Operator's manual
Kodiak (40 ft and 20 ft unit)

Outland Camp
Baker Lake - Nunavut
Projets: NU-P14-1028

BIONEST
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Contact information

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1 BIONEST KODIAK CONTACTS

Customer Service: 1-866-538-5662

1.1 Bionest

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KODIAK Technology

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2 DESCRIPTION AND OPERATION PRINCIPLE OF THE KODIAK TREATMENT SYSTEM

KODIAK systems are ready-to-use BIONEST™ advanced secondary wastewater treatment. They are treatment solution units that can easily be moved from one location to another. All treatment components are prepared and assembled at our production plant to ensure optimum quality, quick and simple onsite installation with long durability and low maintenance. KODIAK unit includes two different sections; the BIONEST™ system (conventional septic tank followed by a bioreactor) and a mechanical room. Once units are in place, tanks need to be filled with clean water. Once inlet/outlet pipes are connected, treatment may begin.

Illustration 1 : KODIAK unit

2.1 Primary treatment

The primary treatment consists in the removal of floating material and settling of heavier particles. This is carried out in the septic tank portion of the KODIAK unit. This step also plays a role in the advanced treatment process.

The septic tank is divided into 2/3 and 1/3 sections by a partition wall. This helps to separate the solids from the liquid in the first section, allowing the liquid to flow to the second section, which is equipped with an effluent filter. It is important that routine maintenance is carried out. It is the owners' responsibility to have the septic tank pumped out at frequencies established upon local regulation or on a recommendation from the Kodiak maintenance technician. Please note that the pumping of the septic tank must be performed by a specialised firm and the tank must be filled with clean water after pumping.

2.1.1 EFFLUENT FILTER

The septic tank is equipped with an effluent filter with openings of 1,6mm or less. The effluent filter must be cleaned every time the septic tank is inspected and pumped out. It is recommended that you inform the person emptying the septic tank about the presence of the effluent filter.

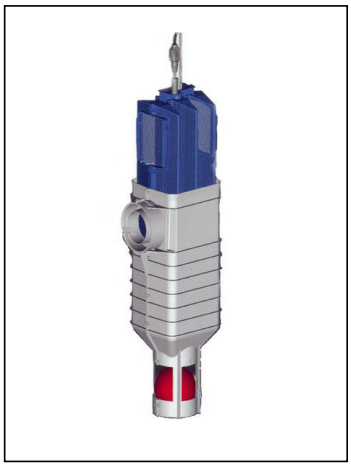


Illustration 2 : Effluent filter

2.2 ADVANCED TREATMENT SYSTEM

Primary effluent leaves the septic tank and flows to the second section of the KODIAK unit: The BIONEST[MD] reactor wastewater is put in contact with microbiological cultures naturally fixed on a synthetic material. This synthetic material is our patented non-biodegradable media called «BIONEST[TM] Media».

2.2.1 BIONEST[TM] BIOREACTOR

The BIONEST[TM] bioreactor is a tank similar to the septic tank divided into 2/3 and 1/3 sections. The first section is aerated with fine air bubble diffusers while the 1/3 section is non aerated to create a non turbulent environment where biosolids will be degraded and filtered out.

2.2.2 MÉDIA

The very low volume occupied by the media reduces the risk of unlikely blockage: less than 2% of the BIONEST^{TM} bioreactors' volume is occupied by the media while it still offer a huge surface for bacteria development. The media is distributed evenly in the tank. A surface of 92,5m^2 of the media is used per cubic meter of wastewater. The texture of the BIONEST^{TM} media, as developed after several years of research, provides strong adhesion and allows for faster growth of bacterial mass. The synthetic media is a non-biodegradable polymer and therefore, it does not deteriorate over time and does not need replacement.

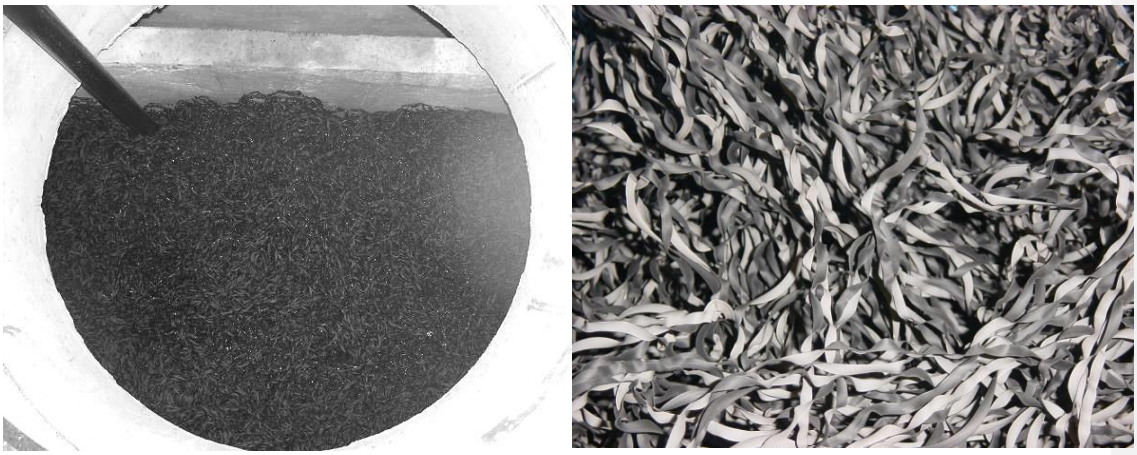


Illustration 3 : Media

2.2.3 AERATION

Air is an essential element in any biological treatment system (BIONEST^{TM}, biofilter, sand filter, leaching field, etc.). Temperature and winds vary continuously during the year, thus varying performances of system using passive aeration. The BIONEST^{TM} system provides consistent air quality and temperature year round, regardless of the season, allowing the performances of the system to be constant. Aeration in the first compartment of the bioreactor is made possible with air pumps and fine air bubble diffusers. The air comes from air pumps which are inside the mechanical room.

Illustration 4 : Fine air bubble diffuser

Illustration 5 : Air Pump

2.2.4 RECIRCULATION

Recirculation of treated water back to the reactor inlet ensures several contacts with bacteria enhancing the transformation of nitrogen. The KODIAK system reduces not only ammonia, but also nitrates. Treated wastewater recirculating continuously in the treatment chain is beneficial in the treatment of BOD, the reduction of coliforms and in the reduction of biosolids production. To prevent water cooling, the recirculation pipe is insulated.

2.2.5 SLUDGE REMOVAL APPARATUS

The BIONEST™ Wastewater treatment system has been designed so that only the septic tank section requires periodic pump outs. Even though most biosolids generated in the BIONEST™ reactor are degraded, some will accumulated with time. Biosolids removal in the reactor may be required after ± 2000 days of operation or based on a recommendation from a maintenance technician. A sludge removal apparatus has been integrated into both sections of the bioreactor to ensure easy sludge removal or in the event that toxic and/or prohibited products are released of in the residence's water facilities.

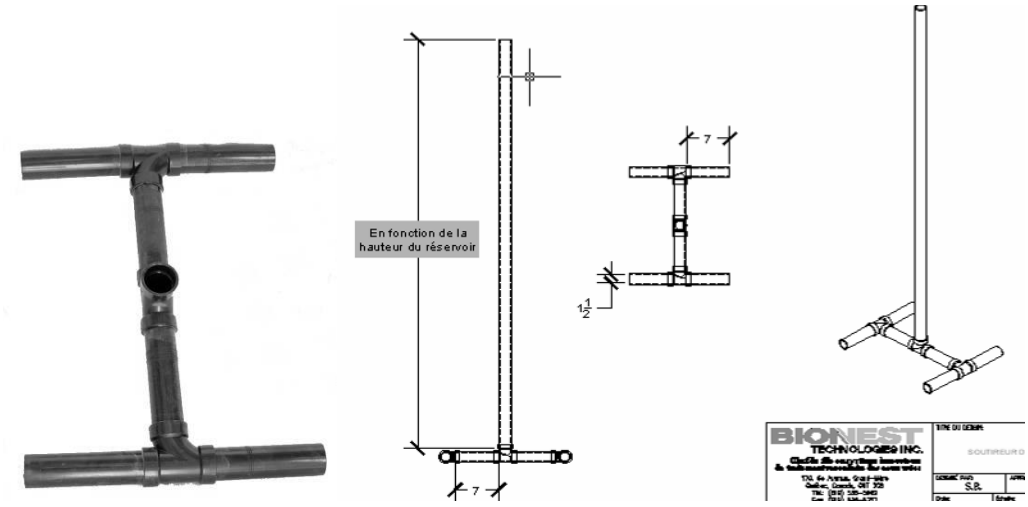


Illustration 6 : Sludge removal apparatus

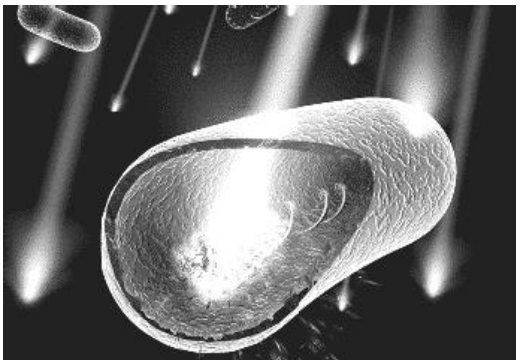
2.3 TERTIARY TREATMENT

The expression «tertiary treatment » can mean different kinds of treatments depending on the local regulations, but always refers to the requirement for a higher treatment level. A tertiary treatment usually refers to the removal of either fecal coliforms, phosphorous or total nitrogen.

2.3.1 ULTRAVIOLET DISINFECTION

The ultraviolet rays can penetrate the cell core of the coliform bacteria and deactivate their reproductive capacity, thus, bringing on their death. This process however requires an environment where light can freely travel, which means as colourless as possible and free of suspended matter. As the BIONEST^{TM} system's effluent is very clear, the UV rays can freely travel within the treated waters and destroy bacteria and parasites as to reach a quality level superior to swimming regulations. The exceptional quality of a BIONEST^{TM} system's effluent also reduces dirt accumulation on the UV lamp, thus preserving the disinfection unit's effectiveness.

Illustration 7 : bacteria DNA damaged by ultraviolet ray



To maintain the effluent quality produced by this treatment unit, the UV lamp has to be inspected and cleaned after 6 months and replaced every year.

To get optimal disinfection results and to prevent an early fouling of the UV lamp, the influent of the UV treatment system should not exceed these concentrations;

- Total suspended solids : 15 mg/l
- Total iron : 0,3 mg/l
- Manganese : 0,05 mg/l
- Total hardess ($CaCO_3$) :120 mg/l

The ultraviolet treatment unit is located in the KODIAK's mechanical room. Its location allows for an easy sampling.

Illustration 8 : Disinfection unit

2.4 Sampling

The KODIAK unit is designed so that a sample of the influent and the treated effluent can be easily taken. In order to do this, different sampling valves are installed in the mechanical room.

2.5 Alarms

To ensure your peace of mind, different alarms are installed in the KODIAK unit monitoring the key components. The Bionest module monitor the following components: recirculation pump, air pumps and effluent filter clogging sensor.

Illustration 9: BIOLARM™

An alarm is also built in the ultraviolet disinfection unit. This one is activated when the uv lamp is burned or when 375 days have elapsed since the replacement of lamp.

The BIOLARM™ , the uv alarm and the different thermostats (mechanical room air temperature, effluent temperature) are located in the mechanical room, which is secured heated and ventilated. The alarm signals are connected to an exterior alarm (tank alert XT), which is connected to an exterior strobe light. A visual and audible signal is also emitted by the tank alert XT when any alarms is activated.

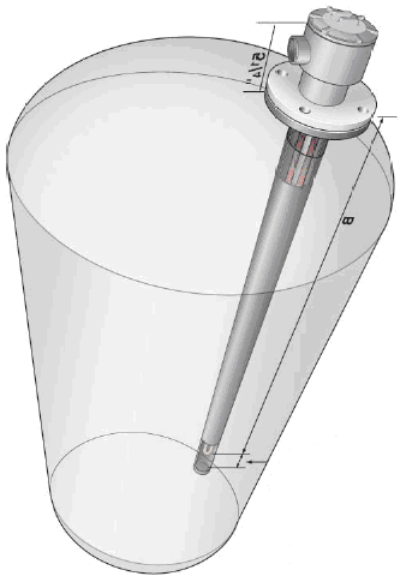
Illustration 10 : Tank alert XT

2.5.1 TEMPERATURE ADJUSMENT DEVICE

In conditions where the influent wastewater may average a temperature less than 10°C, it is required to warm the

water up to keep the bacteria population efficient. This is done by a heating element installed in the septic tank. To ensure a good control, a temperature probe is installed in the bioreactor section. Any temperature detected below 12ºC will activate the heating element.

Illustration 11 : Pipe insert heater



To avoid freezing of stagnant water in the pipe, a ceiling fan heater is installed to maintain a warm temperature in the mechanical room.

Illustration 12 : Ceiling fan heater

To ensure good ventilation within the mechanical room, a 147 CFM ceiling ventilator is installed. The ventilator is connected to a temperature probe, which is installed in the mechanical room. Any temperature detected over 25ºC will activate the ceiling ventilator.

Illustration 13 : Ceiling ventilator

2.6 FINAL DISCHARGE

The treated water is discharged into an outfall sewer designed by the consultant.

2.7 PERFORMANCES

BIONEST[MD] treatment system purifying capacity is exceptional. BIONEST[MD] system active area/ occupied volume rapport is impressive; presently one of the biggest on the market. For each cubic meter relative to the bioreactor, an active area of 92,5 square meter (92,5 m^2 of média/m^3) supply a sustainable habitat to the essential bacteria culture. High concentrations of biomass allow an effective reduction of the amount of toxic organic matter. Beside, water recirculation ensures an effective nitrogen release, preventing water table pollution by nitrates and ammonia.

Illustration 14: Table of official results to the BNQ test

BNQ test bench: Mission accomplished!	Advanced econdary (class III)			Tertiary (class V)
	BOD_5 (mg/L)	TSS (mg/L)	Fecal coliforms (UFC/100mL)	Fecal coliforms (UFC/100mL)
Quebec requirements	15	15	50000	200[a]
Average[1] after 12 months of certification (Annex A and B)[2]	3	3	4000	2[b]

Source : Sommaires analytiques complets et officiels des 52 semaines – BNQ Norme 3680-910/2000-06-16 M_1 (2004-0910)

[1] averages are calculated from the official results of Appendices A and B in accordance with the standard 3680-910/2000- 06-16 M_1 (2004-0910)
[2] explanations about data interpretations are found in the BNQ report
[a] after photoreactivation
[b] before photoreactivation

Drawings

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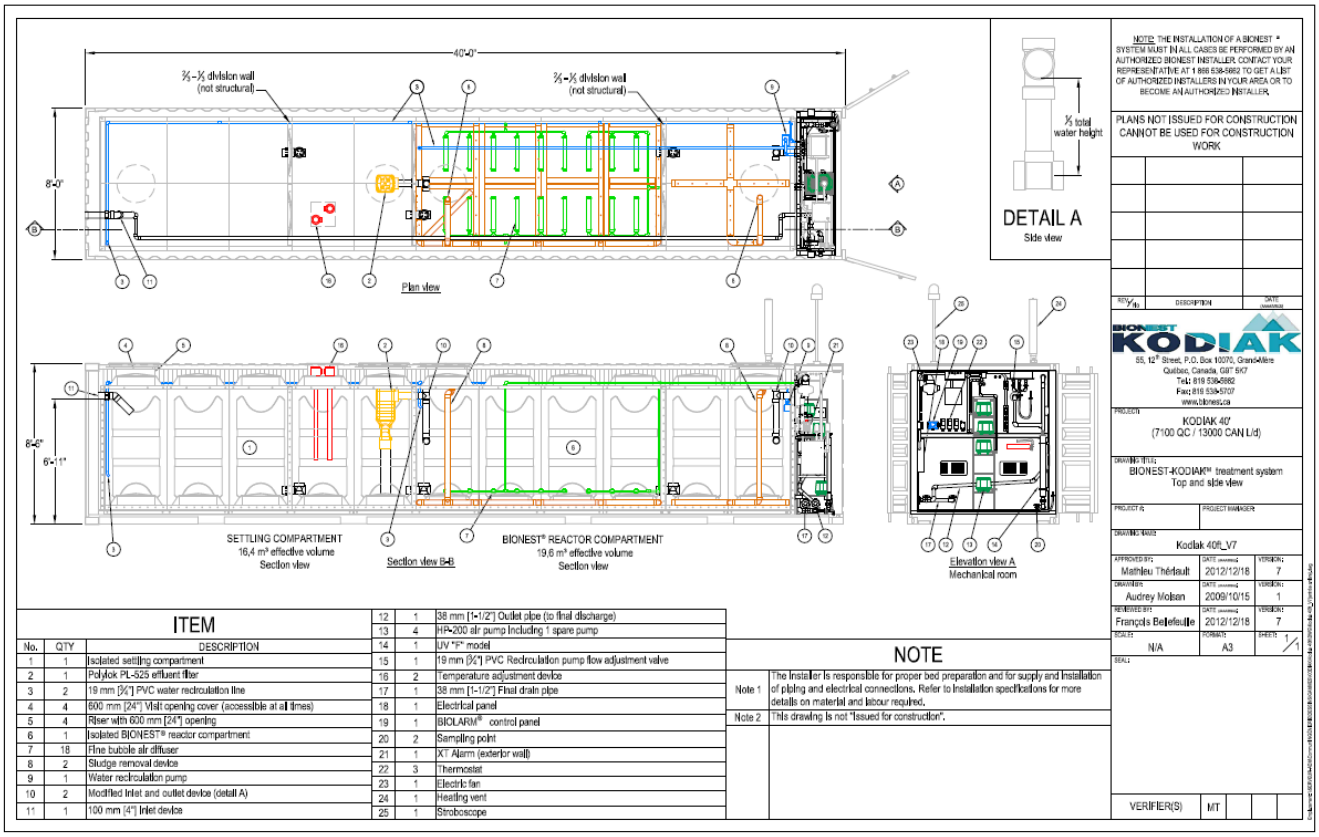
3.0 WORKSHOP DRAWING

Here are the drawings of the 40 feet and 20 feet KODIAK units.



ITEM		
No.	QTY	DESCRIPTION
1	1	Isolated settling compartment
2	1	Polylok PL-525 effluent filter
3	2	19 mm [¾"] PVC water recirculation line
4	4	600 mm [24"] Visit opening cover (accessible at all times)
5	4	Riser with 600 mm [24"] opening
6	1	Isolated BIONEST® reactor compartment
7	18	Fine bubble air diffuser
8	2	Sludge removal device
9	1	Water recirculation pump
10	2	Modified inlet and outlet device (detail A)
11	1	100 mm [4"] Inlet device
12	1	38 mm [1-1/2"] Outlet pipe (to final discharge)
13	4	HP-200 air pump including 1 spare pump
14	1	UV "F" model
15	1	19 mm [¾"] PVC Recirculation pump flow adjustment valve
16	2	Temperature adjustment device
17	1	38 mm [1-1/2"] Final drain pipe
18	1	Electrical panel
19	1	BIOLARM® control panel
20	2	Sampling point
21	1	XT Alarm (exterior wall)
22	3	Thermostat
23	1	Electric fan
24	1	Heating vent
25	1	Stroboscope

NOTE	
Note 1	The Installer is responsible for proper bed preparation and for supply and installation of piping and electrical connections. Refer to installation specifications for more details on material and labour required.
Note 2	This drawing is not "Issued for construction".

NOTE: THE INSTALLATION OF A BIONEST ® SYSTEM MUST IN ALL CASES BE PERFORMED BY AN AUTHORIZED BIONEST INSTALLER. CONTACT YOUR REPRESENTATIVE AT 1 866 838-5662 TO GET A LIST OF AUTHORIZED INSTALLERS IN YOUR AREA OR TO BECOME AN AUTHORIZED INSTALLER.

PLANS NOT ISSUED FOR CONSTRUCTION CANNOT BE USED FOR CONSTRUCTION WORK

REV.	DESCRIPTION	DATE

55, 12th Street, P.O. Box 10070, Grand-Mère
Québec, Canada, G8T 5K7
Tel.: 819 538-5662
Fax: 819 538-5707
www.bionest.ca

PROJECT: KODIAK 40' (7100 QC / 13000 CAN L/d)

DRAWING TITLE: BIONEST-KODIAK™ treatment system Top and side view

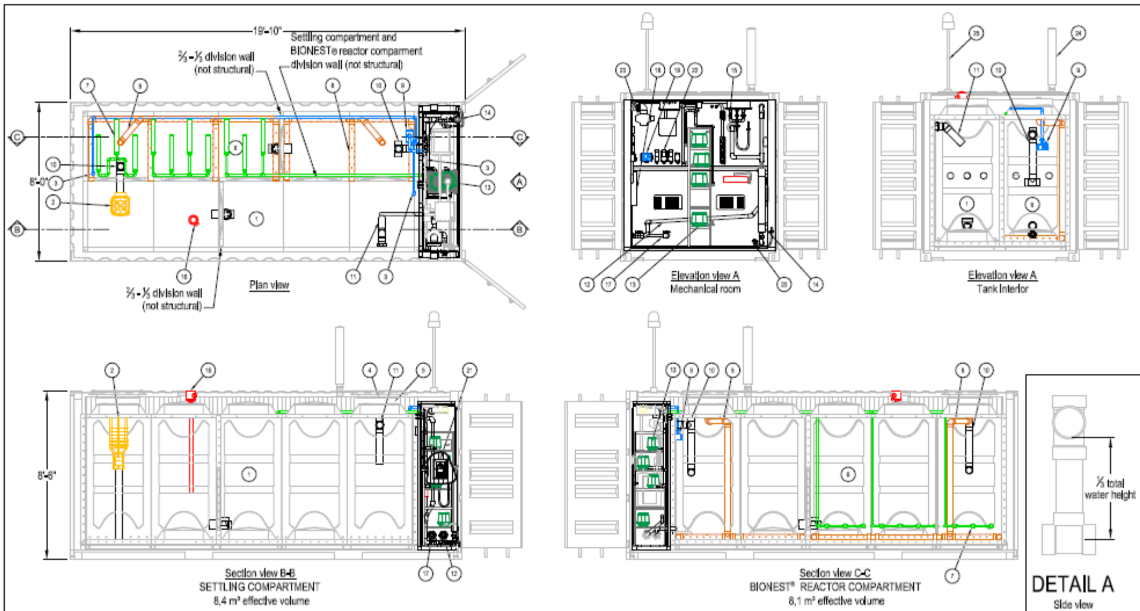
PROJECT #: | PROJECT MANAGER:

DRAWING NAME: Kodiak 40ft_V7

APPROVED BY: Mathieu Thérault	DATE: 2012/12/18	VERSION: 7
DRAWN BY: Audrey Molson	DATE: 2009/10/15	VERSION: 1
REVIEWED BY: François Bellefeuille	DATE: 2012/12/18	VERSION: 7
SCALE: N/A	FORMAT: A3	SHEETS: 1

SEAL:

VERIFIER(S): MT



ITEM

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9	1	Water recirculation pump
10	2	Modified inlet and outlet device (detail A)
11	1	100 mm [4"] Inlet device
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13	4	HP-200 air pump including 1 spare pump
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NOTE

Note 1	The installer is responsible for proper bed preparation and for supply and installation of piping and electrical connections. Refer to installation specifications for more details on material and labour required.
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NOTE: THE INSTALLATION OF A BIONEST ® SYSTEM MUST IN ALL CASES BE PERFORMED BY AN AUTHORIZED BIONEST INSTALLER. CONTACT YOUR REPRESENTATIVE AT 1 866 538-5662 TO GET A LIST OF AUTHORIZED INSTALLERS IN YOUR AREA OR TO BECOME AN AUTHORIZED INSTALLER.

PLANS NOT ISSUED FOR CONSTRUCTION CANNOT BE USED FOR CONSTRUCTION WORK

REV/No	DESCRIPTION	DATE

BIONEST KODIAK
55, 12[e] Street, P.O. Box 10070, Grand-Mère
Québec, Canada, G9T 5K7
Tel: 819 538-5662
Fax: 819 538-5707
www.bionest.ca

PROJECT: KODIAK 20'
(3600 QC / 5500 CAN L/d)

DRAWING TITLE: BIONEST-KODIAK™ treatment system
Top and side view

PROJECT #:	PROJECT MANAGER:	
DRAWING NAME: Kodiak 20ft_V5		
APPROVED BY: Mathieu Thériault	DATE: 2012/12/18	VERSION: 5
DRAWN BY: Audrey Moisan	DATE: 2009/12/10	VERSION: 2
REVIEWED BY: François Bellefeuille	DATE: 2012/12/18	VERSION: 5
SCALE: N/A	FORMAT: A3	SHEET: 1/1

SEAL:

VERIFIER(S)	MT			

Warranty

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4.0 SUMMARY OF WARRANTY

In order for the warranty to stay valid, the customer must immediately notify Bionest Kodiak of any apparent abnormality, irregularity, or malfunction of the KODIAK unit. Neglecting to inform Bionest Kodiak within a reasonable timeframe can result in the cancellation of the warranty. Bionest Kodiak is committed to responding to and to taking appropriate measures to correct the situation, as long as the system is used properly.

Table1 : Summary of Warranty

Warranty	Warranty period
Binest Kodiak warranties all BIONEST™ KODIAK system parts and components	For TWO (2) years
Bionest Kodiak warranties its media will not deteriorate	For TWENTY (20) years following the purchase date

Warnings

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5.0 SAFETY INFORMATION

To ensure the best performance of your KODIAK wastewater treatment system unit,

DO NOT use or discard any of the following products into the sinks, toilets, or other water facilities in your building:

- Caustic products used to unclog pipes such as: **Liquid Plumr®, Liquid Drano®, etc.**
- Paint, solvent, petroleum based products, etc.
- Pesticides
- Backwash effluents of a water softening system
- Large quantities of household cleaning products
- Oil and grease (engine, cooking, etc.)
- Septic tank treatment products
- All non-biodegradable objects (cigarette butts, sanitary napkins/products, etc.)

Please respect manufacturers' recommended usage for domestic cleaning products and avoid all antibacterial products. Do not use automatic toilet cleaners. Do not use a waste disposal unit in the sink (e.g. In-Sink-Erator).

Do not connect drain pipes or gutters to the septic installation.

Do not modify the configuration of the treatment system installation.

5.1 Warnings

The discharge of any of the aforementioned products into the system may destroy the bacterial culture responsible for treating the wastewater and therefore cause the system to be **non-operational.**

Always disconnect the power supply cord before servicing any unit. Failure to do so may result in electrical shock causing serious bodily injury or death.

If contact with wastewater occurs, please remove any contaminated clothing and thoroughly wash all body areas and clothing exposed to wastewater with soap and water. To minimize any risk of illness, consult a physician.

Please ensure that **the KODIAK unit has been filled with water before starting the system**. **Water filling has to be done on the reactor side. On the opposite, drainage must be done on the septic tank side.** Serious problem can result from the non respect of this procedure.

The use of your system when the air pump is not in function can result in serious consequences (e.g. cancellation of your warranty).

For intermittent use and extended non-use periods please refer to section 4.0 of this manual. Always advise Bionest Kodiak before shutting down your system.

In the event the septic tank has not been serviced for sludge removal within the timelines required by local regulations, or if there is abnormal sludge accumulation noticed in the effluent filter when sludge is being removed, please contact Bionest Kodiak

5.2 Servicing the kodiak unit

KODIAK systems operate automatically and require no individual/specific intervention. When the system is functioning properly, no odours should be present. If odours do occur, make sure the air pump is functioning normally. If not, please call Bionest Kodiak.

WARNING: THE VENTING PIPE MUST BE MOUNTED ON THE UNIT ROOF AT ALL TIME DURING OPERATION AND REMOVED AND STORE IN THE TECHNICAL ROOM BEFORE MOVING THE UNIT

5.3 Intermittent Use And Extended Non-Use Periods

Even if wastewater does not enter the BIONEST™ system for an extended period of time, the system will function properly. The power should be left on during short periods of non-use when there is no water flow to the system (intermittent use) to assure aeration of the stagnant wastewater.

If the property is going to be used seasonally (i.e. summer use only and closed for winter) and if the system is not in use for periods extending over 6 consecutive weeks, please refer to the shut down procedure (Maintenance manual).

5.4 Confined space

Please note that KODIAK's different tanks (septic tank and bioreactor) are considered to be confined space and are hazardous to your health.

➔ **DO NOT** ENTER ANY TANK OR MANHOLE AT ANY TIME.

Please refer to the following document for more information:
http://www.labour.gov.on.ca/english/hs/pdf/confined.pdf.

Components

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