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April 7, 2017

CNG/O17-04-01

Oregon Public Utility Commission
Attn: Filing Center
201 High St SE, Suite 100
P.O. Box 1088
Salem, OR 97308-1088

Re: **CNG/O17-04-01**, Schedule 800, Biomethane Receipt Services

Cascade Natural Gas Corporation (Cascade or the Company) files the following revisions to its Tariff P.U.C. Or. No. 10, stated to become effective with service on and after June 1, 2017:

Second Revision Sheet No. iii	Original Sheet No. 800.10
First Revision Sheet No. 192.1	Original Sheet No. 800.11
Original Sheet No. 800.1	Original Sheet No. 800.12
Original Sheet No. 800.2	Original Sheet No. 800.13
Original Sheet No. 800.3	Original Sheet No. 800.14
Original Sheet No. 800.4	Original Sheet No. 800.15
Original Sheet No. 800.5	Original Sheet No. 800.16
Original Sheet No. 800.6	Original Sheet No. 800.17
Original Sheet No. 800.7	Original Sheet No. 800.18
Original Sheet No. 800.8	
Original Sheet No. 800.9	

This filing introduces a new service to allow biomethane producers the ability to inject pipeline-quality biomethane into the Company's distribution system for delivery to a Cascade transportation end-use customer. This proposed Schedule encourages the development and use of biomethane by providing a path for the sale and direct use of the renewable gas, while establishing cost protections and gas quality standards to protect other customers' interests.

Currently, the renewable attribute associated with biomethane may be sold as a commodity to parties complying to either Environmental Protection Agency's (EPA's) renewable fuel standard or a State's low carbon fuel standard. The financial credits currently available for the renewable attribute are encouraging potential biomethane producers to inquire about injecting biomethane into local distribution company's distribution systems. The Company would like to support the development of renewable gas, because finding viable alternative energy supplies are crucial in a carbon constrained world.

In order to better address inquiries about biomethane injection, Cascade hired Sidock Group, Inc., a third party engineering firm, to review currently accepted biomethane gas quality standards. Sidock provided Cascade with gas quality standards for biomethane produced from waste from agricultural products, wastewater treatment plants; landfills, and discarded foods and beverages. The standards match those adopted by the California Public Utilities Commission (CPUC) in response to AB 1900, which was codified in law on September 27, 2012, and required the CPUC to develop standards for constituents in biogas to protect human health and pipeline integrity and safety. The Company believes the standards proposed herein represent the best industry knowledge on biomethane pipeline gas quality for introducing biomethane into the distribution system without jeopardizing the system's integrity, customer equipment, or public health.

Under proposed Schedule 800, the biomethane producer will bear all costs associated with biomethane receipt services, including costs incurred by the Company for equipment maintenance and gas testing. These costs will be passed through to the biomethane producer. Besides paying unscheduled costs as they are incurred, the biomethane producer will pay a monthly service charge of \$2,500. This amount is the sum of the fixed costs associated with serving a Schedule 163, Transportation customer, as billing and metering costs are comparable, and the monthly costs that are unique to a biomethane producer receiving Schedule 800 service such as schedule odorant deliveries and gas chromatograph monitoring. The attached Exhibit A demonstrates how the monthly charge was derived.

The per therm costs cover the distribution system investment, the price of the odorant which must be added to the gas for safety reasons and the Schedule 192, intervenor costs, as biomethane producers are large customers using the distribution system whose interests are likely to be considered by an intervenor.

Biomethane receipt service will be interruptible. Cascade may refuse the gas for a number of reasons that are in the Company's sole discretion including limited capacity or unacceptable gas quality.

In support of this filing, attached as Exhibit B is a representation of a Biomethane Receipt Service Agreement that must be executed prior to a biomethane producer receiving biomethane receipt services under Schedule 800. The biomethane testing standards provided to the Company by Sidock Group, Inc. are provided as Exhibit C. The standard or standards appropriate for each biomethane producer's biogas feedstock will be included as a part of an executed Biomethane Receipt Service Agreement.

Cascade believes that absent a legislative requirement to accept biomethane on its system, this new service as established in Schedule 800 offers the best balance between the two interests of encouraging the development of renewable natural gas and protecting the interests of natural gas customers.

If you have any questions regarding this filing, please contact Jennifer Gross at (509)734-4635.

Sincerely,



Michael Parvinen
Director, Regulatory Affairs

Attachment

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(N)
|
(N)

**SCHEDULE NO. 192
INTERVENOR FUNDING ADJUSTMENT**

APPLICABLE

Applicable to customers served on Schedules 101, 104, 105, 111, 112, 126, 163, 170, and 800.

(N)

PURPOSE

The purpose of this schedule is to recover the cost of Intervenor Funding Grants provided to various entities to cover their costs of advocating on behalf of customers. The awarding of such grants is governed by Section 7.3 of the First Amended and Restated Intervenor Funding agreement adopted by the Public Utility Commission of Oregon in Order No. 07-564.

MONTHLY RATES, MINIMUM BILLS AND OTHER CHARGES

Each of the charges specified in the schedules for gas service hereinafter listed shall be adjusted by the following per therm increase or (decrease) or appropriate multiple thereof:

Rate Schedule	Amount
101	\$0.00191
104	\$0.00000
105	\$0.00131
111	\$0.00131
112	\$0.00000
126	\$0.00000
163*	\$0.00131
170	\$0.00131
800*	\$0.00131
*all rate blocks	

(N)

TAX ADDITIONS

The rates named herein are subject to increases as set forth in Schedule 100 for Municipal Exactions.

GENERAL TERMS

Service under this schedule is governed by the terms of this schedule, the Rules contained in this Tariff, any other schedules that by their terms or by the terms of this schedule apply to service under this schedule, and by all rules and regulations prescribed by regulatory authorities, as amended from time to time.

Schedule 800
Biomethane Receipt Services

PURPOSE:

This Schedule establishes terms and conditions whereby qualifying producers of biomethane (Biomethane Producer) may request either a newly constructed interconnection to the Company’s distribution system or increased capacity at an existing interconnection point for the purpose of injecting qualifying biomethane on the Company’s distribution system.

APPLICABILITY:

Service under this Schedule is available to Biomethane Producers who meet all of the following conditions:

- 1) The Biomethane Producer must meet the following credit screening criteria as established for nonresidential customers in Rule 2;
- 2) The raw biogas from which the biomethane is produced must be from one or a mix of the following feedstocks: a) agricultural byproducts; b) wastewater; c) landfill waste; or d) food and beverage waste;
- 3) The Company, in its sole opinion, has determined that injection of biomethane will not jeopardize or interfere with normal operation of the Company’s distribution system and its provision of gas service to its customers;
- 4) Prior to the Company’s building an interconnection, the Biomethane Producer must demonstrate to the satisfaction of Company that it has secured end user(s) that are Company’s customers who agree to purchase all the estimated biomethane production; and
- 5) The Biomethane Producer must comply with all terms and conditions preceding biomethane receipt services as established herein, including:
 - a. Paying all costs for the Interconnection Capacity Study and the Engineering Study as well as all interconnect costs; and
 - b. Executing a Biomethane Receipt Services Agreement for ongoing receipt services under this Schedule.

MONTHLY CHARGES

A Biomethane Producer receiving service under this Schedule shall receive the following monthly charges:

Basic Service Charge \$2,500.00

Blocks By Therms		Base Rate	Odorant	Sch. 192	Billing Rate
First	10,000	\$0.12402	\$ 0.0002125	\$0.00006	0.124293
Next	10,000	\$0.11188	\$ 0.0002125	\$0.00006	0.112153
Next	30,000	\$0.10512	\$ 0.0002125	\$0.00006	0.105393
Next	50,000	\$0.06456	\$ 0.0002125	\$0.00006	0.064833
Next	400,000	\$0.03275	\$ 0.0002125	\$0.00006	0.033023
Over	500,000	\$0.01755	\$ 0.0002125	\$0.00006	0.017823

(continued)

Schedule 800 Biomethane Receipt Services

MONTHLY CHARGES (continued)

In no instance will monthly charges be prorated. Monthly Charges represent costs incurred regardless of the Company's receipt of biomethane.

Failure to pay a monthly bill within 15 days of receipt of the bill may result in curtailment of receipt services and a Late Payment Charge as defined in Schedule 200 will be applied until full payment of any past due amount is received.

Upon termination of service under this Schedule, the Company may charge the Biomethane Producer for the removal and, or capping-off of Company-owned facilities.

The service charges herein are subject to increases as set forth in Schedule No. 31, Public Purposes Funding and Schedule No. 100, Municipal Exactions, as applicable.

Service under this Schedule is not subject to Schedule 31, Public Purposes Funding charge.

MONTHLY MINIMUM BILL:

The monthly minimum bill shall be \$2,500.00.

SERVICES PROVIDED:

The Company will provide a qualifying Biomethane Producer with a Company-owned, operated, and maintained point of interconnection to enable receipt of qualifying biomethane into the Company's distribution system for the purpose of delivering the biomethane to an end-user who is located on the Company's distribution system.

PREREQUISITES TO BIOMETHANE RECEIPT SERVICES

Preceding the receipt of biomethane, service under this Schedule requires an Interconnection Capacity Study and an Interconnection Study; both of which are followed by the execution of the Biomethane Receipt Services Agreement.

1. Interconnection Capacity Study

To initiate the review prior to receiving service on this Schedule, a Biomethane Producer must provide the Company a written request for an Interconnection Capacity Study. The written request must include the following information: a) the location of the facilities; b) the source of the biomethane; c) specifics on forecasted minimum and maximum biomethane deliveries; d) forecasted operating profile; e) service pressure requirements or limitations; f) if natural gas and or the biomethane will be consumed on the site; g) details on the expected end-user of the biomethane, including the name and address and, if applicable, the anticipated gas marketer; and h) any other information deemed necessary by the Company.

(continued)

Schedule 800

Biomethane Receipt Services

PREREQUISITES TO BIOMETHANE RECEIPT SERVICES (continued)

Interconnection Capacity Study (continued)

Upon receipt of the required information, the Company will perform an Interconnection Capacity Study to determine if the Company can provide the receipt service on its distribution system located nearest to the Biomethane Producers' biomethane production site. Upon receipt of the study, the Biomethane Producer must pay the fully loaded actual hourly costs for producing this study.

The Interconnection Capacity Study will include: a) a determination of whether or not receipt service of the estimated biomethane production is possible at the Biomethane Producer's site; b) a non-itemized, non-binding cost estimate for the Company to build an interconnection to its distribution system; and c) if necessary, an evaluation of whether or not the requested service will indirectly impact service from NW Pipeline and if upgrades to NW Pipeline may be required.

2. Engineering Study

If the Company has determined it can provide receipt service for the proposed biomethane production as presented in writing by the Biomethane Producer, and the Biomethane Producer has fully paid for the Interconnection Capacity Study, the Biomethane Producer may request in writing an Engineering Study for the design and estimated costs of all necessary interconnection facilities. The Biomethane Producer will be required to pay all actual fully loaded costs incurred in the development and delivery of the Engineering Study.

3. Interconnection

After the Biomethane Producer has: a) paid for both the Interconnection Capacity Study and the Engineering Study in full, b) provided written proof of a committed buyer for the biomethane subject for receipt service under this Schedule; c) executed a Biomethane Receipt Service Agreement; and d) paid one-third of the anticipated costs to install interconnect facilities and provide an irrevocable letter of credit for the remaining two thirds costs, the Company will build the interconnection from the Biomethane Producer's output flange to the Company's distribution system.

(continued)

Schedule 800 Biomethane Receipt Services

PREREQUISITES TO BIOMETHANE RECEIPT SERVICES (continued)

Interconnection (continued)

The Company will design, build, own and operate all interconnection facilities related to the provision of this service and such interconnection facilities will include, but are not limited to, required pressure relief equipment, a gas chromatograph, an emergency shutdown valve, a custody transfer receipt meter, applicable pressure regulation remote telemetering equipment (SCADA), and odorant injection facilities. The interconnection facilities owned, operated, and maintained by the Company will not include any equipment necessary for the production, conditioning, or drying of the biomethane.

The maximum physical capacity of the interconnection will be determined by the sizing of the point of receipt, including the metering and odorization capacities, but is not nor is intended to be, any commitment by the Company of receipt service capacity.

4. Interconnection Costs

Prior to the initiation of receipt services, the Biomethane Producer must pay all costs associated with the interconnection including but not limited to permitting, upgrades to the Company's system, any upgrades required on an upstream transmission pipeline to ensure the receipt of Biomethane does not interfere with the Company's typical, balanced gas distribution services on the Company's system, and all taxes and fees.

5. Biomethane Receipt Service Agreement

Prior to the Company installing interconnection facilities, the Biomethane Producer must execute a Biomethane Receipt Service Agreement that will further clarify the responsibilities of the Company and the Biomethane Producer. The Biomethane Receipt Service Agreement is a binding agreement between the Company and the Biomethane Producer that can only be modified in writing when approved with both parties' signatures.

The Biomethane Receipt Service Agreement is not transferrable regardless of a change in ownership or agency. Should the site where the biomethane is produced be sold or should the responsibility for biomethane production be transferred to another entity, a new Biomethane Receipt Service Agreement would need to be executed for service under this Schedule to continue at the site.

(continued)

Schedule 800
Biomethane Receipt Services

RECEIPT SERVICESI. **GENERAL**

For continuing the Biomethane Receipt Services, the Biomethane Producer must have a written agreement with a qualified supplier/marketer that has secured one or more Transportation Customer(s) served on Schedule 163 who will purchase all the estimated production of biomethane for end-use. If the Biomethane Producer does not demonstrate to Company's satisfaction a contractually-obligated end-use customer(s) for the biomethane, Biomethane Receipt Services will terminate until the Biomethane Produce has a verifiable end-use customer.

II. **NOMINATIONS**

- A. The Biomethane Producer or a supplier acting as the Biomethane Producer's agent must report to the Company's Gas Supply Department, the estimated monthly biomethane production for the upcoming month at least by the 15th day of the current month. Such estimate shall include any scheduled down time or increased production time.
- B. The Biomethane Producer or a supplier acting as the Biomethane Producer's agent is required to report estimated gas biomethane production volumes at least 32 hours prior to the beginning of each Gas Day unless other arrangements are agreed upon in writing with the Company. Such estimated volumes will be considered the Biomethane Producer's daily nomination. Changes to a Biomethane Producer's daily nomination for receipt services are allowed, provided the changes are communicated to the Company as soon as reasonably possible.

(continued)

Schedule 800 Biomethane Receipt Services

MINIMUM BIOMETHANE QUALITY STANDARDS

Service under this Schedule requires continual compliance to the Minimum Biomethane Quality Standards and reporting requirement as established below. The Minimum Biomethane Quality Standards were established by a third-party subject matter expert. Additional clarifying information on the Minimum Biomethane Quality Standard found herein may be provided in the Biomethane Receipt Services Agreement.

In general, the biomethane shall be commercially-free from objectionable odors (excluding the Company added odorant), solid matter, dust, gums, and gum forming constituents, or any other substance which interferes with the intended purpose of merchantability of the biomethane, or causes interference with the proper and safe operation of the lines, meters, regulators, or other appliances through which it may flow.

The biomethane shall not contain any toxic or hazardous substance in concentrations which, in the normal use of the biomethane, may be hazardous to health, injurious to pipeline facilities, or be a limit to merchantability or be contrary to applicable government standards.

Biomethane must be free from bacteria, pathogens, and any other substances injurious to utility facilities or that would cause the gas to be unpleasant or undesirable to end -use customers.

Prior to finalizing an interconnection agreement or, otherwise, as soon as possible, the Biomethane Producer must notify the Company in writing of any constituent potentially damaging to health or pipeline integrity that is not listed in Table 2, but known to be present in detectable quantities.

The Company reserves the right to refuse receipt of Biomethane that does not conform to the Minimum Biomethane Quality Standards as established in this section.

Table 1

The Biomethane Producer and the Company will both independently monitor the constituents listed in Table 1 on a real time and continuous basis of intervals not to exceed four minutes. If monitoring reveals that the biomethane contains a constituent outside the acceptable range, biomethane receipt services shall be interrupted until the biomethane can meet the gas quality standards put forth in Table 1. The gas quality standards established in Table 1 are applicable to all biomethane regardless of fuel source used to generate the biomethane.

(continued)

**Schedule 800
Biomethane Receipt Services**

MINIMUM BIOMETHANE QUALITY STANDARDS (continued)**Table 1 – Basic Properties for Biomethane**

SPECIFICATION or CONSTITUENT	TRIGGER LEVEL	STANDARD TEST METHOD
Min. Heat Content (dry, HHV)	985 BTU/scf	AGA-5; AGA-8; ASTM D3588; ASTM D7164; ASTM D1945; ASTM D7314; GPA 2172 / API 14.5; GPA 2261; GPA 2145
Max. Heat Content (dry, HHV)	1,100 BTU/scf	
Min. Wobbe Number	1,275	
Max. Wobbe Number	1,390	
Min. Temperature	40 °F	Temperature element and transmitter in pipeline.
Max. Temperature	120 °F	
Min. Pressure	Must be sufficient for injection into Company's distribution system.	Pressure element and transmitter in pipeline
Max Pressure	Must not exceed the Company's MAOP for the pipe where injection is to occur.	
Max. Hydrocarbon Dew Point (HDP)	15 °F	ASTM D1945; ASTM D1142; ASTM D5454
Max. Cricondenthem (CHDP)	15 °F	
Max. C ₄ ⁺	0.75 %vol	ASTM D1945; ASTM D1946; ASTM D1766; GPA 2261 ASTM D1142; ASTM D5454; ASTM D4888
Max. C ₅ ⁺ GPM	0.2 gal/Mscf	
Max. C ₅ ⁺	0.12% vol	
Max. C ₆ ⁺ GPM	0.05 gal/Mscf	
Max. Water Vapor Content	7.0 lb/MMscf	
Max. Total Sulfur	5.0 grains per 100 scf	
Max. Hydrogen Sulfide (H ₂ S)	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv	ASTM D4810; ASTM D5504; ASTM D7165; ASTM D7493; GPA 2261
Max. Mercaptans (RSH)	0.2 grain per 100 scf 4.6 mg/m ³ 2.3 ppmv	ASTM D1988; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D7165; ASTM D7493; GPA 2265
Max. Particle Size	3 microns	EPA Method 5
Max. Hydrogen	400 ppm 0.04% vol	ASTM D1945; ASTM D1946; ASTM D1766; GPA 2261. Also for CO ₂ : ASTM D4984; ASTM D7164; GPA 2377
Max. Total Diluent Gases	3% vol	
Carbon Dioxide (CO ₂)	2% vol	
Nitrogen (N ₂)	1% vol	
Oxygen (O ₂)	0.1% vol	

(continued)

**Schedule 800
Biomethane Receipt Services**

MINIMUM BIOMETHANE QUALITY STANDARDS (continued)

Table 2

Table 2 lists additional biomethane quality standards that must be met for biomethane to be acceptable for receipt services. The Biomethane Producer is responsible for testing for the constituents in Table 2 in the manner as established in both Table 2 and the Monitoring section below. Preferred testing requirements per constituent are dependent upon the fuel source (landfill; wastewater treatment; food and beverage; or agricultural) used to generate the biomethane. Where biomethane is produced from more than one fuel source, the testing requirements for each fuel sources is required.

Table 2– Additional Gas Quality Standards for Biomethane

SPECIFICATION or CONSTITUENT	TRIGGER LEVEL	LOWER ACTION LEVEL	UPPER ACTION LEVEL	REQUIRED FOR	TEST METHOD*
PART A – Health Constituents (carcinogenic)					
Arsenic	0.019 mg/m 0.006 ppmv	0.19 mg/m 0.06 ppmv	0.48 mg/m 0.15 ppmv	Landfill	EPA Method 29; EPA Method 200.8
p-Dichlorobenzene	5.7 mg/m 0.95 ppmv	57 mg/m 9.5 ppmv	140 mg/m 24 ppmv	Landfill; Wastewater Treatment; Food & Beverage	EPA TO-15
Ethylbenzene	26 mg/m 6.0 ppmv	260 mg/m 60 ppmv	650 mg/m 150 ppmv	Landfill; Agricultural; Wastewater Treatment; Food & Beverage	EPA TO-15
n-Nitroso-di-n-propylamine	0.033 mg/m 0.006 ppmv	0.33 mg/m 0.06 ppmv	0.81 mg/m 0.15 ppmv	Landfill; Agricultural	EPA Method 8270
Vinyl Chloride	0.84 mg/m 0.33 ppmv	8.4 mg/m 3.3 ppmv	21 mg/m 8.3 ppmv	Landfill; Wastewater Treatment; Food & Beverage	EPA TO-15
PART B - Health Constituents (non-carcinogenic)					
Antimony	0.60 mg/m 0.12 ppmv	6.0 mg/m 1.2 ppmv	30 mg/m 6.1 ppmv	Landfill;	EPA Method 29; EPA Method 200.8
Copper	0.060 mg/m 0.02 ppmv	0.60 mg/m 0.23 ppmv	3.0 mg/m 1.2 ppmv	Landfill; Wastewater Treatment; Food & Beverage	EPA Method 29; EPA Method 200.8
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m 4.0 ppmv	57 mg/m 40 ppmv	285 mg/m 200 ppmv	Landfill; Agricultural	ASTM D4810; ASTM d5504; ASTM D7165; ASTM D7493; GPA 2261
Lead	0.075 mg/m 0.009 ppmv	0.75 mg/m 0.09 ppmv	3.8 mg/m 0.44 ppmv	Landfill;	EPA Method 29; EPA Method 200.8
Mercaptans (Alkyl Thiols)	0.2 grain Sulfur per 100 scf 4.6 mg Sulfur/m 3.4 ppmv mercaptan	2.0 grain Sulfur per 100 scf 46 mg Sulfur/m 34 ppmv mercaptan	10 grain Sulfur per 100 scf 230 mg Sulfur/m 170 ppmv mercaptan	Landfill; Agricultural; Wastewater Treatment; Food & Beverage	ASTM D1988; ASTM D5504; ASTM D7165; ASTM D7493; GPA 2261
Methacrolein	1.1 mg/m 0.37 ppmv	11 mg/m 3.7 ppmv	53 mg/m 18 ppmv	Landfill;	EPA TO-15, EPA TO-11A
Toluene	904 mg/m 240 ppmv	9000 mg/m 2400 ppmv	45000 mg/m 12000 ppmv	Landfill; Agricultural; Wastewater Treatment; Food & Beverage	EPA TO-15

(continued)

**Schedule 800
Biomethane Receipt Services**

MINIMUM BIOMETHANE QUALITY STANDARDS (continued)
Table 2– Additional Gas Quality Standards for Biomethane

SPECIFICATION or CONSTITUENT	TRIGGER LEVEL	LOWER ACTION LEVEL	UPPER ACTION LEVEL	REQUIRED FOR	TEST METHOD*
PART C – Pipeline Integrity Constituents					
Ammonia	0.001%	0.005%	N/A	Landfill; Agricultural	Chromatograph
Biologicals	4 x 10 ⁴ / scf (qPCR per APB, SRB, IOB group) and commercially free of bacteria of >0.2 microns	2 x 10 ⁵ / scf (qPCR per APB, SRB, IOB group)	N/A	Landfill; Agricultural; Wastewater Treatment; Food & Beverage	Filter to 0.2 micron and analyze for total APB, SRB, and IOB using qPCR
Hydrogen	400 ppm 0.04% vol	2,000	N/A	Landfill; Agricultural; Wastewater Treatment; Food & Beverage	ASTM D1945; ASTM D1946
Mercury	0.08 mg/m	0.4	N/A	Landfill; Agricultural; Wastewater Treatment; Food & Beverage	EPA Method 29; EPA Method 200.8
Siloxanes	0.01 mg Si/m	0.1 mg Si/m	N/A	Landfill; Agricultural; Wastewater Treatment; Food & Beverage	Chromatograph
*A third party lab may recommend a different testing method in which case the testing method must be noted in the report with the testing results. Acceptance of different testing methods is in the Company's sole discretion.					

(continued)

**Schedule 800
Biomethane Receipt Services**

MINIMUM BIOMETHANE QUALITY STANDARDS (continued)

Table 3

Table 3 establishes a cumulative constituents standard applicable to biomethane from all sources.

Table 3 Cumulative Constituents Risk

CONSTITUENT	TRIGGER LEVEL A	Actual Analysis B	Ratio (B/A)= C
Level 1			
Arsenic	0.019 mg/m 0.006 ppmv		
p-Dichlorobenzene	5.7 mg/m 0.95 ppmv		
Ethylbenzene	26 mg/m 6.0 ppmv		
n-Nitroso-di-n-propylamine	0.033 mg/m 0.006 ppmv		
Vinyl Chloride	0.84 mg/m 0.33 ppmv		
The collective potential risk is the sum of the last column, the sum of each C value for each constituent.			
STANDARD: Biomethane Receipt Services is not permitted for biomethane from any source if the Sum of C values is equal to or greater than 10.0.			
Level 2			
Copper	0.060 mg/m 0.02 ppmv		
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m 4.0 ppmv		
Lead	0.075 mg/m 0.009 ppmv		
Mercaptans (Alkyl Thiols)	0.2 grain Sulfur per 100 scf 4.6 mg Sulfur/m 3.4 ppmv mercaptan		
Methacrolein	1.1 mg/m 0.37 ppmv		
Toluene	904 mg/m 240 ppmv		
The collective potential risk is the sum of the last column, the sum of each C value for each constituent.			

(continue)

**Schedule 800
Biomethane Receipt Services**

MINIMUM BIOMETHANE QUALITY STANDARDS (continued)

Table 3 (continued)

TESTING STANDARD:			
Risk Level	The Sum of C Values for Level 1	The Sum of C Values for Level 2	Action
Trigger Level	≥ 1.0	≥ 0.1	Periodic testing required
Lower Action Level	≥ 10.0	≥ 1.0	Stop Biomethane Receipt Service after three such instances in a 12-month period
Upper Action Level	≥ 25.0	≥ 5.0	Stop Biomethane Receipt Service Immediately

MONITORING AND REPORTING REQUIREMENTS

A. Pre-Injection Monitoring

1. Prior to injecting Biomethane into the Company’s distribution system, a Biomethane Producer must meet the following requirements:
 - Over a two- to four-week period, conduct two tests for compliance to the parameters established in Tables 2 and 3.
 - The tests shall not be more than fourteen days or less than five days apart.
 - The parameters for testing as established in this Schedule under the Ongoing Monitoring Section apply for Pre-Injection Monitoring.

2. **Compliance to the Gas Quality Standard found in Tables 2**
 A test is non-compliant to the Gas Quality Standard in Table 2 if any of the following are true:
 - Any constituent in Part A of Table 2 is at or above the lower action level;
 - Any constituent in Part B of Table 2 is at or above the trigger level; or
 - Any constituent in Part C of Table 2 is at or above the lower action level.

3. **Injection after Pre-Injection Monitoring**
 Biomethane may be injected into the Company’s distribution system if all of the following are true:
 - The biomethane complies with the parameters established in Table 1.
 - All constituents in Table 2 have tested values consistent with one of the following:
 - Non-detectible or below the trigger levels; or
 - The cumulative value of constituents per Table 3 is below the trigger level.

Schedule 800
Biomethane Receipt Services

B. Ongoing Monitoring

1. Testing

- Gas sampling techniques should conform to applicable provisions of Section 1 of Chapter 14 of API Manual of Petroleum Measurement Standards (MPMS) or Gas Processors Association (GPA) document GPA-2166, "Obtaining Natural Gas Samples for Analysis for Gas Chromatography."
- The Biomethane Producer shall have the biomethane sampled onsite and tested by an ELAP certified lab (or third party lab when a ELAP is not available) for the constituents as detailed in Table 2 and the cumulative value of constituents as established in Table 3.
- The testing should be conducted using the test methods as noted in Tables 1 and 2. When that is not feasible, analytical methods and techniques considered as generally accepted by the industry as well as the Company may be used.
- The biomethane quality tests should occur with the biomethane production operating at a steady state and at anticipated normal production capacity.
- The Company shall be notified of the Biomethane sampling and tests and have the option to observe the samples being taken.
- Test results shall be shared with Company within five business days of Customer's receipt of the test results.

(continued)

Schedule 800

Biomethane Receipt Services

MONITORING AND REPORTING REQUIREMENTS (continued)

Ongoing Monitoring (continued)

2. Frequency:

- For Table 2, Part A and Part B constituents that test below the trigger level, testing is required once every twelve months.
- For Table 2, Part A and Part B constituents that test at or above the trigger level, testing is required every three months. The frequency can be reduced if one of the following is true:
 - If four consecutive quarterly tests show that a constituent subject to the quarterly testing requirement is below the trigger level, then the monitoring frequency can be reduced to 12-month intervals; or
 - If four consecutive quarterly tests show that the total cumulative value for constituents as measured in Table 3 is less than the lower action level, then the monitoring frequency of all these constituents can be reduced to 12-month intervals.
- Table 2, Part 3 – All Table 2, Part 3 constituents need to be tested quarterly.

3. Results.

- The Company must be notified immediately when any constituent tests at or above the trigger level.
- Test results must be provided in writing to the Company within five calendar days of receipt.

4. Unsatisfactory Test Results:

- Biomethane Receipt Service must be terminated if any Table 2 constituent tests above the upper action level or the test results show a total collective constituents risk level high than the allowable level per Table 3.

5. Re-establishing Biomethane Receipt Services After Service Has Been Terminated Due to a Constituent Testing Outside the Acceptable Limits.

To reinstate service after a Table 1 constituent tests outside the acceptable limits, a Biomethane Producer must reduce the constituents to acceptable levels and will contact the appropriate Company personnel to allow the Biomethane to be reintroduced into the distribution or pipeline system. The Company will monitor the Gas Quality per the Gas Chromatograph to ensure the gas is within the acceptable limits.

(continued)

Schedule 800
Biomethane Receipt Services

MONITORING AND REPORTING REQUIREMENTS (continued)

Ongoing Monitoring (continued)

Re-establishing Biomethane Receipt Services After Service Has Been Terminated Due to a Constituent Testing Outside the Acceptable Limits (continued)

To reinitiate service after a Table 2 constitute tests outside the acceptable limits, a Biomethane Producer must present the Company with one test that demonstrates compliance with the Minimum Biomethane Quality Standards. Frequency of testing reverts to baseline. Testing requirements for re-establishing Biomethane Receipt Services are consistent with the requirements established above in Pre-Injection Monitoring Section.

6. Biomethane Producer-owned Monitoring Equipment

The Biomethane Producer shall install, maintain and operate equipment designed to interrupt the upstream supply of Biomethane automatically in the event that the Biomethane does not meet Biomethane Gas Quality Standard. This is in addition to the Company-owned equipment.

The Company may inspect the Biomethane Producer's monitoring equipment during design, construction and operation; provided that nothing herein shall be construed to impose any obligation on the Company to so inspect such equipment, nor shall the Company's undertaking to inspect such equipment relieve or diminish the Biomethane Producer's obligations to so install and operate such equipment. The Company may also refuse to accept Biomethane that is shown, by either the Biomethane Producer's monitoring equipment or the Company's equipment used to register the readings of the gas quality measurement equipment of Customer, to not meet the Biomethane Quality Standards, regardless of whether supplies are interrupted by automatic equipment.

Within ten (10) business days following the execution of the Biomethane Receipt Service Agreement, the Biomethane Producer shall provide to the Company a list of all instruments and equipment (Monitoring Equipment) used by the Biomethane Producer to monitor and confirm that Biomethane delivered to the Company pursuant to this Schedule meets the Biomethane Quality Standards Quality. The Biomethane Producer shall consult with the Company before adding to, retiring or modifying any of the Monitoring Equipment. The Biomethane Producer shall provide to the Company an updated list of all Monitoring Equipment within ten (10) business days following any additions thereto or modification or retirement thereof.

(continued)

Schedule 800
Biomethane Receipt Services

MONITORING AND REPORTING REQUIREMENTS (continued)

Biomethane Producer-owned Monitoring Equipment (continued)

Within ten (10) business days following the execution of the Biomethane Receipt Service Agreement and within ten (10) business days following any additions to or modification of the Monitoring Equipment, the Biomethane Producer shall provide to the Company an accurate copy of the applicable manufacturer's performance and operating specifications for the Monitoring Equipment, together with the applicable manufacturer's recommended maintenance and calibration procedures and intervals therefor. The Biomethane Producer shall contemporaneously provide the Company an accurate copy of any maintenance and calibration procedures it uses other than the applicable manufacturer's recommended maintenance and calibration procedures, with any differences between the Biomethane Producer's maintenance and calibration procedures and the applicable manufacturer's recommended maintenance and calibration procedures clearly noted. The Biomethane Producer shall promptly provide updates of such information to the Company upon any change by the Biomethane Producer or the applicable manufacturer to its maintenance or calibration procedures. Upon the Company's request, the Biomethane Producer shall provide to the Company a demonstration of Customer's maintenance or calibration procedures for any of the Monitoring Equipment. The Biomethane Producer shall be responsible for operating, calibrating and maintaining the Monitoring Equipment, at a minimum, in accordance with the manufacturer's recommended specifications.

The Biomethane Producer shall provide the Company, upon the Company's reasonable request, and in any event not less frequently than once every quarter during the term of the Service Agreement pursuant to this Schedule, information that the Company deems necessary for ascertaining the accuracy of the Monitoring Equipment or of the Company's equipment (which may be SCADA equipment) used to register the readings of the Monitoring Equipment. The Company's undertaking to review such information does not relieve or diminish the Customer's obligations to so install, operate, calibrate and maintain such equipment. Such information shall include, but shall not be limited to, if otherwise requested by the Company, the following:

(continued)

Schedule 800
Biomethane Receipt Services

MONITORING AND REPORTING REQUIREMENTS (continued)**Biomethane Producer-owned Monitoring Equipment (continued)**

- A. Next scheduled maintenance or calibration date of the Monitoring Equipment (based on the most recently completed maintenance or calibration and the applicable maintenance or calibration interval);
- B. Actual maintenance or calibration date;
- C. "As found" calibration results;
- D. Maintenance conducted (if any);
- E. "As left" calibration results;
- F. Description of any differences between the maintenance or calibration conducted by Customer and the applicable manufacturer's recommended maintenance or calibration procedures, as the case may be;
- G. A tracking number for such maintenance or calibration (or the name of the technician that performed the maintenance or calibration).

7. Changes to Feedstock

The Biomethane Producer will notify Company in advance if possible but in no case more than ten (10) business days following, any planned or unplanned significant additions or modifications to the feedstock source of the biogas processed or scrubbed to produce Biomethane, and shall provide the Company all relevant information related to the new biogas source and the possible impact on the quality of the Biomethane delivered to Company. The change to feedstock may cause the Company to require the Biomethane Producer meet the requirements established above in Pre-Injection Monitoring Section. Nothing herein shall be construed to impose any obligation on the Company to review or approve any additions or modifications to the feedstock source of the biogas.

CURTAILMENT OF BIOMETHANE RECEIPT SERVICES

The Company may curtail receipt services without notice for reasons including Force Majeure, safety, failure for Biomethane to meet the Minimum Gas Quality Standards, and scheduled or unscheduled maintenance. The Company will not be liable for damages occasioned by partial or total curtailment of Biomethane Receipt Service under this Schedule.

Also, any failure by the Biomethane Producer to comply with the terms and condition of service in this Schedule and or the Biomethane Receipt Service Agreement, including the not limited to failure to provide information in a timely manner, failure to provide access in a timely manner, and failure to pay for services rendered may result in curtailment of services.

(continued)

Schedule 800 Biomethane Receipt Services

BIOMETHANE QUALITY PROCESSING EQUIPMENT

The Biomethane Producer shall own all facilities designed to process Biomethane to meet the Minimum Biomethane Quality Standards and deliver such biomethane to the receipt meter. The Biomethane Producer-owned facilities include but are not limited to the equipment necessary to scrub, dry, compress, monitor, and interrupt biomethane. By taking service under this Schedule, the Biomethane Producer is representing that all Biomethane Producer-owned equipment is constructed, installed, and maintained in accordance with all applicable codes, standards, specifications, and warranties.

RIGHT TO AUDIT

The Company maintains the right to at any time audit the biomethane for compliance to the minimum Biomethane Quality Standards. Audit requests must be delivered in writing (including email) to the Biomethane Producer's designated representative as identified in the Biomethane Receipt Services Agreement. If the Biomethane Producer denies or fails to respond within twenty-four (24) hours to a written request from the Company to audit the biomethane quality, receipt services under this Schedule may be terminated without further notice.

INCREASES IN BIOMETHANE PRODUCTION

A new or an amended Biomethane Receipt Service Agreement is required prior to an increase in annual biomethane production of ten percent (10%).

SPECIAL CONDITIONS

1. Service under this Schedule requires an executed Biomethane Receipt Services Agreement.
2. The point of interconnection shall be established as a transportation scheduling point for service to a customer receiving service under Schedule 663.
3. The Company's receipt meter shall be the point at which receipt service occurs. There is no custody transfer point for the biomethane as the Company in no instance owns the gas as part of the service received under this Schedule. If the Company chooses to buy the gas for service to its core customers, the Company's purchase of the biomethane will occur under a separate agreement and will be different from services provided in this Schedule.

(continued)

Schedule 800 Biomethane Receipt Services

SPECIAL CONDITIONS (continued)

4. The Company-owned point of interconnection should be protected by an enclosed and locked fence.
5. The Company will have the right to adjust a Biomethane Producer's daily nomination when, in the Company's sole judgment, such action is necessary to bring into balance its system or otherwise maintain operational control or maintain the integrity of the Company's distribution system.
6. The available receipt capacity for any particular day may be affected by physical flows from other points of receipt, physical pipeline and storage conditions for that day, and end-use demand on the Company's system.
7. The Biomethane Producer shall defend and indemnify the Company and hold it harmless from all suits, actions, debts, accounts, damage, costs, losses, taxes, and expenses arising from or out of any adverse legal claim of third parties to or against the biomethane received on the Company's distribution system in accordance with this Schedule.
8. The Company may terminate service under this Schedule if the Biomethane Producer's is non-compliant on any requirement herein.
9. By accepting Biomethane Receipt Services, the Biomethane Producer shall defend and indemnify the Company and holds it harmless against any claims related to the interruption or termination of biomethane receipt services, including but not limited to claims that service interruption damaged equipment, or facilities, or interfered with an ability to see biomethane.

TERM OF SERVICE

Service under this Schedule shall be rendered in accordance with the effective date established in the Biomethane Receipt Service Agreement and shall continue until terminated. To terminate service under this Schedule, either party must provide written notice stating the intent to terminate service effective no less than 60 days from the date the notice is received by the other party's designated representative as identified in the Biomethane Receipt Service Agreement. Upon termination of service, the Company may, at its sole option, remove or retire in place any or all Company-owned facilities.

GENERAL TERMS

Service under this Schedule is governed by the terms of this Schedule, the rules contained in this Tariff, and other schedules that by their terms or by the terms of this Schedule apply to service under this Schedule, by all the rules and regulations prescribed by regulatory authorities, as amended from time to time, and by the applicable Biomethane Receipt Services Agreement.

Advice No. CNG/O17-04-01

Exhibit A

**CNGC Advice No. 17-04-01, Schedule 800 Biomethane Receipt Services
Exhibit A**

Schedule 800 Monthly Service Charge

Hours	Rate per Hour	Annual	Monthly Cost	Description
			\$500	Billing and metering. Monthly Charge for Schedule 163 customer.
		\$18,000.00	\$1,500.00	Biomethane Producer under Sch 800 is most like a Sch 163 customer with additional costs.
36	\$50.67	\$1,823.98	\$152.00	Gas Chromatograph Monitoring, annual contract with third party
12	\$50.67	\$607.99	\$50.67	Corrective maintenance
6	\$50.67	\$304.00	\$25.33	Odorant Reads
8	\$50.67	\$405.33	\$33.78	Monthly Odorant tank
		\$2,261.77	\$188.48	Odorant Delivery
				Contingency
Total			\$2,450.26	
Monthly Charge			\$2,500.00	

Advice No. CNG/O17-04-01

Exhibit B

Biomethane Interconnection and Receipt Service Agreement
Between
Cascade Natural Gas Corporation
And
[insert Name of Biomethane Producer]

This Biomethane Interconnection and Receipt Service Agreement (“Agreement”) dated _____ (“Effective Date”) is made between Cascade Natural Gas Corporation (“Cascade” or “Company”), located at 8113 W Grandridge Blvd, Kennewick, Washington, and _____ [INSERT BIOMETHANE PRODUCER NAME _____] (“Biomethane Producer”) (, a(n) [State and business entity] located at [INSERT BIOMETHANE PRODUCER ADDRESS] (individually “Party”, collectively “Parties”).

1. Recitals

Whereas Cascade owns and operates a local natural gas distribution system located in the States of Oregon and Washington;

Whereas Cascade is subject to the jurisdiction of the Public Utility Commission of Oregon (“OPUC”);

Whereas Cascade installs and owns an interconnection to its distribution system for the purpose of providing a qualifying Biomethane Producer biomethane receipt services in compliance with the terms and conditions established in Schedule 800 in Oregon;

Whereas a qualifying Biomethane Producer pays Cascade for all costs incurred for the establishment and provision of biomethane receipt services;

In consideration of the mutual covenants contained herein, and with the intent to be legally bound, the Company and the Biomethane Producer shall perform the functions and assume the responsibilities detailed in this Agreement.

2. Definitions

“**BTU**” means British Thermal Unit.

“**Biogas**” means a mixture of methane (50% to 70%) and carbon dioxide (30% to 50%) as well as other non-hydrocarbon gasses and trace compounds.

“**Biomethane**” means purified biogas that meets the pipeline quality specification as set forth in Schedule 800 and included herein.

“**Engineering Study**” refers to the design for the interconnection and the associated estimated Project Costs the Company provides the Biomethane Producer after an initial feasibility study is performed and before the interconnection is built.

“**MMBTU**” means one million (1,000,000) BTUs.

“Interconnect Facilities” refers to all equipment that comprises a connection between the Company’s distribution system and the Biomethane Producer’s biomethane output flange.

“Project Costs” means the costs incurred for the design and installation of Interconnect Facilities including but not limited to costs for fully loaded labor, materials, and all applicable taxes.

“Schedule 800” is the Company’s tariff schedule establishing the terms and conditions for Biomethane Receipt Services.

“Tariff” is the compilation of all rules and rate schedules as currently effective or hereafter amended that are on file with and have been approved by the OPUC.

3. Conditions Precedent

Cascade will not commence construction of the Interconnect Facilities until all of the following conditions are met to the reasonable satisfaction of Cascade:

- a. The Biomethane Producer and Cascade mutually provide the other Party with an executed original of this Agreement.
- b. The Biomethane producer is able to demonstrate that one or more qualified end users of the biomethane who are also customers of Cascade, served on Schedule 163, have contractually agreed to purchase the biomethane subject for Biomethane Receipt Services.
- c. The Biomethane Producer has paid the Company a non-refundable payment equal to 1/3 of the estimated Project Costs, as presented in the Engineering Study, and an irrevocable letter of credit for the remaining 2/3 of the estimated Project Costs.

4. Parties’ Responsibilities

Biomethane Producer

The Biomethane Producer will be responsible for acquiring or providing all necessary easements for Interconnect Facilities. The Parties shall cooperate with each other to secure property rights necessary for the installation of Interconnection Facilities.

The Biomethane Producer will: (a) condition the biomethane, (b) test the biomethane to ensure it meets the Minimum Gas Quality Standards as stated herein under Section 6 as well as in Schedule 800, (c) provide Cascade with the required reporting, and (d) stay current in payment for said Biomethane Receipt Services.

The Biomethane Producer shall establish, maintain, and administer a biomethane quality monitoring program to ensure the biomethane supplied by the Biomethane Producer and is received in Cascade’s distribution system, pursuant to Schedule 800 and this Agreement, meets or exceeds the Minimum Biomethane Quality Standards.

The Biomethane Producer must grant Cascade or its authorized representatives access to: (a) audit the biomethane facilities, (b) test the gas quality, (c) and observe the Biomethane Producer draw a sample of biomethane for gas quality testing as determined by Cascade.

The Biomethane Producer must sell biomethane subject to biomethane receipt services to an end-use transportation customer on Cascade’s distribution systems.

In compliance with Schedule 800, the Biomethane Producer must nominate gas subject to daily injection on the Company's distribution system and must pay all associated costs for balancing.

The Company

The Company will make a good faith effort to begin installation of Interconnect Facilities in place within three months of the execution of this Agreement, provided that within such time all necessary easements and permits, on terms acceptable to the Company, have been acquired.

The Company shall design, construct, install, own, and maintain the Interconnect Facilities, including but not limited to billing meters, regulators, valves, gas analyzers, shut-in valves, separators, filters, odorizers, check valves, insulating flanges, and anything else the Company deems necessary.

Company installation and maintenance of Interconnect Facilities will meet all governing codes, standards, laws, and regulations.

The Company will own, operate, and maintain the Interconnect Facilities defined above.

Subject to Biomethane Producer's full compliance with the terms and conditions established herein, the Company will provide the Biomethane Producer with Biomethane Receipt Services.

The Company may change the Minimum Gas Quality Standards as necessary to maintain a safe and reliable gas distribution system and ensure no unacceptable impacts on Cascade's end-use natural gas customers, in which case Cascade shall provide the Biomethane Producer a basis for any modifications to the Standards.

Parties shall comply with the terms and conditions established in Schedule 800 which is part of the Company's Oregon Tariff. If a conflict between this Agreement and the Tariff exists, the conditions in the Tariff shall prevail.

5. Project Costs

The Company will provide a written estimate of Project Costs in the Engineering Study. Prior to the Company initiating the installation of Interconnect Facilities, the Biomethane Producer shall pay one third (1/3) of the estimated Project Costs and provide an irrevocable letter of credit for the remaining two thirds (2/3) of the estimated Project Costs.

6. Biomethane Quality, Monitoring, and Reporting Standards

Biomethane Receipt Services is subject to ongoing monitoring of and compliance to the Minimum Biomethane Quality Standards and reporting requirement as established in Schedule 800. Additional clarifying information on the Minimum Biomethane Quality Standards for biogas made from [NAME FEEDSTOCK] is included as Appendix A [ATTACH SIDOCK'S STANDARDS FOR THE BIOMETHANE PRODUCER'S APROPRIATE FEEDSTOCK(S)].

7. Curtailment

The Company may curtail receipt services without notice for reasons including Force Majeure, safety, failure for Biomethane to meet the Minimum Gas Quality Standards, and scheduled or unscheduled maintenance. The Company will not be liable for damages occasioned by partial or total curtailment of Biomethane Receipt Service under this Schedule.

When reasonably possible, such as for scheduled maintenance, the Company will provide the Biomethane Producer with prior notice of the curtailment.

8. Force Majeure

Neither the Company nor the Biomethane Producer shall be liable for damage to the other for any act, omission or circumstances occasioned by or in consequence of any acts of God, strikes, lockouts, acts of the public enemy, wars, blockades, insurrections, riots, epidemics, landslides, lightning, earthquakes, fires, storms, floods, unforeseeable or unusual weather conditions, washouts, arrests and restraint of rulers and peoples, civil disturbances, explosion, breakage or accident to machinery or lines of pipe, line freeze-ups, temporary failure of gas supply, the binding order of any court or governmental authority which has been resisted in good faith by all reasonable legal means, and any other cause, whether of the kind herein enumerated, or otherwise, and whether caused or occasioned by or happening on account of the act or omission of one of the parties to this Agreement or some person or concern not a party thereto, not reasonably within the control of the Party claiming suspension and which by the exercise of due diligence such Party is unable to prevent or overcome. A failure to settle or prevent any strike or other controversy with employees or with anyone purporting or seeking to represent employees shall not be considered to be a matter within the control of the Party claiming suspension

9. Insurance

Prior to the Company installing Interconnect Facilities, the Biomethane Producer shall provide the Company with a Certificate of Insurance evidencing the form, limits and issuing companies for Worker's Compensation (statutory), Commercial General Liability Insurance (minimum of \$5,000,000) and Commercial Automobile and Liability Insurance (minimum of \$1,000,000). Such Certificate of Insurance shall contain the provisions that: (a) no cancellation or material changes in the policy shall become effective upon thirty (30) days advance written notice, and (b) waive the right of subrogation in favor of Cascade.

10. Indemnification

By receiving service under this Schedule, the Biomethane Producer agrees to protect, defend, indemnify, and hold Cascade Natural Gas Corporation and affiliated companies, its directors, officers, employees, attorney's-in-fact, agents, free and harmless from and against any and all losses, claims, liens, demands, causes of action of very kind and character, arising out of, in connection with, or incident to the biomethane, and, or receipt of service under Schedule 800.

11. Confidentiality

Any drawings, documentations, specifications, prints, designs, ideas, or other information (“Proprietary Information”) provided by either Party, or its designee, to the other pertaining to services provided per Schedule 800 or this Agreement is considered confidential and proprietary information and to be treated as strictly confidential. Neither Party will, without the prior express written consent of the other, disclose such Proprietary Information to any third party or use such information for its own benefits except in connection with the provision of services or fulfillment of responsibilities’ described in this Agreement.

12. Access protocols for locked point of interconnection

The Biomethane Producer must install and maintain a locked gate no less than 6 feet tall enclosing the point of interconnection. The Biomethane Producer must provide the Company with access to the point of interconnection at all times such as by providing the key or combination to the lock that secure the gate.

13. Disputes

This Agreement shall be governed by, and construed in accordance with the laws of the state of Oregon, without regard to its conflict of law provisions. Any litigation between the Parties arising out of or relating to this Agreement will be conducted exclusively in federal or state courts in the state of Oregon and the Parties agree and consent to jurisdiction by such courts.

14. Assignment

Biomethane Producer may not assign or transfer this Biomethane Receipt Service Agreement without Cascade’s prior written consent which shall be in Cascade’s sole discretion. For purposes of this Agreement, any change in control or change in ownership of Biomethane Producer shall be deemed to be an assignment that requires prior written consent from Cascade.

15. Termination

To terminate service under this Agreement, either Party must provide written notice of termination effective no less than 60 days from the date the notice is received by the other Party’s designated representative as identified in Section 17 below. Upon termination of service, the Company may, at its sole option, remove or retire in place any or all Company-owned facilities.

16. Signatories have Authority

The signatories to this Agreement certify that they have the authority to bind the Party they represent.

17. Notices and Communication

Any notice, request, statement, or other communication related to services provided under this Agreement, shall be in writing and shall be given by personal delivery or by United States mail, postage prepaid, and addressed as follows:

To Cascade Natural Gas Corporation

8223 West Grandridge Blvd
Kennewick, Washington 99336

Attn: _____

PHONE NUMBER

FAX NUMBER

EMAIL

To Biomethane Producer

NAME

ADDRESS

ATTN

PHONE NUMBER

FAX NUMBER

EMAIL

For the purposes of this Agreement, the date on which any notice, request, statement, bill, payment, or other communication is given shall be deemed to be the date on which it is received by the recipient, provided any such notice, request, statement, payment, or other communication is transmitted by registered or certified mail, return receipt requested, postage paid, otherwise it shall have deemed to have been given on the third day following the date on which same was deposited in the United States mail, addressed in accordance with this Section. Either Party hereto may designate in writing a further or different address to which subsequent notices, requests, statements, payments, or other communications shall be sent

IN WITNESS WHEREOF, [BIOMETHANE PRODUCER NAME] and Cascade Natural Gas Corporation have executed this Agreement in two (2) duplicate originals, effective as of -----(DATE)-----.

CASCADE NATURAL GAS CORPORATION

Co.: _____

Co.: _____

By: _____

By: _____

Title: _____

Title: _____

Date: _____

Date: _____

Advice No. CNG/O17-04-01

Exhibit C

ATTACHMENT 1
BIOMETHANE RECEIPT SPECIFICATIONS - AGRICULTURAL

NOTE: *This document is intended to become the "Quality" or "Receipt Specifications" portion of Cascade Natural Gas Corporation's Biogas Interconnection Rule or Tariff.*

BIOMETHANE QUALITY REQUIREMENTS AT RECEIPT POINTS

1. Biomethane is defined as biogas which has been conditioned to meet quality specifications similar to pipeline quality natural gas. Additional definitions of terms appear below.
2. Definitions:
 - 2.1. *Biogas*: Gas resulting from the anaerobic digestion of various sources of organic matter.
 - 2.2. *Biomethane*: Methane purified from biogas.
 - 2.3. *Constituent*: A chemical, compound, or material contained in a gas volume.
 - 2.4. *Group 1 Constituents*: Constituents of gas with a concentration below the test detection level or below the Trigger Level.
 - 2.5. *Group 2 Constituents*: Constituents of gas present at a concentration at or above the Trigger Level.
 - 2.6. *Hazardous Waste Landfill*: All contiguous land and structures, and other appurtenances and improvements, on the land used for treatment, transfer, storage, resource recovery, disposal, or recycling of hazardous waste. The facility may consist of one or more treatment, transfer, storage, resource recovery, disposal, or recycling hazardous waste management units, or combinations of these units. This includes facilities permitted by the Department of Toxic Substance Control.
 - 2.7. *Pipeline quality gas*: Natural gas which has been processed to assure that the hydrocarbon content is nearly all methane and to reduce fractions of other constituents to small percentage or trace quantities
 - 2.8. *Supplier*: Provider proposing to inject biogas / biomethane into transporter's pipeline.
 - 2.9. *Transporter*: Pipeline owner (Cascade Natural Gas Corporation)
3. Biomethane delivered to the utility receipt point must meet quality specifications of this document section. Quality specifications are described in Table 1.
 - 3.1. Several constituents are listed in the "Basic Natural Gas Properties" as well as in "Health Protective Constituents" and "Pipeline Integrity Protective Constituents" sections of Table 1 because they have been deemed significant specifications from more than one perspective.

4. In addition to specifications contained in this document, biomethane received by Transporter may be subject to interchangeability testing per American Gas Association (AGA) Research Bulletin 36 in order to satisfy requests of Transporter or Transporter's customers.
5. Biomethane received by Transporter (Cascade Natural Gas Corporation) may be supplied to end users as a discreet gas supply or as a mixed gas supply blended with natural gas or different biomethane provided by others.
 - 5.1. Biomethane received by Transporter must not contain constituents which might restrict the Transporter's inventory, blended or otherwise, to be marketed as a natural gas supply.
6. Biomethane must not contain constituents at concentrations which could present a health or safety hazard to utility workers or the general public.
 - 6.1. These are considered "Health Protective Constituents". Specific carcinogenic constituents and non-carcinogenic constituents are listed in Table 1.
 - 6.2. The Supplier is required to identify health or safety constituents not listed in Table 1, but known to be present in detectable quantities, to the Transporter prior to finalizing an interconnection agreement or supply contract. Such constituents will be addressed in interconnection or contract documents.
7. Biomethane must not contain constituents at concentrations which could damage or deteriorate the integrity of pipeline facilities.
 - 7.1. These are considered "Pipeline Integrity Protective Constituents". Specific constituents are listed in Table 1.
 - 7.2. The Supplier is required to identify such constituents not listed in Table 1, but known to be present in detectable quantities, to the Transporter prior to finalizing an interconnection agreement or supply contract. Such constituents will be addressed in the interconnection or contract documents.

Table 1: QUALITY SPECIFICATIONS FOR BIOMETHANE FROM AGRICULTURAL SOURCES

SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING	STANDARD TEST METHOD [28]
BASIC NATURAL GAS PROPERTIES					
Min. Heat Content (dry, HHV) [1]	985 BTU/scf	N/A	N/A	Continuous real-time monitoring	AGA-5; AGA-8; ASTM D3588; ASTM D7164;
Max. Heat Content (dry, HHV) [1]	1,100 BTU/scf	N/A	N/A		
Min. Wobbe Number	1,275	N/A	N/A	Continuous real-time monitoring	ASTM D1945; ASTM D7314; GPA 2172 / API 14.5; GPA 2261; GPA 2145
Max. Wobbe Number	1,390	N/A	N/A		
Min. Temperature	40 °F	N/A	N/A	Continuous real-time monitoring	Temperature element and transmitter in pipeline.
Max. Temperature	120 °F	N/A	N/A		
Min. Pressure	[4]	N/A	N/A	Continuous real-time monitoring	Pressure element and transmitter in pipeline
Max. Pressure	[5]	N/A	N/A		
Max. Hydrocarbon Dew Point (HDP)	15 °F [6]	N/A	N/A	Continuous real-time monitoring	ASTM D1945; ASTM D1142; ASTM D5454
Max. Cricondenthem (CHDP)	15 °F [7]	N/A	N/A		
Max. C ₄ ⁺	0.75 %vol	N/A	N/A		ASTM D1945; ASTM D1946; ASTM D1766; GPA 2261
Max. C ₅ ⁺ GPM	0.2 gal/Mscf	N/A	N/A		
Max. C ₅ ⁺	0.12% vol	N/A	N/A		
Max. C ₆ ⁺ GPM	0.05 gal/Mscf	N/A	N/A		
Max. Water Vapor Content	7.0 lb/MMscf [9]	N/A	N/A	Continuous real-time monitoring	ASTM D1142; ASTM D5454; ASTM D4888
Max. Total Sulfur [10]	5.0 grains per 100 scf	N/A	N/A	Continuous real-time monitoring	ASTM D1072; ASTM D3246; ASTM D4468; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D6667; ASTM D7165; GPA 2199
Max. Hydrogen Sulfide (H ₂ S)	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv	N/A	N/A		

TABLE 1 – QUALITY SPECIFICATIONS FOR BIOMETHANE FROM AGRICULTURAL SOURCES (continued)					
SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING	STANDARD TEST METHOD [28]
Max. Mercaptans (RSH) [23]	0.2 grain Sulfur per 100 scf 4.6 mg Sulfur/m ³ 3.4 ppmv mercaptan	N/A	N/A	Continuous real-time monitoring	ASTM D1988; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D7165; ASTM D7493; GPA 2265
Max. Particle Size	3 microns	N/A	N/A	Customize to gas source [27]	EPA Method 5
Max. Hydrogen	400 ppm 0.04% vol	N/A	N/A	Continuous or intermittent[26]	ASTM D1945; ASTM D1946; ASTM D1766; GPA 2261.
Max. Total Diluent Gases [11]	3% vol	N/A	N/A	Continuous real-time monitoring	Also for CO ₂ : ASTM D4984; ASTM D7164; GPA 2377
Carbon Dioxide (CO ₂)	2% vol	N/A	N/A		
Nitrogen (N ₂)	1% vol	N/A	N/A		
Oxygen (O ₂)	0.1% vol	N/A	N/A		
General Statements	<p>The gas shall be commercially free from objectionable odors (excluding odorant), solid matter, dust, gums, and gum forming constituents, or any other substance which interferes with the intended purpose of merchantability of the gas, or causes interference with the proper and safe operation of the lines, meters, regulators, or other appliances through which it may flow.</p> <p>The gas shall not contain any toxic or hazardous substance in concentrations which, in the normal use of the gas, may be hazardous to health, injurious to pipeline facilities, or be a limit to merchantability or be contrary to applicable government standards.</p> <p>Biomethane must be free from bacteria, pathogens, and any other substances injurious to utility facilities or that would cause the gas to be unmarketable. [15]</p>			Testing frequency of subject constituent to be same as for similar constituents found in this table.	Testing method of subject constituent to be same as for similar constituents found in this table.

TABLE 1 – QUALITY SPECIFICATIONS FOR BIOMETHANE FROM AGRICULTURAL SOURCES (continued)					
SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING	STANDARD TEST METHOD [28]
BIOMETHANE: HEALTH PROTECTIVE CONSTITUENTS – CARCINOGENIC					
Arsenic	0.019 mg/m ³ 0.006 ppmv	0.19 mg/m ³ 0.06 ppmv	0.48 mg/m ³ 0.15 ppmv	Not Required	EPA Method 29; EPA Method 200.8
p-Dichlorobenzene	5.7 mg/m ³ 0.95 ppmv	57 mg/m ³ 9.5 ppmv	140 mg/m ³ 24 ppmv	Not Required	EPA TO-15
Ethylbenzene	26 mg/m ³ 6.0 ppmv	260 mg/m ³ 60 ppmv	650 mg/m ³ 150 ppmv	Required	EPA TO-15
n-Nitroso-di-n-propylamine	0.033 mg/m ³ 0.006 ppmv	0.33 mg/m ³ 0.06 ppmv	0.81 mg/m ³ 0.15 ppmv	Required	EPA Method 8270
Vinyl Chloride	0.84 mg/m ³ 0.33 ppmv	8.4 mg/m ³ 3.3 ppmv	21 mg/m ³ 8.3 ppmv	Not Required	EPA TO-15
BIOMETHANE: HEALTH PROTECTIVE CONSTITUENTS – NON-CARCINOGENIC					
Antimony	0.60 mg/m ³ 0.12 ppmv	6.0 mg/m ³ 1.2 ppmv	30 mg/m ³ 6.1 ppmv	Not Required	EPA Method 29; EPA Method 200.8
Copper	0.060 mg/m ³ 0.02 ppmv	0.60 mg/m ³ 0.23 ppmv	3.0 mg/m ³ 1.2 ppmv	Not Required	EPA Method 29; EPA Method 200.8
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv	57 mg/m ³ 40 ppmv	285 mg/m ³ 200 ppmv	Required	ASTM D4810; ASTM D5504; ASTM D7165; ASTM D7493; GPA 2261
Lead	0.075 mg/m ³ 0.009 ppmv	0.75 mg/m ³ 0.09 ppmv	3.8 mg/m ³ 0.44 ppmv	Not Required	EPA Method 29; EPA Method 200.8
Mercaptans (Alkyl Thiols)	0.2 grain Sulfur per 100 scf 4.6 mg Sulfur/m ³ 3.4 ppmv mercaptan	2.0 grain Sulfur per 100 scf 46 mg Sulfur/m ³ 34 ppmv mercaptan	10 grain Sulfur per 100 scf 230 mg Sulfur/m ³ 170 ppmv mercaptan	Required	ASTM D1988; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D7165; ASTM D7493; GPA 2265
Methacrolein	1.1 mg/m ³ 0.37 ppmv	11 mg/m ³ 3.7 ppmv	53 mg/m ³ 18 ppmv	Not Required	EPA TO-15, EPA TO-11A
Toluene	904 mg/m ³ 240 ppmv	9000 mg/m ³ 2400 ppmv	45000 mg/m ³ 12000 ppmv	Required	EPA TO-15

TABLE 1 – QUALITY SPECIFICATIONS FOR BIOMETHANE FROM AGRICULTURAL SOURCES (continued)					
SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING	STANDARD TEST METHOD [28]
BIOMETHANE: PIPELINE INTEGRITY PROTECTIVE CONSTITUENTS					
Ammonia	0.001%	0.005% [12]	TBD [12]	Required	Gas Chromatograph with CID or lab analysis [30]
Biologicals	4 x 10 ⁴ / scf (qPCR per APB, SRB, IOB group) and commercially free of bacteria of >0.2 microns [13]	2 x 10 ⁵ / scf (qPCR per APB, SRB, IOB group) [12, 13]	TBD [12]	Required	Filter to 0.2 micron and analyze for Total, APB, SRB, and IOB using qPCR [29]
Hydrogen	400 ppm 0.04% vol	2,000 [12]	TBD [12]	Required	ASTM D1945; ASTM D1946
Mercury	0.08 mg/m ³	0.4 [12]	TBD [12]	Required	EPA Method 29; EPA Method 200.8
Siloxanes	0.01 mg Si/m ³	0.1 mg Si/m ³	TBD [12]	Required	Gas Chromatograph [31]
BIOMETHANE: TRACE CONSTITUENTS, CONTAMINANTS, AND OBJECTIONABLE MATERIAL					
Contaminants not listed above [25]	Tolerable limits to be evaluated on a case-by-case basis			Prior to introduction and immediately after process changes	

[1] Dry, High Heating Value at 14.73 psia, 60 °F

[2] Not used.

[3] Not used.

[4] Pressure sufficient to allow gas to enter the facilities of Transporter as specified in agreement/contract between Shipper and Transporter

[5] Pressure shall not be in excess of the maximum allowable operating pressure of Transporter’s facilities at receipt point

[6] At any pressure between 100 psia and 1000 psia as calculated from the gas composition and shall be free from hydrocarbons in the liquid state

[7] Cricondentherm Hydrocarbon Dew Point or maximum temperature at which gas and liquid phases can coexist irrespective of pressure

[8] Not used.

[9] Gas shall be free from liquid water

[10] Excluding odorants

[11] Sometimes referred to as “inerts”. Nonhydrocarbons including but not limited to carbon dioxide, nitrogen, and oxygen.

[12] No values available in literature. Allowed value of Lower Action Level to equal five times Trigger Level. Lower Action Levels to be confirmed and Upper Action Levels to be determined after future data becomes available.

[13] qPCR is an abbreviation for Quantitative Polymerase Chain Reaction, a molecular biology analytical technique. APB = Acid Producing Bacteria. SRB = Sulfate Reducing Bacteria. IOB = Iron Oxidizing Bacteria.

[14] Not used.

[15] Not used.

[16] Not used.

[17] Limit is value corresponding to parameter being measured for "Basic Natural Gas" properties. Trigger Level corresponds to a \geq one in one million risk of developing cancer due to exposure at listed value for carcinogens or a hazard quotient of ≥ 0.1 for non-carcinogens as defined in California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, p. 54 – 62.

[18] Lower Action Level corresponds to a \geq ten in one million risk of developing cancer due to exposure at listed value for carcinogens or a hazard quotient of ≥ 1.0 for non-carcinogens as defined in California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, p. 54 – 62.

[19] Upper Action Level corresponds to a ≥ 25 in one million risk of developing cancer due to exposure at listed value for carcinogens or a hazard quotient of ≥ 5.0 for non-carcinogens as defined in California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, p. 54 – 62.

[20] Not used.

[21] Not used.

[22] Not used.

[23] Grains per 100 cu ft and mg per cu meter are both reported as Sulfur. ppmv value is for mercaptan assuming mercaptan is methyl mercaptan.

[24] Not used.

[25] Examples include PCB's, non-halogenated Volatile and Semi-Volatile organics, halocarbons (Freon, chloroethane, etc.), aldehydes, ketones, and others.

[26] At Transporter's discretion, online gas chromatograph can be equipped to monitor hydrogen routinely or grab samples can be analyzed in a laboratory on some intermittent schedule.

[27] At Transporter's discretion, either inline filtering or EPA Method 5 isokinetic sampling can be used. Frequency to match testing frequency of health protective constituents or pipeline integrity protective constituents unless specified otherwise by Transporter.

[28] Although each method is appropriate for corresponding constituents, not all methods listed will be appropriate for the required analyses. An independent laboratory certified to analyze pipeline natural gas should be consulted to determine the appropriate methods.

[29] Reference description in Gas Technology Institute, "Guidance Document for the Introduction of Landfill-Derived Renewable Gas into Natural Gas Pipelines", Final Report # GTI-12-0007; p. 20.

[30] Reference description in Gas Technology Institute, "Guidance Document for the Introduction of Landfill-Derived Renewable Gas into Natural Gas Pipelines", Final Report # GTI-12-0007; p. 25. Gas chromatograph to be coupled with a nitrogen chemiluminescence detector.

[31] Reference description in Gas Technology Institute, "Guidance Document for the Introduction of Landfill-Derived Renewable Gas into Natural Gas Pipelines", Final Report # GTI-12-0007; p. 26. Gas chromatograph to be coupled with an atomic emission detector or mass spectral detector, depending on sample collection method.

8. COSTS RELATED TO QUALITY MONITORING

- 8.1. As part of the interconnection agreement, the Supplier will pay Cascade's costs for all engineering, procurement, and construction of quality monitoring systems. Such expenses will include, but not be limited to, sample fittings, piping, analyzers, equipment enclosures, related permits, land rights, odorizing equipment, communication equipment, software, programming costs, design costs, and other expenses. Cascade will own and operate all related facilities on Cascade's side of the interconnection.
- 8.2. Supplier will be responsible for the cost of analytical testing prior to the initial interconnection, periodic testing during operation, and special testing after biomethane supply is interrupted.
- 8.3. Unless otherwise agreed upon, Transporter will continuously monitor selected biomethane quality specifications to detect general biomethane generation process conditions. Specifications monitored will commonly include those listed in the "Basic Natural Gas Properties" section of Table 1. If Transporter senses that specifications being monitored may indicate changes in biomethane quality, the Transporter may request that the Supplier provide additional testing on an accelerated schedule. The Supplier will be responsible for such testing.
- 8.4. Retesting shall be permitted to validate test results. The party requesting the retest will pay for retesting.

9. BIOMETHANE MONITORING REQUIREMENT PRIOR TO INITIAL BIOMETHANE INTERCONNECTION TO PIPELINE:

- 9.1. Testing prior to interconnection to the pipeline will be the responsibility of the Supplier using independent certified testing facilities. Results are to be shared with the Transporter within five calendar days of the time results are received by the Supplier.
- 9.2. Biomethane should be analyzed at two different times over a 2 – 4 week period prior to interconnection in order to detect parameters or components listed in Table 1^{1,2,3}. Tests should occur with biomethane production operating at steady state and at the anticipated normal production capacity. The two tests should be performed at least five days apart. Testing should be conducted using analytical methods and techniques considered acceptable in the natural gas industry.
- 9.3. Biomethane cannot be injected into the natural gas pipeline if:
 - 9.3.1. any parameter fails to comply with quality limits listed in the "Basic Natural Gas Properties" section of Table 1; or
 - 9.3.2. any constituent listed in the "Health Protective Constituents - Carcinogenic" or "Health Protective Constituents – Non-Carcinogenic" sections of Table 1 exceeds the Lower Action Levels listed in Table 1; or
 - 9.3.3. any constituent listed in the "Health Protective Constituents - Carcinogenic" or "Health Protective Constituents – Non-Carcinogenic" sections of Table 1 exceeds the Trigger Levels listed in Table 1 and the collective potential cancer risk or non-

cancer risk is at or above the Lower Action Level listed in Table 5 (see below for method of calculating collective potential risk); or

9.3.4. any constituent listed in “Pipeline Integrity Protective Constituents” sections of Table 1 exceeds the Lower Action Levels listed in Table 1.

9.4. Biomethane can be injected into the natural gas pipeline if:

9.4.1. all conditions specifically described in the Supplier – Transporter contract have been satisfied; and

9.4.2. all parameters comply with quality limits listed in the “Basic Natural Gas Properties” section of Table 1; and

9.4.3. constituents listed in the “Health Protective Constituents - Carcinogenic” or “Health Protective Constituents – Non-Carcinogenic” sections of Table 1 are found to be either:

9.4.3.1. non-detectable or below the Trigger Levels listed in Table 1, or

9.4.3.2. below Lower Action Level with the collective potential cancer risk and non-cancer risk both below the Lower Action Level listed in Table 5 (see below for method of calculating collective potential risk); and

9.4.4. all constituents listed in “Pipeline Integrity Protective Constituents” sections of Table 1 are either:

9.4.4.1. non-detectable or below the Trigger Levels listed in Table 1, or

9.4.4.2. below Lower Action Level and subject to more frequent testing during active injection as agreed upon between Supplier and Transporter.

10. BIOMETHANE MONITORING REQUIREMENT DURING OPERATION + SHUTOFF CRITERIA

10.1. Testing at the interconnection during active flow into the pipeline at the interconnection will be the responsibility of the Transporter using independent certified testing facilities. Results are to be shared with the Supplier in a timely manner. Testing of raw biogas and biomethane upstream from the interconnection during this period will be the responsibility of the Supplier.

10.2. BASIC NATURAL GAS PROPERTIES:

10.2.1. Transporter shall provide continuous real-time or near-real time monitoring for selected basic natural gas properties listed in Table 1. Compliance shall be assessed using a 4- to 8-minute monitoring interval⁴. Unless transporter specifically agrees to other conditions, injected gas must meet all quality specifications. The transporter may refuse to accept any gas which does not meet specifications listed in this document or listed in a separate agreement between the transporter and supplier.

10.3. HEALTH PROTECTIVE CONSTITUENTS (CARCINOGENIC AND NON-CARCINOGENIC):

- 10.3.1. For purposes of categorizing the various constituents, they will be defined as either Group 1 or Group 2 constituents. Group 1 constituents are those with a concentration below the test detection level or below the Trigger Level. Group 2 constituents are those present at a concentration at or above the Trigger Level.⁵
 - 10.3.1.1. Group 1 constituents should be monitored at least once every 12 months of injection into the transporter’s pipeline.⁶
 - 10.3.1.2. Group 2 constituents should be monitored and the total potential cancer risk and non-cancer risk estimated at least every 3 months of injection into the transporter’s pipeline.⁷
 - 10.3.1.2.1. If four consecutive quarterly tests show that an individual group 2 constituent is below the trigger level, then monitoring frequency can be reduced to 12 month intervals.⁸
 - 10.3.1.2.2. If four consecutive quarterly tests show that the total potential cancer risk or non-cancer risk for group 2 constituents is below the lower action level (see Table 2), monitoring can be reduced to 12 month intervals for all of the constituents tested for these risks.⁹
- 10.3.2. If test results exceed the lower action level but are below the upper action level three times in a 12-month period, the flow of injected gas must be stopped unless temporary provisions are made with the transporter.
- 10.3.3. If any test result is at or above the upper action level, the flow of injected gas must be stopped unless temporary provisions are made with the transporter. Similarly, if the collective health risk is calculated to be at or above the upper action level (see Table 2), the flow of injected gas must be stopped unless or until temporary provisions are made with the transporter.
- 10.3.4. Selected testing details are summarized in Table 2.

Table 2: TESTING INTERVALS DURING BIOMETHANE INJECTION

GROUP	TESTING INTERVAL	COMMENTS
1 (Less than Trigger Level)	12 Months	Move constituent to Group 2 if analysis yields \geq Trigger Level
2 (Equal to or greater than Trigger Level)	3 Months	Move constituent to Group 1 if 4 consecutive analyses yield concentrations $<$ Trigger Level

10.4. PIPELINE INTEGRITY PROTECTIVE CONSTITUENTS

- 10.4.1. Group 1 and Group 2 categories will be defined in a manner similar to health protective constituents above. Group 1 constituents are those with a concentration below the test detection level or below the Trigger Level. Group 2 constituents are those present at a concentration at or above the Trigger Level.

- 10.4.2. Group 1 and Group 2 constituents should be monitored at least quarterly, unless another frequency is requested or agreed to by the transporter.¹⁰
- 10.4.3. If any test result is at or above the trigger level, the transporter must be notified immediately.
- 10.4.4. If any test result is at or above the lower action level, the flow of injected gas must be stopped unless temporary provisions are made with the transporter.
- 10.4.5. Refer to Table 2 for selected testing details.
- 10.5. BIOMETHANE DELIVERY PROCESS CHANGES
 - 10.5.1. Supplier must notify Transporter prior to changing the biomethane production and delivery system. Prospective changes may include, but not be limited to, feedstock changes, biogas conditioning equipment changes, biogas process condition changes, system control changes, addition or deletion of process equipment or operating parameters, and other modifications.
 - 10.5.2. If Transporter deems that proposed changes to biomethane production and delivery system will potentially increase the level of any constituent of concern above previous levels, Transporter can require that biomethane injection be stopped and startup testing similar to initial interconnection testing be performed.
- 11. BIOMETHANE MONITORING REQUIREMENT PRIOR TO REINTRODUCING BIOMETHANE TO PIPELINE INTERCONNECTION AFTER BIOMETHANE SUPPLY SHUTOFF
 - 11.1. If agreed upon by carrier, interrupted biomethane flow can be restarted after successfully proving compliance with monitoring limits with a single test. Testing requirements should be identical to testing required prior to initial interconnection to the pipeline. Frequencies of testing would revert to baseline periods. The supplier will need to re-establish the permission to extend time between tests based on consecutive results showing low concentrations of constituents.
 - 11.2. Testing prior to resuming flow at the interconnection to the pipeline will be the responsibility of the Supplier using independent certified testing facilities. Results are to be shared with the Transporter within five calendar days of the time results are received by the Supplier.

12. WAIVER PROVISION

- 12.1. Cascade Natural Gas Corporation, at its sole discretion, may elect, but is not obligated to, on a non-discriminatory basis to waive supplier's obligation to conform with certain gas quality specifications, provided that such waiver does not interfere with Cascade's ability to fulfill its obligations to other parties. Any such waiver is temporary and is without prejudice to Cascade's right hereunder or any other rights which it may have, including without limitation, Cascade's right to reject other non-conforming gas.

13. CALCULATION OF COLLECTIVE POTENTIAL HEALTH RISK

- 13.1. The collective potential health risk is an indication of the cumulative effect of all Group 2 constituents (constituents found at or above the Trigger Level). This is calculated using the ratio of measured concentrations divided by the Trigger Level of each particular constituent and summing the individual calculation results.

13.2. CARCINOGENIC CONSTITUENTS

- 13.2.1. The Trigger Level is based on a one in one million cancer risk for each constituent.
- 13.2.2. The risk level for each constituent is calculated by dividing the measured concentration by the Trigger Level concentration for that constituent.
- 13.2.3. The collective health risk will equal the sum of all individual risk levels.
- 13.2.4. If the collective risk level reaches or exceeds the Lower Action Level or Upper Action Level, flow of gas should be adjusted according to criteria listed above.

13.3. NON-CARCINOGENIC CONSTITUENTS

- 13.3.1. The Trigger Level is based on a hazard quotient of 0.1 for each constituent.
- 13.3.2. The risk level for each constituent is calculated by dividing the measured concentration by the Trigger Level concentration for that constituent then multiplying the ratio by 0.1.
- 13.3.3. The collective health risk will equal the sum of all individual risk levels.
- 13.3.4. If the collective risk level reaches or exceeds the Lower Action Level or Upper Action Level, flow of gas should be adjusted according to criteria listed above.
- 13.4. Guidance for calculating and applying collective potential health risk data is summarized in Tables 3, 4, and 5.

Table 3: TESTING OUTCOMES CALCULATION TABLE FOR GROUP 2 CONSTITUENTS PRIOR TO BIOMETHANE INJECTION

CONSTITUENT	TRIGGER LEVEL	ACTUAL ANALYSIS	RATIO (B / A)
	A	B *	C **
HEALTH PROTECTIVE CONSTITUENTS - CARCINOGENIC			
Arsenic	0.019 mg/m ³ 0.006 ppmv		
p-Dichlorobenzene	5.7 mg/m ³ 0.95 ppmv		
Ethylbenzene	26 mg/m ³ 6.0 ppmv		
n-Nitroso-di-n-propylamine	0.033 mg/m ³ 0.006 ppmv		
Vinyl Chloride	0.84 mg/m ³ 0.33 ppmv		
TOTAL COLLECTIVE POTENTIAL RISK*** (Total of Ratio's) BIOMETHANE INJECTION CANNOT BE PERMITTED IF THIS TOTAL EQUALS OR EXCEEDS <u>10.0</u>			
HEALTH PROTECTIVE CONSTITUENTS – NON-CARCINOGENIC			
Antimony	0.60 mg/m ³ 0.12 ppmv		
Copper	0.060 mg/m ³ 0.02 ppmv		
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv		
Lead	0.075 mg/m ³ 0.009 ppmv		
Mercaptans (Alkyl Thiols)	0.2 grain per 100 scf 4.6 mg/m ³ 2.3 ppmv		
Methacrolein	1.1 mg/m ³ 0.37 ppmv		
Toluene	904 mg/m ³ 240 ppmv		
TOTAL COLLECTIVE HAZARD INDEX (Total of Ratio's) BIOMETHANE INJECTION CANNOT BE PERMITTED IF THIS TOTAL EQUALS OR EXCEEDS <u>1.0</u>			

* To be determined by analysis. Only one unit of measure is required.

** To be calculated by dividing value B by value A (B / A = C). (units of measurement in numerator and denominator must match)

***Sum of values for individual constituents (carcinogenic and non-carcinogenic constituents to be calculated separately)

Table 4: TESTING OUTCOMES CALCULATION TABLE FOR GROUP 2 CONSTITUENTS DURING BIOMETHANE INJECTION

CONSTITUENT	TRIGGER LEVEL	ACTUAL ANALYSIS	RATIO (B / A)
	A	B *	C **
HEALTH PROTECTIVE CONSTITUENTS - CARCINOGENIC			
Arsenic	0.019 mg/m ³ 0.006 ppmv		
p-Dichlorobenzene	5.7 mg/m ³ 0.95 ppmv		
Ethylbenzene	26 mg/m ³ 6.0 ppmv		
n-Nitroso-di-n-propylamine	0.033 mg/m ³ 0.006 ppmv		
Vinyl Chloride	0.84 mg/m ³ 0.33 ppmv		
TOTAL COLLECTIVE POTENTIAL RISK*** (Total of Ratio's) BIOMETHANE INJECTION MUST BE STOPPED IF THIS TOTAL EQUALS OR EXCEEDS <u>25.0</u> FOR ANY SINGLE PERIOD OR IF IT EQUALS OR EXCEEDS <u>10.0</u> THREE TIMES IN 12 MONTHS			
HEALTH PROTECTIVE CONSTITUENTS – NON-CARCINOGENIC			
Antimony	0.60 mg/m ³ 0.12 ppmv		
Copper	0.060 mg/m ³ 0.02 ppmv		
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv		
Lead	0.075 mg/m ³ 0.009 ppmv		
Mercaptans (Alkyl Thiols)	0.2 grain per 100 scf 4.6 mg/m ³ 2.3 ppmv		
Methacrolein	1.1 mg/m ³ 0.37 ppmv		
Toluene	904 mg/m ³ 240 ppmv		
TOTAL COLLECTIVE HAZARD INDEX (Total of Ratio's) BIOMETHANE INJECTION MUST BE STOPPED IF THIS TOTAL EQUALS OR EXCEEDS <u>5.0</u> FOR ANY SINGLE PERIOD OR IF IT EQUALS OR EXCEEDS <u>1.0</u> THREE TIMES IN 12 MONTHS			

* To be determined by analysis. Only one unit of measure is required.

** To be calculated by dividing value B by value A (B / A = C). (units of measurement in numerator and denominator must match)

***Sum of values for individual constituents (carcinogenic and non-carcinogenic constituents to be calculated separately)

Table 5: COLLECTIVE POTENTIAL RISK OR HAZARD INDEX LEVEL FROM HEALTH PROTECTIVE CONSTITUENTS [1]

RISK MANAGEMENT LEVEL	POTENTIAL RISK FROM CARCINOGENS	HAZARD INDEX FROM NON-CARCINOGENS	ACTION / TESTING
Trigger Level	≥ 1.0	≥ 0.1	Periodic Testing Required
Lower Action Level	≥ 10.0	≥ 1.0	Stop injection after three exceedances in 12-month period
Upper Action Level	≥ 25.0	≥ 5.0	Stop injection immediately

[1] Sum of risk or hazard index values for individual constituents present at or above trigger level concentrations. Carcinogens and non-carcinogens are calculated and summarized separately.

BIBLIOGRAPHY / REFERENCES

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- ¹ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 65.
 - ² Pacific Gas and Electric Company, "Gas Rule No. 21, Transportation of Natural Gas", April 19, 2015, sheet 21.
 - ³ Southern California Gas Company, "Rule No. 30, Transportation of Customer-owned Gas", May 1, 2015, sheet 51383-G.
 - ⁴ Southern California Gas Company, "Rule No. 30, Transportation of Customer-owned Gas", May 1, 2015, sheet 50808-G.
 - ⁵ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 67.
 - ⁶ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 67
 - ⁷ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 67
 - ⁸ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 68
 - ⁹ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 68
 - ¹⁰ Recommended testing frequency was not found in literature reviewed.

ATTACHMENT 4
BIOMETHANE RECEIPT SPECIFICATIONS – FOOD & BEVERAGE BIODIGESTERS

NOTE: *This document is intended to become the “Quality” or “Receipt Specifications” portion of Cascade Natural Gas Corporation’s Biogas Interconnection Rule or Tariff.*

BIOMETHANE QUALITY REQUIREMENTS AT RECEIPT POINTS

1. Biomethane is defined as biogas which has been conditioned to meet quality specifications similar to pipeline quality natural gas. Additional definitions of terms appear below.
2. Definitions:
 - 2.1. *Biogas*: Gas resulting from the anaerobic digestion of various sources of organic matter.
 - 2.2. *Biomethane*: Methane purified from biogas.
 - 2.3. *Constituent*: A chemical, compound, or material contained in a gas volume.
 - 2.4. *Group 1 Constituents*: Constituents of gas with a concentration below the test detection level or below the Trigger Level.
 - 2.5. *Group 2 Constituents*: Constituents of gas present at a concentration at or above the Trigger Level.
 - 2.6. *Hazardous Waste Landfill*: All contiguous land and structures, and other appurtenances and improvements, on the land used for treatment, transfer, storage, resource recovery, disposal, or recycling of hazardous waste. The facility may consist of one or more treatment, transfer, storage, resource recovery, disposal, or recycling hazardous waste management units, or combinations of these units. This includes facilities permitted by the Department of Toxic Substance Control.
 - 2.7. *Pipeline quality gas*: Natural gas which has been processed to assure that the hydrocarbon content is nearly all methane and to reduce fractions of other constituents to small percentage or trace quantities
 - 2.8. *Supplier*: Provider proposing to inject biogas / biomethane into transporter’s pipeline.
 - 2.9. *Transporter*: Pipeline owner (Cascade Natural Gas Corporation)
3. Biomethane delivered to the utility receipt point must meet quality specifications of this document section. Quality specifications are described in Table 1.
 - 3.1. Several constituents are listed in the “Basic Natural Gas Properties” as well as in “Health Protective Constituents” and “Pipeline Integrity Protective Constituents” sections of Table 1 because they have been deemed significant specifications from more than one perspective.

4. In addition to specifications contained in this document, biomethane received by Transporter may be subject to interchangeability testing per American Gas Association (AGA) Research Bulletin 36 in order to satisfy requests of Transporter or Transporter's customers.
5. Biomethane received by Transporter (Cascade Natural Gas Corporation) may be supplied to end users as a discreet gas supply or as a mixed gas supply blended with natural gas or different biomethane provided by others.
 - 5.1. Biomethane received by Transporter must not contain constituents which might restrict the Transporter's inventory, blended or otherwise, to be marketed as a natural gas supply.
6. Biomethane must not contain constituents at concentrations which could present a health or safety hazard to utility workers or the general public.
 - 6.1. These are considered "Health Protective Constituents". Specific carcinogenic constituents and non-carcinogenic constituents are listed in Table 1.
 - 6.2. The Supplier is required to identify health or safety constituents not listed in Table 1, but known to be present in detectable quantities, to the Transporter prior to finalizing an interconnection agreement or supply contract. Such constituents will be addressed in interconnection or contract documents.
7. Biomethane must not contain constituents at concentrations which could damage or deteriorate the integrity of pipeline facilities.
 - 7.1. These are considered "Pipeline Integrity Protective Constituents". Specific constituents are listed in Table 1.
 - 7.2. The Supplier is required to identify such constituents not listed in Table 1, but known to be present in detectable quantities, to the Transporter prior to finalizing an interconnection agreement or supply contract. Such constituents will be addressed in the interconnection or contract documents.

Table 1: QUALITY SPECIFICATIONS FOR BIOMETHANE FROM FOOD & BEVERAGE BIODIGESTERS

SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING	STANDARD TEST METHOD [28]
BASIC NATURAL GAS PROPERTIES					
Min. Heat Content (dry, HHV) [1]	985 BTU/scf	N/A	N/A	Continuous real-time monitoring	AGA-5; AGA-8; ASTM D3588; ASTM D7164;
Max. Heat Content (dry, HHV) [1]	1,100 BTU/scf	N/A	N/A		
Min. Wobbe Number	1,275	N/A	N/A	Continuous real-time monitoring	ASTM D1945; ASTM D7314; GPA 2172 / API 14.5; GPA 2261; GPA 2145
Max. Wobbe Number	1,390	N/A	N/A		
Min. Temperature	40 °F	N/A	N/A	Continuous real-time monitoring	Temperature element and transmitter in pipeline.
Max. Temperature	120 °F	N/A	N/A		
Min. Pressure	[4]	N/A	N/A	Continuous real-time monitoring	Pressure element and transmitter in pipeline
Max. Pressure	[5]	N/A	N/A		
Max. Hydrocarbon Dew Point (HDP)	15 °F [6]	N/A	N/A	Continuous real-time monitoring	ASTM D1945; ASTM D1142; ASTM D5454
Max. Cricondenthem (CHDP)	15 °F [7]	N/A	N/A		
Max. C ₄ ⁺	0.75 %vol	N/A	N/A		ASTM D1945; ASTM D1946; ASTM D1766; GPA 2261
Max. C ₅ ⁺ GPM	0.2 gal/Mscf	N/A	N/A		
Max. C ₅ ⁺	0.12% vol	N/A	N/A		
Max. C ₆ ⁺ GPM	0.05 gal/Mscf	N/A	N/A		
Max. Water Vapor Content	7.0 lb/MMscf [9]	N/A	N/A	Continuous real-time monitoring	ASTM D1142; ASTM D5454; ASTM D4888
Max. Total Sulfur [10]	5.0 grains per 100 scf	N/A	N/A	Continuous real-time monitoring	ASTM D1072; ASTM D3246; ASTM D4468; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D6667; ASTM D7165; GPA 2199
Max. Hydrogen Sulfide (H ₂ S)	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv	N/A	N/A		

TABLE 1 – QUALITY SPECIFICATIONS FOR BIOMETHANE FROM FOOD & BEVERAGE BIODIGESTERS (continued)					
SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING	STANDARD TEST METHOD [28]
Max. Mercaptans (RSH) [23]	0.2 grain Sulfur per 100 scf 4.6 mg Sulfur/m ³ 3.4 ppmv mercaptan	N/A	N/A	Continuous real-time monitoring	ASTM D1988; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D7165; ASTM D7493; GPA 2265
Max. Particle Size	3 microns	N/A	N/A	Customize to gas source [27]	EPA Method 5
Max. Hydrogen	400 ppm 0.04% vol	N/A	N/A	Continuous or intermittent[26]	ASTM D1945; ASTM D1946; ASTM D1766; GPA 2261.
Max. Total Diluent Gases [11]	3% vol	N/A	N/A	Continuous real-time monitoring	Also for CO ₂ : ASTM D4984; ASTM D7164; GPA 2377
Carbon Dioxide (CO ₂)	2% vol	N/A	N/A		
Nitrogen (N ₂)	1% vol	N/A	N/A		
Oxygen (O ₂)	0.1% vol	N/A	N/A		
General Statements	<p>The gas shall be commercially free from objectionable odors (excluding odorant), solid matter, dust, gums, and gum forming constituents, or any other substance which interferes with the intended purpose of merchantability of the gas, or causes interference with the proper and safe operation of the lines, meters, regulators, or other appliances through which it may flow.</p> <p>The gas shall not contain any toxic or hazardous substance in concentrations which, in the normal use of the gas, may be hazardous to health, injurious to pipeline facilities, or be a limit to merchantability or be contrary to applicable government standards.</p> <p>Biomethane must be free from bacteria, pathogens, and any other substances injurious to utility facilities or that would cause the gas to be unmarketable. [15]</p>			Testing frequency of subject constituent to be same as for similar constituents found in this table.	Testing method of subject constituent to be same as for similar constituents found in this table.

TABLE 1 – QUALITY SPECIFICATIONS FOR BIOMETHANE FROM FOOD & BEVERAGE BIODIGESTERS (continued)					
SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING [32]	STANDARD TEST METHOD [28]
BIOMETHANE: HEALTH PROTECTIVE CONSTITUENTS – CARCINOGENIC					
Arsenic	0.019 mg/m ³ 0.006 ppmv	0.19 mg/m ³ 0.06 ppmv	0.48 mg/m ³ 0.15 ppmv	Not Required	EPA Method 29; EPA Method 200.8
p-Dichlorobenzene	5.7 mg/m ³ 0.95 ppmv	57 mg/m ³ 9.5 ppmv	140 mg/m ³ 24 ppmv	Required	EPA TO-15
Ethylbenzene	26 mg/m ³ 6.0 ppmv	260 mg/m ³ 60 ppmv	650 mg/m ³ 150 ppmv	Required	EPA TO-15
n-Nitroso-di-n-propylamine	0.033 mg/m ³ 0.006 ppmv	0.33 mg/m ³ 0.06 ppmv	0.81 mg/m ³ 0.15 ppmv	Not Required	EPA Method 8270
Vinyl Chloride	0.84 mg/m ³ 0.33 ppmv	8.4 mg/m ³ 3.3 ppmv	21 mg/m ³ 8.3 ppmv	Required	EPA TO-15
BIOMETHANE: HEALTH PROTECTIVE CONSTITUENTS – NON-CARCINOGENIC					
Antimony	0.60 mg/m ³ 0.12 ppmv	6.0 mg/m ³ 1.2 ppmv	30 mg/m ³ 6.1 ppmv	Not Required	EPA Method 29; EPA Method 200.8
Copper	0.060 mg/m ³ 0.02 ppmv	0.60 mg/m ³ 0.23 ppmv	3.0 mg/m ³ 1.2 ppmv	Not Required	EPA Method 29; EPA Method 200.8
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv	57 mg/m ³ 40 ppmv	285 mg/m ³ 200 ppmv	Required	ASTM D4810; ASTM D5504; ASTM D7165; ASTM D7493; GPA 2261
Lead	0.075 mg/m ³ 0.009 ppmv	0.75 mg/m ³ 0.09 ppmv	3.8 mg/m ³ 0.44 ppmv	Not Required	EPA Method 29; EPA Method 200.8
Mercaptans (Alkyl Thiols)	0.2 grain Sulfur per 100 scf 4.6 mg Sulfur/m ³ 3.4 ppmv mercaptan	2.0 grain Sulfur per 100 scf 46 mg Sulfur/m ³ 34 ppmv mercaptan	10 grain Sulfur per 100 scf 230 mg Sulfur/m ³ 170 ppmv mercaptan	Required	ASTM D1988; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D7165; ASTM D7493; GPA 2265
Methacrolein	1.1 mg/m ³ 0.37 ppmv	11 mg/m ³ 3.7 ppmv	53 mg/m ³ 18 ppmv	Not Required	EPA TO-15, EPA TO-11A
Toluene	904 mg/m ³ 240 ppmv	9000 mg/m ³ 2400 ppmv	45000 mg/m ³ 12000 ppmv	Required	EPA TO-15

TABLE 1 – QUALITY SPECIFICATIONS FOR BIOMETHANE FROM FOOD & BEVERAGE BIODIGESTERS (continued)					
SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING [32]	STANDARD TEST METHOD [28]
BIOMETHANE: PIPELINE INTEGRITY PROTECTIVE CONSTITUENTS					
Ammonia	0.001%	0.005% [12]	TBD [12]	Required	Gas Chromatograph with CID or lab analysis [30]
Biologicals	4 x 10 ⁴ / scf (qPCR per APB, SRB, IOB group) and commercially free of bacteria of >0.2 microns [13]	2 x 10 ⁵ / scf (qPCR per APB, SRB, IOB group) [12, 13]	TBD [12]	Required	Filter to 0.2 micron and analyze for Total, APB, SRB, and IOB using qPCR [29]
Hydrogen	400 ppm 0.04% vol	2,000 [12]	TBD [12]	Required	ASTM D1945; ASTM D1946
Mercury	0.08 mg/m ³	0.4 [12]	TBD [12]	Required	EPA Method 29; EPA Method 200.8
Siloxanes	0.01 mg Si/m ³	0.1 mg Si/m ³	TBD [12]	Required	Gas Chromatograph [31]
BIOMETHANE: TRACE CONSTITUENTS, CONTAMINANTS, AND OBJECTIONABLE MATERIAL					
Contaminants not listed above [25]	Tolerable limits to be evaluated on a case-by-case basis			Prior to introduction and immediately after process changes	

[1] Dry, High Heating Value at 14.73 psia, 60 °F

[2] Not used.

[3] Not used.

[4] Pressure sufficient to allow gas to enter the facilities of Transporter as specified in agreement/contract between Shipper and Transporter

[5] Pressure shall not be in excess of the maximum allowable operating pressure of Transporter’s facilities at receipt point

[6] At any pressure between 100 psia and 1000 psia as calculated from the gas composition and shall be free from hydrocarbons in the liquid state

[7] Cricondentherm Hydrocarbon Dew Point or maximum temperature at which gas and liquid phases can coexist irrespective of pressure

[8] Not used.

[9] Gas shall be free from liquid water

[10] Excluding odorants

[11] Sometimes referred to as “inerts”. Nonhydrocarbons including but not limited to carbon dioxide, nitrogen, and oxygen.

- [12] No values available in literature. Allowed value of Lower Action Level to equal five times Trigger Level. Lower Action Levels to be confirmed and Upper Action Levels to be determined after future data becomes available.
- [13] qPCR is an abbreviation for Quantitative Polymerase Chain Reaction, a molecular biology analytical technique. APB = Acid Producing Bacteria. SRB = Sulfate Reducing Bacteria. IOB = Iron Oxidizing Bacteria.
- [14] Not used.
- [15] Not used.
- [16] Not used.
- [17] Limit is value corresponding to parameter being measured for "Basic Natural Gas" properties. Trigger Level corresponds to a \geq one in one million risk of developing cancer due to exposure at listed value for carcinogens or a hazard quotient of ≥ 0.1 for non-carcinogens as defined in California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, p. 54 – 62.
- [18] Lower Action Level corresponds to a \geq ten in one million risk of developing cancer due to exposure at listed value for carcinogens or a hazard quotient of ≥ 1.0 for non-carcinogens as defined in California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, p. 54 – 62.
- [19] Upper Action Level corresponds to a ≥ 25 in one million risk of developing cancer due to exposure at listed value for carcinogens or a hazard quotient of ≥ 5.0 for non-carcinogens as defined in California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, p. 54 – 62.
- [20] Not used.
- [21] Not used.
- [22] Not used.
- [23] Grains per 100 cu ft and mg per cu meter are both reported as Sulfur. ppmv value is for mercaptan assuming mercaptan is methyl mercaptan.
- [24] Not used.
- [25] Examples include PCB's, non-halogenated Volatile and Semi-Volatile organics, halocarbons (Freon, chloroethane, etc.), aldehydes, ketones, and others.
- [26] At Transporter's discretion, online gas chromatograph can be equipped to monitor hydrogen routinely or grab samples can be analyzed in a laboratory on some intermittent schedule.
- [27] At Transporter's discretion, either inline filtering or EPA Method 5 isokinetic sampling can be used. Frequency to match testing frequency of health protective constituents or pipeline integrity protective constituents unless specified otherwise by Transporter.
- [28] Although each method is appropriate for corresponding constituents, not all methods listed will be appropriate for the required analyses. An independent laboratory certified to analyze pipeline natural gas should be consulted to determine the appropriate methods.
- [29] Reference description in Gas Technology Institute, "Guidance Document for the Introduction of Landfill-Derived Renewable Gas into Natural Gas Pipelines", Final Report # GTI-12-0007; p. 20.
- [30] Reference description in Gas Technology Institute, "Guidance Document for the Introduction of Landfill-Derived Renewable Gas into Natural Gas Pipelines", Final Report # GTI-12-0007; p. 25. Gas chromatograph to be coupled with a nitrogen chemiluminescence detector.
- [31] Reference description in Gas Technology Institute, "Guidance Document for the Introduction of Landfill-Derived Renewable Gas into Natural Gas Pipelines", Final Report # GTI-12-0007; p. 26. Gas chromatograph to be coupled with an atomic emission detector or mass spectral detector, depending on sample collection method.
- [32] Refer to text for testing requirements

8. COSTS RELATED TO QUALITY MONITORING

- 8.1. As part of the interconnection agreement, the Supplier will pay Cascade's costs for all engineering, procurement, and construction of quality monitoring systems. Such expenses will include, but not be limited to, sample fittings, piping, analyzers, equipment enclosures, related permits, land rights, odorizing equipment, communication equipment, software, programming costs, design costs, and other expenses. Cascade will own and operate all related facilities on Cascade's side of the interconnection.
- 8.2. Supplier will be responsible for the cost of analytical testing prior to the initial interconnection, periodic testing during operation, and special testing after biomethane supply is interrupted.
- 8.3. Unless otherwise agreed upon, Transporter will continuously monitor selected biomethane quality specifications to detect general biomethane generation process conditions. Specifications monitored will commonly include those listed in the "Basic Natural Gas Properties" section of Table 1. If Transporter senses that specifications being monitored may indicate changes in biomethane quality, the Transporter may request that the Supplier provide additional testing on an accelerated schedule. The Supplier will be responsible for such testing.
- 8.4. Retesting shall be permitted to validate test results. The party requesting the retest will pay for retesting.

9. BIOMETHANE MONITORING REQUIREMENT PRIOR TO INITIAL BIOMETHANE INTERCONNECTION TO PIPELINE:

- 9.1. Testing prior to interconnection to the pipeline will be the responsibility of the Supplier using independent certified testing facilities. Results are to be shared with the Transporter within five calendar days of the time results are received by the Supplier.
- 9.2. Biomethane should be analyzed at two different times over a 2 – 4 week period prior to interconnection in order to detect parameters or components listed in Table 1^{1,2,3}. Tests should occur with biomethane production operating at steady state and at the anticipated normal production capacity. The two tests should be performed at least five days apart. Testing should be conducted using analytical methods and techniques considered acceptable in the natural gas industry.
- 9.3. Biomethane cannot be injected into the natural gas pipeline if:
 - 9.3.1. any parameter fails to comply with quality limits listed in the "Basic Natural Gas Properties" section of Table 1; or
 - 9.3.2. any constituent listed in the "Health Protective Constituents - Carcinogenic" or "Health Protective Constituents – Non-Carcinogenic" sections of Table 1 exceeds the Lower Action Levels listed in Table 1; or
 - 9.3.3. any constituent listed in the "Health Protective Constituents - Carcinogenic" or "Health Protective Constituents – Non-Carcinogenic" sections of Table 1 exceeds the Trigger Levels listed in Table 1 and the collective potential cancer risk or non-

cancer risk is at or above the Lower Action Level listed in Table 5 (see below for method of calculating collective potential risk); or

9.3.4. any constituent listed in “Pipeline Integrity Protective Constituents” sections of Table 1 exceeds the Lower Action Levels listed in Table 1.

9.4. Biomethane can be injected into the natural gas pipeline if:

9.4.1. all conditions specifically described in the Supplier – Transporter contract have been satisfied; and

9.4.2. all parameters comply with quality limits listed in the “Basic Natural Gas Properties” section of Table 1; and

9.4.3. constituents listed in the “Health Protective Constituents - Carcinogenic” or “Health Protective Constituents – Non-Carcinogenic” sections of Table 1 are found to be either:

9.4.3.1. non-detectable or below the Trigger Levels listed in Table 1, or

9.4.3.2. below Lower Action Level with the collective potential cancer risk and non-cancer risk both below the Lower Action Level listed in Table 5 (see below for method of calculating collective potential risk); and

9.4.4. all constituents listed in “Pipeline Integrity Protective Constituents” sections of Table 1 are either:

9.4.4.1. non-detectable or below the Trigger Levels listed in Table 1, or

9.4.4.2. below Lower Action Level and subject to more frequent testing during active injection as agreed upon between Supplier and Transporter.

10. BIOMETHANE MONITORING REQUIREMENT DURING OPERATION + SHUTOFF CRITERIA

10.1. Testing at the interconnection during active flow into the pipeline at the interconnection will be the responsibility of the Transporter using independent certified testing facilities. Results are to be shared with the Supplier in a timely manner. Testing of raw biogas and biomethane upstream from the interconnection during this period will be the responsibility of the Supplier.

10.2. BASIC NATURAL GAS PROPERTIES:

10.2.1. Transporter shall provide continuous real-time or near-real time monitoring for selected basic natural gas properties listed in Table 1. Compliance shall be assessed using a 4- to 8-minute monitoring interval⁴. Unless transporter specifically agrees to other conditions, injected gas must meet all quality specifications. The transporter may refuse to accept any gas which does not meet specifications listed in this document or listed in a separate agreement between the transporter and supplier.

10.3. HEALTH PROTECTIVE CONSTITUENTS (CARCINOGENIC AND NON-CARCINOGENIC):

- 10.3.1. For purposes of categorizing the various constituents, they will be defined as either Group 1 or Group 2 constituents. Group 1 constituents are those with a concentration below the test detection level or below the Trigger Level. Group 2 constituents are those present at a concentration at or above the Trigger Level.⁵
 - 10.3.1.1. Group 1 constituents should be monitored at least once every 12 months of injection into the transporter’s pipeline.⁶
 - 10.3.1.2. Group 2 constituents should be monitored and the total potential cancer risk and non-cancer risk estimated at least every 3 months of injection into the transporter’s pipeline.⁷
 - 10.3.1.2.1. If four consecutive quarterly tests show that an individual group 2 constituent is below the trigger level, then monitoring frequency can be reduced to 12 month intervals.⁸
 - 10.3.1.2.2. If four consecutive quarterly tests show that the total potential cancer risk or non-cancer risk for group 2 constituents is below the lower action level (see Table 2), monitoring can be reduced to 12 month intervals for all of the constituents tested for these risks.⁹
- 10.3.2. If test results exceed the lower action level but are below the upper action level three times in a 12-month period, the flow of injected gas must be stopped unless temporary provisions are made with the transporter.
- 10.3.3. If any test result is at or above the upper action level, the flow of injected gas must be stopped unless temporary provisions are made with the transporter. Similarly, if the collective health risk is calculated to be at or above the upper action level (see Table 2), the flow of injected gas must be stopped unless or until temporary provisions are made with the transporter.
- 10.3.4. Selected testing details are summarized in Table 2.

Table 2: TESTING INTERVALS DURING BIOMETHANE INJECTION

GROUP	TESTING INTERVAL	COMMENTS
1 (Less than Trigger Level)	12 Months	Move constituent to Group 2 if analysis yields \geq Trigger Level
2 (Equal to or greater than Trigger Level)	3 Months	Move constituent to Group 1 if 4 consecutive analyses yield concentrations $<$ Trigger Level

10.4. PIPELINE INTEGRITY PROTECTIVE CONSTITUENTS

- 10.4.1. Group 1 and Group 2 categories will be defined in a manner similar to health protective constituents above. Group 1 constituents are those with a concentration below the test detection level or below the Trigger Level. Group 2 constituents are those present at a concentration at or above the Trigger Level.

- 10.4.2. Group 1 and Group 2 constituents should be monitored at least quarterly, unless another frequency is requested or agreed to by the transporter.¹⁰
- 10.4.3. If any test result is at or above the trigger level, the transporter must be notified immediately.
- 10.4.4. If any test result is at or above the lower action level, the flow of injected gas must be stopped unless temporary provisions are made with the transporter.
- 10.4.5. Refer to Table 2 for selected testing details.
- 10.5. BIOMETHANE DELIVERY PROCESS CHANGES
 - 10.5.1. Supplier must notify Transporter prior to changing the biomethane production and delivery system. Prospective changes may include, but not be limited to, feedstock changes, biogas conditioning equipment changes, biogas process condition changes, system control changes, addition or deletion of process equipment or operating parameters, and other modifications.
 - 10.5.2. If Transporter deems that proposed changes to biomethane production and delivery system will potentially increase the level of any constituent of concern above previous levels, Transporter can require that biomethane injection be stopped and startup testing similar to initial interconnection testing be performed.
- 11. BIOMETHANE MONITORING REQUIREMENT PRIOR TO REINTRODUCING BIOMETHANE TO PIPELINE INTERCONNECTION AFTER BIOMETHANE SUPPLY SHUTOFF
 - 11.1. If agreed upon by carrier, interrupted biomethane flow can be restarted after successfully proving compliance with monitoring limits with a single test. Testing requirements should be identical to testing required prior to initial interconnection to the pipeline. Frequencies of testing would revert to baseline periods. The supplier will need to re-establish the permission to extend time between tests based on consecutive results showing low concentrations of constituents.
 - 11.2. Testing prior to resuming flow at the interconnection to the pipeline will be the responsibility of the Supplier using independent certified testing facilities. Results are to be shared with the Transporter within five calendar days of the time results are received by the Supplier.

12. WAIVER PROVISION

- 12.1. Cascade Natural Gas Corporation, at its sole discretion, may elect, but is not obligated to, on a non-discriminatory basis to waive supplier's obligation to conform with certain gas quality specifications, provided that such waiver does not interfere with Cascade's ability to fulfill its obligations to other parties. Any such waiver is temporary and is without prejudice to Cascade's right hereunder or any other rights which it may have, including without limitation, Cascade's right to reject other non-conforming gas.

13. CALCULATION OF COLLECTIVE POTENTIAL HEALTH RISK

- 13.1. The collective potential health risk is an indication of the cumulative effect of all Group 2 constituents (constituents found at or above the Trigger Level). This is calculated using the ratio of measured concentrations divided by the Trigger Level of each particular constituent and summing the individual calculation results.

13.2. CARCINOGENIC CONSTITUENTS

- 13.2.1. The Trigger Level is based on a one in one million cancer risk for each constituent.
- 13.2.2. The risk level for each constituent is calculated by dividing the measured concentration by the Trigger Level concentration for that constituent.
- 13.2.3. The collective health risk will equal the sum of all individual risk levels.
- 13.2.4. If the collective risk level reaches or exceeds the Lower Action Level or Upper Action Level, flow of gas should be adjusted according to criteria listed above.

13.3. NON-CARCINOGENIC CONSTITUENTS

- 13.3.1. The Trigger Level is based on a hazard quotient of 0.1 for each constituent.
- 13.3.2. The risk level for each constituent is calculated by dividing the measured concentration by the Trigger Level concentration for that constituent then multiplying the ratio by 0.1.
- 13.3.3. The collective health risk will equal the sum of all individual risk levels.
- 13.3.4. If the collective risk level reaches or exceeds the Lower Action Level or Upper Action Level, flow of gas should be adjusted according to criteria listed above.
- 13.4. Guidance for calculating and applying collective potential health risk data is summarized in Tables 3, 4, and 5.

Table 3: TESTING OUTCOMES CALCULATION TABLE FOR GROUP 2 CONSTITUENTS PRIOR TO BIOMETHANE INJECTION

CONSTITUENT	TRIGGER LEVEL	ACTUAL ANALYSIS	RATIO (B / A)
	A	B *	C **
HEALTH PROTECTIVE CONSTITUENTS - CARCINOGENIC			
Arsenic	0.019 mg/m ³ 0.006 ppmv		
p-Dichlorobenzene	5.7 mg/m ³ 0.95 ppmv		
Ethylbenzene	26 mg/m ³ 6.0 ppmv		
n-Nitroso-di-n-propylamine	0.033 mg/m ³ 0.006 ppmv		
Vinyl Chloride	0.84 mg/m ³ 0.33 ppmv		
TOTAL COLLECTIVE POTENTIAL RISK*** (Total of Ratio's) BIOMETHANE INJECTION CANNOT BE PERMITTED IF THIS TOTAL EQUALS OR EXCEEDS <u>10.0</u>			
HEALTH PROTECTIVE CONSTITUENTS – NON-CARCINOGENIC			
Antimony	0.60 mg/m ³ 0.12 ppmv		
Copper	0.060 mg/m ³ 0.02 ppmv		
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv		
Lead	0.075 mg/m ³ 0.009 ppmv		
Mercaptans (Alkyl Thiols)	0.2 grain per 100 scf 4.6 mg/m ³ 2.3 ppmv		
Methacrolein	1.1 mg/m ³ 0.37 ppmv		
Toluene	904 mg/m ³ 240 ppmv		
TOTAL COLLECTIVE HAZARD INDEX (Total of Ratio's) BIOMETHANE INJECTION CANNOT BE PERMITTED IF THIS TOTAL EQUALS OR EXCEEDS <u>1.0</u>			

* To be determined by analysis. Only one unit of measure is required.

** To be calculated by dividing value B by value A (B / A = C). (units of measurement in numerator and denominator must match)

***Sum of values for individual constituents (carcinogenic and non-carcinogenic constituents to be calculated separately)

Table 4: TESTING OUTCOMES CALCULATION TABLE FOR GROUP 2 CONSTITUENTS DURING BIOMETHANE INJECTION

CONSTITUENT	TRIGGER LEVEL	ACTUAL ANALYSIS	RATIO (B / A)
	A	B *	C **
HEALTH PROTECTIVE CONSTITUENTS - CARCINOGENIC			
Arsenic	0.019 mg/m ³ 0.006 ppmv		
p-Dichlorobenzene	5.7 mg/m ³ 0.95 ppmv		
Ethylbenzene	26 mg/m ³ 6.0 ppmv		
n-Nitroso-di-n-propylamine	0.033 mg/m ³ 0.006 ppmv		
Vinyl Chloride	0.84 mg/m ³ 0.33 ppmv		
TOTAL COLLECTIVE POTENTIAL RISK*** (Total of Ratio's)			
BIOMETHANE INJECTION MUST BE STOPPED IF THIS TOTAL EQUALS OR EXCEEDS <u>25.0</u> FOR ANY SINGLE PERIOD OR IF IT EQUALS OR EXCEEDS <u>10.0</u> THREE TIMES IN 12 MONTHS			
HEALTH PROTECTIVE CONSTITUENTS – NON-CARCINOGENIC			
Antimony	0.60 mg/m ³ 0.12 ppmv		
Copper	0.060 mg/m ³ 0.02 ppmv		
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv		
Lead	0.075 mg/m ³ 0.009 ppmv		
Mercaptans (Alkyl Thiols)	0.2 grain per 100 scf 4.6 mg/m ³ 2.3 ppmv		
Methacrolein	1.1 mg/m ³ 0.37 ppmv		
Toluene	904 mg/m ³ 240 ppmv		
TOTAL COLLECTIVE HAZARD INDEX (Total of Ratio's)			
BIOMETHANE INJECTION MUST BE STOPPED IF THIS TOTAL EQUALS OR EXCEEDS <u>5.0</u> FOR ANY SINGLE PERIOD OR IF IT EQUALS OR EXCEEDS <u>1.0</u> THREE TIMES IN 12 MONTHS			

* To be determined by analysis. Only one unit of measure is required.

** To be calculated by dividing value B by value A (B / A = C). (units of measurement in numerator and denominator must match)

***Sum of values for individual constituents (carcinogenic and non-carcinogenic constituents to be calculated separately)

Table 5: COLLECTIVE POTENTIAL RISK OR HAZARD INDEX LEVEL FROM HEALTH PROTECTIVE CONSTITUENTS [1]

RISK MANAGEMENT LEVEL	POTENTIAL RISK FROM CARCINOGENS	HAZARD INDEX FROM NON-CARCINOGENS	ACTION / TESTING
Trigger Level	≥ 1.0	≥ 0.1	Periodic Testing Required
Lower Action Level	≥ 10.0	≥ 1.0	Stop injection after three exceedances in 12-month period
Upper Action Level	≥ 25.0	≥ 5.0	Stop injection immediately

[1] Sum of risk or hazard index values for individual constituents present at or above trigger level concentrations. Carcinogens and non-carcinogens are calculated and summarized separately.

BIBLIOGRAPHY / REFERENCES

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- ¹ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 65.
 - ² Pacific Gas and Electric Company, "Gas Rule No. 21, Transportation of Natural Gas", April 19, 2015, sheet 21.
 - ³ Southern California Gas Company, "Rule No. 30, Transportation of Customer-owned Gas", May 1, 2015, sheet 51383-G.
 - ⁴ Southern California Gas Company, "Rule No. 30, Transportation of Customer-owned Gas", May 1, 2015, sheet 50808-G.
 - ⁵ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 67.
 - ⁶ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 67
 - ⁷ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 67
 - ⁸ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 68
 - ⁹ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 68
 - ¹⁰ Recommended testing frequency was not found in literature reviewed.

ATTACHMENT 3
BIOMETHANE RECEIPT SPECIFICATIONS – LANDFILLS

NOTE: *This document is intended to become the “Quality” or “Receipt Specifications” portion of Cascade Natural Gas Corporation’s Biogas Interconnection Rule or Tariff.*

BIOMETHANE QUALITY REQUIREMENTS AT RECEIPT POINTS

1. Biomethane is defined as biogas which has been conditioned to meet quality specifications similar to pipeline quality natural gas. Additional definitions of terms appear below.
2. Definitions:
 - 2.1. *Biogas*: Gas resulting from the anaerobic digestion of various sources of organic matter.
 - 2.2. *Biomethane*: Methane purified from biogas.
 - 2.3. *Constituent*: A chemical, compound, or material contained in a gas volume.
 - 2.4. *Group 1 Constituents*: Constituents of gas with a concentration below the test detection level or below the Trigger Level.
 - 2.5. *Group 2 Constituents*: Constituents of gas present at a concentration at or above the Trigger Level.
 - 2.6. *Hazardous Waste Landfill*: All contiguous land and structures, and other appurtenances and improvements, on the land used for treatment, transfer, storage, resource recovery, disposal, or recycling of hazardous waste. The facility may consist of one or more treatment, transfer, storage, resource recovery, disposal, or recycling hazardous waste management units, or combinations of these units. This includes facilities permitted by the Department of Toxic Substance Control.
 - 2.7. *Pipeline quality gas*: Natural gas which has been processed to assure that the hydrocarbon content is nearly all methane and to reduce fractions of other constituents to small percentage or trace quantities
 - 2.8. *Supplier*: Provider proposing to inject biogas / biomethane into transporter’s pipeline.
 - 2.9. *Transporter*: Pipeline owner (Cascade Natural Gas Corporation)
3. Biomethane delivered to the utility receipt point must meet quality specifications of this document section. Quality specifications are described in Table 1.
 - 3.1. Several constituents are listed in the “Basic Natural Gas Properties” as well as in “Health Protective Constituents” and “Pipeline Integrity Protective Constituents” sections of Table 1 because they have been deemed significant specifications from more than one perspective.

4. In addition to specifications contained in this document, biomethane received by Transporter may be subject to interchangeability testing per American Gas Association (AGA) Research Bulletin 36 in order to satisfy requests of Transporter or Transporter's customers.
5. Biomethane received by Transporter (Cascade Natural Gas Corporation) may be supplied to end users as a discreet gas supply or as a mixed gas supply blended with natural gas or different biomethane provided by others.
 - 5.1. Biomethane received by Transporter must not contain constituents which might restrict the Transporter's inventory, blended or otherwise, to be marketed as a natural gas supply.
6. Biomethane must not contain constituents at concentrations which could present a health or safety hazard to utility workers or the general public.
 - 6.1. These are considered "Health Protective Constituents". Specific carcinogenic constituents and non-carcinogenic constituents are listed in Table 1.
 - 6.2. The Supplier is required to identify health or safety constituents not listed in Table 1, but known to be present in detectable quantities, to the Transporter prior to finalizing an interconnection agreement or supply contract. Such constituents will be addressed in interconnection or contract documents.
7. Biomethane must not contain constituents at concentrations which could damage or deteriorate the integrity of pipeline facilities.
 - 7.1. These are considered "Pipeline Integrity Protective Constituents". Specific constituents are listed in Table 1.
 - 7.2. The Supplier is required to identify such constituents not listed in Table 1, but known to be present in detectable quantities, to the Transporter prior to finalizing an interconnection agreement or supply contract. Such constituents will be addressed in the interconnection or contract documents.

Table 1: QUALITY SPECIFICATIONS FOR BIOMETHANE FROM LANDFILLS

SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING	STANDARD TEST METHOD [28]
BASIC NATURAL GAS PROPERTIES					
Min. Heat Content (dry, HHV) [1]	985 BTU/scf	N/A	N/A	Continuous real-time monitoring	AGA-5; AGA-8; ASTM D3588; ASTM D7164;
Max. Heat Content (dry, HHV) [1]	1,100 BTU/scf	N/A	N/A		
Min. Wobbe Number	1,275	N/A	N/A	Continuous real-time monitoring	ASTM D1945; ASTM D7314; GPA 2172 / API 14.5; GPA 2261; GPA 2145
Max. Wobbe Number	1,390	N/A	N/A		
Min. Temperature	40 °F	N/A	N/A	Continuous real-time monitoring	Temperature element and transmitter in pipeline.
Max. Temperature	120 °F	N/A	N/A		
Min. Pressure	[4]	N/A	N/A	Continuous real-time monitoring	Pressure element and transmitter in pipeline
Max. Pressure	[5]	N/A	N/A		
Max. Hydrocarbon Dew Point (HDP)	15 °F [6]	N/A	N/A	Continuous real-time monitoring	ASTM D1945; ASTM D1142; ASTM D5454
Max. Cricondetherm (CHDP)	15 °F [7]	N/A	N/A		
Max. C ₄ ⁺	0.75 %vol	N/A	N/A		
Max. C ₅ ⁺ GPM	0.2 gal/Mscf	N/A	N/A		
Max. C ₅ ⁺	0.12% vol	N/A	N/A		
Max. C ₆ ⁺ GPM	0.05 gal/Mscf	N/A	N/A		
Max. Water Vapor Content	7.0 lb/MMscf [9]	N/A	N/A	Continuous real-time monitoring	ASTM D1142; ASTM D5454; ASTM D4888
Max. Total Sulfur [10]	5.0 grains per 100 scf	N/A	N/A	Continuous real-time monitoring	ASTM D1072; ASTM D3246; ASTM D4468; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D6667; ASTM D7165; GPA 2199
Max. Hydrogen Sulfide (H ₂ S)	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv	N/A	N/A		
					ASTM D4810; ASTM D5504; ASTM D7165; ASTM D7493; GPA 2261

TABLE 1 – QUALITY SPECIFICATIONS FOR BIOMETHANE FROM LANDFILLS (continued)					
SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING	STANDARD TEST METHOD [28]
Max. Mercaptans (RSH) [23]	0.2 grain Sulfur per 100 scf 4.6 mg Sulfur/m3 3.4 ppmv mercaptan	N/A	N/A	Continuous real-time monitoring	ASTM D1988; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D7165; ASTM D7493; GPA 2265
Max. Particle Size	3 microns	N/A	N/A	Customize to gas source [27]	EPA Method 5
Max. Hydrogen	400 ppm 0.04% vol	N/A	N/A	Continuous or intermittent[26]	ASTM D1945; ASTM D1946; ASTM D1766; GPA 2261.
Max. Total Diluent Gases [11]	3% vol	N/A	N/A	Continuous real-time monitoring	Also for CO ₂ : ASTM D4984; ASTM D7164; GPA 2377
Carbon Dioxide (CO ₂)	2% vol	N/A	N/A		
Nitrogen (N ₂)	1% vol	N/A	N/A		
Oxygen (O ₂)	0.1% vol	N/A	N/A		
General Statements	<p>Biomethane from Hazardous Waste Landfills and associated systems cannot be injected into Transporter’s pipeline. Supplier must certify that biomethane was not derived from a Hazardous Waste Landfill or associated systems. [33]</p> <p>The gas shall be commercially free from objectionable odors (excluding odorant), solid matter, dust, gums, and gum forming constituents, or any other substance which interferes with the intended purpose of merchantability of the gas, or causes interference with the proper and safe operation of the lines, meters, regulators, or other appliances through which it may flow.</p> <p>The gas shall not contain any toxic or hazardous substance in concentrations which, in the normal use of the gas, may be hazardous to health, injurious to pipeline facilities, or be a limit to merchantability or be contrary to applicable government standards.</p> <p>Biomethane must be free from bacteria, pathogens, and any other substances injurious to utility facilities or that would cause the gas to be unmarketable. [15]</p>			Testing frequency of subject constituent to be same as for similar constituents found in this table.	Testing method of subject constituent to be same as for similar constituents found in this table.

TABLE 1 – QUALITY SPECIFICATIONS FOR BIOMETHANE FROM LANDFILLS (continued)					
SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING [32]	STANDARD TEST METHOD [28]
BIOMETHANE: HEALTH PROTECTIVE CONSTITUENTS – CARCINOGENIC					
Arsenic	0.019 mg/m ³ 0.006 ppmv	0.19 mg/m ³ 0.06 ppmv	0.48 mg/m ³ 0.15 ppmv	Required	EPA Method 29; EPA Method 200.8
p-Dichlorobenzene	5.7 mg/m ³ 0.95 ppmv	57 mg/m ³ 9.5 ppmv	140 mg/m ³ 24 ppmv	Required	EPA TO-15
Ethylbenzene	26 mg/m ³ 6.0 ppmv	260 mg/m ³ 60 ppmv	650 mg/m ³ 150 ppmv	Required	EPA TO-15
n-Nitroso-di-n-propylamine	0.033 mg/m ³ 0.006 ppmv	0.33 mg/m ³ 0.06 ppmv	0.81 mg/m ³ 0.15 ppmv	Required	EPA Method 8270
Vinyl Chloride	0.84 mg/m ³ 0.33 ppmv	8.4 mg/m ³ 3.3 ppmv	21 mg/m ³ 8.3 ppmv	Required	EPA TO-15
BIOMETHANE: HEALTH PROTECTIVE CONSTITUENTS – NON-CARCINOGENIC					
Antimony	0.60 mg/m ³ 0.12 ppmv	6.0 mg/m ³ 1.2 ppmv	30 mg/m ³ 6.1 ppmv	Required	EPA Method 29; EPA Method 200.8
Copper	0.060 mg/m ³ 0.02 ppmv	0.60 mg/m ³ 0.23 ppmv	3.0 mg/m ³ 1.2 ppmv	Required	EPA Method 29; EPA Method 200.8
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv	57 mg/m ³ 40 ppmv	285 mg/m ³ 200 ppmv	Required	ASTM D4810; ASTM D5504; ASTM D7165; ASTM D7493; GPA 2261
Lead	0.075 mg/m ³ 0.009 ppmv	0.75 mg/m ³ 0.09 ppmv	3.8 mg/m ³ 0.44 ppmv	Required	EPA Method 29; EPA Method 200.8
Mercaptans (Alkyl Thiols)	0.2 grain Sulfur per 100 scf 4.6 mg Sulfur/m ³ 3.4 ppmv mercaptan	2.0 grain Sulfur per 100 scf 46 mg Sulfur/m ³ 34 ppmv mercaptan	10 grain Sulfur per 100 scf 230 mg Sulfur/m ³ 170 ppmv mercaptan	Required	ASTM D1988; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D7165; ASTM D7493; GPA 2265
Methacrolein	1.1 mg/m ³ 0.37 ppmv	11 mg/m ³ 3.7 ppmv	53 mg/m ³ 18 ppmv	Required	EPA TO-15, EPA TO-11A
Toluene	904 mg/m ³ 240 ppmv	9000 mg/m ³ 2400 ppmv	45000 mg/m ³ 12000 ppmv	Required	EPA TO-15

TABLE 1 – QUALITY SPECIFICATIONS FOR BIOMETHANE FROM LANDFILLS (continued)					
SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING [32]	STANDARD TEST METHOD [28]
BIOMETHANE: PIPELINE INTEGRITY PROTECTIVE CONSTITUENTS					
Ammonia	0.001%	0.005% [12]	TBD [12]	Required	Gas Chromatograph with CID or lab analysis [30]
Biologicals	4 x 10 ⁴ / scf (qPCR per APB, SRB, IOB group) and commercially free of bacteria of >0.2 microns [13]	2 x 10 ⁵ / scf (qPCR per APB, SRB, IOB group) [12, 13]	TBD [12]	Required	Filter to 0.2 micron and analyze for Total, APB, SRB, and IOB using qPCR [29]
Hydrogen	400 ppm 0.04% vol	2,000 [12]	TBD [12]	Required	ASTM D1945; ASTM D1946
Mercury	0.08 mg/m ³	0.4 [12]	TBD [12]	Required	EPA Method 29; EPA Method 200.8
Siloxanes	0.01 mg Si/m ³	0.1 mg Si/m ³	TBD [12]	Required	Gas Chromatograph [31]
BIOMETHANE: TRACE CONSTITUENTS, CONTAMINANTS, AND OBJECTIONABLE MATERIAL					
Contaminants not listed above [25]	Tolerable limits to be evaluated on a case-by-case basis			Prior to introduction and immediately after process changes	

[1] Dry, High Heating Value at 14.73 psia, 60 °F

[2] Not used.

[3] Not used.

[4] Pressure sufficient to allow gas to enter the facilities of Transporter as specified in agreement/contract between Shipper and Transporter

[5] Pressure shall not be in excess of the maximum allowable operating pressure of Transporter’s facilities at receipt point

[6] At any pressure between 100 psia and 1000 psia as calculated from the gas composition and shall be free from hydrocarbons in the liquid state

[7] Cricondentherm Hydrocarbon Dew Point or maximum temperature at which gas and liquid phases can coexist irrespective of pressure

[8] Not used.

[9] Gas shall be free from liquid water

[10] Excluding odorants

[11] Sometimes referred to as “inerts”. Nonhydrocarbons including but not limited to carbon dioxide, nitrogen, and oxygen.

[12] No values available in literature. Allowed value of Lower Action Level to equal five times Trigger Level. Lower Action Levels to be confirmed and Upper Action Levels to be determined after future data becomes available.

[13] qPCR is an abbreviation for Quantitative Polymerase Chain Reaction, a molecular biology analytical technique. APB = Acid Producing Bacteria. SRB = Sulfate Reducing Bacteria. IOB = Iron Oxidizing Bacteria.

[14] Not used.

[15] Not used.

[16] Not used.

[17] Limit is value corresponding to parameter being measured for "Basic Natural Gas" properties. Trigger Level corresponds to a \geq one in one million risk of developing cancer due to exposure at listed value for carcinogens or a hazard quotient of ≥ 0.1 for non-carcinogens as defined in California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, p. 54 – 62.

[18] Lower Action Level corresponds to a \geq ten in one million risk of developing cancer due to exposure at listed value for carcinogens or a hazard quotient of ≥ 1.0 for non-carcinogens as defined in California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, p. 54 – 62.

[19] Upper Action Level corresponds to a ≥ 25 in one million risk of developing cancer due to exposure at listed value for carcinogens or a hazard quotient of ≥ 5.0 for non-carcinogens as defined in California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, p. 54 – 62.

[20] Not used.

[21] Not used.

[22] Not used.

[23] Grains per 100 cu ft and mg per cu meter are both reported as Sulfur. ppmv value is for mercaptan assuming mercaptan is methyl mercaptan.

[24] Not used.

[25] Examples include PCB's, non-halogenated Volatile and Semi-Volatile organics, halocarbons (Freon, chloroethane, etc.), aldehydes, ketones, and others.

[26] At Transporter's discretion, online gas chromatograph can be equipped to monitor hydrogen routinely or grab samples can be analyzed in a laboratory on some intermittent schedule.

[27] At Transporter's discretion, either inline filtering or EPA Method 5 isokinetic sampling can be used. Frequency to match testing frequency of health protective constituents or pipeline integrity protective constituents unless specified otherwise by Transporter.

[28] Although each method is appropriate for corresponding constituents, not all methods listed will be appropriate for the required analyses. An independent laboratory certified to analyze pipeline natural gas should be consulted to determine the appropriate methods.

[29] Reference description in Gas Technology Institute, "Guidance Document for the Introduction of Landfill-Derived Renewable Gas into Natural Gas Pipelines", Final Report # GTI-12-0007; p. 20.

[30] Reference description in Gas Technology Institute, "Guidance Document for the Introduction of Landfill-Derived Renewable Gas into Natural Gas Pipelines", Final Report # GTI-12-0007; p. 25. Gas chromatograph to be coupled with a nitrogen chemiluminescence detector.

[31] Reference description in Gas Technology Institute, "Guidance Document for the Introduction of Landfill-Derived Renewable Gas into Natural Gas Pipelines", Final Report # GTI-12-0007; p. 26. Gas chromatograph to be coupled with an atomic emission detector or mass spectral detector, depending on sample collection method.

[32] Refer to text for testing requirements

[33] Hazardous Waste Landfill may include facilities used to treat, recover, store, transfer, recycle, or otherwise handle hazardous waste.

8. COSTS RELATED TO QUALITY MONITORING

- 8.1. As part of the interconnection agreement, the Supplier will pay Cascade's costs for all engineering, procurement, and construction of quality monitoring systems. Such expenses will include, but not be limited to, sample fittings, piping, analyzers, equipment enclosures, related permits, land rights, odorizing equipment, communication equipment, software, programming costs, design costs, and other expenses. Cascade will own and operate all related facilities on Cascade's side of the interconnection.
- 8.2. Supplier will be responsible for the cost of analytical testing prior to the initial interconnection, periodic testing during operation, and special testing after biomethane supply is interrupted.
- 8.3. Unless otherwise agreed upon, Transporter will continuously monitor selected biomethane quality specifications to detect general biomethane generation process conditions. Specifications monitored will commonly include those listed in the "Basic Natural Gas Properties" section of Table 1. If Transporter senses that specifications being monitored may indicate changes in biomethane quality, the Transporter may request that the Supplier provide additional testing on an accelerated schedule. The Supplier will be responsible for such testing.
- 8.4. Retesting shall be permitted to validate test results. The party requesting the retest will pay for retesting.

9. BIOMETHANE MONITORING REQUIREMENT PRIOR TO INITIAL BIOMETHANE INTERCONNECTION TO PIPELINE:

- 9.1. Testing prior to interconnection to the pipeline will be the responsibility of the Supplier using independent certified testing facilities. Results are to be shared with the Transporter within five calendar days of the time results are received by the Supplier.
- 9.2. Biomethane should be analyzed at two different times over a 2 – 4 week period prior to interconnection in order to detect parameters or components listed in Table 1^{1,2,3}. Tests should occur with biomethane production operating at steady state and at the anticipated normal production capacity. The two tests should be performed at least five days apart. Testing should be conducted using analytical methods and techniques considered acceptable in the natural gas industry.
- 9.3. Biomethane cannot be injected into the natural gas pipeline if:
 - 9.3.1. any parameter fails to comply with quality limits listed in the "Basic Natural Gas Properties" section of Table 1; or
 - 9.3.2. any constituent listed in the "Health Protective Constituents - Carcinogenic" or "Health Protective Constituents – Non-Carcinogenic" sections of Table 1 exceeds the Lower Action Levels listed in Table 1; or
 - 9.3.3. any constituent listed in the "Health Protective Constituents - Carcinogenic" or "Health Protective Constituents – Non-Carcinogenic" sections of Table 1 exceeds the Trigger Levels listed in Table 1 and the collective potential cancer risk or non-

cancer risk is at or above the Lower Action Level listed in Table 5 (see below for method of calculating collective potential risk); or

9.3.4. any constituent listed in “Pipeline Integrity Protective Constituents” sections of Table 1 exceeds the Lower Action Levels listed in Table 1.

9.4. Biomethane can be injected into the natural gas pipeline if:

9.4.1. all conditions specifically described in the Supplier – Transporter contract have been satisfied; and

9.4.2. all parameters comply with quality limits listed in the “Basic Natural Gas Properties” section of Table 1; and

9.4.3. constituents listed in the “Health Protective Constituents - Carcinogenic” or “Health Protective Constituents – Non-Carcinogenic” sections of Table 1 are found to be either:

9.4.3.1. non-detectable or below the Trigger Levels listed in Table 1, or

9.4.3.2. below Lower Action Level with the collective potential cancer risk and non-cancer risk both below the Lower Action Level listed in Table 5 (see below for method of calculating collective potential risk); and

9.4.4. all constituents listed in “Pipeline Integrity Protective Constituents” sections of Table 1 are either:

9.4.4.1. non-detectable or below the Trigger Levels listed in Table 1, or

9.4.4.2. below Lower Action Level and subject to more frequent testing during active injection as agreed upon between Supplier and Transporter.

10. BIOMETHANE MONITORING REQUIREMENT DURING OPERATION + SHUTOFF CRITERIA

10.1. Testing at the interconnection during active flow into the pipeline at the interconnection will be the responsibility of the Transporter using independent certified testing facilities. Results are to be shared with the Supplier in a timely manner. Testing of raw biogas and biomethane upstream from the interconnection during this period will be the responsibility of the Supplier.

10.2. BASIC NATURAL GAS PROPERTIES:

10.2.1. Transporter shall provide continuous real-time or near-real time monitoring for selected basic natural gas properties listed in Table 1. Compliance shall be assessed using a 4- to 8-minute monitoring interval⁴. Unless transporter specifically agrees to other conditions, injected gas must meet all quality specifications. The transporter may refuse to accept any gas which does not meet specifications listed in this document or listed in a separate agreement between the transporter and supplier.

10.3. HEALTH PROTECTIVE CONSTITUENTS (CARCINOGENIC AND NON-CARCINOGENIC):

- 10.3.1. For purposes of categorizing the various constituents, they will be defined as either Group 1 or Group 2 constituents. Group 1 constituents are those with a concentration below the test detection level or below the Trigger Level. Group 2 constituents are those present at a concentration at or above the Trigger Level.⁵
 - 10.3.1.1. Group 1 constituents should be monitored at least once every 12 months of injection into the transporter’s pipeline.⁶
 - 10.3.1.2. Group 2 constituents should be monitored and the total potential cancer risk and non-cancer risk estimated at least every 3 months of injection into the transporter’s pipeline.⁷
 - 10.3.1.2.1. If four consecutive quarterly tests show that an individual group 2 constituent is below the trigger level, then monitoring frequency can be reduced to 12 month intervals.⁸
 - 10.3.1.2.2. If four consecutive quarterly tests show that the total potential cancer risk or non-cancer risk for group 2 constituents is below the lower action level (see Table 2), monitoring can be reduced to 12 month intervals for all of the constituents tested for these risks.⁹
- 10.3.2. If test results exceed the lower action level but are below the upper action level three times in a 12-month period, the flow of injected gas must be stopped unless temporary provisions are made with the transporter.
- 10.3.3. If any test result is at or above the upper action level, the flow of injected gas must be stopped unless temporary provisions are made with the transporter. Similarly, if the collective health risk is calculated to be at or above the upper action level (see Table 2), the flow of injected gas must be stopped unless or until temporary provisions are made with the transporter.
- 10.3.4. Selected testing details are summarized in Table 2.

Table 2: TESTING INTERVALS DURING BIOMETHANE INJECTION

GROUP	TESTING INTERVAL	COMMENTS
1 (Less than Trigger Level)	12 Months	Move constituent to Group 2 if analysis yields \geq Trigger Level
2 (Equal to or greater than Trigger Level)	3 Months	Move constituent to Group 1 if 4 consecutive analyses yield concentrations $<$ Trigger Level

10.4. PIPELINE INTEGRITY PROTECTIVE CONSTITUENTS

- 10.4.1. Group 1 and Group 2 categories will be defined in a manner similar to health protective constituents above. Group 1 constituents are those with a concentration below the test detection level or below the Trigger Level. Group 2 constituents are those present at a concentration at or above the Trigger Level.

- 10.4.2. Group 1 and Group 2 constituents should be monitored at least quarterly, unless another frequency is requested or agreed to by the transporter.¹⁰
- 10.4.3. If any test result is at or above the trigger level, the transporter must be notified immediately.
- 10.4.4. If any test result is at or above the lower action level, the flow of injected gas must be stopped unless temporary provisions are made with the transporter.
- 10.4.5. Refer to Table 2 for selected testing details.
- 10.5. BIOMETHANE DELIVERY PROCESS CHANGES
 - 10.5.1. Supplier must notify Transporter prior to changing the biomethane production and delivery system. Prospective changes may include, but not be limited to, feedstock changes, biogas conditioning equipment changes, biogas process condition changes, system control changes, addition or deletion of process equipment or operating parameters, and other modifications.
 - 10.5.2. If Transporter deems that proposed changes to biomethane production and delivery system will potentially increase the level of any constituent of concern above previous levels, Transporter can require that biomethane injection be stopped and startup testing similar to initial interconnection testing be performed.
- 11. BIOMETHANE MONITORING REQUIREMENT PRIOR TO REINTRODUCING BIOMETHANE TO PIPELINE INTERCONNECTION AFTER BIOMETHANE SUPPLY SHUTOFF
 - 11.1. If agreed upon by carrier, interrupted biomethane flow can be restarted after successfully proving compliance with monitoring limits with a single test. Testing requirements should be identical to testing required prior to initial interconnection to the pipeline. Frequencies of testing would revert to baseline periods. The supplier will need to re-establish the permission to extend time between tests based on consecutive results showing low concentrations of constituents.
 - 11.2. Testing prior to resuming flow at the interconnection to the pipeline will be the responsibility of the Supplier using independent certified testing facilities. Results are to be shared with the Transporter within five calendar days of the time results are received by the Supplier.

12. WAIVER PROVISION

- 12.1. Cascade Natural Gas Corporation, at its sole discretion, may elect, but is not obligated to, on a non-discriminatory basis to waive supplier's obligation to conform with certain gas quality specifications, provided that such waiver does not interfere with Cascade's ability to fulfill its obligations to other parties. Any such waiver is temporary and is without prejudice to Cascade's right hereunder or any other rights which it may have, including without limitation, Cascade's right to reject other non-conforming gas.

13. CALCULATION OF COLLECTIVE POTENTIAL HEALTH RISK

- 13.1. The collective potential health risk is an indication of the cumulative effect of all Group 2 constituents (constituents found at or above the Trigger Level). This is calculated using the ratio of measured concentrations divided by the Trigger Level of each particular constituent and summing the individual calculation results.

13.2. CARCINOGENIC CONSTITUENTS

- 13.2.1. The Trigger Level is based on a one in one million cancer risk for each constituent.
- 13.2.2. The risk level for each constituent is calculated by dividing the measured concentration by the Trigger Level concentration for that constituent.
- 13.2.3. The collective health risk will equal the sum of all individual risk levels.
- 13.2.4. If the collective risk level reaches or exceeds the Lower Action Level or Upper Action Level, flow of gas should be adjusted according to criteria listed above.

13.3. NON-CARCINOGENIC CONSTITUENTS

- 13.3.1. The Trigger Level is based on a hazard quotient of 0.1 for each constituent.
- 13.3.2. The risk level for each constituent is calculated by dividing the measured concentration by the Trigger Level concentration for that constituent then multiplying the ratio by 0.1.
- 13.3.3. The collective health risk will equal the sum of all individual risk levels.
- 13.3.4. If the collective risk level reaches or exceeds the Lower Action Level or Upper Action Level, flow of gas should be adjusted according to criteria listed above.
- 13.4. Guidance for calculating and applying collective potential health risk data is summarized in Tables 3, 4, and 5.

Table 3: TESTING OUTCOMES CALCULATION TABLE FOR GROUP 2 CONSTITUENTS PRIOR TO BIOMETHANE INJECTION

CONSTITUENT	TRIGGER LEVEL	ACTUAL ANALYSIS	RATIO (B / A)
	A	B *	C **
HEALTH PROTECTIVE CONSTITUENTS - CARCINOGENIC			
Arsenic	0.019 mg/m ³ 0.006 ppmv		
p-Dichlorobenzene	5.7 mg/m ³ 0.95 ppmv		
Ethylbenzene	26 mg/m ³ 6.0 ppmv		
n-Nitroso-di-n-propylamine	0.033 mg/m ³ 0.006 ppmv		
Vinyl Chloride	0.84 mg/m ³ 0.33 ppmv		
TOTAL COLLECTIVE POTENTIAL RISK*** (Total of Ratio's) BIOMETHANE INJECTION CANNOT BE PERMITTED IF THIS TOTAL EQUALS OR EXCEEDS <u>10.0</u>			
HEALTH PROTECTIVE CONSTITUENTS – NON-CARCINOGENIC			
Antimony	0.60 mg/m ³ 0.12 ppmv		
Copper	0.060 mg/m ³ 0.02 ppmv		
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv		
Lead	0.075 mg/m ³ 0.009 ppmv		
Mercaptans (Alkyl Thiols)	0.2 grain per 100 scf 4.6 mg/m ³ 2.3 ppmv		
Methacrolein	1.1 mg/m ³ 0.37 ppmv		
Toluene	904 mg/m ³ 240 ppmv		
TOTAL COLLECTIVE HAZARD INDEX (Total of Ratio's) BIOMETHANE INJECTION CANNOT BE PERMITTED IF THIS TOTAL EQUALS OR EXCEEDS <u>1.0</u>			

* To be determined by analysis. Only one unit of measure is required.

** To be calculated by dividing value B by value A (B / A = C). (units of measurement in numerator and denominator must match)

***Sum of values for individual constituents (carcinogenic and non-carcinogenic constituents to be calculated separately)

Table 4: TESTING OUTCOMES CALCULATION TABLE FOR GROUP 2 CONSTITUENTS DURING BIOMETHANE INJECTION

CONSTITUENT	TRIGGER LEVEL	ACTUAL ANALYSIS	RATIO (B / A)
	A	B *	C **
HEALTH PROTECTIVE CONSTITUENTS - CARCINOGENIC			
Arsenic	0.019 mg/m ³ 0.006 ppmv		
p-Dichlorobenzene	5.7 mg/m ³ 0.95 ppmv		
Ethylbenzene	26 mg/m ³ 6.0 ppmv		
n-Nitroso-di-n-propylamine	0.033 mg/m ³ 0.006 ppmv		
Vinyl Chloride	0.84 mg/m ³ 0.33 ppmv		
TOTAL COLLECTIVE POTENTIAL RISK*** (Total of Ratio's) BIOMETHANE INJECTION MUST BE STOPPED IF THIS TOTAL EQUALS OR EXCEEDS <u>25.0</u> FOR ANY SINGLE PERIOD OR IF IT EQUALS OR EXCEEDS <u>10.0</u> THREE TIMES IN 12 MONTHS			
HEALTH PROTECTIVE CONSTITUENTS – NON-CARCINOGENIC			
Antimony	0.60 mg/m ³ 0.12 ppmv		
Copper	0.060 mg/m ³ 0.02 ppmv		
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv		
Lead	0.075 mg/m ³ 0.009 ppmv		
Mercaptans (Alkyl Thiols)	0.2 grain per 100 scf 4.6 mg/m ³ 2.3 ppmv		
Methacrolein	1.1 mg/m ³ 0.37 ppmv		
Toluene	904 mg/m ³ 240 ppmv		
TOTAL COLLECTIVE HAZARD INDEX (Total of Ratio's) BIOMETHANE INJECTION MUST BE STOPPED IF THIS TOTAL EQUALS OR EXCEEDS <u>5.0</u> FOR ANY SINGLE PERIOD OR IF IT EQUALS OR EXCEEDS <u>1.0</u> THREE TIMES IN 12 MONTHS			

* To be determined by analysis. Only one unit of measure is required.

** To be calculated by dividing value B by value A (B / A = C). (units of measurement in numerator and denominator must match)

***Sum of values for individual constituents (carcinogenic and non-carcinogenic constituents to be calculated separately)

Table 5: COLLECTIVE POTENTIAL RISK OR HAZARD INDEX LEVEL FROM HEALTH PROTECTIVE CONSTITUENTS [1]

RISK MANAGEMENT LEVEL	POTENTIAL RISK FROM CARCINOGENS	HAZARD INDEX FROM NON-CARCINOGENS	ACTION / TESTING
Trigger Level	≥ 1.0	≥ 0.1	Periodic Testing Required
Lower Action Level	≥ 10.0	≥ 1.0	Stop injection after three exceedances in 12-month period
Upper Action Level	≥ 25.0	≥ 5.0	Stop injection immediately

[1] Sum of risk or hazard index values for individual constituents present at or above trigger level concentrations. Carcinogens and non-carcinogens are calculated and summarized separately.

BIBLIOGRAPHY / REFERENCES

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- ¹ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 65.
 - ² Pacific Gas and Electric Company, "Gas Rule No. 21, Transportation of Natural Gas", April 19, 2015, sheet 21.
 - ³ Southern California Gas Company, "Rule No. 30, Transportation of Customer-owned Gas", May 1, 2015, sheet 51383-G.
 - ⁴ Southern California Gas Company, "Rule No. 30, Transportation of Customer-owned Gas", May 1, 2015, sheet 50808-G.
 - ⁵ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 67.
 - ⁶ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 67
 - ⁷ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 67
 - ⁸ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 68
 - ⁹ California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, P. 68
 - ¹⁰ Recommended testing frequency was not found in literature reviewed.

ATTACHMENT 2
BIOMETHANE RECEIPT SPECIFICATIONS – WASTEWATER TREATMENT PLANTS

NOTE: *This document is intended to become the “Quality” or “Receipt Specifications” portion of Cascade Natural Gas Corporation’s Biogas Interconnection Rule or Tariff.*

BIOMETHANE QUALITY REQUIREMENTS AT RECEIPT POINTS

1. Biomethane is defined as biogas which has been conditioned to meet quality specifications similar to pipeline quality natural gas. Additional definitions of terms appear below.
2. Definitions:
 - 2.1. *Biogas*: Gas resulting from the anaerobic digestion of various sources of organic matter.
 - 2.2. *Biomethane*: Methane purified from biogas.
 - 2.3. *Constituent*: A chemical, compound, or material contained in a gas volume.
 - 2.4. *Group 1 Constituents*: Constituents of gas with a concentration below the test detection level or below the Trigger Level.
 - 2.5. *Group 2 Constituents*: Constituents of gas present at a concentration at or above the Trigger Level.
 - 2.6. *Hazardous Waste Landfill*: All contiguous land and structures, and other appurtenances and improvements, on the land used for treatment, transfer, storage, resource recovery, disposal, or recycling of hazardous waste. The facility may consist of one or more treatment, transfer, storage, resource recovery, disposal, or recycling hazardous waste management units, or combinations of these units. This includes facilities permitted by the Department of Toxic Substance Control.
 - 2.7. *Pipeline quality gas*: Natural gas which has been processed to assure that the hydrocarbon content is nearly all methane and to reduce fractions of other constituents to small percentage or trace quantities
 - 2.8. *Supplier*: Provider proposing to inject biogas / biomethane into transporter’s pipeline.
 - 2.9. *Transporter*: Pipeline owner (Cascade Natural Gas Corporation)
3. Biomethane delivered to the utility receipt point must meet quality specifications of this document section. Quality specifications are described in Table 1.
 - 3.1. Several constituents are listed in the “Basic Natural Gas Properties” as well as in “Health Protective Constituents” and “Pipeline Integrity Protective Constituents” sections of Table 1 because they have been deemed significant specifications from more than one perspective.

4. In addition to specifications contained in this document, biomethane received by Transporter may be subject to interchangeability testing per American Gas Association (AGA) Research Bulletin 36 in order to satisfy requests of Transporter or Transporter's customers.
5. Biomethane received by Transporter (Cascade Natural Gas Corporation) may be supplied to end users as a discreet gas supply or as a mixed gas supply blended with natural gas or different biomethane provided by others.
 - 5.1. Biomethane received by Transporter must not contain constituents which might restrict the Transporter's inventory, blended or otherwise, to be marketed as a natural gas supply.
6. Biomethane must not contain constituents at concentrations which could present a health or safety hazard to utility workers or the general public.
 - 6.1. These are considered "Health Protective Constituents". Specific carcinogenic constituents and non-carcinogenic constituents are listed in Table 1.
 - 6.2. The Supplier is required to identify health or safety constituents not listed in Table 1, but known to be present in detectable quantities, to the Transporter prior to finalizing an interconnection agreement or supply contract. Such constituents will be addressed in interconnection or contract documents.
7. Biomethane must not contain constituents at concentrations which could damage or deteriorate the integrity of pipeline facilities.
 - 7.1. These are considered "Pipeline Integrity Protective Constituents". Specific constituents are listed in Table 1.
 - 7.2. The Supplier is required to identify such constituents not listed in Table 1, but known to be present in detectable quantities, to the Transporter prior to finalizing an interconnection agreement or supply contract. Such constituents will be addressed in the interconnection or contract documents.

Table 1: QUALITY SPECIFICATIONS FOR BIOMETHANE FROM WASTEWATER TREATMENT PLANTS

SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING	STANDARD TEST METHOD [28]
BASIC NATURAL GAS PROPERTIES					
Min. Heat Content (dry, HHV) [1]	985 BTU/scf	N/A	N/A	Continuous real-time monitoring	AGA-5; AGA-8; ASTM D3588; ASTM D7164;
Max. Heat Content (dry, HHV) [1]	1,100 BTU/scf	N/A	N/A		
Min. Wobbe Number	1,275	N/A	N/A	Continuous real-time monitoring	ASTM D1945; ASTM D7314; GPA 2172 / API 14.5; GPA 2261; GPA 2145
Max. Wobbe Number	1,390	N/A	N/A		
Min. Temperature	40 °F	N/A	N/A	Continuous real-time monitoring	Temperature element and transmitter in pipeline.
Max. Temperature	120 °F	N/A	N/A		
Min. Pressure	[4]	N/A	N/A	Continuous real-time monitoring	Pressure element and transmitter in pipeline
Max. Pressure	[5]	N/A	N/A		
Max. Hydrocarbon Dew Point (HDP)	15 °F [6]	N/A	N/A	Continuous real-time monitoring	ASTM D1945; ASTM D1142; ASTM D5454
Max. Cricondenthem (CHDP)	15 °F [7]	N/A	N/A		
Max. C ₄ ⁺	0.75 %vol	N/A	N/A		ASTM D1945; ASTM D1946; ASTM D1766; GPA 2261
Max. C ₅ ⁺ GPM	0.2 gal/Mscf	N/A	N/A		
Max. C ₅ ⁺	0.12% vol	N/A	N/A		
Max. C ₆ ⁺ GPM	0.05 gal/Mscf	N/A	N/A		
Max. Water Vapor Content	7.0 lb/MMscf [9]	N/A	N/A	Continuous real-time monitoring	ASTM D1142; ASTM D5454; ASTM D4888
Max. Total Sulfur [10]	5.0 grains per 100 scf	N/A	N/A	Continuous real-time monitoring	ASTM D1072; ASTM D3246; ASTM D4468; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D6667; ASTM D7165; GPA 2199
Max. Hydrogen Sulfide (H ₂ S)	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv	N/A	N/A		

TABLE 1 – QUALITY SPECIFICATIONS FOR BIOMETHANE FROM WASTEWATER TREATMENT PLANTS (continued)					
SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING	STANDARD TEST METHOD [28]
Max. Mercaptans (RSH) [23]	0.2 grain Sulfur per 100 scf 4.6 mg Sulfur/m ³ 3.4 ppmv mercaptan	N/A	N/A	Continuous real-time monitoring	ASTM D1988; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D7165; ASTM D7493; GPA 2265
Max. Particle Size	3 microns	N/A	N/A	Customize to gas source [27]	EPA Method 5
Max. Hydrogen	400 ppm 0.04% vol	N/A	N/A	Continuous or intermittent[26]	ASTM D1945; ASTM D1946; ASTM D1766; GPA 2261.
Max. Total Diluent Gases [11]	3% vol	N/A	N/A	Continuous real-time monitoring	Also for CO ₂ : ASTM D4984; ASTM D7164; GPA 2377
Carbon Dioxide (CO ₂)	2% vol	N/A	N/A		
Nitrogen (N ₂)	1% vol	N/A	N/A		
Oxygen (O ₂)	0.1% vol	N/A	N/A		
General Statements	<p>The gas shall be commercially free from objectionable odors (excluding odorant), solid matter, dust, gums, and gum forming constituents, or any other substance which interferes with the intended purpose of merchantability of the gas, or causes interference with the proper and safe operation of the lines, meters, regulators, or other appliances through which it may flow.</p> <p>The gas shall not contain any toxic or hazardous substance in concentrations which, in the normal use of the gas, may be hazardous to health, injurious to pipeline facilities, or be a limit to merchantability or be contrary to applicable government standards.</p> <p>Biomethane must be free from bacteria, pathogens, and any other substances injurious to utility facilities or that would cause the gas to be unmarketable. [15]</p>			Testing frequency of subject constituent to be same as for similar constituents found in this table.	Testing method of subject constituent to be same as for similar constituents found in this table.

TABLE 1 – QUALITY SPECIFICATIONS FOR BIOMETHANE FROM WASTEWATER TREATMENT PLANTS (continued)					
SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING [32]	STANDARD TEST METHOD [28]
BIOMETHANE: HEALTH PROTECTIVE CONSTITUENTS – CARCINOGENIC					
Arsenic	0.019 mg/m ³ 0.006 ppmv	0.19 mg/m ³ 0.06 ppmv	0.48 mg/m ³ 0.15 ppmv	Not Required	EPA Method 29; EPA Method 200.8
p-Dichlorobenzene	5.7 mg/m ³ 0.95 ppmv	57 mg/m ³ 9.5 ppmv	140 mg/m ³ 24 ppmv	Required	EPA TO-15
Ethylbenzene	26 mg/m ³ 6.0 ppmv	260 mg/m ³ 60 ppmv	650 mg/m ³ 150 ppmv	Required	EPA TO-15
n-Nitroso-di-n-propylamine	0.033 mg/m ³ 0.006 ppmv	0.33 mg/m ³ 0.06 ppmv	0.81 mg/m ³ 0.15 ppmv	Not Required	EPA Method 8270
Vinyl Chloride	0.84 mg/m ³ 0.33 ppmv	8.4 mg/m ³ 3.3 ppmv	21 mg/m ³ 8.3 ppmv	Required	EPA TO-15
BIOMETHANE: HEALTH PROTECTIVE CONSTITUENTS – NON-CARCINOGENIC					
Antimony	0.60 mg/m ³ 0.12 ppmv	6.0 mg/m ³ 1.2 ppmv	30 mg/m ³ 6.1 ppmv	Not Required	EPA Method 29; EPA Method 200.8
Copper	0.060 mg/m ³ 0.02 ppmv	0.60 mg/m ³ 0.23 ppmv	3.0 mg/m ³ 1.2 ppmv	Not Required	EPA Method 29; EPA Method 200.8
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv	57 mg/m ³ 40 ppmv	285 mg/m ³ 200 ppmv	Required	ASTM D4810; ASTM D5504; ASTM D7165; ASTM D7493; GPA 2261
Lead	0.075 mg/m ³ 0.009 ppmv	0.75 mg/m ³ 0.09 ppmv	3.8 mg/m ³ 0.44 ppmv	Not Required	EPA Method 29; EPA Method 200.8
Mercaptans (Alkyl Thiols)	0.2 grain Sulfur per 100 scf 4.6 mg Sulfur/m ³ 3.4 ppmv mercaptan	2.0 grain Sulfur per 100 scf 46 mg Sulfur/m ³ 34 ppmv mercaptan	10 grain Sulfur per 100 scf 230 mg Sulfur/m ³ 170 ppmv mercaptan	Required	ASTM D1988; ASTM D5504; ASTM D6228; ASTM D6968; ASTM D7165; ASTM D7493; GPA 2265
Methacrolein	1.1 mg/m ³ 0.37 ppmv	11 mg/m ³ 3.7 ppmv	53 mg/m ³ 18 ppmv	Not Required	EPA TO-15, EPA TO-11A
Toluene	904 mg/m ³ 240 ppmv	9000 mg/m ³ 2400 ppmv	45000 mg/m ³ 12000 ppmv	Required	EPA TO-15

TABLE 1 – QUALITY SPECIFICATIONS FOR BIOMETHANE FROM WASTEWATER TREATMENT PLANTS (continued)					
SPECIFICATION or CONSTITUENT	LIMIT OR TRIGGER LEVEL [17]	LOWER ACTION LEVEL [18]	UPPER ACTION LEVEL [19]	TESTING [32]	STANDARD TEST METHOD [28]
BIOMETHANE: PIPELINE INTEGRITY PROTECTIVE CONSTITUENTS					
Ammonia	0.001%	0.005% [12]	TBD [12]	Required	Gas Chromatograph with CID or lab analysis [30]
Biologicals	4 x 10 ⁴ / scf (qPCR per APB, SRB, IOB group) and commercially free of bacteria of >0.2 microns [13]	2 x 10 ⁵ / scf (qPCR per APB, SRB, IOB group) [12, 13]	TBD [12]	Required	Filter to 0.2 micron and analyze for Total, APB, SRB, and IOB using qPCR [29]
Hydrogen	400 ppm 0.04% vol	2,000 [12]	TBD [12]	Required	ASTM D1945; ASTM D1946
Mercury	0.08 mg/m ³	0.4 [12]	TBD [12]	Required	EPA Method 29; EPA Method 200.8
Siloxanes	0.01 mg Si/m ³	0.1 mg Si/m ³	TBD [12]	Required	Gas Chromatograph [31]
BIOMETHANE: TRACE CONSTITUENTS, CONTAMINANTS, AND OBJECTIONABLE MATERIAL					
Contaminants not listed above [25]	Tolerable limits to be evaluated on a case-by-case basis		Prior to introduction and immediately after process changes		

[1] Dry, High Heating Value at 14.73 psia, 60 °F

[2] Not used.

[3] Not used.

[4] Pressure sufficient to allow gas to enter the facilities of Transporter as specified in agreement/contract between Shipper and Transporter

[5] Pressure shall not be in excess of the maximum allowable operating pressure of Transporter’s facilities at receipt point

[6] At any pressure between 100 psia and 1000 psia as calculated from the gas composition and shall be free from hydrocarbons in the liquid state

[7] Cricondentherm Hydrocarbon Dew Point or maximum temperature at which gas and liquid phases can coexist irrespective of pressure

[8] Not used.

[9] Gas shall be free from liquid water

[10] Excluding odorants

[11] Sometimes referred to as “inerts”. Nonhydrocarbons including but not limited to carbon dioxide, nitrogen, and oxygen.

[12] No values available in literature. Allowed value of Lower Action Level to equal five times Trigger Level. Lower Action Levels to be confirmed and Upper Action Levels to be determined after future data becomes available.

[13] qPCR is an abbreviation for Quantitative Polymerase Chain Reaction, a molecular biology analytical technique. APB = Acid Producing Bacteria. SRB = Sulfate Reducing Bacteria. IOB = Iron Oxidizing Bacteria.

[14] Not used.

[15] Not used.

[16] Not used.

[17] Limit is value corresponding to parameter being measured for "Basic Natural Gas" properties. Trigger Level corresponds to a \geq one in one million risk of developing cancer due to exposure at listed value for carcinogens or a hazard quotient of ≥ 0.1 for non-carcinogens as defined in California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, p. 54 – 62.

[18] Lower Action Level corresponds to a \geq ten in one million risk of developing cancer due to exposure at listed value for carcinogens or a hazard quotient of ≥ 1.0 for non-carcinogens as defined in California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, p. 54 – 62.

[19] Upper Action Level corresponds to a ≥ 25 in one million risk of developing cancer due to exposure at listed value for carcinogens or a hazard quotient of ≥ 5.0 for non-carcinogens as defined in California Environmental Protection Agency Air Resources Board, "Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline", May 15, 2013, p. 54 – 62.

[20] Not used.

[21] Not used.

[22] Not used.

[23] Grains per 100 cu ft and mg per cu meter are both reported as Sulfur. ppmv value is for mercaptan assuming mercaptan is methyl mercaptan.

[24] Not used.

[25] Examples include PCB's, non-halogenated Volatile and Semi-Volatile organics, halocarbons (Freon, chloroethane, etc.), aldehydes, ketones, and others.

[26] At Transporter's discretion, online gas chromatograph can be equipped to monitor hydrogen routinely or grab samples can be analyzed in a laboratory on some intermittent schedule.

[27] At Transporter's discretion, either inline filtering or EPA Method 5 isokinetic sampling can be used. Frequency to match testing frequency of health protective constituents or pipeline integrity protective constituents unless specified otherwise by Transporter.

[28] Although each method is appropriate for corresponding constituents, not all methods listed will be appropriate for the required analyses. An independent laboratory certified to analyze pipeline natural gas should be consulted to determine the appropriate methods.

[29] Reference description in Gas Technology Institute, "Guidance Document for the Introduction of Landfill-Derived Renewable Gas into Natural Gas Pipelines", Final Report # GTI-12-0007; p. 20.

[30] Reference description in Gas Technology Institute, "Guidance Document for the Introduction of Landfill-Derived Renewable Gas into Natural Gas Pipelines", Final Report # GTI-12-0007; p. 25. Gas chromatograph to be coupled with a nitrogen chemiluminescence detector.

[31] Reference description in Gas Technology Institute, "Guidance Document for the Introduction of Landfill-Derived Renewable Gas into Natural Gas Pipelines", Final Report # GTI-12-0007; p. 26. Gas chromatograph to be coupled with an atomic emission detector or mass spectral detector, depending on sample collection method.

[32] Refer to text for testing requirements

8. COSTS RELATED TO QUALITY MONITORING

- 8.1. As part of the interconnection agreement, the Supplier will pay Cascade's costs for all engineering, procurement, and construction of quality monitoring systems. Such expenses will include, but not be limited to, sample fittings, piping, analyzers, equipment enclosures, related permits, land rights, odorizing equipment, communication equipment, software, programming costs, design costs, and other expenses. Cascade will own and operate all related facilities on Cascade's side of the interconnection.
- 8.2. Supplier will be responsible for the cost of analytical testing prior to the initial interconnection, periodic testing during operation, and special testing after biomethane supply is interrupted.
- 8.3. Unless otherwise agreed upon, Transporter will continuously monitor selected biomethane quality specifications to detect general biomethane generation process conditions. Specifications monitored will commonly include those listed in the "Basic Natural Gas Properties" section of Table 1. If Transporter senses that specifications being monitored may indicate changes in biomethane quality, the Transporter may request that the Supplier provide additional testing on an accelerated schedule. The Supplier will be responsible for such testing.
- 8.4. Retesting shall be permitted to validate test results. The party requesting the retest will pay for retesting.

9. BIOMETHANE MONITORING REQUIREMENT PRIOR TO INITIAL BIOMETHANE INTERCONNECTION TO PIPELINE:

- 9.1. Testing prior to interconnection to the pipeline will be the responsibility of the Supplier using independent certified testing facilities. Results are to be shared with the Transporter within five calendar days of the time results are received by the Supplier.
- 9.2. Biomethane should be analyzed at two different times over a 2 – 4 week period prior to interconnection in order to detect parameters or components listed in Table 1^{1,2,3}. Tests should occur with biomethane production operating at steady state and at the anticipated normal production capacity. The two tests should be performed at least five days apart. Testing should be conducted using analytical methods and techniques considered acceptable in the natural gas industry.
- 9.3. Biomethane cannot be injected into the natural gas pipeline if:
 - 9.3.1. any parameter fails to comply with quality limits listed in the "Basic Natural Gas Properties" section of Table 1; or
 - 9.3.2. any constituent listed in the "Health Protective Constituents - Carcinogenic" or "Health Protective Constituents – Non-Carcinogenic" sections of Table 1 exceeds the Lower Action Levels listed in Table 1; or
 - 9.3.3. any constituent listed in the "Health Protective Constituents - Carcinogenic" or "Health Protective Constituents – Non-Carcinogenic" sections of Table 1 exceeds the Trigger Levels listed in Table 1 and the collective potential cancer risk or non-

cancer risk is at or above the Lower Action Level listed in Table 5 (see below for method of calculating collective potential risk); or

9.3.4. any constituent listed in “Pipeline Integrity Protective Constituents” sections of Table 1 exceeds the Lower Action Levels listed in Table 1.

9.4. Biomethane can be injected into the natural gas pipeline if:

9.4.1. all conditions specifically described in the Supplier – Transporter contract have been satisfied; and

9.4.2. all parameters comply with quality limits listed in the “Basic Natural Gas Properties” section of Table 1; and

9.4.3. constituents listed in the “Health Protective Constituents - Carcinogenic” or “Health Protective Constituents – Non-Carcinogenic” sections of Table 1 are found to be either:

9.4.3.1. non-detectable or below the Trigger Levels listed in Table 1, or

9.4.3.2. below Lower Action Level with the collective potential cancer risk and non-cancer risk both below the Lower Action Level listed in Table 5 (see below for method of calculating collective potential risk); and

9.4.4. all constituents listed in “Pipeline Integrity Protective Constituents” sections of Table 1 are either:

9.4.4.1. non-detectable or below the Trigger Levels listed in Table 1, or

9.4.4.2. below Lower Action Level and subject to more frequent testing during active injection as agreed upon between Supplier and Transporter.

10. BIOMETHANE MONITORING REQUIREMENT DURING OPERATION + SHUTOFF CRITERIA

10.1. Testing at the interconnection during active flow into the pipeline at the interconnection will be the responsibility of the Transporter using independent certified testing facilities. Results are to be shared with the Supplier in a timely manner. Testing of raw biogas and biomethane upstream from the interconnection during this period will be the responsibility of the Supplier.

10.2. BASIC NATURAL GAS PROPERTIES:

10.2.1. Transporter shall provide continuous real-time or near-real time monitoring for selected basic natural gas properties listed in Table 1. Compliance shall be assessed using a 4- to 8-minute monitoring interval⁴. Unless transporter specifically agrees to other conditions, injected gas must meet all quality specifications. The transporter may refuse to accept any gas which does not meet specifications listed in this document or listed in a separate agreement between the transporter and supplier.

10.3. HEALTH PROTECTIVE CONSTITUENTS (CARCINOGENIC AND NON-CARCINOGENIC):

- 10.3.1. For purposes of categorizing the various constituents, they will be defined as either Group 1 or Group 2 constituents. Group 1 constituents are those with a concentration below the test detection level or below the Trigger Level. Group 2 constituents are those present at a concentration at or above the Trigger Level.⁵
- 10.3.1.1. Group 1 constituents should be monitored at least once every 12 months of injection into the transporter’s pipeline.⁶
- 10.3.1.2. Group 2 constituents should be monitored and the total potential cancer risk and non-cancer risk estimated at least every 3 months of injection into the transporter’s pipeline.⁷
- 10.3.1.2.1. If four consecutive quarterly tests show that an individual group 2 constituent is below the trigger level, then monitoring frequency can be reduced to 12 month intervals.⁸
- 10.3.1.2.2. If four consecutive quarterly tests show that the total potential cancer risk or non-cancer risk for group 2 constituents is below the lower action level (see Table 2), monitoring can be reduced to 12 month intervals for all of the constituents tested for these risks.⁹
- 10.3.2. If test results exceed the lower action level but are below the upper action level three times in a 12-month period, the flow of injected gas must be stopped unless temporary provisions are made with the transporter.
- 10.3.3. If any test result is at or above the upper action level, the flow of injected gas must be stopped unless temporary provisions are made with the transporter. Similarly, if the collective health risk is calculated to be at or above the upper action level (see Table 2), the flow of injected gas must be stopped unless or until temporary provisions are made with the transporter.
- 10.3.4. Selected testing details are summarized in Table 2.

Table 2: TESTING INTERVALS DURING BIOMETHANE INJECTION

GROUP	TESTING INTERVAL	COMMENTS
1 (Less than Trigger Level)	12 Months	Move constituent to Group 2 if analysis yields \geq Trigger Level
2 (Equal to or greater than Trigger Level)	3 Months	Move constituent to Group 1 if 4 consecutive analyses yield concentrations $<$ Trigger Level

10.4. PIPELINE INTEGRITY PROTECTIVE CONSTITUENTS

- 10.4.1. Group 1 and Group 2 categories will be defined in a manner similar to health protective constituents above. Group 1 constituents are those with a concentration below the test detection level or below the Trigger Level. Group 2 constituents are those present at a concentration at or above the Trigger Level.

- 10.4.2. Group 1 and Group 2 constituents should be monitored at least quarterly, unless another frequency is requested or agreed to by the transporter.¹⁰
- 10.4.3. If any test result is at or above the trigger level, the transporter must be notified immediately.
- 10.4.4. If any test result is at or above the lower action level, the flow of injected gas must be stopped unless temporary provisions are made with the transporter.
- 10.4.5. Refer to Table 2 for selected testing details.
- 10.5. BIOMETHANE DELIVERY PROCESS CHANGES
 - 10.5.1. Supplier must notify Transporter prior to changing the biomethane production and delivery system. Prospective changes may include, but not be limited to, feedstock changes, biogas conditioning equipment changes, biogas process condition changes, system control changes, addition or deletion of process equipment or operating parameters, and other modifications.
 - 10.5.2. If Transporter deems that proposed changes to biomethane production and delivery system will potentially increase the level of any constituent of concern above previous levels, Transporter can require that biomethane injection be stopped and startup testing similar to initial interconnection testing be performed.
- 11. BIOMETHANE MONITORING REQUIREMENT PRIOR TO REINTRODUCING BIOMETHANE TO PIPELINE INTERCONNECTION AFTER BIOMETHANE SUPPLY SHUTOFF
 - 11.1. If agreed upon by carrier, interrupted biomethane flow can be restarted after successfully proving compliance with monitoring limits with a single test. Testing requirements should be identical to testing required prior to initial interconnection to the pipeline. Frequencies of testing would revert to baseline periods. The supplier will need to re-establish the permission to extend time between tests based on consecutive results showing low concentrations of constituents.
 - 11.2. Testing prior to resuming flow at the interconnection to the pipeline will be the responsibility of the Supplier using independent certified testing facilities. Results are to be shared with the Transporter within five calendar days of the time results are received by the Supplier.

12. WAIVER PROVISION

- 12.1. Cascade Natural Gas Corporation, at its sole discretion, may elect, but is not obligated to, on a non-discriminatory basis to waive supplier's obligation to conform with certain gas quality specifications, provided that such waiver does not interfere with Cascade's ability to fulfill its obligations to other parties. Any such waiver is temporary and is without prejudice to Cascade's right hereunder or any other rights which it may have, including without limitation, Cascade's right to reject other non-conforming gas.

13. CALCULATION OF COLLECTIVE POTENTIAL HEALTH RISK

- 13.1. The collective potential health risk is an indication of the cumulative effect of all Group 2 constituents (constituents found at or above the Trigger Level). This is calculated using the ratio of measured concentrations divided by the Trigger Level of each particular constituent and summing the individual calculation results.

13.2. CARCINOGENIC CONSTITUENTS

- 13.2.1. The Trigger Level is based on a one in one million cancer risk for each constituent.
- 13.2.2. The risk level for each constituent is calculated by dividing the measured concentration by the Trigger Level concentration for that constituent.
- 13.2.3. The collective health risk will equal the sum of all individual risk levels.
- 13.2.4. If the collective risk level reaches or exceeds the Lower Action Level or Upper Action Level, flow of gas should be adjusted according to criteria listed above.

13.3. NON-CARCINOGENIC CONSTITUENTS

- 13.3.1. The Trigger Level is based on a hazard quotient of 0.1 for each constituent.
- 13.3.2. The risk level for each constituent is calculated by dividing the measured concentration by the Trigger Level concentration for that constituent then multiplying the ratio by 0.1.
- 13.3.3. The collective health risk will equal the sum of all individual risk levels.
- 13.3.4. If the collective risk level reaches or exceeds the Lower Action Level or Upper Action Level, flow of gas should be adjusted according to criteria listed above.
- 13.4. Guidance for calculating and applying collective potential health risk data is summarized in Tables 3, 4, and 5.

Table 3: TESTING OUTCOMES CALCULATION TABLE FOR GROUP 2 CONSTITUENTS PRIOR TO BIOMETHANE INJECTION

CONSTITUENT	TRIGGER LEVEL	ACTUAL ANALYSIS	RATIO (B / A)
	A	B *	C **
HEALTH PROTECTIVE CONSTITUENTS - CARCINOGENIC			
Arsenic	0.019 mg/m ³ 0.006 ppmv		
p-Dichlorobenzene	5.7 mg/m ³ 0.95 ppmv		
Ethylbenzene	26 mg/m ³ 6.0 ppmv		
n-Nitroso-di-n-propylamine	0.033 mg/m ³ 0.006 ppmv		
Vinyl Chloride	0.84 mg/m ³ 0.33 ppmv		
TOTAL COLLECTIVE POTENTIAL RISK*** (Total of Ratio's) BIOMETHANE INJECTION CANNOT BE PERMITTED IF THIS TOTAL EQUALS OR EXCEEDS <u>10.0</u>			
HEALTH PROTECTIVE CONSTITUENTS – NON-CARCINOGENIC			
Antimony	0.60 mg/m ³ 0.12 ppmv		
Copper	0.060 mg/m ³ 0.02 ppmv		
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv		
Lead	0.075 mg/m ³ 0.009 ppmv		
Mercaptans (Alkyl Thiols)	0.2 grain per 100 scf 4.6 mg/m ³ 2.3 ppmv		
Methacrolein	1.1 mg/m ³ 0.37 ppmv		
Toluene	904 mg/m ³ 240 ppmv		
TOTAL COLLECTIVE HAZARD INDEX (Total of Ratio's) BIOMETHANE INJECTION CANNOT BE PERMITTED IF THIS TOTAL EQUALS OR EXCEEDS <u>1.0</u>			

* To be determined by analysis. Only one unit of measure is required.

** To be calculated by dividing value B by value A (B / A = C). (units of measurement in numerator and denominator must match)

***Sum of values for individual constituents (carcinogenic and non-carcinogenic constituents to be calculated separately)

Table 4: TESTING OUTCOMES CALCULATION TABLE FOR GROUP 2 CONSTITUENTS DURING BIOMETHANE INJECTION

CONSTITUENT	TRIGGER LEVEL	ACTUAL ANALYSIS	RATIO (B / A)
	A	B *	C **
HEALTH PROTECTIVE CONSTITUENTS - CARCINOGENIC			
Arsenic	0.019 mg/m ³ 0.006 ppmv		
p-Dichlorobenzene	5.7 mg/m ³ 0.95 ppmv		
Ethylbenzene	26 mg/m ³ 6.0 ppmv		
n-Nitroso-di-n-propylamine	0.033 mg/m ³ 0.006 ppmv		
Vinyl Chloride	0.84 mg/m ³ 0.33 ppmv		
TOTAL COLLECTIVE POTENTIAL RISK*** (Total of Ratio's) BIOMETHANE INJECTION MUST BE STOPPED IF THIS TOTAL EQUALS OR EXCEEDS <u>25.0</u> FOR ANY SINGLE PERIOD OR IF IT EQUALS OR EXCEEDS <u>10.0</u> THREE TIMES IN 12 MONTHS			
HEALTH PROTECTIVE CONSTITUENTS – NON-CARCINOGENIC			
Antimony	0.60 mg/m ³ 0.12 ppmv		
Copper	0.060 mg/m ³ 0.02 ppmv		
Hydrogen Sulfide	0.25 grain per 100 scf 5.7 mg/m ³ 4.0 ppmv		
Lead	0.075 mg/m ³ 0.009 ppmv		
Mercaptans (Alkyl Thiols)	0.2 grain per 100 scf 4.6 mg/m ³ 2.3 ppmv		
Methacrolein	1.1 mg/m ³ 0.37 ppmv		
Toluene	904 mg/m ³ 240 ppmv		
TOTAL COLLECTIVE HAZARD INDEX (Total of Ratio's) BIOMETHANE INJECTION MUST BE STOPPED IF THIS TOTAL EQUALS OR EXCEEDS <u>5.0</u> FOR ANY SINGLE PERIOD OR IF IT EQUALS OR EXCEEDS <u>1.0</u> THREE TIMES IN 12 MONTHS			

* To be determined by analysis. Only one unit of measure is required.

** To be calculated by dividing value B by value A (B / A = C). (units of measurement in numerator and denominator must match)

***Sum of values for individual constituents (carcinogenic and non-carcinogenic constituents to be calculated separately)

Table 5: COLLECTIVE POTENTIAL RISK OR HAZARD INDEX LEVEL FROM HEALTH PROTECTIVE CONSTITUENTS [1]

RISK MANAGEMENT LEVEL	POTENTIAL RISK FROM CARCINOGENS	HAZARD INDEX FROM NON-CARCINOGENS	ACTION / TESTING
Trigger Level	≥ 1.0	≥ 0.1	Periodic Testing Required
Lower Action Level	≥ 10.0	≥ 1.0	Stop injection after three exceedances in 12-month period
Upper Action Level	≥ 25.0	≥ 5.0	Stop injection immediately

[1] Sum of risk or hazard index values for individual constituents present at or above trigger level concentrations. Carcinogens and non-carcinogens are calculated and summarized separately.

BIBLIOGRAPHY / REFERENCES

¹ California Environmental Protection Agency Air Resources Board, “Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline”, May 15, 2013, P. 65.

² Pacific Gas and Electric Company, “Gas Rule No. 21, Transportation of Natural Gas”, April 19, 2015, sheet 21.

³ Southern California Gas Company, “Rule No. 30, Transportation of Customer-owned Gas”, May 1, 2015, sheet 51383-G.

⁴ Southern California Gas Company, “Rule No. 30, Transportation of Customer-owned Gas”, May 1, 2015, sheet 50808-G.

⁵ California Environmental Protection Agency Air Resources Board, “Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline”, May 15, 2013, P. 67.

⁶ California Environmental Protection Agency Air Resources Board, “Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline”, May 15, 2013, P. 67

⁷ California Environmental Protection Agency Air Resources Board, “Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline”, May 15, 2013, P. 67

⁸ California Environmental Protection Agency Air Resources Board, “Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline”, May 15, 2013, P. 68

⁹ California Environmental Protection Agency Air Resources Board, “Recommendations to the California Public Utilities Commission Regarding Health Protective Standards for the Injection of Biomethane into the Common Carrier Pipeline”, May 15, 2013, P. 68

¹⁰ Recommended testing frequency was not found in literature reviewed.

**CNGC Advice No. 17-04-01, Schedule 800 Biomethane Receipt Services
Exhibit A**

Schedule 800 Monthly Service Charge

Hours	Rate per Hour	Annual	Monthly Cost	Description
			\$500	Billing and metering. Monthly Charge for Schedule 163 customer. Biomethane Producer under Sch 800 is most like a Sch 163 customer wth additional costs.
		\$18,000.00	\$1,500.00	Gas Chromatograph Monitoring, annual contract with third party
36	\$50.67	\$1,823.98	\$152.00	Corrective maintenance
12	\$50.67	\$607.99	\$50.67	Odorant Reads
6	\$50.67	\$304.00	\$25.33	Monthly Odorant tank
8	\$50.67	\$405.33	\$33.78	Odorant Delivery
		\$2,261.77	\$188.48	Contingency
Total			\$2,450.26	
Monthly Charge			\$2,500.00	

		Base Rate	Oderant	Sch. 192	Billing Rate
First	10,000	#####	#####	#####	\$0.124296250
Next	10,000	#####	#####	#####	\$0.112156250
Next	30,000	#####	#####	#####	\$0.105396250
Next	50,000	#####	#####	#####	\$0.064836250
Next	400,000	#####	#####	#####	\$0.033026250
Over	500,000	#####	#####	#####	\$0.017826250