Applicant Name: Keystone Sanitary Landfill, Inc.**Keystone Sanitary**

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SEWER SYSTEM
MODULE 2

APPLICANT NAME	Keystone Sanitary Landfill, Inc.		
SEWER SYSTEM			
1. CLASS OF CONSTRUCTION: ☒ NEW SYSTEM ☐ REPLACEMENT OF EXISTING SYSTEM ☐ SANITARY			
If other than a new system, list the WQM permit number ammended by this application.			
2. List the WQM permit number of the sewer to which this system connects.			N/A
3. List the WQM permit number of the treatment facility receiving flow from this system.			Primary: Stream Discharge or beneficial use Back-up: Conveyance to Pennsylvania American Water Company Scranton WWTP under existing agreement
4. What is the reserve capacity of the most limiting component between this connection and the treatment facility?			N/A
5. INITIAL POPULATION: N/A		DESIGN YEAR POPULATION:	N/A - Waste is landfill leachate, not muncipal sewage
6. DESIGN FLOW DATA:			
a. Laterals and Submain Sewers	(GPCD)	N/A	
b. Interceptors	(GPCD)	N/A	
c. Average Daily Flow	(mgd)	0.18 (design capacity in two phases)	
d. Infiltration/Inflow (I/I)	(mgd)		
e. Industrial Waste Flow	(mgd)	N/A	
f. Total Average Design Flow	(mgd)	0.18 (design capacity in two phases)	
g. Maximum Expected Flowrate (Peak Instantaneous)	(mgd)	0.20 (design capacity in two phases)	
7. GENERAL INFORMATION:			
a. Describe measures taken to reduce I/I in the system including leakage test and reference applicable portion of the specifications. N/A			
b. Describe any overflows within the system. N/A			
c. If applicable, describe capacity of receiving sewers and pumping station. N/A			

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FLOW EQUALIZATION AND GRIT CHAMBERS
MODULE 3

APPLICANT NAME	Keystone Sanitary Landfill, Inc.

FLOW EQUALIZATION			UNIT Lagoon 1 ☒ Existing ☐ Proposed	UNIT Lagoon 2 ☒ Existing ☐ Proposed	UNIT ☐ Existing ☐ Proposed
INDICATE FUNCTION			Storage of: ☒ Untreated Wastewater ☐ Treated Wastewater	Storage of: ☒ Untreated Wastewater ☐ Treated Wastewater	Storage of: ☐ Untreated Wastewater ☐ Treated Wastewater
DESIGN DATA	1. CAPACITY	a. Normal Operating Capacity (gal)	4,875,000	4,875,000	
		b. Maximum Available Capacity (gal)	5,500,000	5,500,000	
	2. DISCHARGE TO UNIT	a. Flow (mgd)	0.33*	0.33	
		b. Duration (hrs/day)	24	24	
	3. DISCHARGE FROM UNIT	a. Flow (mgd)	0.33*	0.33	
		b. Duration (hrs/day)	24	24	
	4. DETENTION	a. Average (hrs)	30 day minimum	30 day minimum	
		b. Maximum (hrs)	30 day minimum	30 day minimum	

5. GENERAL INFORMATION

a. Describe outlet and method of water level control.

Water is pumped out of the tanks based on operator control and designed level switches inside the tanks. The level switches will turn on the pump at the set-point, and the pumps operate until the level reaches the off level or is turned off by the operator.

b. How will sediment accumulation and/or septic conditions in the unit be minimized?

The leachate lagoons are aerated. Aerating introduces oxygen and keeps the contents will stirred, both will help prevent septicity and solids accumulation.

GRIT CHAMBERS			UNIT ☐ Existing ☐ Proposed	UNIT ☐ Existing ☐ Proposed	UNIT ☐ Existing ☐ Proposed
1. TYPE OF UNIT					
DESIGN DATA 2.	a. Horizontal Velocity (fps)				
	b. Method Of Velocity Control (Specify)				
	c. Detention Period At Average Daily Flow		Avg.	Avg.	Avg.
	d. Detention Period At Maximum Daily Flow		Max.	Max.	Max.

Note – The existing lagoons will remain in use after the new RO equipment is installed at the leachate treatment plants. After equipment installation, flow to the lagoon and discharge from the lagoon will increase by 0.18 MGD from 0.15 MGD to 0.33 MGD.

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SCREENING AND SETTLING
MODULE 4

APPLICANT NAME	Keystone Sanitary Landfill, Inc.

SCREENING AND COMMINUTING DEVICES

For each device being used, provide a brief description.
For function include design data such as capacity, velocity through bars and slope of bars.

TYPE	LOCATION	FUNCTION
In-line screens (2)	Pre-treatment skid	Remove larger solids from the raw leachate prior to pumping it to preliminary treatment.

SETTLING TANKS (Identify function and sequence in the process used.)	UNIT Inclined plate seprator ☐ Existing ☒ Proposed; ☐ Primary ☐ Intermediate ☐ Final	UNIT ☐ Existing ☐ Proposed; ☐ Primary ☐ Intermediate ☐ Final	UNIT ☐ Existing ☐ Proposed; ☐ Primary ☐ Intermediate ☐ Final	UNIT ☐ Existing ☐ Proposed; ☐ Primary ☐ Intermediate ☐ Final

1. HYDRAULIC LOADING DURING RUNOFF PERIOD	a. Forward Flow (mgd)		0.18			
	b. Recirculation Flow (If applicable) (mgd)		N/A			
	c. Total Flow (a + b) (mgd)		0.18			
2. LOADING RATES (BASED ON FORWARD FLOW)	a. Capacity (Gallons)					
	b. Detention	(1) Average				
		(2) Minimum				
	c. Surface Settling Rate (gal/day/sq ft)	(1) Average				
		(2) Maximum				
	d. Weir Overflow Rate (gal/ft/day)	(1) Average	N/A			
		(2) Maximum	N/A			

3. For final settling tanks in the activated sludge process, describe the average and peak solids loading rates based on mixed-liquor flow (forward flow + recirculation).
N/A

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CHEMICAL TREATMENT
MODULE 6

APPLICANT NAME	Keystone Sanitary Landfill, Inc.

CHEMICAL TREATMENT PROCESS (Do not use to describe disinfection facilities.)

1. DESCRIBE PROCESS:

Chemical treatment of influent leachate will consist of pH adjustment and neutralization, depending on leachate characteristics and RO performance. In the RO process the pH will be lowered with sulfuric acid prior to membrane treatment to optimize removal efficiency of the membranes. At the end of the process, prior to conveyance into the effluent tank, pH will be adjusted to an acceptable level for stream discharge (between 6.0 to 9.0). Caustic (NaOH) will be used for the final pH adjustment.

2. WILL THE PROCESS INCREASE TOTAL SOLIDS? ☒ YES ☐ NO

IF YES, SPECIFY INCREASE: TBD MILLIGRAMS PER LITER (any increase will be removed in RO units)

MIXING AND FLOCCULATION FACILITIES

INDICATE FUNCTION OF EACH UNIT AND FILL IN OR CHECK ALL RELEVANT DATA.		UNIT pH Adjustmenet Tank	UNIT	UNIT
		☒ Mixing ☐ Quick Mix ☐ Flocculation	☐ Mixing ☐ Quick Mix ☐ Flocculation	☐ Mixing ☐ Quick Mix ☐ Flocculation
		☐ Existing ☒ Proposed	☐ Existing ☒ Proposed	☐ Existing ☒ Proposed
1. CAPACITY	(gal)	900		
	(cu ft)	120		
2. DETENTION TIME	(min)	Approx 13 min		

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OTHER FILTERS AND DISINFECTION
MODULE 8

APPLICANT NAME	Keystone Sanitary Landfill, Inc.

FILTERS (Other than rapid sand filters)

Describe each filtering device to be used, including: type of filter; media (type, depth, etc.); filtration rate; backwash procedure, rates and applied loading.

Sand and cartridge filters will be used in the process. The sand filter is designed to remove the majority of suspended solids in the untreated leachate. The cartridge filters further pre-treat the influent by removing smaller solids prior to reverse osmosis membrane treatment. The piping will be installed to allow for backwash of the filter surface of the sand filter. The filter backwash will be conveyed to the building sump. The building sump's contents will be pumped back to the lagoons at the front end of the treatment train. The cartridge filter will have pressure sensors that measure the pressure differential across the filter. When the pressure differential exceeds a particular threshold, an alarm will sound and the operator will change the cartridges.

Three stages of RO membranes will be used to treat filtered leachate. Concentrate from the first stage will flow to the second stage for treatment. Permeate from stages one and two will flow to the third stage for additional processing to reduce concentrate volume and provide up to 90% recovery. The design flow for the RO treatment system will be 0.18 MGD. The RO membranes will be manufactured and furnished by Rochem Membrane Systems. Please refer to the Design Engineer's Report located in Section 5 of this application for additional details regarding the RO treatment process.

DISINFECTION

Describe the method of disinfection to be provided, including: disinfectant type; feed mechanism; effective dosage range; expected residual; contact tank; contact time and safety features.

Disinfection will not be needed for this treatment process. The RO membranes remove coliform bacteria if present from the leachate, as required to meet the NPDES effluent limits. If needed, chlorine can be added to further reduce fecal coliform levels.

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INDUSTRIAL WASTEWATER TREATMENT FACILITY
MODULE 15

APPLICANT NAME	Keystone Sanitary Landfill, Inc.

Note: A copy of the *Design Engineer's Report* must be attached to this module.

SIC/NAICS CODES

	SIC CODE	NAICS CODE	Corresponding SIC/NAICS Description
1st	4953	562219	Waste (except sewage) treatment facilities, nonhazardous disposal
2nd	____	____	____
3rd	____	____	____
4th	____	____	____

GENERAL DESCRIPTION AND NATURE OF BUSINESS

The site is a municipal solid waste landfill that operates under PA DEP SWM Permit No. 101247.

LIST OF PERMITS (List all NPDES and WQM permits presently held for this facility.)

The site has the following permits:

- Solid Waste Disposal Permit – 101247
- NPDES Eddy Creek Storm Water Runoff – PAR 502203

An NPDES Permit application for stream discharge of pretreated effluent has been prepared for review under separate cover. A Major Permit Modification to the existing Solid Waste Permit to upgrade the existing treatment plant and permit stream discharge will be submitted to the Department. An Effluent Reuse Monitoring Plan is included with this Part II-WQM Permit application for use of treated effluent onsite. This application is the Part II-WQM application for the detailed design of the treatment plant upgrades. It has already been determined by the Air Quality Program that a separate permit for the treatment plant's air emissions will not be needed.

TREATMENT PROCESS CODES

PHYSICAL TREATMENT PROCESSES

Treatment Process	Code
Ammonia Stripping	AS
Dialysis	DIALY
Diatomaceous Earth Filtration	DEF
Electrodialysis	ELECT
Evaporation	EVAP
Flocculation	FLOCC
Flotation	FLOT
Foam Fractionation	FF
Freezing	FREEZ
Gas-Phase Separation (air stripping)	GPS
Grinding	GRIND
Flow Equalization	FE
Eutectic Freezing	EUTEC
Screening	SCRN
Microstraining	MSTRN
Grit Removal	GR
Mixing	MIX
Moving Bed Filters	MBF
Intermittent Sand Filters	ISF
Reverse Osmosis (Hyperfiltration)	RO
Rapid Sand Filtration	RSF
Sedimentation	SEDI
Slow Sand Filtration	SSF
Solvent Extraction	SE
Sorption (not Carbon)	SORPT
Distillation	DISTL
Multimedia Filtration	MF
Filtration	FILTR

DISINFECTION

Hypochlorite	HYPO
Chlorine Gas	CL
Ozone	OZONE
Ultraviolet	UV

BIOLOGICAL TREATMENT PROCESSES

Treatment Process	Code
Activated Sludge	ACTSL
Aerated Lagoons	AERLG
Anaerobic Treatment	ANAE
Nitrification – Denitrification	NIDI
Pre-Aeration	PA
Spray Irrigation/Land Application	SILA
Stabilization Ponds	SP
Rotating Biological Contactors	RBC
Post Aeration	POA
Holding or Detention Pond	HOLD
Treatment by Plain Aeration	PLAIN
Ridge & Furrow Irrigation	RFI
Sheet or Overland Flow Irrigation	SOFI
Surface/Subsurface Injection	SSSI
Sequence Batch Reactor	SBR
Artificial Wetlands	ARTWL
Imhoff Tank	IMHOF
Polishing Lagoons	POL
Biological Hydrolysis	BIOHY
Trickling Filtration	TF

BIOSOLID USE/DISPOSAL

Incineration	INCIN
Land Application	LNDAP
Landfill	LNDFL
Pyrolysis	PYRO

DISPOSAL

Discharge to Surface Water	
Ocean Discharge through Outfall	OCEAN
Reuse/Recycle of Treated Outfall	RCYEF
Underground Injection	UI
Reuse or Sale of Wastewater or Raw Material for Other Processes	REUSE

CHEMICAL TREATMENT AND OTHER PROCESSES

Treatment Process	Code
Carbon Adsorption	CA
Chemical Oxidation	CO
Chemical Precipitation	CP
Chemical Hydrolysis	CH
Coagulation	COAG
Dechlorination	DC
Electrochemical Treatment	ET
Ion Exchange	IE
Neutralization	NEUT
Oxidation	OX
Temperature Control	TEMP
Oil & Grease Removal, Including Skimming & Separators	OGREM
Reduction	RD
Odor Control	OC

BIOSOLID TREATMENT PROCESSES

Aerobic Digestion	AERON
Anaerobic Digestion	ANEDN
Belt Filtration	BELT
Centrifugation	CENT
Conditioning (Chemical, Heat)	COND
Chlorine Treatment	CHTR
Composting	COMP
Drying	DRY
Elutriation	ELU
Flotation Thickening	FLOT
Freezing	FREEZ
Gravity Thickening	GRAV
Sludge Lagoons	SLAG
Vacuum Filtration	VAC
Vibration	VIB
Wet Oxidation	WETOX
Pressure Filtration	PRESS

Summary of Wastewater Source and Treatment Unit Information	1. SOURCE OF WASTE Landfill Leachate 2. OUTFALL NO. 001, 002, reuse	1. SOURCE OF WASTE Landfill Leachate 2. OUTFALL NO. 001, 002, reuse
3. TYPE(S) OF WASTE (i.e., Sanitary, Process . . .)	Leachate	Leachate
4. WASTE FLOW PATTERN	☒ Continuous ☐ Intermittent From (am) To (pm) ☐ Batch	☒ Continuous ☐ Intermittent From (am) To (pm) ☐ Batch
5. DAILY WASTE VOLUME TOTAL	Batches/day Gallons/batch 90,000 Gallons/day (Phase I)	Batches/day Gallons/batch 90,000 Gallons/day (Phase II)

6. DESIGN FLOW AVERAGE MAXIMUM General Sequence of Treatment Units (See Treatment Process Code List)	90,000 MGD 90,000 MGD Unit [1]	(Check) Existing	(Check) Proposed	Code for Treatment Unit	90,000 MGD 90,000 MGD Unit [1]	(Check) Existing	(Check) Proposed	Code for Treatment Unit
	Lagoons	☒	☐	FE	Lagoons	☒	☐	FE
	Screens	☒	☒	SCRN	Screens	☒	☒	SCRN
	OWS	☒	☒	OGREM	OWS	☒	☒	OGREM
	pH Adjustment	☒	☐	NEUT	pH Adjustment	☒	☒	NEUT
	Sand Filters	☒	☐	MF	Sand Filters	☒	☒	MF
	Cartridge Filter	☒	☐	FILTR	Cartridge Filter	☒	☒	FILTR
	RO Unit	☒	☐	RO	RO Unit	☒	☒	RO
	Air Stripper	☒	☐	GPS	Air Stripper	☒	☐	GPS
		☐	☐			☐	☐	
		☐	☐			☐	☐	

[1] If impoundments are proposed and the wastewater entering the impoundment meets the definition of Residual Waste at Title 25 Pa. Code Chapter 287, the design must be in accordance with Title 25 Pa. Code § 299.144.

Use Additional Sheets If Necessary

WASTE CHARACTERISTICS

OUTFALL
SOURCE OF WASTE: Landfill

SAMPLING PERIOD: 3/2/2018 From 3/2/2018 To

☐ Yes ☐ No NPDES Permit application submitted within last 3 years for this outfall.

NAME OF LABORATORY/CONSULTANT
Hawk Mountain Labs, Inc.
201 West Clay Aveneue
Hazle Township, PA 18202

Telephone No.: (570) 455-6011

SAMPLING LOCATION * -- TREATMENT FACILITY INFLUENT						EXISTING TREATMENT FACILITY EFFLUENT				NEW TREATMENT FACILITY EFFLUENT (Expected)				ANALYTICAL METHOD USED (AA, GC/MS, etc.)
PARAMETER	UNITS	MONTHLY AVERAGE	24 HR. MAX.	MIN.	MAX.	MONTHLY AVERAGE	24 HR. MAX.	MIN.	MAX.	MONTHLY AVERAGE	24 HR. MAX.	MIN.	MAX.	

***Use Additional Sheets as Necessary**

Comments/additional information: See attached sheets.

SECTION 5.0

SECTION 5.0

DESIGN ENGINEER'S REPORT

DESIGN ENGINEER'S REPORT

1.0 GENERAL INFORMATION

1.1 Facility Status

Keystone Sanitary Landfill, Inc. (KSL) owns and operates a municipal solid waste (MSW) landfill under Solid Waste Disposal Permit No. 101247, located in Dunmore and Throop Boroughs, Lackawanna County, Pennsylvania. KSL submits this Part II Water Quality Management (WQM) Permit Application for approval of the proposed leachate treatment plant prior to stream discharge and beneficial use of treated effluent from the treatment plant.

Currently leachate is pretreated on-site before being discharged to the Pennsylvania American Water Company (PAWC) Scranton wastewater treatment plant. The proposed system involves a two-phase, three-stage reverse osmosis (RO) membrane treatment system to treat leachate prior to stream discharge or beneficial use. A similar facility constructed at the Commonwealth Environmental Services Landfill demonstrated the effectiveness of RO systems to treat leachate and produce a high quality effluent. The information provided in this application details the modifications to the existing leachate treatment facilities and the new equipment to be provided to meet the NPDES effluent limits and allow it to be stream discharged or beneficially used for dust control or utility water.

1.2 General Project Description

Leachate generated by the landfill is conveyed to two double lined leachate lagoons totaling 9.75 million gallons of storage capacity, located near the leachate treatment plant building. Current treatment includes physical/chemical and biological processes designed to treat an average of 150,000 gallons per day (gpd), including:

- Aerated lagoons;
- Primary clarification with hydroxide precipitation;
- Leachate heating;

- Ammonia stripping column;
- pH Adjustment;
- Biological treatment by moving bed biofilm reactor; and
- Dissolved air flotation.
- Octopus Aeration Ammonia Removal System

Currently, treated effluent is discharged to the PAWC Scranton wastewater treatment plant for disposal. Sludge is disposed of in the landfill. The existing treatment plant will remain in operation and discharge to the PAWC Scranton wastewater treatment plant will remain.

KSL has installed an RO treatment system supplied by Rochem Americas (Rochem) to treat leachate prior to discharge. The first phase consists of an RO system with a design average capacity of 90,000 gallons per day (100,000 gpd maximum), and a second phase consisting of additional equipment with a design average capacity of 90,000 gpd (100,000 gpd maximum). The total capacity for both phases will be 180,000 gpd (200,000 gpd maximum).

The RO equipment replaces the MetPro reactors in the original leachate treatment building and supplements the moving bed biological reactor (MBBR) process.

The Rochem treatment system is a demonstrated process that produces a high quality effluent which provides the following options for effluent management:

- Discharge to the PAWC Scranton wastewater treatment plant, consistent with the existing agreement;
- Discharge to Eddy Creek or Little Roaring Brook; and/or
- Beneficial use onsite for dust control and utility water.

KSL will submit the following applications to the Pennsylvania Department of Environmental Protection (PA DEP) for this project:

- A Part I – NPDES permit application for approval to discharge treated effluent to Eddy Creek and Little Roaring Brook;
- A Part II-WQM permit application for construction of the leachate treatment facilities prior to stream discharge or onsite beneficial use of the treated effluent (included with this application as Attachment F);
- A Major Modification to Solid Waste Disposal Permit No. 101247 describing the revised leachate management plan associated with the stream discharge or use of treated effluent; and
- A Request for Determination was submitted for air emissions from the treatment plant on June 5, 2018. The Air Quality Program agreed that a permit is not required for emissions from the proposed plant.

Basis of Design for Treatment System

1.2.1 Leachate Quantity

The upgraded treatment system is comprised of a two phase (Phase I and II) RO treatment plant. Phase I consists of an RO system with a design average treatment capacity of 90,000 gpd (100,000 gpd maximum), and Phase II consists of an RO system with a design average capacity of 90,000 gpd (100,000 gpd maximum). The total capacity for both phases will be 180,000 gpd (200,000 gpd maximum). Phase I of the RO system was constructed as authorized by the Minor Modification No. 101247-A183, in January 2019. A Certification of Facility Construction for this modification (Form 37) was approved by PA DEP on April 16, 2019. Phase I effluent is currently discharged to the PAWC Scranton wastewater treatment plant.

The design capacity provides operational flexibility, accommodates cleaning and maintenance, and handles wet weather flows.

1.2.2 Leachate Quality

KSL monitors untreated leachate quality in accordance with the site's solid waste management permit. The raw leachate is sampled quarterly and analyzed for Form 50 parameters. In addition, in September 2018, the raw leachate was sampled and analyzed for NPDES parameters from Pollutant Groups I through VI.

On December 14, 2018, KSL submitted four quarters of Form 50 analytical results (from 2017) and the analytical results from the September 2018 leachate characterization to PA DEP in a letter report. With the submission of the data, KSL requested that the Department establish Preliminary Effluent Limits (PELs) for the proposed treated leachate discharge to Little Roaring Brook. On May 19, 2019, the PA DEP issued PELs for the discharge of treated leachate to Little Roaring Brook. Previously, in May of 2016, the PA DEP provided PELs for discharge of treated leachate to Eddy Creek, based on the effluent guideline limits in 40 CFR Part 455.

The leachate treatment plant was designed using both the influent data and established PELs for Eddy Creek and Little Roaring Brook. The table on the following pages summarizes parameter concentrations that were established as the design influent characteristics for the upgraded RO plant.

Table 1
Design Parameters
KSL Landfill Leachate Treatment Plant

Analyte	Units	Design Influent
Temperature	°C	20
Temperature (Min/Max)	°C	5-30
pH (S.U.)	Units	6-9
Conductivity	µS/cm	23,130
Total Dissolved Solids	mg/l	13,000
COD	mg O2/l	4,730
BOD	mg O2/l	3,500
Ammonia	Mg NH4+/l	1,800
Nitrogen	mg/l	1,630
Sodium	mg/l	2,620
Potassium	mg/l	945
Chloride	mg/l	3,260
Sulfate	mg SO4-2/l	130
Calcium	mg/l	118
Magnesium	mg/l	196
Bicarbonate	mg CaCO3/l	7,673
Oil & Grease	mg/l	10
Barium	mg/l	1.97
Silica	mg/l	17.1

Analyte	Units	Design Influent
Strontium	mg/l	1.15
Aluminum	mg/l	1.25
Fluoride	mg/l	16.5
Iron, total	mg/l	26.2
Manganese	mg/l	3.63
Total Organic Carbon	mg/l	1,180
Alkalinity	mg CaCO3/l	9,283
Nitrate-Nitrogen	mg/l	5
Phenolic	mg/l	21.1
Arsenic, total	µg/l	1,000
Cadmium, total	µg/l	7.9
Copper, total	µg/l	200
Lead, total	µg/l	200
Mercury, total	µg/l	2
Nickel, total	µg/l	350
Silver, total	µg/l	100
Vanadium, total	µg/l	200
Zinc, total	µg/l	292
Acetone	µg/l	14,600
Total Suspended Solids	mg/l	380
Iron, dissolved	mg/l	4.67
a-Terpineol	mg/l	0.005

Analyte	Units	Design Influent
Benzoic Acid	mg/l	0.2
p-Cresol	mg/l	0.0029
Phenol	mg/l	0.2
Fecal Coliform	colonies/100 mg	3,130
Uranium	µg/l	20
Gross Alpha	pCi/l	30
Beta, total	pCi/l	489
Radium 226/228	pCi/l	6.7
Total Petroleum Hydrocarbons	mg/l	100
Chromium, Hexavalent	µg/l	1,000
Cyanide	µg/l	800
Toluene	mg/l	21

A copy of the December 14, 2018 letter report submitted to the PADEP, which includes a summary of the untreated leachate analysis for NPDES and Form 50 parameters, is included as an attachment to the end of this report. Preliminary effluent limits provided by PA DEP are also included.

2.0 DETAILED DESCRIPTION OF WASTEWATER TREATMENT SYSTEM

2.1 Treatment Narrative

KSL landfill is a privately owned municipal solid waste landfill located in Dunmore and Throop Boroughs, Lackawanna County, Pennsylvania (see Figure 1) and operates under Solid Waste Disposal Permit No. 101247 to receive municipal, commercial, residual, construction/demolition, and special handling wastes. The majority of the waste accepted at the landfill is classified as municipal solid waste. No hazardous wastes are disposed at KSL.

KSL has installed an RO treatment system supplied Rochem to treat leachate prior to discharge. Similar RO equipment has been successfully demonstrated at the Commonwealth Environmental Systems Landfill. Phase I consists of an RO system with a design average capacity of 90,000 gallons per day (100,000 gpd maximum), and a Phase II consists of additional RO equipment with a design average capacity of 90,000 gpd (100,000 gpd maximum). The total capacity for both phases will be 180,000 gpd (200,000 gpd maximum). The RO equipment replaces the MetPro reactors in the original leachate treatment building and supplements the MBBR process.

Leachate is collected from the landfill and conveyed to two existing lined leachate lagoons. From the lagoons, the leachate is pumped via duplex, variable speed, self-priming centrifugal pumps through duplex influent strainers and an oil/water separator to the 8,500-gallon, HDPE raw water / pH adjustment tank. Sulfuric acid is added in the pH adjustment tank to bring the leachate pH to within the design range of approximately 5.8 to 6.3 S.U.

After pH adjustment, leachate is pumped through sand filters and cartridge filters. The sand and cartridge filters remove larger solids that could hamper the performance of the RO membranes. The sand filters remove 10-15 μ (nominal) solids, while the cartridge

filter removes solids down to 10 μ (nominal). The skid of filters is shown on the proposed plant layout drawing provided in Attachment C – Figure 4.

After multimedia filtration, cartridge filtration, and pH adjustment, antiscalant is fed into the first stage of RO treatment (RO1). Two parallel high pressure plunger pumps convey pretreated leachate into the first stage of membrane treatment. Leachate passes through the first stage RO1 containing fifty-five (55) modules. Multistage centrifugal pumps recirculate feed water back through the membranes to maintain adequate velocity across the membranes and minimize fouling. Concentrate comprised of the salts and solids rejected by the membranes generated from RO1 is discharged from the system to the third stage (R03) for further processing. Concentrate is disposed of on the landfill working face.

The operating pressure in RO1 is approximately 600 to 1000 psi. The pressure forces clean permeate through the membranes and the leachate proceeds through the modules. RO1 permeate is sent to RO2, containing twenty (20) modules, by a set of two parallel plunger pumps. RO2 permeate is discharged to the air stripper / final pH adjustment tank. RO2 concentrate is returned to the RO1 modules.

RO3 reduces the quantity of concentrate generated by the process by operating at a higher pressure (1800 psi) to produce more permeate and reduce the amount of reject. RO3 is designed to have twenty (20) RO modules. RO3 is essentially a batch process. Concentrate is received in Tank B7001, pumped through the high pressure stage, and discharged to Tank B7002. Permeate from RO3 is returned to the RO2 feed for treatment. Concentrate in Tank B7002 is returned to Tank B7001 (RO3 influent) for reprocessing. As the TDS accumulates in the RO3 train, it is periodically removed from Tank B7002 and pumped to the existing LTP sludge tank. From there it is applied to the landfill working face prior to placement of daily cover. RO3 cleaning waste is discharged to the building sump for retreatment.

RO2 permeate is discharged to the air stripping unit (degassifier, for removal of dissolved carbon dioxide and associated pH increase) and final pH adjustment tank. The unit is a 1,200 gallon storage tank with an air stripping column mounted on top. The degassifier removes dissolved carbon dioxide and volatile organic compounds present in RO2 permeate. The pH of second stage permeate is expected to be approximately five (5) before the degassifier and will be greater than six (6) after the unit. pH adjustment may occur if needed in the air stripper tank to ensure that the effluent pH falls within the acceptable range for discharge (6.0 - 9.0). After final pH adjustment, the treated effluent will be discharged to Eddy Creek, or pumped to the water storage tank before discharge to Little Roaring Brook or used for dust control or for plant make-up water. Effluent is sent to the PAWC Scranton wastewater treatment plant under the existing agreement. Note that MBBR effluent may be polished on the RO units following proper pretreatment including polymer deactivation.

2.2 Treatment System Size, Capacity, and Dimensions

Each phase of the treatment system is designed to handle an average daily flow of 90,000 gpd, with a total average capacity of 180,000 gpd and a maximum flow of 200,000 gpd. Leachate storage and plant capacity is designed to accommodate wet weather flows and provide time for membrane cleaning and plant maintenance, during which time leachate will be stored.

The two existing influent lagoons each have a capacity of 4,875,000 gallons. Figure 4 is a plan view layout that shows the dimensions of the proposed equipment involved including: Phase I and II of the RO1, RO2, and RO3 modules, as well as footprints of the tanks and other major equipment. Plant layout is shown in Attachment C, Figure 4. All treatment equipment fits into the existing treatment plant building. Unit dimensions are shown in the attached equipment plans in Attachment D.

2.3 Supplemental Chemical Use

2.3.1 Process Chemicals

Sulfuric acid is added to the raw water / pH adjustment tank to lower the pH to the range of 5.8 to 6.3 before RO treatment. The storage tanks are double-walled. Sodium hydroxide is used for pH adjustment and neutralization. All chemicals will be fed into the process at their design flow rate by diaphragm metering pumps. Chemical feed lines will be encased in carrier pipes from the feed pump to the point of use.

2.3.2 RO Chemicals

RO membranes foul over time and require periodic cleaning to accumulated growth and scaling. All RO stages will have differential pressure measured and logged across the membranes. A differential pressure reading of 60 psi or higher will automatically trigger unit shutdown and alert the operator of the need for membrane cleaning. Cleaning fluids typically include acid to remove scaling and caustic to remove biofouling. Two (2) 250 gallon totes per phase are supplied with the Rochem equipment for storage of membrane cleaners. Vertical drum pumps convey the cleaners out of the totes and into 50-gallon cleaning tank on the RO skids. On the skids, the cleaning fluids are mixed with water before being pumped through the membranes. Permeate is used for cleaning makeup water. Cleaning waste is discharged from the RO units to the building sump and pumped back to the storage lagoons for treatment. SDS sheets for each of these cleaners are provided in the Form L / PPC Plan in Attachment E.

The RO skid includes a 25 gallon antiscalant storage tank and feed pump. Antiscalant fed into the RO influent line inhibits irreversible scaling on the membrane from materials such as strontium and silica that are present in the leachate. A biocide is used to disinfect and preserve the integrity of the RO membranes during a period of inactivity.

2.4 Pumping Equipment

The existing pumping equipment from the landfill to the lagoons will not change. Two influent pumps convey leachate from the lagoons into the treatment plant. The influent pumps are Grundfos, Model CRN15-1, variable speed, cast iron self-priming pumps. The units are mounted on a steel base with coupling and guard and are powered by a 2 horse power (hp) motor. The pumps are designed to pump 62.5 gallons per minute (gpm). A Hayward duplex basket strainer is installed on a common suction pipe from the tanks to the pair of pumps to prevent trash or other large solids from entering the pump. Duplex pumps are provided for redundancy and operational flexibility.

Vertical centrifugal pumps are utilized for a variety of applications, including: conveying leachate to the filtration skid; conveying filtered leachate from the pH adjustment tank to the RO1 skid; recirculating leachate within the modules of RO1, RO2 and RO3; conveying concentrate out of RO1, RO2 and RO3; and conveying the cleaning mixture to RO1, RO2 modules and RO3. High pressure plunger pumps are used for each stage of RO treatment to force the leachate into the membranes at a high pressure. A complete list of pumps for the RO system is included in Attachment D2 - Pump Schedule.

Plant effluent will be discharged to Outfall 001 (Eddy Creek), Outfall 002 (Little Roaring Brook) or effluent storage prior to beneficial use using the existing effluent pumps. Effluent is currently discharged to the PAWC Scranton wastewater treatment plant. Permeate is used for process water in the plant and cleaning purposes in the RO skid. A pump is provided for mixing within the tank and conveying the permeate to the cleaning tanks.

As stated in Section 2.3.1, acid will be added to the process for pH adjustment. Sulfuric acid will be pumped from the storage tank to the pH adjustment tank via duplex diaphragm metering pumps. Antiscalant used for the RO membranes will also be pumped into the process via diaphragm metering pumps. The cleaning fluids will be pumped from their

storage containers to the cleaning fluid mix tank on the RO skid by using vertical drum pumps.

2.5 Monitoring and Control Equipment

2.5.1 Level

The influent pumps are variable speed and controlled by the operator based on the flow being processed through the plant. The pretreatment effluent pump is controlled by levels in the pH adjustment tank. When the RO is operating, leachate is pumped from the pH adjustment tank into RO1. When levels in the pH adjustment tank drop, the level switch activates the pretreatment effluent pump. In the pH adjustment tank, low level switches shut off the RO feed, and high levels signal an alarm.

Levels switches are used in the RO2 permeate tank to control pumping to beneficial use storage, stream discharge or the PAWC Scranton wastewater treatment plant. High levels switches with alarms are provided in all leachate and concentrate storage tanks.

2.5.2 pH

pH is monitored and adjusted in the pH adjustment tank. pH is continually monitored with a sensor and transmitter and the chemicals are dosed into the tank at the appropriate level based on current pH readings. pH is measured throughout the RO process without adjustment capabilities.

2.5.3 Pressure

There are several elements of the treatment process that require constant pressure monitoring. The first one is the three sand filters in parallel. Pressures on the inlet and outlet side of the filters are monitored and a transmitter sends the pressure differential signal to the plant PLC. There is a set-point of allowable pressure differential, and if this

differential is exceeded, the filter surface is backwashed automatically. The operator can also initiate an air scour of the filter surface once an alarm has shown that the pressure differential threshold has been exceeded. The cartridge filters have a similar system of pressure monitoring with an alarm that prompts the operator to remove and replace the filter cartridge if the allowable pressure differential is exceeded. Lastly, the RO membranes in both stages of RO treatment require pressure monitoring. Similar to the process for the filters, membrane fouling is indicated by an increase in differential pressure across the membrane modules. Pressure is monitored continually and a cleaning cycle of the membranes is started automatically if differential pressure exceeds the allowable threshold across any of the membranes.

2.5.4 Other

The RO process uses conductivity to measure membrane performance. Conductivity provides a measure of the TDS present in the liquid being processed. Conductivity is measured at several key points in the process. If effluent conductivity goes beyond the design level, the unit will shut down and an alarm will sound.

Operational data is measured by the process equipment and recorded by the plant operators. Many parameters are monitored, but only the following will be recorded: influent flow, effluent flow, concentrate flow, influent pH, and effluent pH. Ultimately, effluent quality is monitored by sample collection and laboratory analysis to ensure compliance with NPDES limits prior to discharge, and reported on the discharge monitoring report.

2.6 Handling of By-products

The RO equipment produces the following byproducts: sand filter backwash, sludge (from pretreatment and tanks), RO concentrate, and cleaning waste from the RO units.

The sand filter is backwashed using an air scour from the blower provided and process water. The cartridge filter has replaceable cartridges. The pH adjustment tank is mixed

with a recirculation pump to prevent solids deposition and control foaming. However, the tank will require periodic cleaning and solids removal.

The sand filter backwash and RO cleaning waste is conveyed to the building sump and pumped to the influent lagoons for treatment.

Concentrate generated from the first stage of RO treatment is stored in the existing LTP sludge tank before being hauled to the working face for disposal. Approximately 10% of the feed flow is rejected (18,000 gpd). RO1 concentrate is fed to RO3. RO2 concentrate is returned to the RO1 feed. RO3 permeate is discharged to RO2, and the RO3 concentrate is sent to the storage tanks before application on the working face.

Sludge from the existing plant and the RO process is landfilled as currently practiced. Excess sludge and RO concentrate may be hauled to offsite disposal if required.

Operational Flexibility and Reliability of Treatment System

2.7 Alarms and Sensing Devices

Influent, effluent, storage and process tanks have level sensing devices with low level, high level, and alarm level alarms. The alarms are designed to notify the operator of high levels that require immediate attention.

There are several pH and pressure sensing devices intrinsic to the RO equipment. Pressure sensing transmitters trigger an alarm when a differential pressure set-point has been exceeded to indicate the need to either backwash the sand filter, replace the cartridge filter's cartridge, or to shutdown the unit for RO membrane cleaning. The pH sensors control the chemical dosing rate in the pretreatment system as well as the initial and final pH adjustment tanks in the RO system.

The Rochem system is highly instrumented both for safety and effluent quality. The system is based on an Allen-Bradley PLC to monitor and control pumps and valves necessary for fail-safe operation of the system. All of the control points are operator settable to ensure the effluent meets the discharge limits. Depending on the nature of the exceedance, either the effluent will be recirculated to the system or the system will be stopped and an alarm will call for operator attention.

The influent to the system is monitored for pH, temperature and conductivity to monitor feed water quality.

The pretreated influent is pressurized to 450 to 850 psi depending on the temperature and Total Dissolved Solids (TDS) of the influent to RO1. RO1 instrumentation includes monitoring for pressure, flow, temperature and conductivity. If any of these parameters fall outside of the controlled range, the system shuts down to ensure system safety and effluent quality. RO2 and RO3 will be monitored for temperature, pressure, flow and conductivity. If any of these parameters are outside of the expected range, the system shuts down to prevent discharge of untreated effluent.

RO2 permeate discharged from the air stripper is monitored for pH, flow and conductivity. If any of these parameters indicate the effluent does not meet the discharge limits, permeate is either recycled back to the inlet of the system or the system is shut down with an alarm calling for operator attention. Effluent not meeting the discharge limits of the system will not be discharged.

The table on the following page is a partial list of alarm conditions that shut down the system to prevent discharge of effluent not meeting the discharge limits.

Table 2
Alarm Conditions

Instrument	Type	Description
YIRCA+- 9003	pH	Effluent pH High or Low
NIRCA+ 9003	Conductivity	Effluent Conductivity High
FQIR 9003	Flow	Effluent Flow High
TIR 9003	Temperature	Effluent Temperature High or Low
YIRCA+ 2001	pH	Influent pH High
2NIRCZA+ 8001	Conductivity	Second Stage Permeate Conductivity High
2PSZA+ 8001	Pressure	Second Stage Permeate Pressure High
2FIRC 8001	Flow	Second Stage Flow High
2TI 8001	Temperature	Second Stage Permeate Temperature High
21PIRCZA++ 6001	Pressure	Second Stage Influent Pressure High
1NIRCZA+ 8001	Conductivity	First Stage Permeate Conductivity High
1FIRC 8001	Flow	First Stage Permeate Flow High
1PSZA+ 8001	Pressure	First Stage Permeate Pressure High
11PIRCZA++ 6001	Pressure	First Stage Permeate Pressure High
1TIRZA+ 4101	Temperature	First Stage Influent Temperature High
1YIR 4101	pH	First Stage Influent pH High or Low
YIRCA+ 2001	pH	Influent pH High

2.8 System Management when Inoperative

The upgraded leachate treatment plant is designed to be run 24 hours per day. Shutdowns and interruptions in operation occur periodically and for various reasons. Minor shutdowns stop plant flow from the pH adjustment tank and alert the operator to take corrective action. High water level in the pH adjustment tank signals the pretreatment equipment to stop transferring leachate and the RO units to stop pumping leachate from the lagoons. Longer term shutdowns trigger a cleaning rinse of the RO membranes to prevent fouling.

If there is an equipment malfunction or interruption in the ability to treat leachate, the site has over 33 days of influent storage based on the MBBR design flow of 150,000 gpd, and the RO design flow of 180,000 gpd. If an extended interruption in service were to occur, the RO membranes would be filled with a disinfectant/biocide to protect the integrity of the

membranes until operational. A SDS sheet of Rocide is provided in the Form L / PPC Plan in Appendix

When the MBBR system is utilized as a back-up treatment system the effluent will be exclusively conveyed to the PAWC until the RO is back online achieving permitted stream quality effluent.

2.9 Containment

There are no significant changes to containment measures proposed as part of the treatment plant upgrades. The influent lagoons have secondary containment provided, and the treatment equipment is located inside of the treatment plant building provides containment. Containment will be provided for chemical tanks.

The site has updated their PPC Plan to address potential spills or other issues with the upgraded plant. A copy of the PPC Plan is included at Attachment E of this application.

2.10 Personnel Training

All plant personnel undergo training from the equipment supplier on the newly installed equipment prior to being responsible for its operation. Start up assistance and on-call services are provided.

2.11 Site Security

No changes are required for security within the site.

3.0 EROSION CONTROL AND STREAM ENCROACHMENT

3.1 Erosion Control

The RO equipment is located inside the existing treatment plant building. The project involves minimal outdoor work that would affect erosion control. Force main construction for conveying treated effluent to the water storage tank or the discharge points represents the extent of the earth disturbance that will take place over the course of the project (see Attachment C, Figure 3). Existing landfill E&S measures will be used to control erosion and sedimentation during construction. Once the force main is constructed and the trench is backfilled, the disturbed area will be stabilized with vegetation in off-road areas and stone in roadways.

3.2 Stream Discharge

Several alternatives are proposed for treated effluent from the KSL LTP. Beneficial use of treated effluent for building utility water and dust control is proposed. The discharge to the PAWC Scranton wastewater treatment plant remains. Stream discharge of effluent to Eddy Creek and Little Roaring Brook under the auspices of an NPDES permit is proposed.

Water trucks will be used for dust control applications. Effluent will be pumped to Outfall 001 and Outfall 002 as required. The outfalls will be comprised of the discharge pipe and rip rap to Eddy Creek (Outfall 001) and Little Roaring Brook (Outfall 002).

ATTACHMENT 1

DECEMBER 14, 2018 LETTER REPORT TO PA DEP

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December 14, 2018

Ms. Amy Bellanca, P.E.
Environmental Engineer Manager
Pennsylvania Department of Environmental Protection
Clean Water Program
Northeast Regional Office
2 Public Square
Wilkes-Barre, PA 18701

RE: Leachate Treatment Plant Data Comparison
Keystone Sanitary Landfill
EARTHRES Project No. 091018.064

Dear Ms. Bellanca:

On behalf of Keystone Sanitary Landfill, Inc. (Keystone), Earthres Group, Inc. (EARTHRES) is pleased to submit the data comparison for the proposed discharge and beneficial use of treated effluent from Keystone's leachate treatment plant (LTP) located in Dunmore, PA. The data comparison was requested by the Department (PA DEP) during our August 14, 2018 pre-application meeting.

PA DEP requested comparison of leachate data from Keystone and Commonwealth Environmental Systems (CES) Landfill in order to evaluate the preliminary effluent limits for the Keystone plant. The initial preliminary effluent limits for discharge to Eddy Creek were provided by the Department based on and EPA effluent guideline limits in 40 CFR Part 455. In addition, PA DEP wanted to evaluate EPA and water quality-based limits for other parameters for a discharge to Little Roaring Brook. PA DEP requested comparison to CES limits since similar treatment technology is proposed.

As part of this analysis, EARTHRES compiled and compared the following data (copies attached):

- Table 1 - Keystone untreated leachate analysis for NPDES and Form 50 parameters
- Table 2 - Keystone and CES untreated leachate analysis for NPDES parameters
- Table 3 - CES treated leachate analysis for NPDES parameters

Due to the sampling frequency, there are a greater number of Form 50 analyses than the NPDES analyses, but for fewer parameters. The Form 50's show leachate quality over four quarters.

The sample results for Keystone can be summarized as follows:

- Wet chemistry parameters are within the range observed at municipal solid waste landfills
- Low and Not Detected levels for Pollutant Groups III, IV, V and VI
- Pollutant Group VII was not analyzed at Keystone

Comparison of the Keystone and CES data can be summarized as follows:

- Comparable levels of wet chemistry parameters including pH, BOD5, TDS and NH3-N
- Differing levels of TSS, SO4 and iron
- Low and Not Detected levels for Pollutant Groups III, IV, V and VI
- Pollutant Group VII was analyzed at CES, but no effluent limits are included in the NPDES permit

A review of the CES data shows effective pollutant removal using the Rochem reverse osmosis process that is comparable to the Keystone plant. It is our opinion that comparable removal efficiencies can be used in the evaluation of the Keystone discharge. Based on this review, the Keystone Rochem equipment should be capable of meeting the preliminary effluent limits provided by PA DEP.

During the pre-application meeting, discussions were held regarding the sanitary connections to the leachate collection and treatment system. Currently, Keystone has diverted the sanitary waste from the administration and truck wash buildings from the leachate lagoon and treatment system to the public sewer.

With the submission of this data, Keystone requests the final effluent limits for the proposed treated leachate discharge to Little Roaring Brook and Eddy Creek for evaluation. The final limits will allow the treatment equipment to be tested and adjusted as required to demonstrate compliance. It will also allow Keystone to complete and submit the permit applications required for the beneficial use of treated effluent. We look forward to working with the Department to obtain the required permits. Please call me with any questions.

Sincerely,
Earthres Group, Inc.

Thomas G. Pullar, P.E.
Senior Project Manager

Enclosures: As stated

cc: Dominick DeNaples, Jr., Keystone