
EXHIBIT E4

2018 CHAPTER 94 REPORT TO DEP
FOR CORINNE VILLAGE

CHAPTER 94 MUNICIPAL WASTELOAD MANAGEMENT ANNUAL REPORT

2018

**Delaware County Regional Water Quality Control Authority
Corinne Village Wastewater Treatment Facility
Chester County**

Prepared for:

*Delaware County Regional Water Quality Control Authority (DELCORA)
Corinne Village Wastewater Treatment Facility
Authority Address: 100 East 5th Street, Chester, PA 19013
Plant Address: West Pratt Lane, West Chester, PA*

Preparer:

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Permittee:

Robert J. Willert

Robert J. Willert



Executive Director,
DELCORA

March 2019

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SECTION 1 – BACKGROUND

SECTION 1.1 - INTRODUCTION

This report has been prepared for the review of the wastewater collection, treatment and disposal system serving portions of Pocopson Township, in accordance with Title 25, Chapter 94 of the Pennsylvania Code. Aspects of the wastewater system discussed include: general system information, current loading conditions, proposed connections to the treatment system and projected loadings. This report has been prepared for the year 2018.

SECTION 1.2 – GENERAL SYSTEM INFORMATION

The Corinne Village Wastewater Treatment Facility and a portion of the sewage collection system were constructed in 2010 as part of Phase I construction of the Corinne Village Preserves subdivision. The plant began receiving wastewater in March 2011. Phase II of the sewage collection system was completed in 2011. The plant was designed to treat domestic wastewater from the Preserves subdivision and other residential properties adjacent to the development.

A gravity collection system conveys wastewater to the plant where it is pumped to the treatment lagoon. Treated effluent flows via gravity from the treatment lagoon into the storage lagoon to await disposal via a twelve zone drip irrigation system. The collection system includes a low pressure force main along Corinne Road which accepts flows from on-lot simplex grinder pump stations. The force main discharges into a gravity manhole on Corinne Road.

DELCORA took ownership of the Corinne Village WWTF in October 2015. The Permit was transferred to DELCORA in November 2015.

SECTION 2 – HYDRAULIC AND ORGANIC LOADING

SECTION 2.1 – PERMIT CAPACITIES

The plant operates under Permit No. 1507415, renewed on April 11, 2018. No amendments to the permit were made.

The permitted capacities are:

- Annual Average Capacity 0.020 mgd
- Hydraulic Design Capacity (max month) 0.020 mgd
- Organic Design Capacity 50.5 lb/day



SECTION 2.2 – HYDRAULIC LOADING

Flows entering the treatment plant are metered at the influent pump station using an electromagnetic flow meter. This treatment plant has been permitted to treat up to 0.020 million gallons per day (mgd). The average monthly flow for 2018 was 0.013 mgd, which represents 66% of the plant hydraulic design capacity. The highest three (3) month consecutive flow rates occurred in September through November 2018. The average flow over these months was 0.014 mgd, which does not exceed the plant design. Historic five (5) year hydraulic loading data is presented in Table 1 and depicted graphically on Figure 1.

Table 1 - Historical Hydraulic Loading

Hydraulic Loading (mgd)						Precipitation (inches)
Month	2014	2015	2016	2017	2018	2018
January	0.009	0.011	0.012	0.012	0.013	6.1
February	0.009	0.010	0.012	0.012	0.013	5.9
March	0.010	0.011	0.011	0.012	0.012	3.9
April	0.009	0.011	0.011	0.015	0.012	3.2
May	0.011	0.012	0.012	0.013	0.014	8.3
June	0.011	0.011	0.011	0.012	0.016	3.8
July	0.010	0.011	0.011	0.011	0.012	5.9
August	0.011	0.011	0.013	0.014	0.012	9.9
September	0.010	0.011	0.012	0.014	0.013	7.9
October	0.010	0.012	0.011	0.014	0.013	3.4
November	0.011	0.015	0.011	0.013	0.014	8.1
December	0.011	0.015	0.012	0.013	0.014	6.2
Annual Average	0.010	0.012	0.011	0.013	0.013	
3 Month Max	0.010	0.014	0.014	0.014	0.014	
Ratio (3 Month Max. to Annual Average)	1.046	1.186	1.194	1.079	1.059	
5-year Average Hydraulic Ratio = 1.113						

SECTION 2.3 – ORGANIC LOADING

A monthly influent sample is collected from the influent manhole located at the head of the plant. The sampling does not indicate an organic overload.

Calculation of the organic loading for the collected 2018 data is presented below in Table 2.



Table 2 - Current Year Organic Loading

	A	B	C = A x B x 8.34	
Date of Sample	BOD₅ (mg/L)	Flow (mgd)	Daily BOD₅ (lb/day)	Average (lb/day)
January				
1/4/2018	437	0.014	52.57	
1/18/2018	126	0.012	12.72	
1/25/2018	234	0.014	28.27	31.19
February				
2/15/2018	139	0.017	19.59	
2/21/2018	211	0.013	39.59	21.51
March				
3/15/2018	269	0.013	28.88	
3/22/2018	391	0.012	39.59	34.24
April				
4/5/2018	257	0.010	21.82	
4/19/2018	374	0.012	38.38	30.10
May				
5/10/2018	456	0.014	52.04	
5/17/2018	184	0.013	20.19	36.12
June				
6/20/2018	348	0.015	42.43	
6/27/2018	166	0.016	22.05	32.24
July*				
7/5/2018	176	0.020	28.86	28.86
August				
8/8/2018	220	0.014	25.66	
8/22/2018	444	0.015	56.22	40.94
September				
9/12/2018	284	0.014	33.64	
9/19/2018	580	0.016	75.48	54.56
October				
10/17/2018	278	0.013	29.69	
10/24/2018	201	0.012	19.33	24.51
November				
11/14/2018	204	0.011	19.45	
11/28/2018	356	0.019	57.11	38.28
December				
12/4/2018	201	0.015	25.15	
12/19/2018	497	0.013	53.28	39.21

*Note: Due to laboratory error, only one influent BOD sample was taken in July 2018.

Historical five (5) year organic loading data is presented in Table 3 and depicted graphically on Figure 2.



Table 3 - Historical Organic Loading

Organic Loading (lb/day)					
Month	2014	2015	2016	2017	2018
January	41.87	12.40	28.57	28.01	31.19
February	26.35	14.15	23.19	26.22	21.51
March	19.82	16.36	17.41	30.28	34.24
April	23.94	11.87	24.61	45.66	30.10
May	30.10	27.25	19.03	28.98	36.12
June	22.48	30.05	19.42	17.11	32.24
July	11.62	28.61	13.06	17.04	28.86
August	26.42	19.03	18.35	32.77	40.94
September	15.24	24.86	15.83	34.53	54.56
October	16.44	17.22	20.56	20.84	24.51
November	15.46	19.72	23.91	26.61	38.28
December	16.21	34.44	19.41	22.65	39.21
Annual Average	22.16	21.33	20.28	27.56	34.31
Ratio (Max. Month to Annual Average)	1.89	1.61	1.41	1.66	1.59

5-year Average Organic Ratio = 1.63

SECTION 3 – 5-YEAR HYDRAULIC AND ORGANIC LOADING PROJECTIONS

SECTION 3.1 – BASIS OF PROJECTIONS

The plant was designed to provide treatment for the Preserves residential development and an additional 10 offsite residential properties. Development within the Preserves was completed in 2013. Organic loading projections have been calculated using the Adjusted Annual Average Flow and presented in Table 1. Projected hydraulic and organic loadings are depicted graphically on Figure 1 and Figure 2 respectively.

Table 4 - Organic Loading Projections

Year	Annual Average BOD₅ Loading Projection (lb/day)	Maximum Monthly BOD₅ Loading Projections (lb/day)
2019	32.49	52.96
2020	34.47	56.18
2021	36.44	59.39
2022	37.75	61.53
2023	37.75	61.53

The average annual loading projections over the next five (5) years do not indicate an organic overload. The maximum monthly loading projections utilize the Historic Organic Ratio calculated in Table 3.



Detailed calculations are provided as Appendix A to this report. Calculation of the Adjusted Annual Average Flow is presented as Appendix B to this report.

SECTION 4 – SEWER EXTENSIONS

SECTION 4.1 – PROPOSED EXTENSIONS

No extensions are currently planned.

SECTION 5 – PROGRAM FOR SEWER MONITORING, MAINTENANCE AND REPAIR

Sewer monitoring will be conducted as the collection system is in operation in order to identify maintenance and repair issues that may arise.

SECTION 6 – CONDITION OF THE SEWER SYSTEM

The PVC sewer collection system was constructed in 2010 and 2011. All pipes and manholes in the system have passed leak testing. This system did not experience any SSO or surcharge events in this calendar year.

SECTION 7 – SEWAGE PUMPING STATIONS

The collection system for this plant does not include sewage pumping stations. On-lot grinder pump stations are not monitored.

SECTION 8 – INDUSTRIAL WASTES

This treatment facility does not receive industrial wastes. There are no plans to connect industrial facilities at this time.

SECTION 9 – CORRECTIVE ACTION PLAN

System problem requiring the development of a Corrective Action Plan (CAP) have not been identified.

SECTION 10 – CALIBRATION REPORTS

Flow meter calibrations were performed on April 6, June 15, September 20, and December 10 of 2018. Copies of the calibration reports are provided as Appendix C to this report.

SECTION 11 – TRIBUTARY MUNICIPAL REPORTS

This plant does not receive wastewater from another treatment facility. There are not Tributary Municipal reports to include with this report.



FIGURES



Figure 1 - Hydraulic Flow Rates

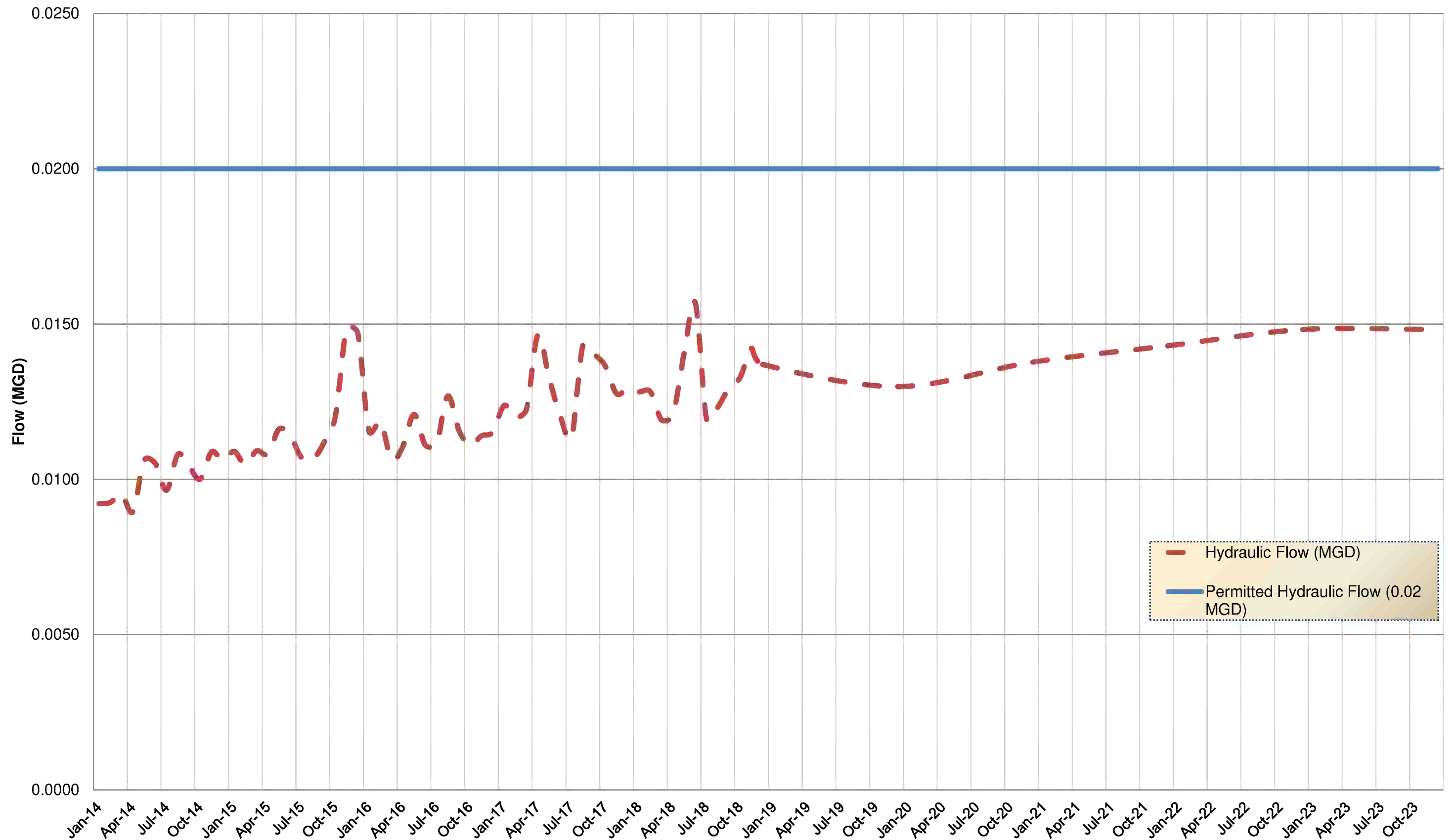
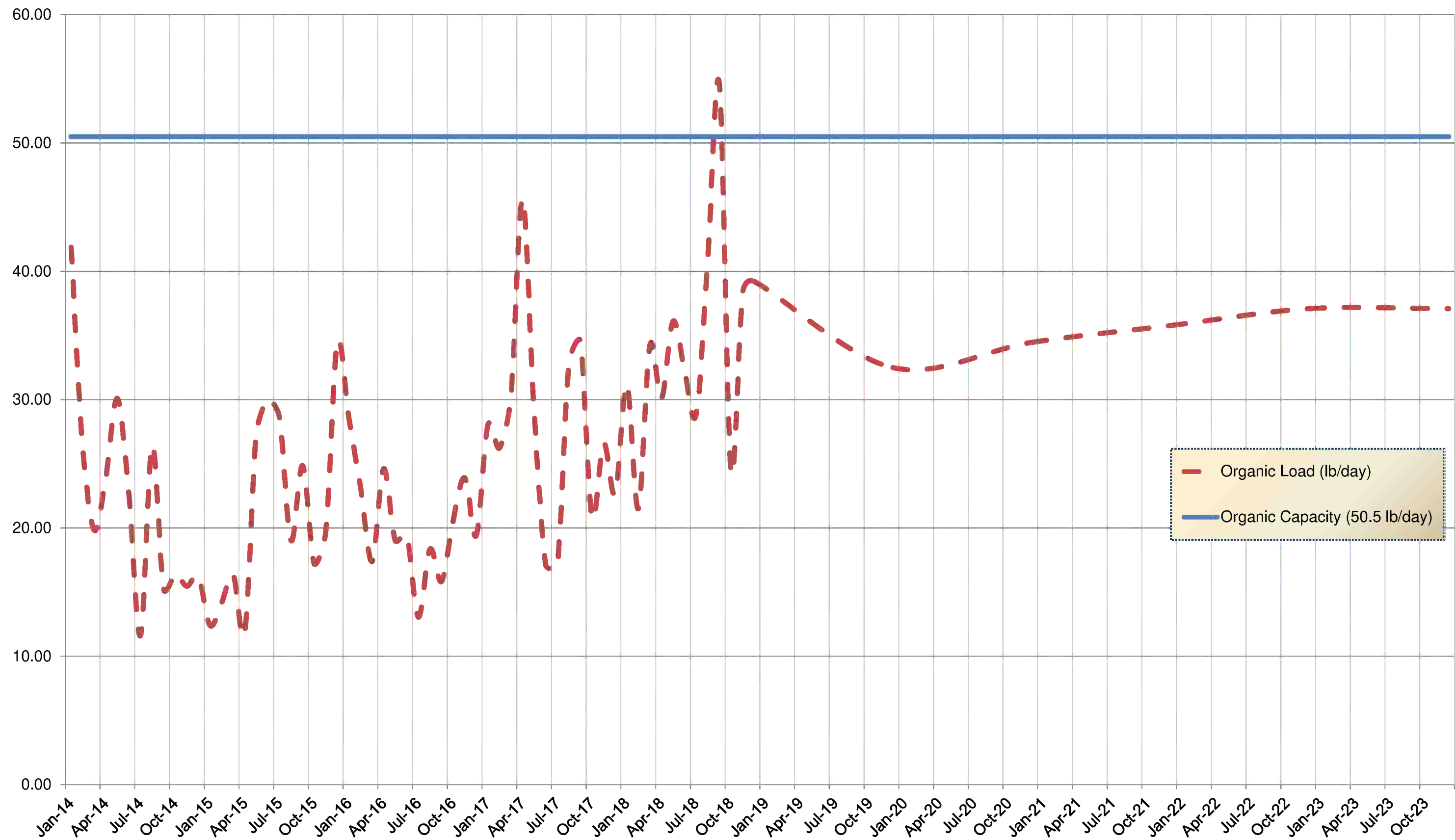
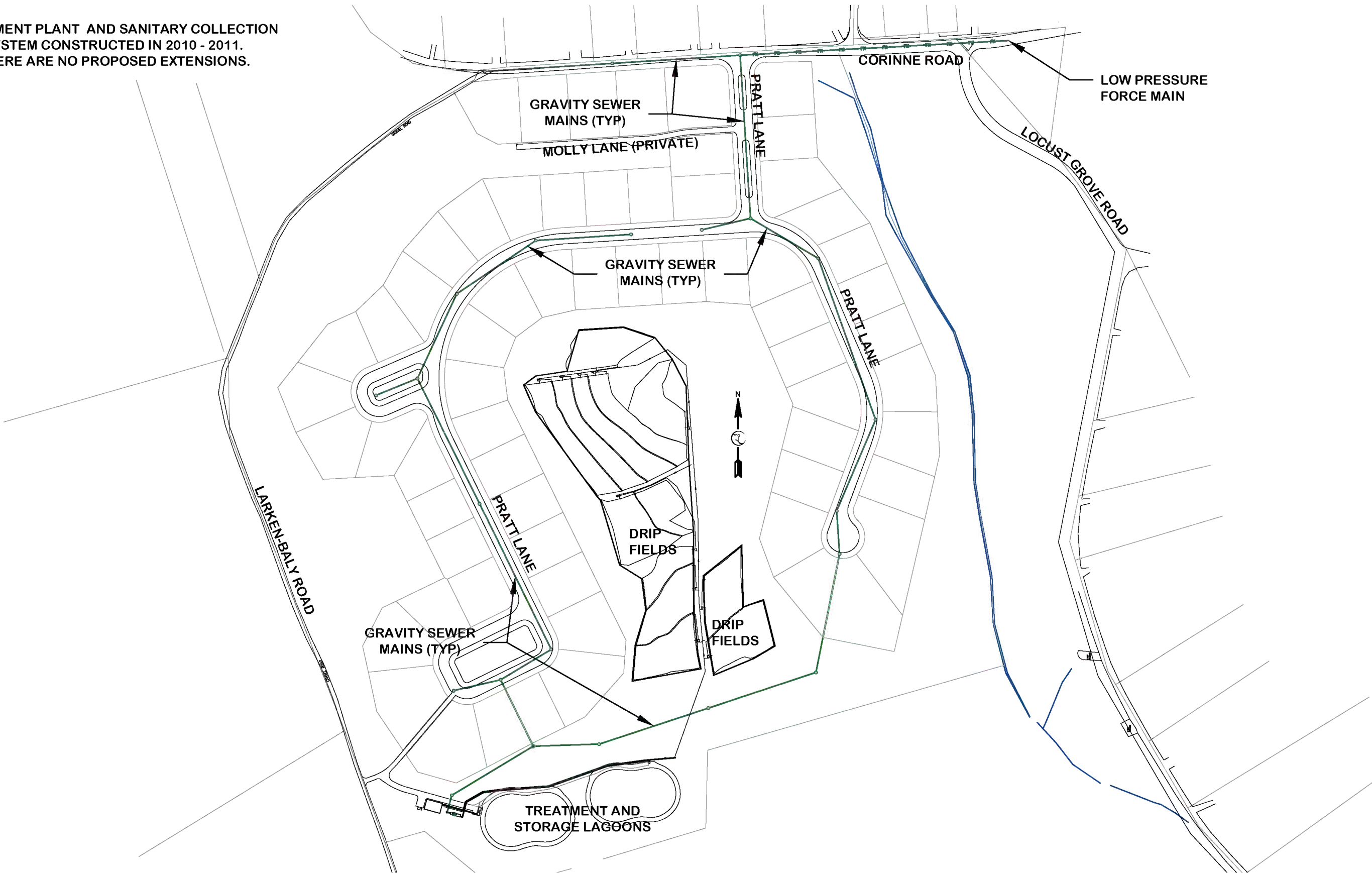


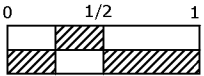

Figure 2 - Organic Loading Rates



TREATMENT PLANT AND SANITARY COLLECTION
SYSTEM CONSTRUCTED IN 2010 - 2011.
THERE ARE NO PROPOSED EXTENSIONS.



FILE LOCATION: I:\POCOPSON\CORINNE VILLAGE\CHAPTER 94 MAP

			 <p>NOT TO SCALE</p>	 <p>Castle Valley Consultants, Inc. Engineers • Planners • Design Professionals 10 Beulah Road, New Britain, PA 18901 Tel: (215) 348-8257 Fax: (215) 348-8267 www.CastleValleyConsultants.com</p>		<p>FIGURE 3 - SYSTEM MAP CORINNE VILLAGE WWTP POCOPSON TOWNSHIP CHESTER COUNTY, PENNSYLVANIA</p>
REV	DESCRIPTION OF REVISION	<p>REVISED BY/DATE</p> <p>CHECKED BY/DATE</p>			MARCH 18, 2014	

APPENDICES



APPENDIX A – PROJECTION CALCULATIONS



APPENDIX A – PROJECTION CALCULATIONS

ORIGINAL PLANT DESIGN DATA

The Engineer's report, prepared and reviewed at permitting, accounted for 77 EDUs of flow to contribute to this plant, with an average BOD₅ concentration of 300 mg/L. At the permitted flow rate of 20,213 gpd, the organic loading rate can be calculated as follows:

$$0.0202(mgd) \times 300 \left(\frac{mg}{L} \right) \times 8.34 = 50.5 \left(\frac{lb}{day} \right)$$

FLOW PROJECTIONS

It is anticipated that the remaining 11 EDUs will connect to the plant within the five year projection. There are no plans or proposal to add flows from any other developments at this time.

Table A1 – Projection Details

A	B	C	D	E	F
Year	Base Flow (mgd)	EDU Added	Flow (gpd) / EDU	Projected AA Flow (mgd)	Projected Max. Monthly Flow (mgd)
2019	0.012	3	262.5	0.013	0.014
2020	0.013	3	262.5	0.014	0.016
2021	0.014	3	262.5	0.015	0.017
2022	0.015	2	262.5	0.016	0.018
2023	0.016	0	262.5	0.016	0.018

The "Base Flow" for 2019 is based on the Adjusted Annual Average Flow, as calculated in Appendix B.

The following equations were used compile Table A1.

$$B(mgd) + \frac{(C \times D)(gpd)}{1,000,000} = E(mgd)$$

$$E(mgd) \times R = F(mgd)$$

Where *R* is the 5-Year Hydraulic Ratio

R = 1.113



ORGANIC LOADING PROJECTIONS

The organic loading projections have been based on the projected flow rates at 300 mg/L BOD, based on the plant design parameters. This plant has been in operation for 5 years as of March 2016. The observed 5-year average BOD concentration for this plant is not considered to be representative of future loading rates. Therefore, the observed 5-year average BOD concentration has not been used for the projections, as the design criteria are more conservative.

Table A2 – Average BOD Loading

Year	Average BOD (mg/L)
2014	276
2015	233
2016	229
2017	245
2018	289
5 Year Average	254.4

Organic loading projections, as presented in Table 4 of this Annual Report, were calculated with the following equation.

$$AA_{Pr}(mgd) \times BOD_D \left(\frac{mg}{L} \right) \times 8.34 = L \left(\frac{lb}{day} \right)$$

Where:

AA_{Pr} is the Projected Annual Average Flow, from Column E of Table A2

BOD_D is the design BOD concentration of 300 mg/L

L is the projected organic loading



APPENDIX B – ADJUSTED ANNUAL AVERAGE FLOW CALCULATIONS



APPENDIX B – ADJUSTED ANNUAL AVERAGE FLOW**NEW CONNECTIONS**

The Corinne Village WWTF was designed to serve a residential development and adjacent existing offsite residential customers, with a total of 77 EDUs. The plant began receiving wastewater in 2011. New annual connection data is presented in Table B1.

Table B1 - New Connections Annually

Year	#EDU Connected	gpd/EDU	New Flow (mgd)
2014	0	262.5	0.000
2015	2	262.5	0.001
2016	0	262.5	0.000
2017	1	262.5	0.000
2018	0	262.5	0.000

FLOW ADJUSTMENTS

The connection data from Table B1 was applied in Table B2 to calculate the adjusted flow rate. The calculated 5-year adjusted flow rate was used the loading projections presented in Table 4.

Table B2 - Adjusted Annual Average Flow

Year	AA Flow (mgd)	New Connection Flow (mgd)					Adjusted AA(mgd)
		2014	2015	2016	2017	2018	
2014	0.010		0.001	0.000	0.000	0.000	0.011
2015	0.012			0.000	0.000	0.000	0.012
2016	0.011				0.000	0.000	0.012
2017	0.013					0.000	0.013
2018	0.013						0.013
5-Year AA		5-Yr Adj.Average					0.012



APPENDIX C – CALIBRATION REPORTS



Calibration Report



ICEA

Instrument Contracting
and Engineering Association

Smith Instrument Company, Inc.
P.O. Box 404
Downingtown, PA 19335
Phone: 610-594-6650
Fax: 610-594-6658
e-mail: bdoleski@smithservice.com

Pocopson Preserve Flow Recorder

Instrument Data

Customer Name: Delcora
Instrument Tag: Pocopson Preserve Flow Recorder
Manufacturer: Honeywell
Model Number: DR411
Serial Number: 0103Y085399700001
Calibrated Range: 4-20 Ma
Description: Riverside Pocopson Flow Recorder
Instrument Accuracy: 0.5000%

Test Results

Cal. Date: 04/06/18
Next Due: 06/06/18

	As Found	As Left
Zero Error	0.0000%	0.0000%
Span Error	0.0000%	0.0000%
Max. Error	0.0000%	0.0000%
Min. Error	0.0000%	0.0000%

Calibration Data

	Low	High	Unit	Calibrator	Serial #
Input Value	4.0000	20.0000	mA	Martel MC1200	9474060
Output Value	0.0000	200.0000	GPM	Visual from Chart	

Input		As Found Data		Output	
% Value	Calculated	Actual	Calculated	Actual	% Error
0%	4.0000	4.0000	0.0000	0.0000	0.0000%
25%	8.0000	8.0000	50.0000	50.0000	0.0000%
50%	12.0000	12.0000	100.0000	100.0000	0.0000%
75%	16.0000	16.0000	150.0000	150.0000	0.0000%
100%	20.0000	20.0000	200.0000	200.0000	0.0000%

Input		As Left Data		Output	
% Value	Calculated	Actual	Calculated	Actual	% Error
0%	4.0000	4.0000	0.0000	0.0000	0.0000%
25%	8.0000	8.0000	50.0000	50.0000	0.0000%
50%	12.0000	12.0000	100.0000	100.0000	0.0000%
75%	16.0000	16.0000	150.0000	150.0000	0.0000%
100%	20.0000	20.0000	200.0000	200.0000	0.0000%

Tag Notes

No adjustments required.
Ran pumps manually to verify Totalizer/Flow Rate/Recorder Indication.
The Recorder/Totalizer and Flow Meter agreed during a 2 minute flow test. With an avg. flow rate of 18 GPM
Totalizer start 2263544
Totalizer end 2263580

Technician ISA Level III
Certification

Technician Signature

Calibration Report



ICEA

Instrument Contracting
and Engineering Association

Smith Instrument Company, Inc.
P.O. Box 404
Downingtown, PA 19335
Phone: 610-594-6650
Fax: 610-594-6658
e-mail: bdoleski@smithservice.com

Pocopson Preserve Flow Recorder

Instrument Data

Customer Name: Delcora
Instrument Tag: Pocopson Preserve Flow Recorder
Manufacturer: Honeywell
Model Number: DR411
Serial Number: 0103Y085399700001
Calibrated Range: 4-20 Ma
Description: Riverside Pocopson Flow Recorder
Instrument Accuracy: 0.5000%

Test Results

Cal. Date: 06/15/18
Next Due: 09/15/18

	As Found	As Left
Zero Error	0.0000%	0.0000%
Span Error	0.0000%	0.0000%
Max. Error	0.0000%	0.0000%
Min. Error	0.0000%	0.0000%

Calibration Data

	Low	High	Unit	Calibrator	Serial #
Input Value	4.0000	20.0000	mA	Martel MC1200	9474060
Output Value	0.0000	200.0000	GPM	Visual from Chart	

Input		As Found Data		Output	
% Value	Calculated	Actual	Calculated	Actual	% Error
0%	4.0000	4.0000	0.0000	0.0000	0.0000%
25%	8.0000	8.0000	50.0000	50.0000	0.0000%
50%	12.0000	12.0000	100.0000	100.0000	0.0000%
75%	16.0000	16.0000	150.0000	150.0000	0.0000%
100%	20.0000	20.0000	200.0000	200.0000	0.0000%

Input		As Left Data		Output	
% Value	Calculated	Actual	Calculated	Actual	% Error
0%	4.0000	4.0000	0.0000	0.0000	0.0000%
25%	8.0000	8.0000	50.0000	50.0000	0.0000%
50%	12.0000	12.0000	100.0000	100.0000	0.0000%
75%	16.0000	16.0000	150.0000	150.0000	0.0000%
100%	20.0000	20.0000	200.0000	200.0000	0.0000%

Tag Notes

No adjustments required.
Ran pumps manually to verify Totalizer/Flow Rate/Recorder Indication.
The Recorder/Totalizer and Flow Meter agreed during a 2 minute flow test. With an avg. flow rate of 62.5 GPM
Totalizer start 3227426
Totalizer end 3227550

Technician ISA Level III
Certification

Technician Signature

Calibration Report



ICEA

Instrument Contracting
and Engineering Association

Smith Instrument Company, Inc.
P.O. Box 404
Downingtown, PA 19335
Phone: 610-594-6650
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e-mail: bdoleski@smithservice.com

Pocopson Preserve Flow Recorder

Instrument Data

Customer Name: Delcora
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Manufacturer: Honeywell
Model Number: DR411
Serial Number: 0103Y085399700001
Calibrated Range: 4-20 Ma
Description: Riverside Pocopson Flow Recorder
Instrument Accuracy: 0.5000%

Test Results

Cal. Date: 09/20/18
Next Due: 12/20/18

	As Found	As Left
Zero Error	0.0000%	0.0000%
Span Error	0.0000%	0.0000%
Max. Error	0.0000%	0.0000%
Min. Error	0.0000%	0.0000%

Calibration Data

	Low	High	Unit	Calibrator	Serial #
Input Value	4.0000	20.0000	mA	Martel MC1200	9474060
Output Value	0.0000	200.0000	GPM	Visual from Chart	

Input		As Found Data		Output	
% Value	Calculated	Actual	Calculated	Actual	% Error
0%	4.0000	4.0000	0.0000	0.0000	0.0000%
25%	8.0000	8.0000	50.0000	50.0000	0.0000%
50%	12.0000	12.0000	100.0000	100.0000	0.0000%
75%	16.0000	16.0000	150.0000	150.0000	0.0000%
100%	20.0000	20.0000	200.0000	200.0000	0.0000%

Input		As Left Data		Output	
% Value	Calculated	Actual	Calculated	Actual	% Error
0%	4.0000	4.0000	0.0000	0.0000	0.0000%
25%	8.0000	8.0000	50.0000	50.0000	0.0000%
50%	12.0000	12.0000	100.0000	100.0000	0.0000%
75%	16.0000	16.0000	150.0000	150.0000	0.0000%
100%	20.0000	20.0000	200.0000	200.0000	0.0000%

Tag Notes

No adjustments required.
Ran pumps manually to verify Totalizer/Flow Rate/Recorder Indication.
The Recorder/Totalizer and Flow Meter agreed during a 2 minute flow test. With an avg. flow rate of 16 GPM
Totalizer start 4443743
Totalizer end 4443775

Technician ISA Level III
Certification

Technician Signature

Calibration Report



ICEA

Instrument Contracting
and Engineering Association

Smith Instrument Company, Inc.
P.O. Box 404
Downingtown, PA 19335
Phone: 610-594-6650
Fax: 610-594-6658
e-mail: bdoleski@smithservice.com

Pocopson Preserve Flow Recorder

Instrument Data

Customer Name: Delcora
Instrument Tag: Pocopson Preserve Flow Recorder
Manufacturer: Honeywell
Model Number: DR411
Serial Number: 0103Y085399700001
Calibrated Range: 4-20 Ma
Description: Riverside Pocopson Flow Recorder
Instrument Accuracy: 0.5000%

Test Results

Cal. Date: 12/10/18
Next Due: 03/10/19

	As Found	As Left
Zero Error	0.0000%	0.0000%
Span Error	0.0000%	0.0000%
Max. Error	0.0000%	0.0000%
Min. Error	0.0000%	0.0000%

Calibration Data

	Low	High	Unit	Calibrator	Serial #
Input Value	4.0000	20.0000	mA	Martel MC1200	9474060
Output Value	0.0000	200.0000	GPM	Visual from Chart	

Input		As Found Data		Output	
% Value	Calculated	Actual	Calculated	Actual	% Error
0%	4.0000	4.0000	0.0000	0.0000	0.0000%
25%	8.0000	8.0000	50.0000	50.0000	0.0000%
50%	12.0000	12.0000	100.0000	100.0000	0.0000%
75%	16.0000	16.0000	150.0000	150.0000	0.0000%
100%	20.0000	20.0000	200.0000	200.0000	0.0000%

Input		As Left Data		Output	
% Value	Calculated	Actual	Calculated	Actual	% Error
0%	4.0000	4.0000	0.0000	0.0000	0.0000%
25%	8.0000	8.0000	50.0000	50.0000	0.0000%
50%	12.0000	12.0000	100.0000	100.0000	0.0000%
75%	16.0000	16.0000	150.0000	150.0000	0.0000%
100%	20.0000	20.0000	200.0000	200.0000	0.0000%

Tag Notes

No adjustments required.
Ran pumps manually to verify Totalizer/Flow Rate/Recorder Indication.
The Recorder/Totalizer and Flow Meter agreed during a 2 minute flow test. With an avg. flow rate of 61 GPM
Totalizer start 5554761
Totalizer end 5554943

Technician ISA Level III
Certification

Technician Signature