department Wastewater Discharge Monitoring Report. The report may require reporting of any or all of the information specified below under 'Recording of Results'. This report is to be returned to the Department no later than the date indicated on the form. A copy of the Wastewater Discharge Monitoring Report Form or an electronic file of the report shall be retained by the permittee.

Monitoring results shall be reported on an electronic discharge monitoring report (eDMR). The eDMR shall be certified electronically by a principal executive officer, a ranking elected official or other duly authorized representative. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

If the permittee monitors any pollutant more frequently than required by this permit, the results of such monitoring shall be included on the Wastewater Discharge Monitoring Report.

The permittee shall comply with all limits for each parameter regardless of monitoring frequency. For example, monthly, weekly, and/or daily limits shall be met even with monthly monitoring. The permittee may monitor more frequently than required for any parameter.

5.1.2 Sampling and Testing Procedures

Sampling and laboratory testing procedures shall be performed in accordance with Chapters NR 218 and NR 219, Wis. Adm. Code and shall be performed by a laboratory certified or registered in accordance with the requirements of ch. NR 149, Wis. Adm. Code. Groundwater sample collection and analysis shall be performed in accordance with ch. NR 140, Wis. Adm. Code. The analytical methodologies used shall enable the laboratory to quantitate all substances for which monitoring is required at levels below the effluent limitation. If the required level cannot be met by any of the methods available in NR 219, Wis. Adm. Code, then the method with the lowest limit of detection shall be selected. Additional test procedures may be specified in this permit.

5.1.3 Recording of Results

The permittee shall maintain records which provide the following information for each effluent measurement or sample taken:

- the date, exact place, method and time of sampling or measurements;
- the individual who performed the sampling or measurements;
- the date the analysis was performed;
- the individual who performed the analysis;
- the analytical techniques or methods used; and
- the results of the analysis.

5.1.4 Reporting of Monitoring Results

The permittee shall use the following conventions when reporting effluent monitoring results:

- Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 0.1 mg/L, report the pollutant concentration as < 0.1 mg/L.
- Pollutant concentrations equal to or greater than the limit of detection, but less than the limit of quantitation, shall be reported and the limit of quantitation shall be specified.
- For purposes of calculating NR 101 fees, the 2 mg/l lower reporting limits for BOD₅ and Total Suspended Solids shall be considered to be limits of quantitation
- For the purposes of reporting a calculated result, average or a mass discharge value, the permittee may substitute a 0 (zero) for any pollutant concentration that is less than the limit of detection. However, if the effluent limitation is less than the limit of detection, the department may substitute a value other than zero for results less than the limit of detection, after considering the number of monitoring results that are greater than the limit of detection and if warranted when applying appropriate statistical techniques.

5.1.5 Compliance Maintenance Annual Reports

Compliance Maintenance Annual Reports (CMAR) shall be completed using information obtained over each calendar year regarding the wastewater conveyance and treatment system. The CMAR shall be submitted by the permittee in accordance with ch. NR 208, Wis. Adm. Code, by June 30, each year on an electronic report form provided by the Department.

In the case of a publicly owned treatment works, a resolution shall be passed by the governing body and submitted as part of the CMAR, verifying its review of the report and providing responses as required. Private owners of wastewater treatment works are not required to pass a resolution; but they must provide an Owner Statement and responses as required, as part of the CMAR submittal.

A separate CMAR certification document, that is not part of the electronic report form, shall be mailed to the Department at the time of electronic submittal of the CMAR. The CMAR certification shall be signed and submitted by an authorized representative of the permittee. The certification shall be submitted by mail. The certification shall verify the electronic report is complete, accurate and contains information from the owner's treatment works.

5.1.6 Records Retention

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 the permit, and records of all data used to complete the application for the permit for a period of at least 3 years from the date of the sample, measurement, report or application. All pertinent sludge information, including permit application information and other documents specified in this permit or s. NR 204.06(9), Wis. Adm. Code shall be retained for a minimum of 5 years.

5.1.7 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 Department, it shall promptly submit such facts or correct information to the Department.

5.2 System Operating Requirements

5.2.1 Noncompliance Notification

- The permittee shall report the following types of noncompliance by a telephone call to the Department's regional office within 24 hours after becoming aware of the noncompliance:
 - any noncompliance which may endanger health or the environment;
 - any violation of an effluent limitation resulting from an unanticipated bypass;
 - any violation of an effluent limitation resulting from an upset; and
 - any violation of a maximum discharge limitation for any of the pollutants listed by the Department in the permit, either for effluent or sludge.
- A written report describing the noncompliance shall also be submitted to the Department's regional office within 5 days after the permittee becomes aware of the noncompliance. On a case-by-case basis, the Department may waive the requirement for submittal of a written report within 5 days and instruct the permittee to submit the written report with the next regularly scheduled monitoring report. In either case, the written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

NOTE: Section 292.11(2)(a), Wisconsin Statutes, requires any person who possesses or controls a hazardous substance or who causes the discharge of a hazardous substance to notify the Department of Natural Resources **immediately** of any discharge not authorized by the permit. The discharge of a hazardous substance that is not authorized by this permit or that violates this permit may be a hazardous substance spill. To report a hazardous substance spill, call DNR's 24-hour HOTLINE at **1-800-943-0003**

5.2.2 Flow Meters

Flow meters shall be calibrated annually, as per s. NR 218.06, Wis. Adm. Code.

5.2.3 Raw Grit and Screenings

All raw grit and screenings shall be disposed of at a properly licensed solid waste facility or picked up by a licensed waste hauler. If the facility or hauler are located in Wisconsin, then they shall be licensed under chs. NR 500-536, Wis. Adm. Code.

5.2.4 Sludge Management

All sludge management activities shall be conducted in compliance with ch. NR 204 "Domestic Sewage Sludge Management", Wis. Adm. Code.

5.2.5 Prohibited Wastes

Under no circumstances may the introduction of wastes prohibited by s. NR 211.10, Wis. Adm. Code, be allowed into the waste treatment system. Prohibited wastes include those:

- which create a fire or explosion hazard in the treatment work;
- which will cause corrosive structural damage to the treatment work;
- solid or viscous substances in amounts which cause obstructions to the flow in sewers or interference with the proper operation of the treatment work;
- wastewaters at a flow rate or pollutant loading which are excessive over relatively short time periods so as to cause a loss of treatment efficiency; and

- changes in discharge volume or composition from contributing industries which overload the treatment works or cause a loss of treatment efficiency.

5.2.6 Unscheduled Bypassing

Any unscheduled bypass or overflow of wastewater at the treatment works or from the collection system is prohibited, and the Department may take enforcement action against a permittee for such occurrences under s. 283.89, Wis. Stats., unless all of the following occur:

- The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage.
- 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.
- The permittee notifies the department of the unscheduled bypass or overflow. The permittee shall notify the department within 24 hours of initiation of the bypass or overflow occurrence by telephone, voicemail, fax or e-mail. Within 5 days of conclusion of the bypass or overflow occurrence, the permittee shall submit to the department in writing, all of the following information:
 - Reason the bypass or overflow occurred, or explanation of other contributing circumstances that resulted in the overflow event. If the overflow or bypass is associated with wet weather, provide data on the amount and duration of the rainfall or snow melt for each separate event.
 - Date the bypass or overflow occurred.
 - Location where the bypass or overflow occurred.
 - Duration of the bypass or overflow and estimated wastewater volume discharged.
 - Steps taken or the proposed corrective action planned to prevent similar future occurrences.
 - Any other information the permittee believes is relevant.

5.2.7 Scheduled Bypassing

Any construction or normal maintenance which results in a bypass of wastewater is prohibited unless authorized by the Department in writing. If the Department determines that there is significant public interest in the proposed action, the Department may schedule a public hearing or notice a proposal to approve the bypass. Each request shall specify the following minimum information:

- Proposed date of bypass.
- Estimated duration of the bypass.
- Alternatives to bypassing.
- Measures to mitigate environmental harm caused by the bypass.
- Estimated volume of the bypass.

5.2.8 Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of this permit. The wastewater treatment facility shall be under the direct supervision of a state certified operator as required in s. NR 108.06(2), Wis. Adm. Code. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training as required in ch. NR 114, Wis. Adm. Code, 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.

5.3 Surface Water Requirements

5.3.1 Permittee-Determined Limit of Quantitation Incorporated into this Permit

For pollutants with water quality-based effluent limits below the Limit of Quantitation (LOQ) in this permit, the LOQ calculated by the permittee and reported on the Discharge Monitoring Reports (DMRs) is incorporated by reference into this permit. The LOQ shall be reported on the DMRs, shall be the lowest quantifiable level practicable, and shall be no greater than the minimum level (ML) specified in or approved under 40 CFR Part 136 for the pollutant at the time this permit was issued, unless this permit specifies a higher LOQ.

5.3.2 Appropriate Formulas for Effluent Calculations

The permittee shall use the following formulas for calculating effluent results to determine compliance with average concentration limits and mass limits and total load limits:

Weekly/Monthly/Six-Month/Annual Average Concentration = the sum of all daily results for that week/month/six-month/year, divided by the number of results during that time period. [Note: When a six-month average effluent limit is specified for Total Phosphorus the applicable periods are May through October and November through April.]

Weekly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the week.

Monthly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the month.

Six-Month Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the six-month period. [Note: When a six-month average effluent limit is specified for Total Phosphorus the applicable periods are May through October and November through April.]

Annual Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the entire year.

Total Monthly Discharge: = monthly average concentration (mg/L) x total flow for the month (MG/month) x 8.34.

Total Annual Discharge: = sum of total monthly discharges for the calendar year.

5.3.3 Effluent Temperature Requirements

Weekly Average Temperature – The permittee shall use the following formula for calculating effluent results to determine compliance with the weekly average temperature limit (as applicable): Weekly Average Temperature = the sum of all daily maximum results for that week divided by the number of daily maximum results during that time period.

Cold Shock Standard – Water temperatures of the discharge shall be controlled in a manner as to protect fish and aquatic life uses from the deleterious effects of cold shock. ‘Cold Shock’ means exposure of aquatic organisms to a rapid decrease in temperature and a sustained exposure to low temperature that induces abnormal behavior or physiological performance and may lead to death.

Rate of Temperature Change Standard – Temperature of a water of the state or discharge to a water of the state may not be artificially raised or lowered at such a rate that it causes detrimental health or reproductive effects to fish or aquatic life of the water of the state.

5.3.4 Visible Foam or Floating Solids

There shall be no discharge of floating solids or visible foam in other than trace amounts.

5.3.5 Percent Removal

During any 30 consecutive days, the average effluent concentrations of BOD₅ and of total suspended solids shall not exceed 15% of the average influent concentrations, respectively. This requirement does not apply to removal of total suspended solids if the permittee operates a lagoon system and has received a variance for suspended solids granted under NR 210.07(2), Wis. Adm. Code.

5.3.6 Fecal Coliforms

The limit for fecal coliforms shall be expressed as a monthly geometric mean.

5.3.7 Seasonal Disinfection

Disinfection shall be provided from May 1 through September 30 of each year. Monitoring requirements and the limitation for fecal coliforms apply only during the period in which disinfection is required. Whenever chlorine is used for disinfection or other uses, the limitations and monitoring requirements for residual chlorine shall apply. A dechlorination process shall be in operation whenever chlorine is used.

5.4 Land Application Requirements

5.4.1 Sludge Management Program Standards And Requirements Based Upon Federally Promulgated Regulations

In the event that new federal sludge standards or regulations are promulgated, the permittee shall comply with the new sludge requirements by the dates established in the regulations, if required by federal law, even if the permit has not yet been modified to incorporate the new federal regulations.

5.4.2 General Sludge Management Information

The General Sludge Management Form 3400-48 shall be completed and submitted prior to any significant sludge management changes.

5.4.3 Sludge Samples

All sludge samples shall be collected at a point and in a manner which will yield sample results which are representative of the sludge being tested, and collected at the time which is appropriate for the specific test.

5.4.4 Land Application Characteristic Report

Each report shall consist of a Characteristic Report Form 3400-49 and Lab Report. The Characteristic Report Form 3400-49 shall be submitted electronically by January 31 following each year of analysis. Following submittal of the electronic Characteristic Report Form 3400-49, this form shall be certified electronically via the 'eReport Certify' page by a principal executive officer, ranking elected official or duly authorized representative. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete. The Lab Report must be sent directly to the facility's DNR sludge representative or basin engineer unless approval for not submitting the lab reports has been given.

The permittee shall use the following convention when reporting sludge monitoring results: Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 1.0 mg/kg, report the pollutant concentration as < 1.0 mg/kg .

All results shall be reported on a dry weight basis.

5.4.5 Calculation of Water Extractable Phosphorus

When sludge analysis for Water Extractable Phosphorus is required by this permit, the permittee shall use the following formula to calculate and report Water Extractable Phosphorus:

$$\text{Water Extractable Phosphorus (\% of Total P)} = \frac{[\text{Water Extractable Phosphorus (mg/kg, dry wt)} \div \text{Total Phosphorus (mg/kg, dry wt)}] \times 100$$

5.4.6 Monitoring and Calculating PCB Concentrations in Sludge

When sludge analysis for "PCB, Total Dry Wt" is required by this permit, the PCB concentration in the sludge shall be determined as follows.

Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with the following provisions and Table EM in s. NR 219.04, Wis. Adm. Code.

- EPA Method 1668 may be used to test for all PCB congeners. If this method is employed, all PCB congeners shall be delineated. Non-detects shall be treated as zero. The values that are between the limit of detection and the limit of quantitation shall be used when calculating the total value of all congeners. All results shall be added together and the total PCB concentration by dry weight reported. **Note:** It is recognized that a number of the congeners will co-elute with others, so there will not be 209 results to sum.
- EPA Method 8082A shall be used for PCB-Aroclor analysis and may be used for congener specific analysis as well. If congener specific analysis is performed using Method 8082A, the list of congeners tested shall include at least congener numbers 5, 18, 31, 44, 52, 66, 87, 101, 110, 138, 141, 151, 153, 170, 180, 183, 187, and 206 plus any other additional congeners which might be reasonably expected to occur in the particular sample. For either type of analysis, the sample shall be extracted using the Soxhlet extraction (EPA Method 3540C) (or the Soxhlet Dean-Stark modification) or the pressurized fluid extraction (EPA Method 3545A). If Aroclor analysis is performed using Method 8082A, clean up steps of the extract shall be performed as necessary to remove interference and to achieve as close to a limit of detection of 0.11 mg/kg as possible. Reporting protocol, consistent with s. NR 106.07(6)(e), should be as follows: If all Aroclors are less than the LOD, then the Total PCB Dry Wt result should be reported as less than the highest LOD. If a single Aroclor is detected then that is what should be reported for the Total PCB result. If multiple Aroclors are detected, they should be summed and reported as Total PCBs. If congener specific analysis is done using Method 8082A, clean up steps of the extract shall be performed as necessary to remove interference and to achieve as close to a limit of detection of 0.003 mg/kg as possible for each congener. If the aforementioned limits of detection cannot be achieved after using the appropriate clean up techniques, a reporting limit that is achievable for the Aroclors or each congener for the sample shall be determined. This reporting limit shall be reported and qualified indicating the presence of an interference. The lab conducting the analysis shall perform as many of the following methods as necessary to remove interference:

3620C – Florisil	3611B - Alumina
3640A - Gel Permeation	3660B - Sulfur Clean Up (using copper shot instead of powder)
3630C - Silica Gel	3665A - Sulfuric Acid Clean Up

5.4.7 Annual Land Application Report

The Annual Land Application Report Form 3400-55 shall be submitted electronically by January 31 each year whether or not non-exceptional quality sludge is land applied. Non-exceptional quality sludge is defined in s. NR 204.07(4), Wis. Adm. Code. Following submittal of the electronic Annual Land Application Report Form 3400-55, this form shall be certified electronically via the 'eReport Certify' page by a principal executive officer, ranking elected official or duly authorized representative. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

5.4.8 Other Methods of Disposal or Distribution Report

The permittee shall submit electronically the Other Methods of Disposal or Distribution Report Form 3400-52 by January 31 each year whether or not sludge is hauled, landfilled, incinerated, or exceptional quality sludge is distributed or land applied. Following submittal of the electronic Report Form 3400-52, this form shall be certified electronically via the 'eReport Certify' page by a principal executive officer, ranking elected official or duly authorized representative. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

5.4.9 Approval to Land Apply

Bulk non-exceptional quality sludge as defined in s. NR 204.07(4), Wis. Adm. Code, may not be applied to land without a written approval letter or Form 3400-122 from the Department unless the Permittee has obtained permission from the Department to self approve sites in accordance with s. NR 204.06 (6), Wis. Adm. Code. Analysis of sludge characteristics is required prior to land application. Application on frozen or snow covered ground is restricted to the extent specified in s. NR 204.07(3) (1), Wis. Adm. Code.

5.4.10 Soil Analysis Requirements

Each site requested for approval for land application must have the soil tested prior to use. Each approved site used for land application must subsequently be soil tested such that there is at least one valid soil test in the four years prior to land application. All soil sampling and submittal of information to the testing laboratory shall be done in accordance with UW Extension Bulletin A-2100. The testing shall be done by the UW Soils Lab in Madison or Marshfield, WI or at a lab approved by UW. The test results including the crop recommendations shall be submitted to the DNR contact listed for this permit, as they are available. Application rates shall be determined based on the crop nitrogen recommendations and with consideration for other sources of nitrogen applied to the site.

5.4.11 Land Application Site Evaluation

For non-exceptional quality sludge, as defined in s. NR 204.07(4), Wis. Adm. Code, a Land Application Site Request Form 3400-053 shall be submitted to the Department for the proposed land application site. The Department will evaluate the proposed site for acceptability and will either approve or deny use of the proposed site. The permittee may obtain permission to approve their own sites in accordance with s. NR 204.06(6), Wis. Adm. Code.

5.4.12 Class B Sludge: Aerobic Digestion

Agitate the sludge with air or oxygen to maintain an aerobic condition for a mean cell residence time and temperature between 40 days at 20° C and 60 days at 15° C.

5.4.13 Vector Control: Specific Oxygen Uptake Rate

The specific oxygen uptake rate (SOUR) for aerobic sludge shall be equal to or less than 1.5 milligrams of oxygen per hour per gram of total solids on a dry weight basis, corrected to 20° Celsius. See Municipal Wastewater Sludge Guidance Memo #2 (Guidance Notes for Specific Oxygen Uptake Rates on Aerobically Digested Sludge).

5.4.14 Class B Sludge - Vector Control: Incorporation

Class B sludge shall be incorporated within 6 hours of surface application, or as approved by the Department.

5.4.15 Sludge Hauling

If sludge is hauled to another facility, the permittee is required to submit Form 3400-52 to the Department. Information shall include the quantity of sludge hauled, the name, address, phone number, contact person, and permit

number of the receiving facility. Form 3400-52 shall be submitted annually by January 31 following each year sludge is hauled.

6 Summary of Reports Due

FOR INFORMATIONAL PURPOSES ONLY

Description	Date	Page
Chloride Target Value -Annual Chloride Progress Report	September 30, 2014	11
Chloride Target Value -Annual Chloride Progress Report #2	September 30, 2015	11
Chloride Target Value -Annual Chloride Progress Report #3	September 30, 2016	11
Chloride Target Value -Annual Chloride Progress Report #4	September 30, 2017	11
Chloride Target Value -Final Chloride Report	March 31, 2018	11
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Operational Evaluation Report	September 30, 2014	11
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Study of Feasible Alternatives	September 30, 2014	12
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Compliance Alternatives, Source Reduction, Improvements and Modifications Status	September 30, 2015	12
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Preliminary Compliance Alternatives Plan	September 30, 2016	12
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Final Compliance Alternatives Plan	September 30, 2017	12
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Progress Report on Plans & Specifications	September 30, 2018	13
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Final Plans and Specifications	September 30, 2019	13
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Treatment Plant Upgrade to Meet WQBELs	December 31, 2019	13
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Construction Upgrade Progress Report #1	December 31, 2020	13
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Construction Upgrade Progress Report #2	June 30, 2021	13
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Complete Construction	September 30, 2021	13
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Achieve Compliance	September 30, 2022	13

Report forms shall be submitted to the address printed on the report form. Any facility plans or plans and specifications for municipal, industrial, industrial pretreatment and non industrial wastewater systems shall be submitted to the Bureau of Water Quality, P.O. Box 7921, Madison, WI 53707-7921. All other submittals required by this permit shall be submitted to:

Southeast Region - Plymouth, 1155 Pilgrim Road, Plymouth, WI 53073

APPENDIX B

**DESIGN BASIS MEMORANDUM
FOR STAGED WASTEWATER TREATMENT PLANT
IMPROVEMENTS
FOR
THE VILLAGE OF HOWARDS GROVE**

Village of Howards Grove
Wastewater Treatment Facility Improvements
Design Basis Memorandum

March 2015

	Average 2011-2014	Year 2016	Year 2022	Design Year 2035
Flow				
Average Day Flow	0.2380 mgd	0.2439 mgd	0.2675 mgd	0.3000 mgd
Average Day Dry Weather Flow	0.2200 mgd	0.2255 mgd	0.2473 mgd	0.2773 mgd
Average Day Wet Weather Flow	0.3442 mgd	0.3527 mgd	0.3869 mgd	0.4339 mgd
Maximum Month Flow	0.6170 mgd	0.6322 mgd	0.6932 mgd	0.7770 mgd
Maximum Day Flow	1.2470 mgd	1.2415 mgd	1.2194 mgd	1.1890 mgd
Peak Hourly Flow	1.4300 mgd	1.4486 mgd	1.5229 mgd	1.6250 mgd
BOD				
Average Day	415 lb/day	427 lb/day	475 lb/day	540 lb/day
Maximum Month	520 lb/day	535 lb/day	594 lb/day	675 lb/day
Maximum Day	969 lb/day	997 lb/day	1109 lb/day	1,264 lb/day
Suspended Solids				
Average Day	389 lb/day	408 lb/day	484 lb/day	588 lb/day
Maximum Month	600 lb/day	629 lb/day	745 lb/day	905 lb/day
Maximum Day	1,354 lb/day	1419 lb/day	1681 lb/day	2,040 lb/day
Ammonia Nitrogen 30 mg/L NH3-N				
Average Day	60 lb/day	61 lb/day	67 lb/day	75 lb/day
Maximum Month	74 lb/day	76 lb/day	84 lb/day	94 lb/day
Maximum Day	129 lb/day	133 lb/day	151 lb/day	176 lb/day
Phosphorus 10 mg/L as P				
Average Day	20 lb/day	20 lb/day	22 lb/day	25 lb/day
Maximum Month	25 lb/day	26 lb/day	28 lb/day	31 lb/day
Maximum Day	47 lb/day	48 lb/day	53 lb/day	59 lb/day

EFFLUENT LIMITS

BOD (weekly and monthly average)	
Summer (May - October)	5 mg/L
Winter (November - April)	10 mg/L
Suspended Solids (monthly average)	10 mg/L
Chlorine Residual	37 ug/L
Fecal Coliform (weekly)	400 /100 ml
Ammonia Nitrogen	
Daily Max, November-April	34.0 mg/L
Monthly Average May-September	1.8 mg/L
Monthly Average October	4.3 mg/L
Monthly Average April	2.1 mg/L
Weekly Average October	9.2 mg/L
Weekly Average May-September	2.7 mg/L
Weekly Average November-March	10.0 mg/L
Dissolved Oxygen	7.0 mg/L
pH	6.0-9.0
Phosphorus, Total	1.0 mg/L - interim limit
Final limit, 6 month average	0.075 mg/L
Final limit, monthly average	0.225 mg/L
Chloride (weekly average)	600.0 mg/L - interim limit
Target Limit	450.0 mg/L

WASTEWATER TREATMENT FACILITIES

Raw Wastewater Pump Station

	8 ft dia x 6 ft SWD			
Wetwell				
Dimensions	8 ft dia x 6 ft SWD			
Volume	2,260 gal	2,260 gal	2,260 gal	2,260 gal
Raw Wastewater Pumps				
No. Units	2 existing	2 existing	2 existing	2 existing
Type	Submersible	Submersible	Submersible	Submersible
Capacity Each	1,200 gpm	1,200 gpm	1,200 gpm	1,200 gpm
Horsepower	25	25	25	25
Drive	Ajustable Speed	Ajustable Speed	Ajustable Speed	Ajustable Speed
Control	Water Level in Wetwell			
Total Capacity	3.456 mgd	3.456 mgd	3.456 mgd	3.456 mgd
Firm Capacity	1.728 mgd	1.728 mgd	1.728 mgd	1.728 mgd

Village of Howards Grove
Wastewater Treatment Facility Improvements
Design Basis Memorandum

March 2015

	Average 2011-2014	Year 2016	Year 2022	Design Year 2035
Raw Wastewater Flow Meter				
No. Units	2 existing	2 existing	2 existing	2 existing
Type	Magnetic	Magnetic	Magnetic	Magnetic
Size	8 inch	8 inch	8 inch	8 inch
Fine Screen				
No. Units	1 new	1 existing	1 existing	1 existing
Capacity	1,200 gpm	1,200 gpm	1,200 gpm	1,200 gpm
Horsepower	2	2	2	2
Bypass Channel with Manual Bar Screen				
Grit Removal				
Grit Chamber				
No. Units	1 existing	1 existing	1 existing	1 existing
Type	Vortex	Vortex	Vortex	Vortex
Dimensions	7 ft diameter	7 ft diameter	7 ft diameter	7 ft diameter
Capacity	2.5 mgd	2.5 mgd	2.5 mgd	2.5 mgd
Grit Slurry Pump				
No. Units	1 existing	1 existing	1 existing	1 existing
Type	Centrifugal	Centrifugal	Centrifugal	Centrifugal
Capacity	250 gpm	250 gpm	250 gpm	250 gpm
Horsepower	2	2	2	2
Drive	Constant Speed	Constant Speed	Constant Speed	Constant Speed
Grit Washing/Dewatering Unit				
No. Units	1 existing	1 existing	1 existing	1 existing
Capacity	250 gpm	250 gpm	250 gpm	250 gpm
Horsepower	2	2	2	2
Drive	Constant Speed	Constant Speed	Constant Speed	Constant Speed
Compact Plant Nos. 1 and 2				
No. Units	2 existing	2 existing	2 existing	2 existing
Aeration				
Outer Diameter	37.5 ft	37.5 ft	37.5 ft	37.5 ft
Inner Diameter	18 ft	18 ft	18 ft	18 ft
Depth	15 ft	15 ft	15 ft	15 ft
Area Each	425 ft ²	425 ft ²	850 ft ²	850 ft ²
Volume Each	6,375 ft ³	6,375 ft ³	12,750 ft ³	12,750 ft ³
	47,685 gal	47,685 gal	95,370 gal	95,370 gal
Clarifier				
Diameter	18 ft	18 ft	18 ft	18 ft
Depth	15 ft	15 ft	15 ft	15 ft
Surface Area Each	254 ft ²	254 ft ²	254 ft ²	254 ft ²
Weir Length Each	51 ft	51 ft	51 ft	51 ft
Compact Plant Nos. 3 and 4				
No. Units	2 existing	2 existing	2 existing	2 existing
Aeration				
Outer Diameter	33 ft	33 ft	33 ft	33 ft
Inner Diameter	23 ft	23 ft	23 ft	23 ft
Depth	15 ft	15 ft	15 ft	15 ft
Area Each	440 ft ²	440 ft ²	440 ft ²	440 ft ²
Volume Each	6,597 ft ³	6,597 ft ³	6,597 ft ³	6,597 ft ³
	49,348 gal	49,348 gal	49,348 gal	49,348 gal
Clarifier				
Diameter	22 ft	22 ft	22 ft	22 ft
Depth	15 ft	15 ft	15 ft	15 ft
Surface Area Each	380 ft ²	380 ft ²	380 ft ²	380 ft ²
Weir Length Each	63 ft	63 ft	63 ft	63 ft

	Average 2011-2014	Year 2016	Year 2022	Design Year 2035
Aeration Design Parameters				
Total Aeration Surface Area	1,730 ft ²	1,730 ft ²	2,580 ft ²	2,580 ft ²
Total Aeration Volume	194,066 gal	194,066 gal	289,435 gal	289,435 gal
Aeration Detention Time				
Average Day Flow	19.6 hours	19.3 hours	26.0 hours	23.2 hours
Average Day Dry Weather Flow	21.2 hours	20.9 hours	28.1 hours	25.0 hours
Average Day Wet Weather Flow	13.5 hours	13.4 hours	18.0 hours	16.0 hours
Maximum Month Flow	7.5 hours	7.5 hours	8.9 hours	8.9 hours
Maximum Day Flow	3.7 hours	3.7 hours	5.8 hours	5.8 hours
Peak Hourly Flow	3.3 hours	3.2 hours	4.3 hours	4.3 hours
BOD Loading				
Average Day	16.0 lb BOD/1,000 ft ³	16.5 lb BOD/1,000 ft ³	12.3 lb BOD/1,000 ft ³	17.7 lb BOD/1,000 ft ³
Maximum Month	20.0 lb BOD/1,000 ft ³	20.6 lb BOD/1,000 ft ³	15.3 lb BOD/1,000 ft ³	22.1 lb BOD/1,000 ft ³
Maximum Day	37.3 lb BOD/1,000 ft ³	38.5 lb BOD/1,000 ft ³	28.7 lb BOD/1,000 ft ³	41.5 lb BOD/1,000 ft ³
F:M				
MLSS	3,500 mg/L	3,500 mg/L	3,500 mg/L	3,500 mg/L
MLVSS:MLSS	0.65	0.65	0.65	0.65
Average Day	0.113	0.116	0.086	0.125
Maximum Month	0.141	0.145	0.108	0.156
Maximum Day	0.263	0.271	0.202	0.292
Sludge Age	10.7 days	11.0 days	14.8 days	10.3 days
RAS Rate				
RAS Concentration	0.75 percent	0.75 percent	0.75 percent	0.75 percent
Average Day Flow	283 gpm	286 gpm	316 gpm	343 gpm
WAS Production				
WAS rate calculated by assuming a solids production rate of 0.7 lb VSS/lb BOD. WAS concentration same as RAS concentration.				
WAS Solids Produced				
Average Day Flow	498 lb/day	513 lb/day	570 lb/day	824 lb/day
WAS VSS Produced				
Average Day Flow	324 lb/day	334 lb/day	370 lb/day	535 lb/day
WAS Flow Rate				
Average Day Flow @ 0.75 percent	7,987 gal/day	8,203 gal/day	9,109 gal/day	13,169 gal/day
WAS Flow Rate				
Average Day Flow @ 2 percent	2,987 gal/day	3,076 gal/day	3,416 gal/day	4,938 gal/day
Clarification Design Parameters				
Total Surface Area	1,269 ft ²	1,269 ft ²	1,269 ft ²	1,269 ft ²
Total Weir Length	228 ft	228 ft	228 ft	228 ft
Surface Overflow Rate				
Average Day Flow	188 gpd/ft ²	190 gpd/ft ²	211 gpd/ft ²	236 gpd/ft ²
Average Day Dry Weather Flow	173 gpd/ft ²	175 gpd/ft ²	195 gpd/ft ²	216 gpd/ft ²
Average Day Wet Weather Flow	271 gpd/ft ²	274 gpd/ft ²	305 gpd/ft ²	342 gpd/ft ²
Maximum Month Flow	486 gpd/ft ²	492 gpd/ft ²	612 gpd/ft ²	612 gpd/ft ²
Maximum Day Flow	983 gpd/ft ²	980 gpd/ft ²	937 gpd/ft ²	937 gpd/ft ²
Peak Hourly Flow	1,127 gpd/ft ²	1,134 gpd/ft ²	1,280 gpd/ft ²	1,280 gpd/ft ²
Weir Overflow Rate				
Average Day Flow	1,044 gpd/ft	1,056 gpd/ft	1,173 gpd/ft	1,316 gpd/ft
Average Day Dry Weather Flow	965 gpd/ft	976 gpd/ft	1,085 gpd/ft	1,216 gpd/ft
Average Day Wet Weather Flow	1,510 gpd/ft	1,528 gpd/ft	1,697 gpd/ft	1,903 gpd/ft
Maximum Month Flow	2,706 gpd/ft	2,738 gpd/ft	3,408 gpd/ft	3,408 gpd/ft
Maximum Day Flow	5,469 gpd/ft	5,458 gpd/ft	5,215 gpd/ft	5,215 gpd/ft
Peak Hourly Flow	6,272 gpd/ft	6,311 gpd/ft	7,127 gpd/ft	7,127 gpd/ft

	Average 2011-2014	Year 2016	Year 2022	Design Year 2035
RAS/WAS Pumping System				
RAS Wetwell				
No. Units	4 existing	4 existing	4 existing	4 existing
Dimensions	4 ft x 4 ft x 12 ft SWD	4 ft x 4 ft x 12 ft SWD	4 ft x 4 ft x 12 ft SWD	4 ft x 4 ft x 12 ft SWD
Volume Each	1,440 gal	1,440 gal	1,440 gal	1,440 gal
RAS Pumps				
No. Units	4 existing	4 existing	4 existing	4 existing
Spare Units	1 uninstalled	1 uninstalled	1 uninstalled	1 uninstalled
Type	Submersible	Submersible	Submersible	Submersible
Capacity	150 gpm	150 gpm	150 gpm	150 gpm
Horsepower	2	2	2	2
Drive	Adjustable Frequency	Adjustable Frequency	Adjustable Frequency	Adjustable Frequency
Control	Raw WW Flow Pace			
WAS Pumps				
No. Units	1 existing	1 existing	1 existing	1 existing
Spare Units	1 uninstalled	1 uninstalled	1 uninstalled	1 uninstalled
Type	Submersible	Submersible	Submersible	Submersible
Capacity	150 gpm	150 gpm	150 gpm	150 gpm
Horsepower	2	2	2	2
Drive	Adjustable Frequency	Adjustable Frequency	Adjustable Frequency	Adjustable Frequency
Control	Timer	Timer	Timer	Timer
Aerobic Digesters (new digesters to be constructed after Year 2022)				
No. Units	2 existing	2 existing	2 new	2 existing
Outer Diameter	37.5 ft	37.5 ft	30 ft	30 ft
Inner Diameter	18 ft	18 ft		
Depth	15 ft	15 ft	15 ft	15 ft
Area Each	425 ft ²	425 ft ²	707 ft ²	707 ft ²
Volume Each	6,375 ft ³	6,375 ft ³	10,603 ft ³	10,603 ft ³
Total Digester Volume	47,685 gal	47,685 gal	79,309 gal	79,309 gal
	95,370 gal	95,370 gal	158,619 gal	158,619 gal
Hydraulic Detention Time				
Average Day Flow @ 2 percent	31.9 days	31.0 days	46.4 days	32.1 days
Air Requirements				
Aeration Process Air Requirements				
BOD (1.8 lb O₂/lb BOD)				
Average Day	747 lb O ₂ /day	768 lb O ₂ /day	854 lb O ₂ /day	972 lb O ₂ /day
Maximum Month	936 lb O ₂ /day	963 lb O ₂ /day	1,069 lb O ₂ /day	1,215 lb O ₂ /day
Maximum Day	1,744 lb O ₂ /day	1,795 lb O ₂ /day	1,997 lb O ₂ /day	2,275 lb O ₂ /day
NH₃-N (4.6 lb O₂/lb NH₃-N)				
Average Day	274 lb O ₂ /day	281 lb O ₂ /day	308 lb O ₂ /day	345 lb O ₂ /day
Maximum Month	342 lb O ₂ /day	351 lb O ₂ /day	385 lb O ₂ /day	431 lb O ₂ /day
Maximum Day	593 lb O ₂ /day	614 lb O ₂ /day	696 lb O ₂ /day	810 lb O ₂ /day
TOTAL O₂ REQUIRED (AOR)				
Average Day	1,021 lb O ₂ /day	1,049 lb O ₂ /day	1,162 lb O ₂ /day	1,317 lb O ₂ /day
Maximum Month	1,278 lb O ₂ /day	1,313 lb O ₂ /day	1,454 lb O ₂ /day	1,646 lb O ₂ /day
Maximum Day	2,338 lb O ₂ /day	2,409 lb O ₂ /day	2,693 lb O ₂ /day	3,085 lb O ₂ /day

	Average 2011-2014	Year 2016	Year 2022	Design Year 2035
Alpha				
Average Day	0.6			
Maximum Month	0.6			
Maximum Day	0.6			
Beta				
Beta	0.98			
Diffuser Submergence	14.1 ft			
Temperature	20 C			
Oxygen Transfer Efficiency				
Average Day	28.4 %			
Maximum Month	26 %			
Maximum Day	24.2 %			
Csat	9.07 mg/L			
Csw	9.952 mg/L			
Csc*	9.02 mg/L			
Co	2.0 mg/L			
Barom. Pressure	14.7 psia			
SOR (Standard Oxygen Rate)				
Average Day	2,256 lb O2/day	2,319 lb O2/day	2,568 lb O2/day	2,911 lb O2/day
Maximum Month	2,825 lb O2/day	2,903 lb O2/day	3,213 lb O2/day	3,638 lb O2/day
Maximum Day	5,166 lb O2/day	5,324 lb O2/day	5,953 lb O2/day	6,818 lb O2/day
AOR:SOR Ratio				
Average Day	0.45	0.45	0.45	0.45
Maximum Month	0.45	0.45	0.45	0.45
Maximum Day	0.45	0.45	0.45	0.45
Air Flow Rates				
Average Day	310 scfm	318 scfm	352 scfm	399 scfm
Maximum Month	423 scfm	435 scfm	481 scfm	545 scfm
Maximum Day	832 scfm	857 scfm	958 scfm	1,098 scfm
Check of Mixing Air Requirement				
Criteria	0.12 scfm/ft2			
Plant 1 Surface Area	425 ft2	425 ft2	850 ft2	850 ft2
Plant 2 Surface Area	425 ft2	425 ft2	850 ft2	850 ft2
Plant 3 Surface Area	440 ft2	440 ft2	440 ft2	440 ft2
Plant 4 Surface Area	440 ft2	440 ft2	440 ft2	440 ft2
Total Surface Area	1,730 ft2	1,730 ft2	2,580 ft2	2,580 ft2
Mixing Air Requirement	208 scfm	208 scfm	208 scfm	310 scfm
<i>Process requirement will govern air flow rate.</i>				
Aerobic Digestion Process Air Requirements				
Oxygen Requirements				
WAS Solids Discharged to Digester				
Average Day	498 lb/day	513 lb/day	570 lb/day	824 lb/day
VSS Content	65 percent			
Anticipated VSS Reduction	40 percent			
WAS Solids Destroyed				
Average Day	130 lb/day	133 lb/day	148 lb/day	214 lb/day
Oxygen Requirement (AOR)				
2.0 lb O2/lb VSS destroyed				
Average Day	259 lb O2/day	267 lb O2/day	296 lb O2/day	428 lb O2/day
Oxygen Requirement (SOR)				
Alpha	0.4			
Beta	0.95			
Csat	9.07 mg/L			
Co	1.5 mg/L			
Temperature	20			
Oxygen Transfer Efficiency	20 percent			
Average Day	837 lb O2/day	862 lb O2/day	958 lb O2/day	1,384 lb O2/day
Air Flow Required				
Average Day	163 scfm	168 scfm	187 scfm	270 scfm
Mixing Air Requirement				
30 scfm/1,000 ft3				
Mixing Air Flow Rate	382 scfm	382 scfm	636 scfm	636 scfm
<i>Mixing Air Requirement will govern air flow rate.</i>				

	Average 2011-2014	Year 2016	Year 2022	Design Year 2035
Aerated Sludge Storage Air Requirements				
Aerated Sludge Storage Volume	81,682 gal	81,682 gal	81,682 gal	81,682 gal
Mixing Air Requirement	30 scfm/1000 ft ³			
Mixing Air Flow Rate	328 scfm	328 scfm	328 scfm	328 scfm
Total Air Requirements				
Average Day				
Aeration	310 scfm	318 scfm	352 scfm	399 scfm
Aerobic Digesters	382 scfm	382 scfm	636 scfm	636 scfm
Aerated Sludge Storage	328 scfm	328 scfm	328 scfm	328 scfm
Average Day Total	1,020 scfm	1,028 scfm	1,316 scfm	1,363 scfm
Maximum Month				
Aeration	423 scfm	435 scfm	481 scfm	545 scfm
Aerobic Digesters	382 scfm	382 scfm	636 scfm	636 scfm
Aerated Sludge Storage	328 scfm	328 scfm	328 scfm	328 scfm
Maximum Month Total	1,133 scfm	1,145 scfm	1,445 scfm	1,509 scfm
Maximum Day				
Aeration	832 scfm	857 scfm	958 scfm	1,098 scfm
Aerobic Digesters	382 scfm	382 scfm	636 scfm	636 scfm
Aerated Sludge Storage	328 scfm	328 scfm	328 scfm	328 scfm
Maximum Day Total	1,542 scfm	1,567 scfm	1,922 scfm	2,061 scfm
Aeration Blowers				
No. Units	3 existing	1 new, 2 existing	1 new, 2 existing	1 new, 2 existing
Type	Centrifugal	High Speed Turbo	High Speed Turbo	High Speed Turbo
Capacity	1,300 scfm	1,200 scfm	1,200 scfm	1,200 scfm
Horsepower	50	50	50	50
Drive	2 units constant speed 1 unit variable speed	Variable Speed	Variable Speed	Variable Speed
Firm Capacity	2,600 scfm	2,400 scfm	2,400 scfm	2,400 scfm
Total Capacity	3,900 scfm	3,600 scfm	3,600 scfm	3,600 scfm

	Average 2011-2014	Year 2016	Year 2022	Design Year 2035
Filtration				
Filters				
No. Units	4 existing	4 existing	3 new	3 existing
Type	Conventional	Conventional	Disc Filter	Disc Filter
Capacity Each			0.85 mgd	0.85 mgd
Firm Capacity			1.7 mgd	1.7 mgd
Total Capacity			2.55 mgd	2.55 mgd
Dimensions	6 ft x 7 ft	6 ft x 7 ft		
Surface Area Each	42 ft ²	42 ft ²		
Total Surface Area	168 ft ²	168 ft ²		
Filtration Rates				
One Unit Out of Service				
Average Day Flow	1.3 gpm/ft ²	1.3 gpm/ft ²		
Average Day Dry Weather Flow	1.2 gpm/ft ²	1.2 gpm/ft ²		
Average Day Wet Weather Flow	1.9 gpm/ft ²	1.9 gpm/ft ²		
Maximum Month Flow	3.4 gpm/ft ²	3.5 gpm/ft ²		
Maximum Day Flow	6.9 gpm/ft ²	6.8 gpm/ft ²		
Peak Hourly Flow	7.9 gpm/ft ²	8.0 gpm/ft ²		
All Units in Service				
Average Day Flow	1.0 gpm/ft ²	1.0 gpm/ft ²		
Average Day Dry Weather Flow	0.9 gpm/ft ²	0.9 gpm/ft ²		
Average Day Wet Weather Flow	1.4 gpm/ft ²	1.5 gpm/ft ²		
Maximum Month Flow	2.6 gpm/ft ²	2.6 gpm/ft ²		
Maximum Day Flow	5.2 gpm/ft ²	5.1 gpm/ft ²		
Peak Hourly Flow	5.9 gpm/ft ²	6.0 gpm/ft ²		
Filter Feed Pumps				
No. Units	2 (one standby)	2 (one standby)		
Type	Submersible	Submersible		
Capacity	1,200 gpm	1,200 gpm		
Horsepower	10 hp	10 hp		
Drive	Adjustable Speed	Adjustable Speed		
Control	Wetwell Level	Wetwell Level		
Backwash Supply Well				
No. Units	1 existing	1 existing		
Volume	29,400 gal	29,400 gal		
Backwash Supply Pumps				
No. Units	2 (one standby)	2 (one standby)		
Type	Vertical Turbine	Vertical Turbine		
Capacity	1,050 gpm	1,050 gpm		
Horsepower	5	5		
Drive	Constant Speed	Constant Speed		
Control	Filter Controls	Filter Controls		
Backwash Waste Wetwell				
No. Units	1 existing	1 existing	1 existing	1 existing
Volume	44,300 gal	44,300 gal	44,300 gal	44,300 gal
Backwash Waste Pumps				
No. Units	2 (one standby)	2 (one standby)	2 existing	2 existing
Type	Submersible	Submersible	Submersible	Submersible
Capacity	50 gpm	50 gpm	50 gpm	50 gpm
Horsepower	2	2	2	2
Drive	Constant Speed	Constant Speed	Constant Speed	Constant Speed
Control	Wetwell Level	Wetwell Level	Wetwell Level	Wetwell Level

	Average 2011-2014	Year 2016	Year 2022	Design Year 2035
Backwash Air Scour Blower				
No. Units	1 existing	1 existing		
Type	Positive Displacement	Positive Displacement		
Capacity	252 scfm	252 scfm		
Horsepower	10 hp	10 hp		
Drive	Constant Speed	Constant Speed		
Control	Filter controls	Filter controls		
Disinfection				
No. Units	1 existing	1 existing	1 existing	1 existing
Type	Ultraviolet	Ultraviolet	Ultraviolet	Ultraviolet
Capacity	1.625 mgd	1.625 mgd	1.625 mgd	1.625 mgd
Alum Storage and Feed Facilities				
Alum Usage				
Alum Characteristics				
MW of Alum	594			
Solution Strength	48.5 percent			
Specific Gravity	1.335			
Alum Dosage				
	80 mg/L as Al			
Usage at Average Day Flow				
	29.4 gpd	30.2 gpd	33.1 gpd	37.1 gpd
Alum Storage Tanks				
No. Units	2			
Type	Fiberglass Bulk Storage Tank			
Volume Each	2,500 gal			
Total Volume	5,000 gal			
Days Storage at Average Day Flow	169.9 days	165.8 days	151.2 days	134.8 days
Alum Feed Pumps				
No. Units	2 existing	2 new	2 existing	2 existing
Type	Diaphragm	Diaphragm	Diaphragm	Diaphragm
Capacity	5.5 gph	5.5 gph	5.5 gph	5.5 gph
Horsepower	0.25	0.25	0.25	0.25
Drive	Constant Speed	Constant Speed	Constant Speed	Constant Speed
Control	Raw WW Flow Pace Variable Stroke Length			
Polymer Feed Facilities				
Polymer Solution Units				
Application Point	Secondary Clarifier Influent Line			
Polymer Dosage	0.5 mg/L			
Polymer Specific Gravity	1.3			
Polymer Usage				
Average Day Flow	0.1 gpd	0.1 gpd	0.1 gpd	0.1 gpd
Average Day Dry Weather Flow	0.1 gpd	0.1 gpd	0.1 gpd	0.1 gpd
Average Day Wet Weather Flow	0.1 gpd	0.1 gpd	0.1 gpd	0.2 gpd
Maximum Month Flow	0.2 gpd	0.2 gpd	0.3 gpd	0.3 gpd
Maximum Day Flow	0.5 gpd	0.5 gpd	0.5 gpd	0.5 gpd
Peak Hourly Flow	0.6 gpd	0.6 gpd	0.6 gpd	0.6 gpd
Liquid Polymer Feed Equipment				
No. Units	3 (1 standby) existing	3 existing	3 existing	3 existing
Type	Liquid Polymer Feed Clarifier Inlets			
Feed Points	Sludge Thickener	Sludge Thickener	Sludge Thickener	Sludge Thickener
Capacity each	0.1 gph	0.1 gph	0.1 gph	0.1 gph

	Average 2011-2014	Year 2016	Year 2022	Design Year 2035
Sludge Handling				
Sludge Thickener				
No. Units	1 existing	1 existing	1 existing	1 existing
Type	Gravity Belt Thickener	Gravity Belt Thickener	Gravity Belt Thickener	Gravity Belt Thickener
Size	0.75 meters	0.75 meters	0.75 meters	0.75 meters
Capacity	80 gpm	80 gpm	80 gpm	80 gpm
Thickener Feed Pumps				
No. Units	2 existing	2 existing	2 existing	2 existing
Type	Progressing Cavity	Progressing Cavity	Progressing Cavity	Progressing Cavity
Capacity	100 gpm	100 gpm	100 gpm	100 gpm
Horsepower	10	10	10	10
Drive	Adjustable Speed	Adjustable Speed	Adjustable Speed	Adjustable Speed
Thickened Sludge Transfer Pump				
No. Units	1 existing	1 existing	1 existing	1 existing
Type	Progressing Cavity	Progressing Cavity	Progressing Cavity	Progressing Cavity
Capacity	100 gpm	100 gpm	100 gpm	100 gpm
Horsepower	15	15	15	15
Drive	Adjustable Speed	Adjustable Speed	Adjustable Speed	Adjustable Speed
Aerated Sludge Storage Tank				
No. Units	2 existing	2 existing	2 existing	2 existing
Type	Concrete	Concrete	Concrete	Concrete
Dimensions	26 ft x 14 ft x 15 ft SWD	26 ft x 14 ft x 15 ft SWD	26 ft x 14 ft x 15 ft SWD	26 ft x 14 ft x 15 ft SWD
Capacity Each	40,841 gal	40,841 gal	40,841 gal	40,841 gal
Total Capacity	81,682 gal	81,682 gal	81,682 gal	81,682 gal