Maricopa County
Air Quality Department

NON-TITLE V
TECHNICAL SUPPORT DOCUMENT

PERMIT NUMBER:	150120	**App. ID(s):**	409698
BUSINESS NAME:	Ninety-First Avenue Renewable Biogas LLC	**Revision(s):**	0.0.0.0
SOURCE TYPE:	Biogas Production	**Revision Type(s):**	New Permit
PERMIT ENGINEER:	Sara Seuberling	**Date Prepared:**	10/19/2016

BACT: No **MACT:** No **NSPS:** No **SYNTH MINOR:** Yes **AIRS:** Yes
DUST PLAN REQUIRED: No **DUST PLAN RECEIVED:** No
O&M PLAN REQUIRED: Yes **O&M PLAN RECEIVED:** Yes
PORTABLE SOURCE: No **SITE VISIT: Waived**

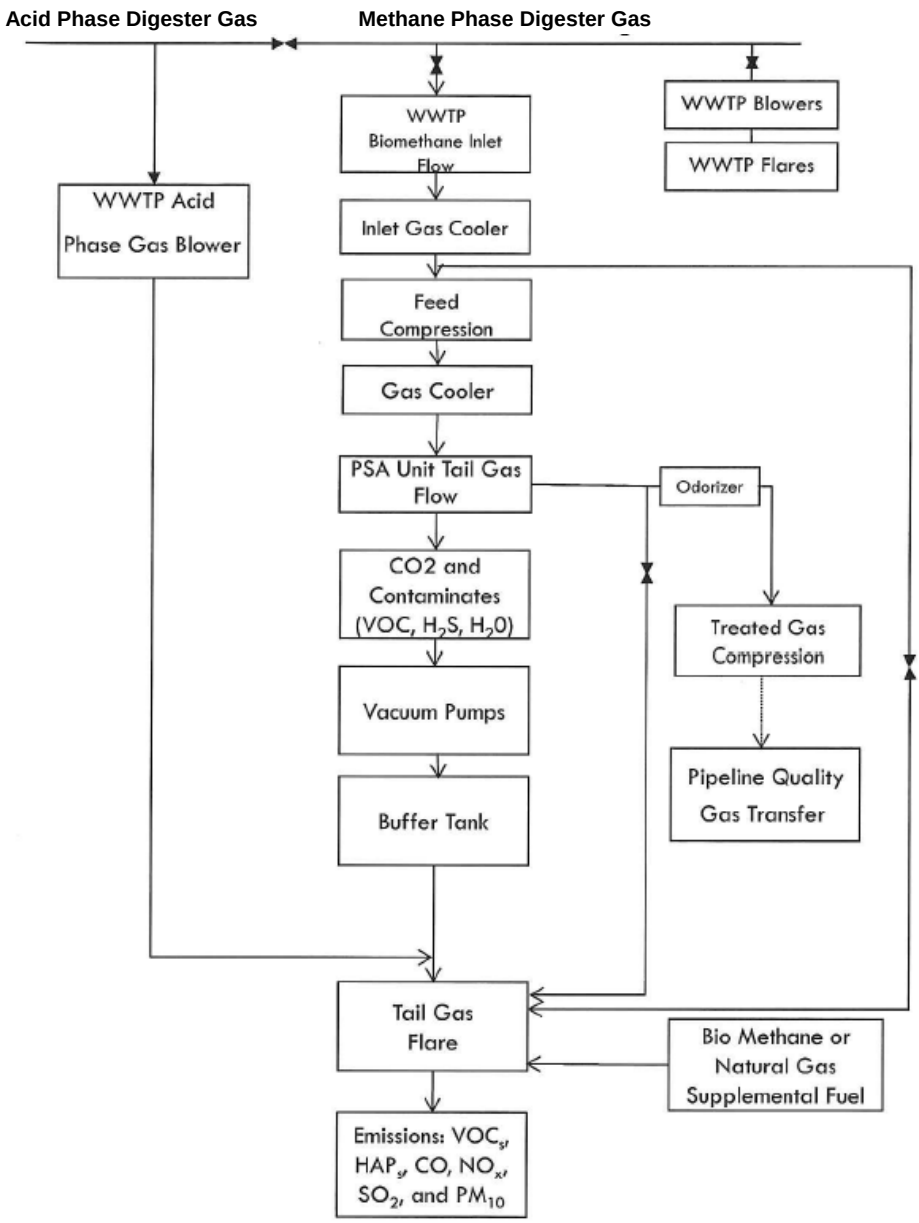
PROCESS DESCRIPTION:
A biomethane plant is proposed to be built to treat the excess digester gas from the 91st Avenue Wastewater Treatment Plant (WWTP) and convert it to biomethane gas, which will be compressed and transported through a pipeline to the El Paso Natural Gas interstate gas transmission pipeline located 2.5 miles west of the WWTP. The proposed plant will use a Pressure Swing Adsorption (PSA) process to condense and remove contaminants from the biogas such as carbon dioxide (CO_2), hydrogen sulfide (H_2S) and water. Waste gas from the PSA process will be sent to a tailgas flare for destruction while condensed liquids will be piped to the WWTP headwaters and treated as regular influent. Emissions from the flare include carbon monoxide (CO), nitrogen oxides (NOx), sulfur oxides (SO_X), volatile organic compounds (VOC), particulate matter (PM), and hazardous air pollutants (HAPs). Emissions from the PSA process (primarily VOC and sulfur compounds), are assumed to be negligible since it is a closed-loop system. The tailgas flare will combust the waste stream, consisting of PSA tail gas, PSA depress gas (during startup) and WWTP acid phase digester gas along with any supplemental fuel needed to startup and maintain the tailgas flare operating temperature. Since the energy content of the tail gas is not sufficient to keep the flare operating temperature above 1400°F, about 1 MMBtu/hr of either biogas or natural gas will be used as supplemental fuel. If the temperature of the flare is less than 1400°F, emissions of VOC and CO might increase due to incomplete combustion.

The PSA Unit is designed to treat up to 4.32 million standard cubic feet per day (MMscf/d) of digester gas and produce 2.57MMscf/d of pipeline quality gas. The operating principal of the system is the relative capacity to adsorb biogas contaminants such as CO_2, water, siloxanes and H_2S at high pressure and the subsequent ability to release these contaminants at low pressure. The PSA unit consists of the following major components:

- Adsorber vessels
- Valve and piping skid containing the valves and instrumentation to automatically sequence the PSA system
- Vacuum pumps
- Buffer tanks to minimize fluctuations in gas composition, flow rate, and pressure.
- Programmable logic controller (PLC) which receives and transmits signals to keep the system properly functioning by maintaining minimum inlet pressures and monitoring all critical system parameters such as lubrication oil pressure, safety switches and temperatures. The PLC will discontinue flow of the biomethane when the operational conditions are outside of accepted normal ranges.

If the biogas plant successfully processes excess digester gas from the WWTP, most emissions will decrease from current levels since less digester gas will need to be flared. SO_X emissions will remain the same regardless of whether the biogas plant operates since essentially all sulfur compounds in the digester gas generated at the WWTP will still be flared.

DRAFT



PERMIT HISTORY:

Date Received	Revision Number	Description
10/15/2015	0.0.0.0	Submitted application for new permit to process digester gas from the 91st Avenue WWTP (Permit #970580) into pipeline quality gas.

PURPOSE FOR APPLICATION:
New Permit

A. APPLICABLE COUNTY REGULATIONS:

Rule 100: General Provisions and Definitions
Rule 200: Permit Requirements
Rule 220: Non-Title V Permit Provisions
Rule 280: Fees: Table A (Non-major Title V Source)
Rule 300: Visible Emissions
Rule 310: Fugitive Dust Sources

Rule 320: Odors and Gaseous Air Contaminants

SIP Rule 32 (Odors and Gaseous Emissions): In addition to material containment and H_2S requirements mirrored in Rule 320, SIP Rule 32.F also limits the ambient air concentration of SO_2 to the limits shown in Section G (SO_2 Emission Impacts) of this TSD.

Rule 241:
The biogas plant, if considered a new stand-alone source, exceeds the BACT threshold for SO_2 emissions (25 tons/yr). For this operation, the WWTP achieves BACT upstream of the biogas plant by reducing the H_2S content of the digester gas. The WWTP adds ferric chloride to the influent wastewater stream to reduce the concentration of free sulfur in the wastewater, which in turn reduces the concentration of H_2S in the digester gas. Since nearly all sulfur is converted to SO_2 when it is burned, reducing the amount of sulfur entering the digester gas also reduces the emission of SO_2 when the digester gas is burned. According to a calculation sheet submitted by the WWTP in 1998, the concentration of H_2S in digester gas generated at the plant was reduced from 1989 ppm to 700 ppm when influent wastewater was treated with ferric chloride. The average average sulfur content of digester gas generated at the WWTP in 2012 was 735 ppmv.

The remaining emissions from the tail gas flare alone are all less than the BACT thresholds in Rule 241 §304, regardless of whether the biogas plant is considered a new stationary source or a modification to the WWTP. Overall emissions of all criteria pollutants are expected to decrease if the biogas plant is operational except for VOC. Conservative sssumptions made by the applicant indicate that VOC emissions from the biogas plant might increase facility-wide emissions by about 7.5 tons/yr. Since the fate of essentially all VOC contained in the biogas is incineration in a flare or boiler, actual VOC emissions are expected to remain the same unless the tailgas flare is less effective at destroying VOC than the WWTP flares.

A NAAQS compliance assessment is not necessary since the biogas plant will not interfere with attainment or maintenance of a NAAQS. The flare is of the same size and dimensions as the existing WWTP flares and is located in the same general viscinity so air impacts will remain the same or decrease since actual emissions will decrease if the biogas plant successfully operations. VOC emissions might increase based on the applicants assumptions but it is not likely and VOCs are a precursor to ozone rather than a primary pollutant requiring modeling.

B. APPLICABLE FEDERAL REGULATIONS:

This facility is not currently subject to any Federal air quality regulations.

NON-APPLICABLE REGULATIONS
40 CFR 63 Subpart HH (National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities) does not apply to this facility since digester gas is not found in geologic formations beneath the earth's surface and therefore does not meet the definition of natural gas found in 40 CFR 63.761.

40 CFR 63 Subpart HHH (National Emission Standards for Hazardous Air Pollutants From Natural Gas Transmission and Storage Facilities) does not apply to this facility since digester gas is not found in geologic formations beneath the earth's surface and therefore does not meet the definition of natural gas found in 40 CFR 63.1271.

Although neither natural gas nor field gas is defined in 40 CFR 60 Subpart OOOO (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution) it is assumed that natural gas has the same meaning as in 40 CFR 63 Subparts HH and HHH and NSPS Subpart LLL. Since digester gas is not found in geologic formations beneath the earth's surface (40 CFR 63.761, 63.1271, 60.641), it is surmised that NSPS OOOO does not apply to this facility.

Acid Rain regulations covered by 40 CFR Parts 72-78 do not apply to this facility, per 40 CFR 72.6(b)(8) and 72.2 (definition of utility), since the processing unit is not used to generate and sell electricity.

Greenhouse Gas Reporting: Although the proposed facility combusts fuel and is processing gas for the natural gas pipeline, 40 CFR 98 (Mandatory Greenhouse Gas Reporting) does not apply to this facility since flares are exempt from the general stationary fuel combustion source category under 98.3(b)(4), and biogas does not meet the definition of natural gas, per 40 CFR 98.238.

DRAFT

C. SYNTHETIC MINOR STATUS DISCUSSION:

The WWTP uses a multiphase digestion process, which produces a separate acid phase and a methane phase gas stream (see table below). Calculations for SO_2 emissions from digester gas combustion assume that the gas from the acid phase continues to be 4.7% of the total digester gas generated at the WWTP while methane phase gas makes up the remaining 95.3%. Assuming all sulfur compounds are converted to SO_2 and peak sulfur concentrations can occur for prolonged periods throughout the year, the following calculations show that the plant is a synthetic minor source for SO_X emissions from digester gas combustion alone. The proposed biogas permit and existing WWTP permits require weekly sulfur monitoring for all gas streams entering a flare or boiler, enforceable gas throughput limits and submittal of semi-annual SO_X emission reports to ensure that the Title V threshold for SO_X is not exceeded for the WWTP and biogas plant.

2012 Digester Gas Make-up for the 91st Ave. WWTP (as reported in Permit #150120 application)

	2012 Average flow	Gas stream fraction	Average Sulfur content	Peak Sulfur Content	Methane content
Acid Phase	99 scfm	4.7%	11,536 ppmv	20,600 ppmv	15%
Methane phase	2,025 scfm	95.3%	207 ppmv	631 ppmv	61%
Combined stream	**2,124 scfm**	**100%**	**735 ppmv**	**1,562 ppmv**	**59%**

<u>SO_X Emissions from the Combustion of Digester/Waste Gas Sulfur Compounds</u>

Note: The following equation only accounts for SO_X emissions from burning sulfur in digester gas generated at the WWTP. Additional SO_X emissions are released from emergency generators and sodium bisulfite tank filling operations at the WWTP. These additional emission sources are accounted for in Permit #970580 and are included in the combined SO_X limit of 182,000 lbs/yr for both facilities.

$$SO_X \text{ (as } SO_2) = \frac{(H_2S) \times (V_{DG}) \times (64 \text{ kg/kg-mol}) \times (AF)}{(849.5 \text{ scf/kg-mol}) \times (0.454 \text{ kg/lb})}$$

Where:

SOx emissions are in terms of lbs per year
H_2S is the volume concentration (ppmv) of hydrogen sulfide in the digester gas.
V_{DG} is the total volume of digester gas (MMscf) produced at the WWTP per year adjusted to 68°F, 14.7 psia.
64 kg/kg-mol is the molecular mass of SO_2.
849.5 scf/kg-mol is the molar volume of an ideal gas at 68°F and 14.7 psia.
AF is an adjustment factor to convert H2S to total sulfur compounds.

Note: For the equations below, concentrations (ppmv) are for all sulfur compounds so an adjustment factor is not necessary.

SO_2 (peak) = (1562 ppmv)(1400 MMscf/yr)(64)/(849.5*0.454) = 362,886 lbs/yr = **184.4 tpy**
SO_2 (average) = (735 ppmv)(1400 MMscf/yr)(64)/(849.5*0.454) = 170,756 lbs/yr = **85.4 tpy**

D. AIR POLLUTION CONTROL EQUIPMENT/EMISSION CONTROL SYSTEM(s):

A tail gas flare will be used to incinerate digester gas from the acid phase digesters and gas-phase contaminants from the PSA system. The flare controls methane and regulated air pollutants such as VOC, CO, volatile HAPs, and H_2S contained in the waste gas. An O&M Plan was submitted with the application and is pending approval.

E. EMISSIONS:

UNCONTROLLED EMISSIONS (TAIL GAS AND ACID PHASE GAS WITHOUT FLARE)*

VOC	812,413 lbs/yr
H2S	83,000 lbs/yr
Total HAPs	515 lbs/yr
Carbonyl Sulfide	104 lbs/yr
Hexane	57 lbs/yr
Toluene	79 lbs/yr

DRAFT

Xylenes	274 lbs/yr

*Assumes Products of combustion (CO, NO_X, PM_{10}, $PM_{2.5}$, and SO_X) are created during combustion rather than being present in waste gas.

FACILITY WIDE ALLOWABLE EMISSIONS

Pollutants	Tail Gas Flare (lbs/yr)	Annual Allowable Limit
CO	22,354	23,000 lbs
NO_X	6,706	7,000 lbs
PM_{10}	1,863	2,000 lbs
$PM_{2.5}$	1,863	2,000 lbs
VOC	16,248	16,300 lbs
SO_X*	166,650	182,000 lbs
Total HAPs	10	-
Carbonyl Sulfide	2	-
Hexane	1	-
Toluene	2	-
Xylenes	5	-

*Flare SO_X emissions assume 120 MMscf/yr is burned in the WWTP boilers and the remaining 1280 MMscf/yr is burned in the tail gas flare. Allowable SO_X limits include emissions from the WWTP.

F. HAP EMISSION IMPACTS:

Based on the information provided in the permit application, the facility emits insignificant amount of HAPs; therefore, SCREEN modeling was not performed per the Department's HAPs policy.

G. SO_2 EMISSION IMPACTS:

Aerscreen modeling was used to estimate the maximum concentration of SO_2 in the ambient air closest to the flares to verify compliance with the limits in SIP Rule 32.F. Aerscreen does not provide 72-hour concentrations but the value must fall somewhere between the 24 hour and annual modeled values (0.892 µg/m³ to 5.352 µg/m³). Conservatively sssuming the scaled 72-hour concentration is equal to the 24-hour maximum concentration, results indicate that the facility complies with all SIP Rule 32 limits for SO_2.

	Emissions	**Maximum Concentration (µg/m³)**			**SIP (µg/m³)**		
	lbs/hr	1 hour	24 hour	Annual	1 hour	24 hour	72 hour
SO_2	21	8.92	5.352	0.892	850	250	120

H. PERFORMANCE TESTING:

Performance testing is required for the tailgas flare to quantify NO_X, CO, VOC and PM10 emissions. Waste gas burned in the flare has a low methane content compared to other waste gasses, such as landfill and digester gas, so AP-42 factors might not be accurate for this operation. Testing also needs to show that emissions will not increase significantly compared to burning all digester gas at the WWTP since the WWTP exceeded the BACT threshold for NO_X emissions. Performance testing is not necessary for SO_2 emissions since they are based on a mass balance rather than performance standards.

I. REGULATORY REQUIREMENTS AND MONITORING:

Condition 1: This operation is co-located at the 91st Avenue WWTP so SO_X emissions are being shared with the WWTP to avoid exceeding the Title V threshold for SO_2. Separate limits are included for remaining criteria pollutants from the tail gas flare to ensure emissions do not increase in an amount that would trigger any applicable requirements when combined with emissions from the WWTP. Overall Emissions are not guaranteed to decrease even if less DG is flared if the tail gas flare emits significantly more than the existing WWTP flares.

Condition 2 contains a mass balance equation to calculate monthly emissions of SO_X (as SO_2). The level of sulfur compounds in digester gas is reduced by the WWTP by adding ferric chloride to the headwater. However, the effectiveness of this treatment is not known until approximately 28 days later when digester gas is produced from contaminants ininitially contained in the headwater. The sulfur content of digester gas varies significantly from

DRAFT

month to month based on various factors including the makeup of wastewater to the plant and atmospheric conditions. As such, simple limits on digester gas production and sulfur content are not realistic for the WWTP or biogas plant. The SO_2 equation allows the source and the Department to track SO_2 emissions and ensure that the Title V threshold is not exceeded.

Condition 3 requires semi-annual SO_X reporting. Emissions Inventory indicated that AIRS (ICIS-AIR) reporting is not necessary for this facility. Similar language appears in Permit #970580 for the WWTP to ensure that both facilities are held accountable for reporting SO_X emissions and the Title V threshold for SO_X is not exceeded.

Condition 4 - 10 are based primarily on a template for odor sources subject to Rule 320 and SIP Rule 32. If digester gas and waste gas from the PSA system are not contained and flared, odors from H_2S might increase outside of the property line.

Condition 4.a: The biogas plant is only allowed to process digester gas from the WWTP to keep the co-located facilties from exceeding the Title V threshold for SO_X.

Condition 4.b: The limit of 1400 MMscf/yr of digester gas processed corresponds to the limit on the amount of digester gas that can be produced by the WWTP. If the WWTP is not able to burn the digester gas in their flares or boilers, all of it can be directed to the biogas plant and tail gas flare.

Condition 4.e includes performance standards for the tail gas flare and are based on assumptions provided in the application (i.e.: 98% flare efficiency, 5000 ppmv VOC content for waste gas vented to tail gas flare)

Condition 9.a requires the Permittee to monitor the H_2S content of digester gas entering the tail gas flare so SO_2 emissions can be calculated in accordance with Condition 2. ASTM Method D5504-01 is accurate up to 1,000 mg/m^3 so it is not appropriate for this facility, which has an average sulfur content in excess of 14,000 mg/m^3. This Condition allows for a spectrometer to be used as the primary method of monitoring H_2S and Dräger tubes as a back-up. If the Dräger tubes are used for more than 7 days, the facility must verify the accuracy of that method compared to Method 16B on a weekly basis. Since the Dräger tubes only measure H_2S while Method 16B measures total reduced sulfur compounds, a value of 7% was chosen for accuracy, equivalent to 5% plus an adjustment factor of 2%, to account for reduced sulfur compounds other than H_2S. SO_2 in digester gas is about 0.1% – 0.2% of total sulfur compounds so it is assumed to be negligible for daily monitoring purposes.

Condition 9.b allows the facility to reduce daily monitoring requirements to once weekly if it is demonstrated that H_2S levels do not vary significantly between tests.

Condition 9.c requires the facility to speciate the sulfur compounds in waste gas annually and update the adjustment factor used in Condition 2 (total sulfur compounds / H2S) accordingly.

Condition 11 requires performance testing of the flare to verify emission factors and assumptions used to calculate tail gas flare emissions.

Conditions 12 – 21 are based on a template for fugitive dust sources subject to Rule 310. Requirements for operations not conducted at this facility were removed from the permit conditions. This facility does not require a dust control plan as long as the disturbed land area does not exceed 0.1 acre. Per the City's request, this facility will not be covered under Block Permit E142873 approved 12/19/14 that was issued to the City of Phoenix Water Services Department.

APPENDIX

150120 Emission Calculations.xlsx

SO2 Modeling.txt

DRAFT

Biogas Plant Emissions

This worksheet compares facility-wide (WWTP and biogas plant) emissions from digester gas (DG) combustion with and without the biogas plant to assess the overall impact of diverting excess DG from WWTP flares to the biogas plant. The biogas plant will not affect the WWTP boiler usage of DG.

Constants:

1020	BTU/scf natural gas
0.6	lbs SOx per MMscf natural gas (AP-42 Chapter 1.4: Natural Gas Combustion)
97%	Assumed methane content of natural gas (NG). Remainder assumed to be inert.
8760	annual hours of operation
1400	MMscf/yr allowable DG combustion limit for biogas plant and WWTP
1	MMBtu/hr supplemental biogas or NG is needed for proper operation of the tail gas flare (application)

Table 1: Average Sulfur Content and composition of DG (based on 2012 WWTP data provided in application)

	DG generation rate (scfm)	Sulfur Content (ppmv)		WWTP DG Composition
		Average	Weighted ave.	
acid phase	99	11536	538	4.66%
methane phase	2025	207	197	95.34%
Total	2124		**735**	

Table 2: Methane Equivalent Burned in Tail Gas Flare

Volume of gas streams to tail gas flare	Methane Content[2]	Methane Equivalent MMscf/yr
653.3 MMscf/yr PSA tail gas (Permit Application)	14%	91.46
8.6 MMscf/yr supplemental NG	97%	8.33
65.3 MMscf/yr acid phase gas[3]	15%	9.79
727.1 MMscf/yr to flare		**109.58**

[1]Summary values provided above are converted from MMscf/day, assuming the biogas plant operates 365 days/yr.

[2]Methane values for tail gas and acid phase gas were provided in the permit application.

[3]Assumed to be 4.66% of allowable DG production from the WWTP (see Table1). Permit application states that all acid phase gas from the WWTP will be burned in the tail gas flare.

Table 3: Tail Gas Flare VOC[1]

$$\text{VOC (lbs/yr)} = \frac{(5000\ \text{ppmv}) \times (\text{MMscf/yr to flare}) \times (86.18\ \text{kg/kg-mol})}{(849.5\ \text{scf/kg-mol}) \times (0.454\ \text{kg/lb})}$$

MMscf/yr to flare	VOC ppmv	MW hexane	Inlet VOC	Destruction	VOC lbs/yr
727.14	5000	86.18	1117 lbs/MMscf	98%	16,248

[1]The VOC concentration and destruction efficiency were provided by the applicant.

Table 4: Changes in Regulated Emissions if DG is Diverted from the WWTP to the biogas plant

	DG Combustion Emissions with Biogas Plant						**Total DG Combustion Emissions (lbs/yr)**		**Emission change from biogas plant (lbs/yr)**
Incinerator:	WWTP Boilers		WWTP Flares[6]		Tail Gas Flare				
DG Throughput:	120 MMscf/yr		0.00 MMscf/yr		727.14 MMscf/yr				
	EF (lbs/MMscf)	Emissions (lbs/yr)	EF (lbs/MMscf)	Emissions (lbs/yr)	EF[7] (lbs/MMBtu)	Emissions (lbs/yr)	With Biogas Plant	Without Biogas Plant	
CO[1,5]	10.2	1,224	19.95	-	204	22,354	23,578	26,760	**(3,182)**
NOx[1,5]	26.8	3,216	34.2	-	61	6,706	9,922	46,992	**(37,070)**
PM_{10}[2]	17	1244	17	-	17	1,863	3,107	14,518	**(11,411)**
$PM_{2.5}$[2]	17	1244	17	-	17	1,863	3,107	14,518	**(11,411)**
SOx[3]	34.4	4122					170,772	170,767	**5**
VOC[4]	3.5	420	0.75	-	22	16,248	16,668	1,380	**15,288**
Benzene[4,5]	0.0013	0.2	0.0013	-	0.0000	-	0	1.8	**(2)**
Carbonyl Sulfide[5]	0.0000	0.0	0.0000	-	0.0016	2	2	0	**2**
Dichlorobenzene[4,5]	0.0008	0.1	0.0008	-	0.0000	-	0	1.1	**(1)**
Formaldehyde[4]	0.0478	5.7	0.0478	-	0.0000	-	6	66.9	**(61)**
Hexane[4,5]	1.1471	137.7	1.1471	-	0.0009	1	139	1605.9	**(1,467)**
PAHs[4]	0.0001	0.0	0.0001	-	0.0000	-	0	0.1	**(0)**
Toluene[4,5]	0.0022	0.3	0.0022	-	0.0012	2	2	3.1	**(1)**
Xylenes[4,5]	0.0000	0.0	0.0000	-	0.0043	5	5	0	**5**
Total HAPs		143.9		-		10	154	1679	**(1,525)**

[1]Emission factors for the WWTP were derived from test results approved by the Department.

[2]PM factors were taken from AP42 Table 2.4-5 for LFG destruction and are interms of lbs/MM dscf methane. DG burned in the WWTP contains 61% methane. See Table 2 for methane content of waste gas.

[3]Assumes all sulfur from DG is emitted on site as SO_2. If 1 MMBtu/hr supplemental NG is burned in flare 8760 hrs/yr, plant-wide SO_X emissions increase by 5 lbs/yr, assuming no sulfur remains in the biogas.

[4]Emission factors were provided by the WWTP from independent test results. VOC emissions for the tail gas flare are calculated in Table 3.

[5]HAP emissions from the tail gas flare are based on information provided in the application, are in terms of lbs/MMscf DG, and assumes all HAPS from excess DG is removed from biogas and flared.

[6]Excess methane phase digester gas from the WWTP is assumed to be treated in the biogas plant rather than flared at the WWTP.

[7]Tail gas flare emission factors for CO and NO_X were obtained from the flare manufacturer. PM emission factors are interms of lbs/MMscf methane (see note 2).

DRAFT

91st Ave. WWTP Allowable Emissions Summary (lbs/yr)*

Pollutant	Digester Gas Combustion	Emergency Engines	Wastewater Processes	Sludge Processes	Gasoline Tank	Sodium Bisulfite	Solar Drying Beds	**Totals**	**Allowable Limits**
Criteria Pollutants									
CO	26,760	5,761	-	-	-	-	-	**32,521**	**42,705**
NOx	46,992	34,349	-	-	-	-	-	**81,341**	**88,000**
PM10	14,518	617	-	-	-	-	-	**15,135**	**19,000**
PM2.5	14,518	617						**15,135**	**19,000**
SOx	170,767	22	-	-	-	104	-	**170,789**	**182,000**
VOC	1,380	786	1,641	511	7,502	-	438	**12,259**	**20,000**
Hazardous Air Pollutants									
Benzene	1.8	9.6	-	-	67.5	-	-	**79**	
Dichlorobenzene	1.1	-	-	-	-	-	-	**1**	
Dichloromethane	-	-	4965.6	304.2	-	-	28.6	**5,298**	**5,300**
Formaldehyde	66.9	1.0	-	-	-	-	-	**68**	
Hexane	1605.9	-	-	-	120.0	-	-	**1,726**	
Isooctane	-	-	-	-	60.0	-	-	**60**	
PAHs	0.1	2.6	-	-	37.5	-	-	**40**	
Propylene	-	34.7	-	-	-	-	-	**35**	
Toluene	3.1	3.5	1641.2	511.4	97.5	-	438.2	**2,695**	
Xylenes	-	0.2	-	-	37.5	-	-	**38**	
HAPs Totals	1,679	52	6,607	816	420	0	467	**10,040**	**10,340**

*See the emission worksheets provided in the TSD for Permit #970580 for emission calculations and notes.

$$\text{SOx (lbs/yr)} = \frac{(735\ \text{ppmv}) \times (1400\ \text{MMscf/yr DG}) \times (64\ \text{kg/kg-mol})}{(849.5\ \text{scf/kg-mol}) \times (0.454\ \text{kg/lb})} = 170767$$

DRAFT

```
AERSCREEN 11126 / AERMOD  1234                                        10/17/16
                                                                       10:40:44
 TITLE:  SO2

 ------------------------------------------------------------------------------
 ****************************  FLARE PARAMETERS  ****************************
 ------------------------------------------------------------------------------

 SOURCE EMISSION RATE:            2.6460 g/s                21.000 lb/hr
 FLARE HEIGHT:                    12.192 meters              40.00 feet
 EFF RELEASE HEIGHT:              19.948 meters              65.45 feet
 HEAT RELEASE RATE:           0.5738E+07 cal/sec
 HEAT LOSS FRACTION:               0.000
 EFF STACK DIAMETER:               2.367 meters              93.18 inches
 EFF EXIT TEMPERATURE:            1273.0 K                  1831.7 Deg F
 EFF EXIT VELOCITY:               20.000 m/s                 65.62 ft/s
 RURAL OR URBAN:                   RURAL
 INITIAL PROBE DISTANCE =          2450. meters              8038. feet

 ------------------------------------------------------------------------------
 ***********************  BUILDING DOWNWASH PARAMETERS  **********************
 ------------------------------------------------------------------------------
          NO BUILDING DOWNWASH HAS BEEN REQUESTED FOR THIS ANALYSIS

 ***************************  PROBE ANALYSIS  ****************************
                  25 meter receptor spacing: 811. meters - 2450. meters

      Zo       ROUGHNESS       1-HR CONC   DIST      TEMPORAL
      SECTOR     LENGTH         (ug/m3)     (m)       PERIOD
      ---------------------------------------------------------------------
       1*         0.010         8.920      810.8      WIN
 * = worst case flow sector

 ------------------------------------------------------------------------------
 **********************  MAKEMET METEOROLOGY PARAMETERS  *********************
 ------------------------------------------------------------------------------

 MIN/MAX TEMPERATURE:    288.7 / 319.3 (K)
 MINIMUM WIND SPEED:       0.5 m/s
 ANEMOMETER HEIGHT:     10.000 meters
 SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES
 DOMINANT SURFACE PROFILE: Cultivated Land
 DOMINANT CLIMATE TYPE:    Dry Conditions
 DOMINANT SEASON:          Winter
 ALBEDO:                  0.60
 BOWEN RATIO:             2.00
 ROUGHNESS LENGTH:       0.010 (meters)

-------------------------------------------------------------------------------
**********************  AERSCREEN MAXIMUM IMPACT SUMMARY  **********************
 ------------------------------------------------------------------------------

                     MAXIMUM      SCALED      SCALED      SCALED      SCALED
                      1-HOUR      3-HOUR      8-HOUR     24-HOUR      ANNUAL
  CALCULATION          CONC        CONC        CONC        CONC        CONC
   PROCEDURE         (ug/m3)     (ug/m3)     (ug/m3)     (ug/m3)     (ug/m3)
---------------    ----------  ----------  ----------  ----------  ----------
 FLAT TERRAIN        8.920       8.920       8.028       5.352       0.8920

 DISTANCE FROM SOURCE        810.77 meters

 IMPACT AT THE
 AMBIENT BOUNDARY    8.920       8.920       8.028       5.352       0.8920

 DISTANCE FROM SOURCE        810.77 meters
```

DRAFT

Items 1-15 Front page: Items 1 to 15 (14 for Renewals) must be completed.

Notes to engineer:

- *For renewal applications the source must either answer 'No' to questions 2-5 or submit an application for a permit modification.*
- *Item 8: Many applicants do not know the SIC code or NAICS code for their industry. For a new application the code can be obtained by doing an on-line search. http://www.osha.gov/pls/imis/sicsearch.html*
- *Items 5, 7 and 14: These may be the same for many applicants.*

Complete: [x] Incomplete: [ ]

Item 16: A simple site diagram has been included, preferably on a standard size paper. Detailed blueprints or construction drawings are not required.

Complete: [x] Incomplete: [ ] N/A: [ ]

Item 17: A simple process flow diagram on a standard size paper is preferred. A process flow diagram may not be needed for some small businesses.

Complete: [x] Incomplete: [ ] N/A: [ ]

Item 18: An O&M plan is required only for a control device. An O&M plan is not required for a spray booth. Instead of including the O&M plan with the application, an applicant may submit it after receiving the permit.

Complete: [x] Incomplete: [ ] N/A: [ ]

Item 19: A dust control plan, if required, must accompany the permit application. The plan will be reviewed and approved by the dust compliance group.

Complete: [ ] Incomplete: [ ] N/A: [x]

Item 20: The applicant needs to complete only those sections of the permit application that are applicable.

Complete: [x] Incomplete: [ ] N/A: [ ]

Notes to engineer:

- *Concerning Section Z: Many applicants will not be able to perform these engineering calculations. We will accept the permit application with a blank Section Z.*

Instructions for completing Sections A, B, C, D, E-1, E-2, F, G, H, I, J, K-1, K-2, K-3, K-4, L, M, X-1, X-2, Y and Z of the permit application are included at the beginning of each section and are self-explanatory.

In general, a material safety data sheet (MSDS) is required for each chemical used, stored or processed at the facility. Exceptions are for very common materials, such as gasoline, diesel, acetone, etc.

Business name: **Ninety-First Avenue Renewable Biogas LLC**

Permit number: **150120**

Completeness review completed.
Application determined to be: Complete: [x] Incomplete: [ ]

Permit Engineer: **Sara Seuberling** Date: **12/17/15**

DRAFT