VEOLIA Water Delaware
Residuals Process Description

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1. Company Overview

VEOLIA Water Delaware (VWDE) is an investor owned water utility in New Castle County Delaware, serving over 110,000 persons. The areas served by VEOLIA Water Delaware lie generally northeast and southwest of the City of Wilmington. In 2023, the system average day demand was approximately 13.7 MGD and the system max day demand was over 18.8 MGD. At year end of 2023, there were approximately 39,242 customer accounts in Delaware, including residential, commercial and industrial.

VWDE operates two water treatment plants to supply its customers. The Stanton Water Treatment Plant (SWTP), located near the confluence of the Red and White Clay Creeks, has a withdrawal allocation of 30 MGD and uses both the White and Red Clay Creeks as a source of supply. This is the primary water supply for the distribution system. Raw water is pumped to pre-sedimentation basins to remove sand and then flows through a conventional treatment train consisting of flash mix coagulation, flocculation and settling in DensaDeg clarifiers, filtration in dual media filters, and finally disinfection by sodium hypochlorite. Adjustment of pH throughout the treatment process is controlled by use of sodium hydroxide. Fluoride is also added to the water as required by the State of Delaware.

The Christiana Water Treatment Plant (CWTP) has a withdrawal allocation of 6 MGD and is located adjacent to Smalley's Pond on the Christina River which the plant uses as a source of supply. The Christiana WTP is used to provide limited backup to the Stanton WTP. The Christiana WTP is a conventional treatment plant with coagulation, baffles for flocculation, a large settling basin, pressure filters, and finally disinfection by hypochlorite. This facility is currently out of service, but still has an active allocation permit.

VWDE’s mission is to provide innovative water and waste management solutions that improve the quality of life in the communities we serve. To that end, VWDE strives to provide quality water to our customers. To find out more about VEOLIA, please visit our website at www.veolianorthamerica.com.

2. Stanton Water Treatment Plant Residuals Handling

2.1 Process Narrative

Solids handling facilities were constructed at the Stanton Water Treatment Plant as part of the upgrade in the early 1990s which was constructed in response to the 1986 Safe Drinking Water Act Amendments. An upgrade was performed in 2016 which allowed for the SWTP, via permit with New Castle County Delaware, to directly send its treatment waste to sewer. These solids handling facilities, which allow the plant to either separate residuals into a solids cake, residuals sent directly to sewer, or clarified water to be returned to the head of the plant, are the primary residuals handling facilities at the SWTP. They are described below and in the following process flow chart and equipment descriptions.

Solids are generated by several treatment processes during the production of potable water. As shown in the process flow chart on the following page, settled solids are produced by the clarifiers and the filters in the treatment process train. At the Stanton WTP, the clarifiers are DensaDegs, a specific type of clarifier developed by Infilco Degremont, Inc. The clarifiers settle solids out and the solids are then pumped to holding tanks for further processing. The filter backwash is sent through another clarifier called the Accelator, again a specific clarifier developed by Infilco Degremont. Settled solids from this clarifier are sent to the same holding tank for further processing.

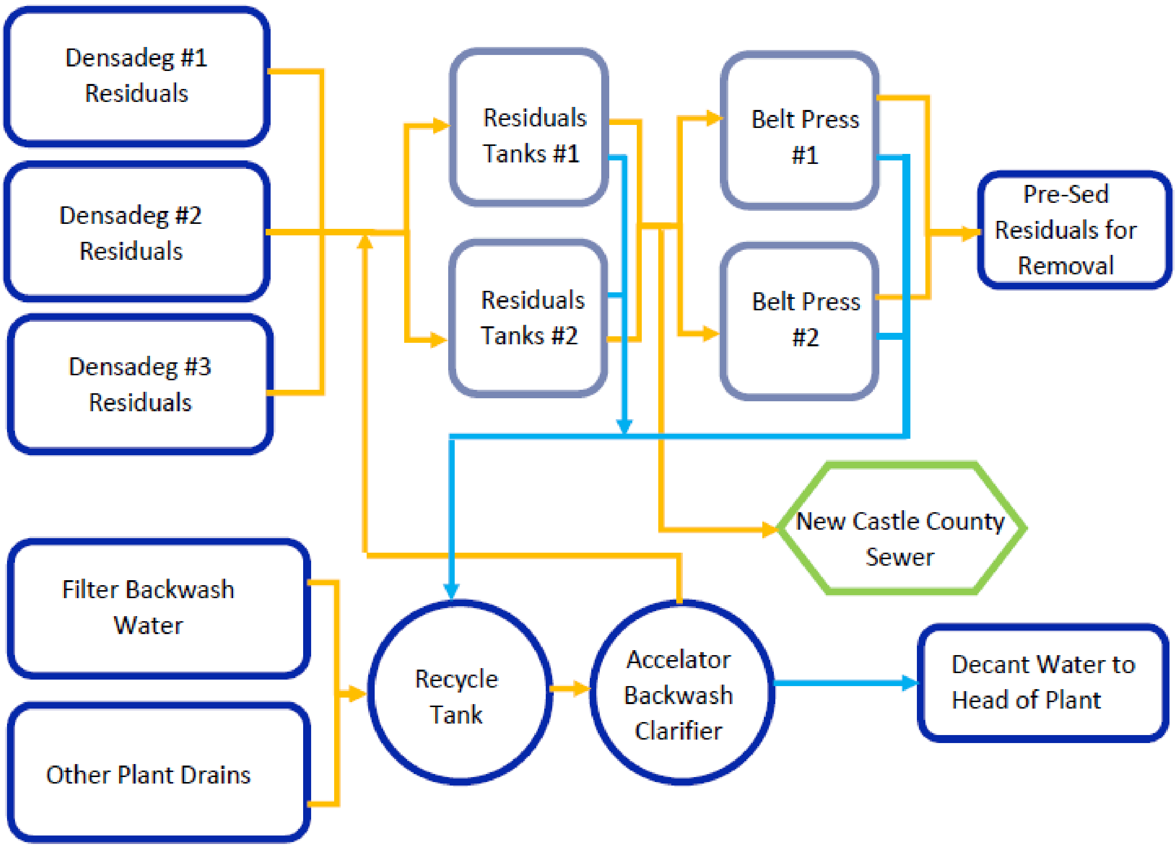
As of July 2016, residuals from the holding tanks began primarily pumping to New Castle County Sewer System via wastewater sewer discharge permit #WDP17-143. Prior to that date, SWTP utilized belt filter presses which used two porous belts allowing both gravity and pressurized dewatering. The solids concentration exiting the belt press ranged from 20% to 30%. The solid cake was trucked out and disposed of under the conditions of the existing State Permit. These belt presses, although not currently in use, still remain intact and in place should VEOLIA ever decide to reactivate the assets.

VEOLIA Water Delaware also has a secondary residuals handling process to provide redundancy in the case of an emergency and also to use as needed if the demand is too high on the primary handling facilities. The secondary system is the lagoons on the west side of the confluence of the White and Red Clay Creeks. These lagoons are approximately 45,000 sq. ft. and hold roughly 2 million gallons (MG) each. A decanting chamber located in one corner of each lagoon allows supernatant to flow from the lagoon back to the head of the plant.

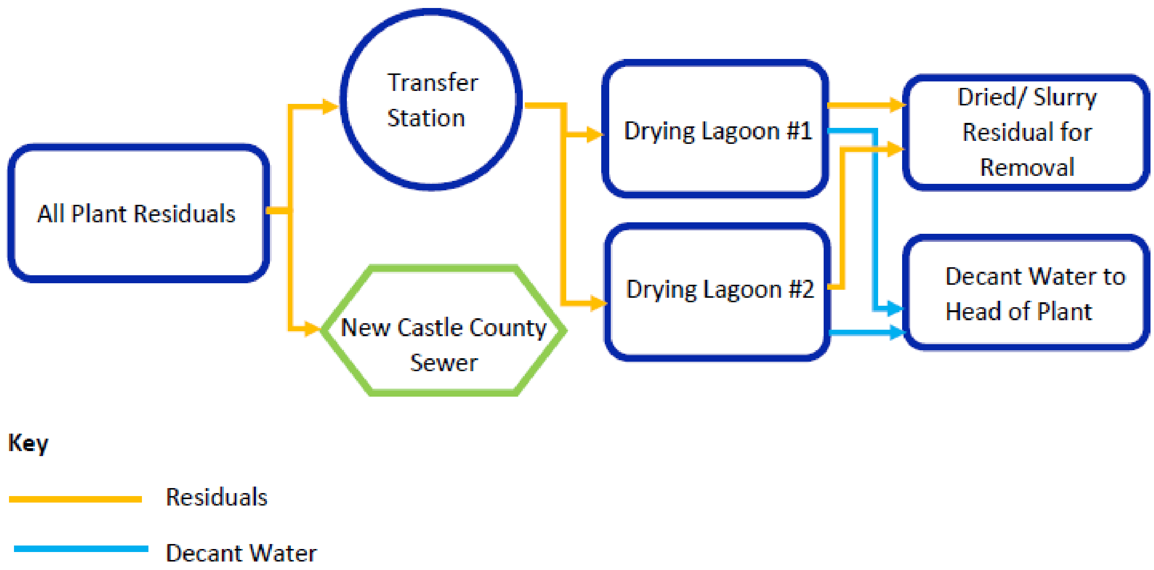
Residuals are pumped into the lagoons and naturally dewatered for a period of time until the lagoon is full. At that point, the lagoon is cleaned and the solids are taken off site for land disposal under the conditions of the State Permit. Before the construction of the belt press facilities and connection to the New Castle County sewer system, the lagoons were the primary residuals handling process.

2.2 Process Flow Charts

Belt Press / Sewer Flow Chart



Lagoon Process Flow Chart



2.3 Description of Major Equipment

Sewer Discharge / Belt Filter Press Process

DENSADEG CLARIFIERS: DensaDeg clarifiers are solids contact clarifiers designed by Infilco Degremont. The clarifiers take coagulated water from the flash mixer and flocculate and settle out solids through the use of polymer, reaction chambers, and tube settlers. Solids are thickened by a scraper and pumped out of the unit to the residual tanks for further processing. Effluent water proceeds down the plant treatment train to the dual media filters.

RESIDUALS TANKS: The residuals tanks are two rectangular concrete basins each holding a maximum of about 170,000 gallons. The residual tanks receive all of the thickened solids from the DensaDeg clarifiers, backwash clarifier and the Accelator. Solids are moved and thickened by chain and flight and auger system and pumped directly to the New Castle County Sewer System. Decant water is recycled to the recycle tank.

BELT PRESSES (currently out of service): Residuals entering the two belt presses are conditioned (flocculated) with a polymer and fed onto a porous belt. At the top of the press, water drains through the belt by gravity. Solids are further dewatered by an S-shaped configuration set of rollers of decreasing diameter which increases the pressure and shear forces on the slurry. The resulting "cake" has a solids concentration from 20% to 30% and is discharged onto the lower belt conveyors that distribute the solids into 30 yard containers for hauling. The filtrate water is recycled to the recycle tank.

RECYCLE TANK: The recycle tank is an equalization tank that receives decant water from residual tanks and belt presses and also receives plant backwash water and water from various plant drains. Pumps in the recycle tank provide the influent flow to the Accelator.

ACCELATOR BACKWASH CLARIFIER: The Accelator is a solids contact clarifier designed by Infilco Degremont.   Influent residuals from the recycle tank are separated and the thickened solids are sent to the residuals tanks. Decant water is returned to the head of the plant.

Lagoon Process

Lagoon Pit: Plant residuals drain by gravity or are pumped to the transfer station where sludge pumps move the residuals over to the lagoons.

LAGOONS: The two lagoons are approximately 45,000 sq. ft. and hold roughly 2 MG each. Residuals pumped into the lagoons naturally dewater by settling and drying until the lagoons fill. When full, the solids are removed and hauled away for land distribution.

Each lagoon contains a decanting chamber which allows settled water or rain water to flow from the lagoons back to the head of the plant.

3. Christiana Water Treatment Plant Residuals Handling

3.1 Process Narrative

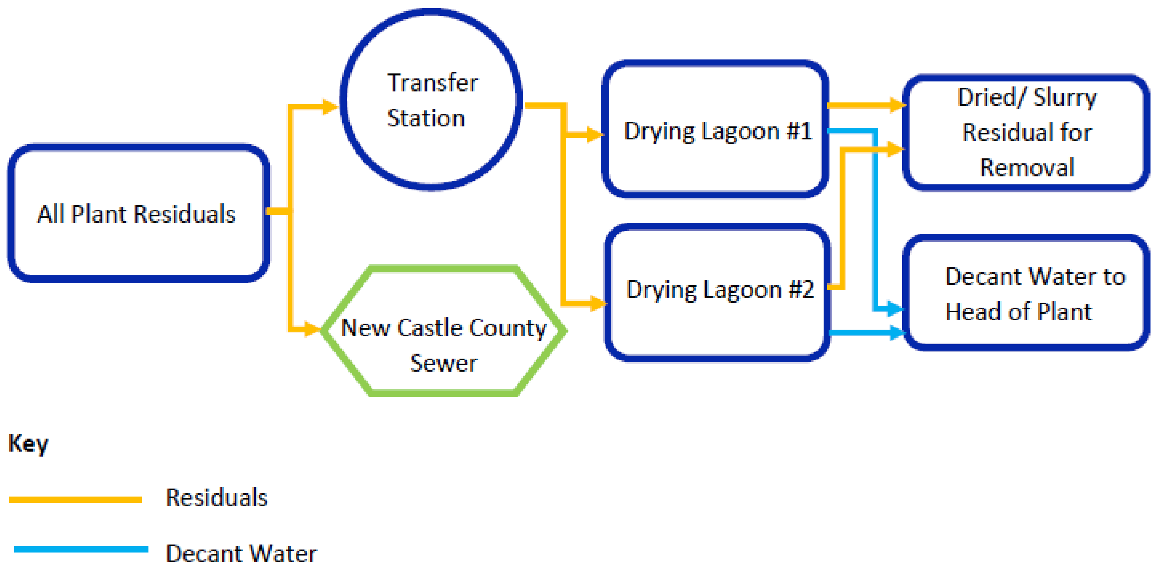
The solids handling facilities at the Christiana WTP were constructed and put into service in 1977 in order to meet the new National Pollutant Discharge Elimination System (NPDES) requirements. The facilities provide a closed loop whereby solids generated by the plant can be accumulated and dewatered to a point where they can be disposed of by land distribution.

Decanted water is returned to the head of the plant. This plant is a stand-by plant and has not been operated in the past several years. The facilities are further detailed below and in the following process flow chart and equipment descriptions.

All plant residuals, whether it is filter backwash water or solids being cleared out of the settling basin, are piped to a sludge pump which moves all the residuals into one of two 20,000 sq. ft. lagoons where settling and solids concentration takes place. A decanting chamber located in one corner of the lagoon allows supernatant to flow from the lagoon back to the head of the plant. Having two lagoons allows the filling of one unit while the other unit is isolated for dewatering by percolation, evaporation, and transpiration. The dewatered solids are removed from the lagoon with excavating equipment and loaded onto dump trucks for transporting to a designated temporary storage area or for distribution by the hauler. Solids are disposed of under the conditions of the State Permit.

3.2 Process Flow Chart

Lagoon Process Flow Chart



3.3 Description of Major Equipment

Lagoon Process

<u>TRANSFER STATION</u>: All plant residuals drain by gravity to the transfer station where sludge pumps move the residuals over to the lagoons.

<u>LAGOONS:</u> Residuals from the transfer station are pumped into two 100 ft. by 200 ft. lagoons where settling and solids concentration takes place. A decanting chamber located in one corner of the rectangular lagoon allows supernatant to flow from the lagoon back to the head of the plant.

4. Residuals Removed: Stanton Water Treatment Plant

Tons of Residual Removed (Belt Presses)			
	2014	**2015**	**2016**
January	**200**	**420**	**245**
February	**200**	**371**	**386**
March	**122**	**319**	**347**
April	**203**	**331**	**187**
May	**154**	**102**	**285**
June	**42**	**299**	**292**
July	**7**	**270**	**56**
August	**9**	**220**	**0**
September	**25**	**238**	**0**
October	**259**	**244**	**0**
November	**287**	**196**	**0**
December	**320**	**226**	**0**
	1828	**3236**	**1798**

Table 1. Tons of residual removed / land applied from the SWTP belt presses. The belt presses were used primarily before the NCC sewer connection was approved in 2016. These residuals were sent off site for land application. SWTP possesses these belt presses for emergency use.

Tons of Residual Removed (Lagoons)					
	2014	**2015**	**2018**	**2022**	**2023**
Lagoon #1	**0**	**437**	**0**	**344**	**0**
Lagoon #2	**1,343**	**0**	**687**	**0**	**311**

Table 2. Tons of residual removed / land applied from the SWTP's two lagoons. SWTP's lagoons were used as a backup to the two filter presses prior to 2016. They have been used as a backup to the NCC sewer discharge as of 2016. These residuals are sent off site to be dewatered, and then distributed for land application.

Residuals Analysis Results

The following pages contain sludge sampling results for the Stanton and Christiana Water Treatment Plants.

Residuals analysis results presented are:

5.1 RESIDUALS ANALYSIS RESULTS STANTON WATER TREATMENT PLANT: These results are the most updated laboratory results for parameters and constituents required by the sampling plan for the Stanton WTP.

5.2 RESIDUALS ANALYSIS RESULTS: CHRISTIANA WATER TREATMENT PLANT: These results are the most up-to-date laboratory results known to SWDE for parameters and constituents required by the sampling plan for the Christiana WTP. Because this plant has not operated in the past several years, no sludge has been generated and the lagoons have not been cleaned in the past several years.

5.1 Residuals Analysis Results Stanton

Water Treatment Plant

SUBURBAN TESTING LABS

Results Report

Order ID: 3B04738

Veolia Inc. - Wilmington
2000 First State Blvd
Wilmington, DE 19804

Project: Sewer/Sludge

Attn: Robert Penman

Regulatory ID:

Sample Number: 3B04738-01 | Site: SWTP Lagoon #2 | Sample ID:
Collector: JC | Collect Date: 02/24/2023 8:05 am | Sample Type: Grab

Department / Test / Parameter	Result		Units	Method	R.L.	DF	Prep Date	By	Analysis Date	By
CALC										
Ammonia as n, (As Received)	47.0		mg/kg	CALC	47.0	1	03/14/23		03/14/23 14:00	RJS2
TKN (As Received)	372		mg/kg	CALC	96.6	1	03/14/23		03/14/23 14:00	RJS2
TON, Solid	10510		mg/kg dry	CALC	2730	1	03/13/23		03/13/23 16:00	RJS2
Total Nitrogen	10510		mg/kg dry	CALC	2730	1	03/13/23		03/13/23 16:00	RJS2
Calculated Analyte - Does not appear on FLIs Scope										
Nitrate-Nitrite (as N)	< 1298		mg/kg	EPA 9056A	1298	2	03/02/23		03/08/23 4:28	SUB*
Conventional Chemistry Parameters by SM/EPA Method										
Phosphorus	1030		mg/kg dry	EPA 365.3	786	1	03/06/23		03/07/23 13:06	SUB*
% Solids	3.54		%	SM 2540 G-11	0.100	1	03/06/23		03/06/23 8:28	SUB*
Inorganics										
Corrosivity (pH)										
Corrosivity, pH (pH Units)	6.34		N/A	SW 846 9045D		1	03/03/23	LAD	03/03/23 10:35	LAD
Corrosivity, Temperature (C)	18.7		N/A	SW 846 9045D		1	03/03/23	LAD	03/03/23 10:35	LAD
Moisture	96.4		%	SM 2540-G		1	02/27/23	CH	02/27/23 14:30	CH
Total Solids	3.6		%	SM 2540-G		1	02/27/23	CH	02/27/23 14:30	CH
Metals										
Aluminum	19400	M3	mg/kg dry	SW 846 6010D	69.4	1	03/01/23	EED	03/02/23 10:56	RPV
Arsenic	7.05	J	mg/kg dry	SW 846 6010D	6.94	1	03/01/23	EED	03/02/23 10:56	RPV
Cadmium	< 0.694		mg/kg dry	SW 846 6010D	0.694	1	03/01/23	EED	03/02/23 10:56	RPV
Chromium	170		mg/kg dry	SW 846 6010D	13.9	1	03/01/23	EED	03/02/23 10:56	RPV
Copper	178		mg/kg dry	SW 846 6010D	2.08	1	03/01/23	EED	03/02/23 10:56	RPV
Iron	281000	M2	mg/kg dry	SW 846 6010D	69.4	1	03/01/23	EED	03/02/23 10:56	RPV
Lead	13.0	J	mg/kg dry	SW 846 6010D	4.17	1	03/01/23	EED	03/02/23 10:56	RPV
Mercury	< 0.174		mg/kg dry	SW 846 7471B	0.174	1	03/07/23	NLP	03/07/23 12:56	RPV
Molybdenum	18.8		mg/kg dry	SW 846 6010D	13.9	1	03/01/23	EED	03/02/23 10:56	RPV
Nickel	34.7		mg/kg dry	SW 846 6010D	13.9	1	03/01/23	EED	03/02/23 10:56	RPV
Potassium	2130		mg/kg dry	SW 846 6010D	694	1	03/01/23	EED	03/02/23 10:56	RPV
Selenium	< 18.1		mg/kg dry	SW 846 6010D	18.1	1	03/01/23	EED	03/02/23 10:56	RPV
Zinc	180		mg/kg dry	SW 846 6010D	139	1	03/01/23	EED	03/02/23 10:56	RPV

SUBURBAN TESTING LABS
1037F MacArthur Road, Reading, PA 19605 Phone: 610-375-TEST Fax: 610-375-4090 suburbantestinglabs.com

PA DEP # 06-00208
NJDEP# PA081

SUBURBAN TESTING LABS

Sample Number: 3B04738-01	Site: SWTP Lagoon #2	Sample ID:
Collector: JC	Collect Date: 02/24/2023 8:05 am	Sample Type: Grab

Department / Test / Parameter	Result	Units	Method	R.L.	DF	Prep Date	By	Analysis Date	By
Pesticide/PCB									
PCBs, 8082									
Aroclor 1016	< 2780	µg/Kg dry	SW846 3550C/8082A	2780	2	03/01/23	HSK	03/04/23 4:40	MAG
Aroclor 1221	< 2780	µg/Kg dry	SW846 3550C/8082A	2780	2	03/01/23	HSK	03/04/23 4:40	MAG
Aroclor 1232	< 2780	µg/Kg dry	SW846 3550C/8082A	2780	2	03/01/23	HSK	03/04/23 4:40	MAG
Aroclor 1242	< 2780	µg/Kg dry	SW846 3550C/8082A	2780	2	03/01/23	HSK	03/04/23 4:40	MAG
Aroclor 1248	< 2780	µg/Kg dry	SW846 3550C/8082A	2780	2	03/01/23	HSK	03/04/23 4:40	MAG
Aroclor 1254	< 2780	µg/Kg dry	SW846 3550C/8082A	2780	2	03/01/23	HSK	03/04/23 4:40	MAG
Aroclor 1260	< 2780	µg/Kg dry	SW846 3550C/8082A	2780	2	03/01/23	HSK	03/04/23 4:40	MAG
Aroclor 1262	< 2780	µg/Kg dry	SW846 3550C/8082A	2780	2	03/01/23	HSK	03/04/23 4:40	MAG
Aroclor 1268	< 2780	µg/Kg dry	SW846 3550C/8082A	2780	2	03/01/23	HSK	03/04/23 4:40	MAG
PCBS, Total	< 2780	µg/Kg dry	SW846 3550C/8082A	2780	2	03/01/23	HSK	03/04/23 4:40	MAG

Surrogate Recoveries	*Results*	*Units*	*Method*	*%Recovery*	*DF*	*Limits (%Recovery)*	*Analysis Date*
Surrogate: Tetrachloro-m-xylene	1290	µg/Kg dry	SW846 3550C/8082A	93%	2	35-135	03/04/23 4:40
Surrogate: Decachlorobiphenyl	1390	µg/Kg dry	SW846 3550C/8082A	100%	2	10-153	03/04/23 4:40

Physical Parameters by APHA/ASTM/EPA Methods

Department / Test / Parameter	Result	Units	Method	R.L.	DF	Prep Date	By	Analysis Date	By
Ammonia as N	< 1329	mg/kg dry	ASTM D6919-03	1329	5	03/03/23		03/07/23 1:43	SUB*
Total Kjeldahl Nitrogen	10510	mg/kg dry	SM 4500NorgC-11/ASTMD6919-03	2730	1	03/04/23		03/07/23 10:01	SUB*

Data Qualifiers:

J	The analyte was detected above the method detection limit but below the method reporting limit; the reported result is an estimated value.
M2	The Matrix Spike associated with this sample is below established acceptance criteria, indicating potential matrix interference. Results of this sample may be biased low.
M3	The Matrix Spike associated with this sample is above established acceptance criteria, indicating potential matrix interference. Results of this sample may be biased high.

Sample Receipt Conditions:

All samples met the sample receipt requirements for the relevant analyses.

Units P/A = Present/Absent
Units P/F = Pass/Fail

Work Order Memo

SUB: SM 2540 G-11 performed by LAB ID # 07-062
SUB: ASTM D6919-03 performed by LAB ID # 07-062
SUB: SM 4500NorgC-11/ASTMD6919-03 performed by LAB ID # 07-062

The test *pH, Lab* is performed in the Laboratory as soon as possible. These results are not appropriate for compliance with NPDES, SDWA, or other regulatory programs that require analysis within 15 minutes of sample collection and should be considered for informational purposes only.

**pH, Final* for ASTM leachate is performed by method SM 4500-H-B.

All results meet the requirements of STL's TNI (NELAC) Accredited Quality System unless otherwise noted. If your results contain any data qualifiers or comments, you should evaluate useability relative to your needs.

If collectors initials include "STL", samples have been collected in accordance with STL SOP SL0015.

All results reported on an As Received (Wet Weight) basis unless otherwise noted.

This laboratory report may not be reproduced, except in full, without the written approval of STL.

Results are considered Preliminary unless report is signed by authorized representative of STL.

Reviewed and Released By:
Devin Kohler
Project Manager I

SUBURBAN TESTING LABS
1037F MacArthur Road, Reading, PA 19605 Phone: 610-375-TEST Fax: 610-375-4090 suburbantestinglabs.com
PA DEP # 06-00208
NJDEP# PA081

SUBURBAN TESTING LABS

3B04738
Devin Kohler

TAT(Check One): [X] Standard [ ] 24hr [ ] 48hr [ ] 72hr [ ] Other____
(Additional charges may apply for rush TAT. If not specified, standard TAT will apply)

Order ID: ____________

Client Name: Veolia Water Delaware
Address: 2000 First State Blvd
Wilmington DE 19804
Contact Name: Sierra Taylor
Phone: 302-528-6904
Fax: ____________
Email: sierra.taylor@veolia.com

Project Name: Sewer Sample (DE)
Address: ____________
Payment / P.O. Info: ____________

Comments: X Standard Sample pick-up APD STR 2/24/23

(2) 1L G

SWTL Sample Number	Sample Description / Site ID:	Date Sampled	Time Sampled	Samplers Initials	Test(s) Requested:	Bottle Quantity	Matrix	Sample Type	Bottle Type	Preservative	Comments / Field Data:
	SWTP Lagoon #2	2/24/23	0805	JC	Metals, PCBs, Wet Chem	2	Solid	G	G	NA	
					refer to PM for methods and analyses list						

(See Codes Below: Matrix, Sample Type, Bottle Type, Preservative)

Relinquished By: [signature]	Date: 2/24/23 Time: 0819	
Received By: Amy Deviney (2)	Date: 2/24/23 Time: 1338	Temp °C: ice Acceptable: Y / N
Relinquished By: Amy Deviney	Date: 2/24/23 Time: 1546	Temp °C: ____ Acceptable: Y / N
Received in Lab By: CTB 2	Date: 2-24-23 Time: 1546	Temp °C: 0.12 Acceptable: (Y) / N

Sample Conditions

- Submitted with COC? (Y) / N
- Number of containers match number on COC? (Y) / N
- All containers in tact? (Y) / N
- Tests within holding times (Y) / N
- 40 mL VOA vials free of headspace? ~~Y / N~~

Matrix Key

- NPW = Non-Potable Water
- Solid = Raw Sludge, Dewatered sludge, soil, etc. (reported as mg/kg)
- PW = Potable Water (not for SDWA compliance)
- SDWA = Safe Drinking Water Act Potable Sample

Sample Type Key

- G = Grab
- 8HC = 8 Hr. Composite
- 24HC = 24 Hr. Composite

SDWA Sample Types

- D=Distribution
- E=Entry Point
- R=Raw
- C=Check
- S=Special
- M=Maximum Residence

Bottle Type Key

- P = Plastic
- G = Glass
- O = Other

Preservative Key

- N = Sodium Thiosulfate
- A = Ascorbic Acid
- H = HNO_3
- C = HCl
- S = H_2SO_4
- OH = NaOH
- O = Other
- NA = None Required

Reporting Options

- [X] SDWA Reporting PWSID: 0000564
- [ ] Fax
- [X] Email
- [ ] Other____
- [X] Return a copy of this form with Report

5.2 Residuals Analysis Results

Christiana Water Treatment Plant

ARTESIAN LABORATORIES

Artesian Laboratories, Inc.
630 Churchmans Road
Newark, Delaware 19702
(302) 453-6920 • 453-6986 (FAX)

REPORT OF ANALYSIS

Wilmington Suburban Water Co.
General Waterworks
P.O. Box 6508
Wilmington, DE 19804
Attn: Mr. William E. Zimmerman

Order #: 93-09-546
Date: 10/19/93 09:41
Work ID: Sludge Sampling CHRISTIANA PLANT SLUDGE
Date Received: 09/20/93
Date Completed: 10/19/93

Purchase Order:
Acct:1070182
Invoice Number:
Client Code: WILM_SUBURB

SAMPLE IDENTIFICATION

Sample Number	Sample Description	Sample Number	Sample Description
01	Grantham Lane		

Entries under "Limit" in test results are Method Detection Limits (MDLs) for that test.

Certified By
Warren Van Arsdall

CHRISTIANA TLT ·

Order # 93-09-546
10/20/93 12:54

TEST RESULTS BY SAMPLE

Sample Description: Grantham Lane
Test Description: Pesticides/PCBs,SW846 8080
Collected: 09/20/93 15:00

Lab No: 01C
Method:
Category: SOLID

Test Code: PE608S

PARAMETER	RESULT	LIMIT	UNITS
alpha-BHC	ND	0.020	
beta_BHC	ND	0.020	
gamma-BHC (lindane)	ND	0.020	
delta-BHC	ND	0.020	
Heptachlor	ND	0.020	
Aldrin	ND	0.030	
Heptachlor epoxide	ND	0.020	
Endosulfan I	ND	0.030	
Dieldrin	ND	0.020	
4,4'-DDE	ND	0.020	
Endrin	ND	0.030	
Endosulfan II	ND	0.030	
4,4'-DDD	ND	0.030	
Endosulfan sulfate	ND	0.030	
4,4'-DDT	ND	0.040	
Endrin aldehyde	ND	0.030	
Methoxychlor	ND	0.19	
Chlordane	ND	3.4	
Toxaphene	ND	1.2	
PCB-1016	ND	5.0	
PCB-1221	ND	5.0	
PCB-1232	ND	5.0	
PCB-1242	ND	5.0	
PCB-1248	ND	5.0	
PCB-1254	ND	5.0	
PCB-1260	ND	5.0	

Notes and Definitions for this Report:

EXTRACTED 09/28/93
DATE RUN 10/02/93 19:33:00
ANALYST cd
INSTRUMENT
FILE ID
CONC FACTOR 10
UNITS mg/Kg

CHRISTIANA PT.

Order # 93-09-546
10/20/93 12:54

TEST RESULTS BY SAMPLE

Sample: 01A Grantham Lane
Collected: 09/20/93 15:00

Category: SOLID

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
% Moisture @ 105C	35.6		% moisture	NG	09/21/93 09:00
Ammonia, Titrimetric	30.8	20.0	mg/Kg as N	NG	10/14/93 08:00
Cyanide, Total	ND	0.5	mg/Kg	JJ	10/06/93 07:30
Nitrate	61	5.0	mg/Kg as N	JJ	10/04/93 13:30
Organic Nitrogen	670	0.05	mg/Kg as N	JJ	10/19/93 07:25
Phenol, Total, Soil	ND	1.3	mg/kg	AMH	10/14/93 15:00
Phosphorous, Total	160	5.0	mg/Kg as P	JJ	10/04/93 08:10
Total Kjeldahl N,Titration	700	100	mg/Kg as N	JJ	10/11/93 09:45
pH in soil by SW846 9045	8.3		pH Units	AMH	09/30/93 10:30

Sample: 01B Grantham Lane
Collected: 09/20/93 15:00

Category: SOLID

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Aluminum, ICP	19200	5.2	mg/Kg	ST	09/30/93 19:02
Antimony, ICP	10.4	1.9	mg/Kg	ST	09/30/93 19:02
Arsenic, Furnace AA	0.16	0.05	mg/Kg	CKC	09/30/93 15:42
Beryllium, ICP	2.05	0.2	mg/Kg	ST	09/30/93 19:02
Cadmium, ICP	1.68	0.4	mg/Kg	ST	09/30/93 19:02
Chromium, ICP	383	0.8	mg/Kg	ST	09/30/93 19:02
Copper, ICP	ND	0.1	mg/Kg	ST	09/30/93 19:02
Digestion, As/Se	09/27/93		date digested	ST	09/27/93 12:00
Digestion, Furnace/Ag	09/29/93		date digested	ST	09/29/93
Digestion, Microwave	09/30/93		date digested	ST	09/30/93 09:30
Iron, ICP	50300	0.9	mg/Kg	ST	09/30/93 19:02
Lead, ICP	114	1.4	mg/Kg	ST	09/30/93 19:02
Mercury, Cold Vapor AA	0.065	0.004	mg/Kg	RJM	10/04/93 15:00
Nickel, ICP	18.2	1.1	mg/Kg	ST	09/30/93 19:02
Potassium, ICP	903	39	mg/Kg	ST	09/30/93 19:02
Selenium, Furnace AA	ND	0.125	mg/Kg	CKC	09/30/93 08:08
Silver, ICP	0.24	0.10	mg/Kg	ST	09/30/93 11:52
Thallium, Furnace AA	ND	0.10	mg/Kg	CKC	09/23/93 14:12
Zinc, ICP	264	1.4	mg/Kg	STA	09/30/93 19:02

Order # 93-09-546
10/20/93 12:54

TEST RESULTS BY SAMPLE

Sample Description: Grantham Lane — Lab No: 01C
Test Description: Acid/Base Neutrals in Soil — Method: Method 8270 — Test Code: SVSOIL
Collected: 09/20/93 15:00 — Category: SOLID

PARAMETER	RESULT	LIMIT	UNITS
N-nitrosodimethylamine	ND	220	
Bis(2-chloroethyl) ether	ND	320	
1,3-Dichlorobenzene	ND	520	
1,4-Dichlorobenzene	ND	480	
1,2-Dichlorobenzene	ND	560	
Bis(2-chloroisopropyl) ether	ND	560	
N-nitroso-di-n-propylamine	ND	470	
Hexachloroethane	ND	830	
Nitrobenzene	ND	380	
Isophorone	ND	390	
Bis(2-chloroethoxy)methane	ND	280	
1,2,4-Trichlorobenzene	ND	390	
Naphthalene	ND	360	
Hexachlorobutadiene	ND	780	
Hexachlorocyclopentadiene	ND	2000	
2-Chloronaphthalene	ND	200	
Dimethyl phthalate	ND	1000	
Acenaphthylene	ND	200	
2,6-Dinitrotoluene	ND	160	
Acenaphthene	ND	140	
2,4-Dinitrotoluene	ND	140	
Diethylphthalate	27000	610	
4-Chlorophenyl-phenylether	ND	250	
Fluorene	ND	140	
N-nitrosodiphenylamine	ND	140	
Azobenzene	ND	240	
4-Bromophenyl-phenylether	ND	590	
Hexachlorobenzene	ND	470	
Phenanthrene	ND	210	
Anthracene	ND	200	
Di-n-butylphthalate	ND	320	
Fluoranthene	ND	230	
Benzidine	ND	800	
Pyrene	ND	200	
Butylbenzylphthalate	2060	380	
Chyrsene	ND	130	
3,3'-Dichlorobenzidine	ND	450	
Benzo(a)anthracene	ND	150	
Bis(2-ethylhexyl) phthalate	ND	460	
Di-n-octyl phthalate	ND	1500	
Benzo(b)fluoranthene	ND	110	
Benzo(k)fluoranthene	ND	120	
Benzo(a)pyrene	ND	190	
Dibenzo(a,h)anthracene	ND	220	
Indeno(1,2,3-cd)pyrene	ND	110	

Order # 93-09-546
10/20/93 12:54

TEST RESULTS BY SAMPLE

Sample Description: Grantham Lane   Lab No: 01C
Test Description: Acid/Base Neutrals in Soil   Method: Method 8270   Test Code: SVSOIL
Collected: 09/20/93 15:00   Category: SOLID

Benzo(g,h,i)perylene	ND	100	
Phenol	ND	150	
2-Chlorophenol	ND	290	
2-Nitrophenol	ND	250	
2,4-Dimethylphenol	ND	160	
2,4-Dichlorophenol	ND	280	
4-Chloro-3-methylphenol	ND	330	
2,4,6-Trichlorophenol	ND	290	
2,4-Dinitrophenol	ND	8200	
4-Nitrophenol	ND	2300	
4,6-Dinitro-2-methylphenol	ND	1500	
Pentachlorophenol	ND	1900	

Notes and Definitions for this Report:

EXTRACTED 09/23/93
DATE RUN 09/28/93 08:37:00
ANALYST ded
INSTRUMENT ______
FILE ID ______
CONC FACTOR 100
UNITS ug/Kg

Order # 93-09-546
10/20/93 12:54

TEST RESULTS BY SAMPLE

Sample Description: Grantham Lane
Test Description: PPL VOCs in Soil-GC/MS
Collected: 09/20/93 15:00

Lab No: 01C
Method: SW846 8260
Category: SOLID

Test Code: VMSOIL

PARAMETER	RESULT	LIMIT
Chloromethane	ND	1.0
Bromomethane	ND	1.0
Vinyl chloride	ND	1.0
Chloroethane	ND	1.0
Methylene chloride	ND	1.0
Trichlorofluoromethane	ND	1.0
1,1-Dichloroethene	ND	1.0
1,1-Dichloroethane	ND	1.0
trans-1,2-Dichloroethene	ND	1.0
Chloroform	ND	1.0
1,2-Dichloroethane	ND	1.0
1,1,1-Trichloroethane	ND	1.0
Carbon tetrachloride	ND	1.0
Bromodichloromethane	ND	1.0
1,2-Dichloropropane	ND	1.0
trans-1,3-Dichloropropene	ND	1.0
Trichloroethene	ND	1.0
Benzene	ND	1.0
Dibromochloromethane	ND	1.0
1,1,2-Trichloroethane	ND	1.0
cis-1,3-Dichloropropene	ND	1.0
2-Chloroethylvinyl ether	ND	1.0
Bromoform	ND	1.0
1,1,2,2-Tetrachloroethane	ND	1.0
Tetrachloroethene	ND	1.0
Toluene	ND	1.0
Chlorobenzene	ND	1.0
Ethylbenzene	ND	1.0
1,3-Dichlorobenzene	ND	1.0
1,2-Dichlorobenzene	ND	1.0
1,4-Dichlorobenzene	ND	1.0
Acrylonitrile	ND	10
Acrolein	ND	10

Notes and Definitions for this Report:

EXTRACTED 09/21/93
DATE RUN 09/21/93 23:08:00
ANALYST ded
INSTRUMENT ______
FILE ID ______
CONC FACTOR 1
UNITS mg/Kg

CHRISTINA MJ

Silver (Ag) - ICP (Inductively Coupled Argon Plasma Emission Spectroscopy)

Wastewater & drinking water	EPA (1983) Method 200.7
RCRA TCLP & groundwater	SW 846 Method 6010
Solids	SW 846 Method 6010

Aluminum (Al) - ICP (Inductively Coupled Argon Plasma Emission Spectroscopy)

Wastewater & drinking water	EPA (1983) Method 200.7
RCRA TCLP & groundwater	SW 846 Method 6010
Solids	SW 846 Method 6010

Arsenic (As) - Furnace AA

Wastewater & drinking water	EPA (1983) 206.2
RCRA TCLP & groundwater	SW 846 7060
Solids	SW 846 7060

Beryllium (Be) - ICP (Inductively Coupled Argon Plasma Emission Spectroscopy)

Wastewater & drinking water	EPA (1983) Method 200.7
RCRA TCLP & groundwater	SW 846 Method 6010
Solids	SW 846 Method 6010

Cadmium (Cd) - ICP (Inductively Coupled Argon Plasma Emission Spectroscopy)

Wastewater & drinking water	EPA (1983) Method 200.7
RCRA TCLP & groundwater	SW 846 Method 6010
Solids	SW 846 Method 6010

Chromium (Cr) - ICP (Inductively Coupled Argon Plasma Emission Spectroscopy)

Wastewater & drinking water	EPA (1983) Method 200.7
RCRA TCLP & groundwater	SW 846 Method 6010
Solids	SW 846 Method 6010

Copper (Cu) - ICP (Inductively Coupled Argon Plasma Emission Spectroscopy)

Wastewater & drinking water	EPA (1983) Method 200.7
RCRA TCLP & groundwater	SW 846 Method 6010
Solids	SW 846 Method 6010

Acid Digestion, Furnace AA Analysis of As & Se

Wastewater & drinking water	EPA (1983) Methods 206.2/270.2
RCRA TCLP & groundwater	SW 846 Methods 7060/7740
Solids	SW 846 Method 3050

Acid Digestion, Furnace AA and/or Ag

Wastewater/drinking water	EPA (1983) Sec 4.1.3

RCRA TCLP & groundwater	SW 846 Method 3020
Solids	SW 846 Method 3050

Microwave Digestion

Wastewater	Federal Register 9/11/92
Soils/Solids	SW-846 Method 3051

Iron (Fe) - ICP (Inductively Coupled Argon Plasma Emission Spectroscopy)

Wastewater & drinking water	EPA (1983) Method 200.7
RCRA TCLP & groundwater	SW 846 Method 6010
Solids	SW 846 Method 6010

Mercury, Soil

Sediment	EPA (1983) Method 245.5 (cold vapor AA)
Solids	SW 846 Method 7471

Potassium (K) - ICP (Inductively Coupled Argon Plasma Emission Spectroscopy)

Wastewater & drinking water	EPA (1983) Method 200.7
RCRA TCLP & groundwater	SW 846 Method 6010
Solids	SW 846 Method 6010

Nickel (Ni) - ICP (Inductively Coupled Argon Plasma Emission Spectroscopy)

Wastewater & drinking water	EPA (1983) Method 200.7
RCRA TCLP & groundwater	SW 846 Method 6010
Solids	SW 846 Method 6010

Lead (Pb) - ICP (Inductively Coupled Argon Plasma Emission Spectroscopy)

Wastewater & drinking water	EPA (1983) Method 200.7
RCRA TCLP & groundwater	SW 846 Method 6010
Solids	SW 846 Method 6010

Antimony (Sb) - ICP (Inductively Coupled Argon Plasma Emission Spectroscopy)

Wastewater & drinking water	EPA (1983) Method 200.7
RCRA TCLP & groundwater	SW 846 Method 6010
Solids	SW 846 Method 6010

Selenium (Se) - furnace AA.

Wastewater & drinking water	EPA (1983) 270.2
RCRA TCLP & groundwater	SW 846 7740
Solids	SW 846 7740

Thallium (Tl) - Furnace AA

Wastewater & drinking water	EPA (1983) Method 279.2

RCRA TCLP & groundwater	SW 846 Method 7840
Solids	SW 846 Method 7840

Zinc (Zn) - ICP (Inductively Coupled Argon Plasma Emission Spectroscopy)

Wastewater & drinking water	EPA (1983) Method 200.7
RCRA TCLP & groundwater	SW 846 Method 6010
Solids	SW 846 Method 6010

Pesticides/PCBs, Soil

SW 846 Method 3550/8080

Percent Moisture

EPA Method 160.3 (gravimetric, dried @ 105C)

Base/Neutral and Acid Extractable Organics, Soil

SW 846 Method 8270

Volatile Organics in Soil/Solids by GC-MS

SW 846 Methods 5030 and 8260

Cyanide, Total

EPA Method 335.2 (manual distillation, colorimetric)

Ammonia, Titration

EPA Method 350.2

Nitrate

EPA Method 353.2 (colorimetric, automated Cd reduction)

Organic Nitrogen

EPA Method 351.3

Phenols, Soil

SW846 Method 9065
Colorimetric, manual 4-AAP with distillation

Phosphorous, Total

EPA Method 365.3

pH, Soil

SW 846 Method 9045
Reported as "soil pH as measured in 0.01M CaCl2"

Total Kjeldahl Nitrogen, Titration

EPA Method 351.3 (titrimetric)

5. Waste management Plan

5.1 Distribution and marketing Plan

Residuals from the Stanton and Christiana Water Treatment Plants will be hauled and distributed for land application. VEOLIA Water Delaware does not do land application itself and only markets the product for hauling and distribution. VWDE has distributed the residuals from its water treatment plants this way for nearly a decade and there is no indication that the market for these residuals will end. VWDE produces the solids and characterizes the solids in the product literature in section 7.0 below for potential haulers. Whichever hauler provides the most economical price for VWDE is the vendor that is chosen. In 2023, VEOLIA Water Delaware had a contract with Commonwealth Disposal Inc. (CDI) in Pennsylvania to remove the solids. CDI uses and distributes the solids for land application under its own permitting.

The water treatment plants process water removed only from natural sources as described in section 1, Company Overview. Water treatment at the Stanton and Christiana WTPs does not involve biological treatment and will not introduce pathogens. Chlorine is applied to the water after settling has occurred and backwash water contains some residual chlorine which will mix with the residuals. Because of the source and production process, methods to control pathogenic organisms are not recognized as necessary.

Sludge sampling indicates that the constituent concentrations in the residuals are within the regulated levels. These results can be seen above in section 5, Residuals Analysis Results.

5.2 Operation Plan

VEOLIA Water Delaware operates the Stanton Water Treatment Plant on a constant basis in order to provide quality water to its customers. For that reason, the plant will be constantly generating residuals. Residuals are primarily discharged to the New Castle County sewer system under a separate permit. The solids production will be consistent (except for when lagoons are cleaned) as described in section 4 which details sludge production. Residuals from the belt press are generally hauled daily during the work week. The lagoons are cleaned after several years of operation and all residuals are distributed at that time.

VWDE operates the Christiana WTP only on an as needed basis and has not needed to operate the plant for the past several years. The lagoons would be cleaned after several years of operation and all residuals would be distributed at that time.

6.3 Storage

Residuals from the Stanton WTP belt press operation are stored in thirty yard containers for hauling Containers are stored underneath the belt filter presses and conveyor belts and are covered inside the plant building. The floors are concrete and drains exist to contain any runoff. The belt press storage area was built in the early 1990s. Containers are on site for no more than four days before being removed for distribution. Typical time on site is only one day.

The lagoons were constructed in the late 1970s. Residuals from the Stanton and Christiana Water Treatment Plants' lagoons are hauled immediately during the lagoon cleaning process. Any additional processing or temporary storage are used only as required to clean the lagoons and are removed afterwards. Duration of the cleaning process varies with the type of cleaning method, the supplier cleaning the lagoons, and any potential problems during lagoon cleaning such as weather and solids quality. During cleaning, provisions are made as necessary to contain temporarily stored solids.

Both plants maintain site security to protect the plant operation. Both plants have locked gates that require key codes and only authorized personnel can access the sites. The Stanton WTP also uses video surveillance and has locked doors on site. The Stanton plant has operators on site twenty four hours per day. Lagoons and plants are enclosed by fencing and locked.

6.4 Quality Assurance and Quality Control Plan

VEOLIA periodically collects samples for monitoring and analysis of sewer discharge in accordance with New Castle County Permit WDP 16-143. The samples are analyzed by a certified laboratory to identify the loading of constituents and results reported as required by the permit.

The Belt presses are not currently in use. However, operators are trained on belt press operation parameters such as feed rate and polymer dosage in order to maintain a consistent product if ever needed. Lab personnel collect samples for semi-annual reports as required and perform monthly testing to verify percent solids. Staff regularly test to confirm that there is no free liquids in the solids prior to hauling the product. The complete sampling plan used in 2011 is described in State Permit Number DM 0904-N-05 and a copy is shown on the following page. The plan will change if and as necessary to follow the plan given in the current permit as the permit is updated and renewed.

Solids removed from the lagoons are required to be tested prior to distribution. Because the lagoons are isolated and cleaned all at once, the solids removed will be consistent and the required tests will confirm that the residuals meet the required specifications.

Parameter	Unit Measurement	Minimum Frequency	Sample Type
Moisture content	percent	Quarterly	Composite
Total Nitrogen as N (dry weight basis)	percent	Semiannually	Composite
Ammonium as N (dry weight basis)	percent	Semiannually	Composite
Nitrate Nitrogen as N (dry weight basis)	percent	Semiannually	Composite
Phosphorus (dry weight basis)	percent	Semiannually	Composite
Potassium (dry weight basis)	percent	Semiannually	Composite
pH	S.U.	Semiannually	Composite
Aluminum (dry weight basis)	mg/kg	Every 2 years	Composite
Arsenic (dry weight basis)	mg/kg	Every 2 years	Composite
Cadmium (dry weight basis)	mg/kg	Every 2 years	Composite
Chromium (dry weight basis)	mg/kg	Every 2 years	Composite
Copper (dry weight basis)	mg/kg	Every 2 years	Composite
Iron (dry weight basis)	mg/kg	Every 2 years	Composite
Lead (dry weight basis)	mg/kg	Every 2 years	Composite
Mercury (dry weight basis)	mg/kg	Every 2 years	Composite
Molybdenum (dry weight basis)	mg/kg	Every 2 years	Composite
Nickel (dry weight basis)	mg/kg	Every 2 years	Composite
Selenium (dry weight basis)	mg/kg	Every 2 years	Composite
Zinc (dry weight basis)	mg/kg	Every 2 years	Composite
PCB's (dry weight basis)	mg/kg	Every 2 years	Composite
**Free Liquids	-	Daily	Composite

*Water treatment residuals samples shall be collected at the following location: Immediately below the discharge chute of the belt presses (Stanton) or from various points throughout the lagoons, one sampling occurrence just prior to lagoon clean out (Stanton and Christiana).

** Free liquid testing is required only on days when water treatment residuals are being distributed.

*** Specific monitoring conditions for the Stanton and Christiana Facility:
The above monitoring shall not be required for the Christiana and Stanton water treatment residuals until the lagoons are to be emptied.

All water treatment residuals shall be collected and analyzed in accordance with the Quality Assurance Program. An annual report summarizing distribution and marketing activities from both facilities, including copies of the original laboratory analysis data, shall be submitted to the

Department by February 1st of the following calendar year. The Department may modify the sampling frequency based upon review of continuing or additional analyses. All parameters listed above shall be analyzed and the results submitted to the Department at least 30 days prior to the distribution of the residuals.

7. Product Literature

Landscape Topping
Product Literature

For Further Information Contact

VEOLIA Water Delaware
2000 First State Blvd.
P.0. Box 6508
Wilmington, DE 19804

(302) 633-5900

LANDSCAPE TOPPING
PRODUCT LITERATURE

Disposal of all material shall conform to State of Delaware Code Title 7 Section 7103 Guidance and Regulations Governing the Land Treatment of Wastes.

ORIGIN

Landscape Topping (L/T) is dewatered solids residuals from two water treatment plants owned by VEOLIA Water Delaware, Inc. The solids residuals consist of silt and other suspended material and constituents found in the creek water along with treatment process chemicals which are added in the treatment process.
The chemicals added include ferric chloride, sodium bicarbonate, sodium hydroxide, sodium hypochlorite, polymer, sulfuric acid and fluorosilicic acid. Due to the source and treatment process, no methods are needed to control pathogens. The product is safe, odorless and meets all the standards as set by the Delaware Department of Natural Resources and Environmental Control (DNREC).

COMPOSITION

Typical dried material properties are:

Component	Concentration
Total Solids	3.54 %
Nitrogen, Total	10,510 mg/kg
Phosphate, Total	ND
Potassium	2,130 mg/kg
Cadmium	ND
Copper	178 mg/kg
Lead	13 mg/kg
Zinc	180 mg/kg
Mercury	ND
Nickel	34.7 mg/kg
Iron	281,000 mg/kg
Arsenic	7.05 mg/kg

Chromium	170 mg/kg
Molybdenum	18.8 mg/kg
Selenium	ND
PCBs	ND

Note: ND means non-detectable. Results given above are based on 2023 lab samples. Content percentages of the various constituents will vary in the applied L/T when blended with sand, soil, compost, peat moss, pearlite, wood chips, etc. to meet specific site requirements.

TRANSPORTING AND STORING

Dried material is much like top soil and requires no special handling in transporting. Precautions should be taken to avoid runoff from the storage area into surface water courses. A buffer distance of 150 ft. should be maintained away from storm drains, drainage ditches, swales and surface water courses.

Storage areas should be relatively level (usually less than five (5) percent slope) to discourage runoff. If runoff does pose a problem, a berm or other effective barrier should be used.

USES

- Lawn grading, renovation and maintenance
- Tree, shrub and ornamental planting and mulching
- Cultivated sod production
- Roadside soil preparation
- Golf course renovation and maintenance
- Athletic field renovation and maintenance

LAWNS

New Construction: After the initial rough grade has been done, the finish grade can be done with L/T. Where a very friable soil with good drainage is desired, a mixture of sand and L/T in a 1to 2 ratio is recommended. Depending on the condition of the original soil, L/T may be either applied as topping or worked in with a rototiller or disc. Depending on availability and economics, L/T may be blended with any of the materials listed in the composition section to obtain the desired results.

Lawn Renovation: The recommended procedure here is to apply a blend of L/T and sand in a 2 to 1ratio to a depth of 2 to 6 inches. Next, disc or rototill into a depth of 4 to 6 inches. For best results, limestone may be broadcast at a rate of 50 pounds per 1000 square feet. Also a lawn fertilizer should be applied following manufacturers guidelines. Smoothing of soil and selection of seed mixture is optional to the owner.

GOLF COURSES

Mixtures of L/T with sand and soil are being successfully used for renovation or maintenance of fairways, tees and greens at some golf courses by innovative grounds superintendents. The same general procedures are followed as for lawn applications.

ATHLETIC FIELDS

Due to size and economics this would be limited to renovation by working a top dressing of L/T and sand mixture into the existing soil and following with smoothing, seeding and nutrient supplement.

SOD PRODUCTION

A layer of 4 to 6 inches of L/T should be worked into a depth of 4 to 6 inches by disc. The soil should then be prepared with lime and fertilizer and seeded in a manner that will most quickly produce sod for commercial use.

LOADING RATES

Due to the listed chemical composition of the material, loading rates should not exceed 50,000 kg/hectare in a year. If future chemical analysis reveals that concentrations have increased, the maximum loading rate may decrease. Mixing of the L/T with other material will decrease the concentrations and allow a higher loading rate. See Table 402.5 in subsection 117.0 in the State of Delaware Code Title 7 Section 7103 Guidance and Regulations Governing the Land Treatment of Wastes for maximum loading rates of pollutant.