CITY OF PALATKA
FLORIDA

Regular meeting 2nd and 4th Thursdays each month at 6:00 p.m.

September 19, 2014

TO COMMISSIONERS: **MARY LAWSON BROWN, ALLEGRA KITCHENS, PHIL LEARY AND JAMES NORWOOD, Jr.:**

You are hereby notified that a Workshop Meeting of the Palatka City Commission is called to be held on Thursday, September 25, 2014, at the regular meeting place of the Palatka City Commission, Palatka City Hall, 201 N. 2nd Street, Palatka, Florida, to commence at **4:30 p.m.**

The purpose of the workshop is to discuss proposed WWTP Improvements, the Ayres Associates Report on Alternatives Cost Analysis for the Sludge Treatment System, and a Letter of Intent to enter into negotiations with BCR Environmental Corp. for the installation and co-operation of a Biosolids Management Facility at the WWTP

/s/ Vernon Myers
Vernon Myers, MAYOR

We acknowledge receipt of a copy of the foregoing notice of a workshop meeting on the 19th day of September, 2014.

/s/ Mary Lawson Brown
COMMISSIONER

/s/ Phil Leary
COMMISSIONER

/s/ James Norwood, Jr.
COMMISSIONER

/s/ Allegra Kitchens
COMMISSIONER

PERSONS WITH DISABILITIES REQUIRING ACCOMMODATIONS IN ORDER TO PARTICIPATE IN THIS MEETING SHOULD CONTACT THE CITY CLERK'S OFFICE AT 329-0100 AT LEAST 24 HOURS IN ADVANCE TO REQUEST ACCOMMODATIONS.

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FAX: (386) 329-0106

CITY of Palatka FLORIDA

CITY COMMISSION AGENDA ITEM

SUBJECT:
WORKSHOP - Proposed Waste Water Treatment Plan Improvements

SUMMARY:
On February 13, 2014 the Palatka City Commission adopted Resolution No. 2014-10-39 to enter into a Scope and Service Agreement with Ayres Associates for the completion of a cost analysis of the WWTP Biosolids (sludge) Management System.

The City's biosolids management system equipment is 30 years old and is showing signs of age and deterioration. With FDEP implementing new rules on the treatment of biosolids, Palatka will not be able to meet those rules with the current system. The cost of maintaining an outdated system is not justified.

Ayers explored three options:
1. Evaluate the existing Sludge Treatment Process (biosolids system) for repair or replacement;
2. Convert the system from anaerobic to aerobic sludge digestion;
3. Convert the system to a *BCR Environmental* Treatment/Processing System, which is a Proprietary treatment system

For discussion, attached are:
1. The results of the Ayres Associates study;
2. BCR Environmental's "Solution offering"
3. A proposed Letter of Intent to enter into negotiations with BCR Environmental to house and co-operate an Organic Waste/Biosolids Management Solution System facility at the Waste Water Treatment Plant (see 9/25/14 City Commission Agenda item No. 5)
4. E-mail correspondent between Michael Czymbor and Aaron Zahn, President & CEO of BCR Environmental, concerning construction of the proposed facility

RECOMMENDED ACTION:
No action -- workshop discussion only

TECHNICAL MEMORANDUM

CITY OF PALATKA, FLORIDA
WASTEWATER TREATMENT FACILITY
SLUDGE TREATMENT SYSTEM – ALTERNATIVES COST ANALYSIS

AYRES ASSOCIATES INC
September 19, 2014

This Technical Memorandum is provided to document and support respective preliminary opinion of estimated probable costs to facilitate considered future improvement alternatives for the City of Palatka (City) Wastewater Treatment Facilities Sludge Processing/Treatment System(s). Per previous discussion and agreement alternatives considered include: (A) retrofit requirements to maintain the existing Anaerobic Treatment System, (B) conversion to an Aerobic Treatment System, and (C) conversion to a proprietary Chemical Treatment System provided by BCR Environmental (BCR). Retrofit of the existing Sludge Dewatering System is also included. The facilities are located at 3010 Browns Landing Road and are known as the Platt Drew Wastewater Treatment Plant (WWTP).

This Technical Memorandum is preliminary in overall context and intent, and subject to revision and/or update depending upon actual facilities that may be considered for respective improvements that may be undertaken and moved forward to formal planning and engineering phases of implementation.

EXISTING FACILITIES

The existing City WWTP facilities were originally constructed and placed into operation during October 1985. This encompassed a 3.0 MGD Secondary Wastewater Treatment facility that included the following main facilities:

- Screening and Grit Removal
- Primary Clarifier
- Aeration Basins
- Secondary Clarifiers
- Chlorine Contact Chamber
- Gravity Sludge Thickener
- Pump/Maintenance/Main Control Building
- Anaerobic Digesters/Control Building
- Sludge Dewatering/Control Building
- Chlorination Storage/Distribution
- Sludge Drying Beds
- Office/Laboratory Building

Since the original facilities above were constructed and placed into operation, modifications to the facilities have included the following:

- Existing Mechanical Bar Screen/Grit Removal equipment replacement;
- Existing Chlorination/De-chlorination equipment improvement/replacement;
- New Reclaim Water Treatment/Tertiary Filtration and Transfer Pump system and conveyance to the City Golf Course and other end users;
- Re-rating of WWTP facilities to current permitted capacity of 3.5 MGD;
- Existing Primary Clarifier drive mechanism replacement;
- Retrofit/replacement of existing mechanical aeration system to more energy efficient diffused aeration system, including new blower and controls building;
- Reclaim Water Tertiary Filtration system expansion including Filtration and Transfer Pump improvements; and
- New Chlorine Contact Chamber.

The existing Anaerobic Sludge Treatment and Dewatering Systems have been in operation for approximately 29 years without any significant replacement of its key process equipment components. The original planning period for the existing WWTP facilities was 20-years. The photos provided in **Appendix A** illustrate the deteriorated mechanical condition of the Anaerobic Sludge Treatment and Dewatering Systems.

The existing Sludge Processing/Treatment and Dewatering Systems consist of (1) Primary Clarifier sludge removal, (2) Secondary Clarifier sludge removal, (3) Gravity Sludge Thickener sludge thickening, (4) Anaerobic Digester sludge treatment, and (5) Mechanical/Gravity digested sludge dewatering. Specifics of the existing sludge handling system(s) are described following.

Primary Clarifier

Primary clarification is provided to reduce the volume of heavier organics and thus decrease the downstream 5-day carbonaceous biochemical demand ($CBOD_5$) and total suspended solids (TSS) load to the wastewater aeration system. The WWTP includes one (1) Primary Clarifier with a diameter of 60-feet and side water depth of 12-feet. Capability to bypass the Primary Clarifier is provided to accommodate any equipment failure or scheduled maintenance.

Secondary Clarifier

Secondary clarification is provided as a quiescent zone for settling of the mixed liquor suspended solids (MLSS) received from the wastewater aeration system. The settled solids are returned to the aeration system to maintain the balance of solids within the treatment system (RAS). Portions of the RAS solids are periodically wasted (WAS) to the Gravity Sludge Thickener and/or the Anaerobic Digester(s) to maintain a consistent RAS MLSS concentration. The WWTP includes two (2) rectangular clarifier units; each 139-feet in length, 28-feet in width, and side water depth of 12-feet.

Gravity Sludge Thickener

Primary/Secondary sludge concentration is accomplished by conveyance to the Gravity Sludge Thickener, which subsequently reduces the hydraulic volume of sludge that is delivered to the Anaerobic Digester(s). The WWTP includes one (1) Gravity Sludge Thickener with a diameter of 35-feet and side water depth of 12-feet.

Anaerobic Sludge Treatment System

WAS is received by the Anaerobic Digester system from the Primary Clarifier, Secondary Clarifier, or combination thereof. The system is a two (2) stage primary/secondary dual-tank process with floating covers configured with gas holder storage for each. Each digester tank is 50-feet in diameter with a side water depth of 25-feet. In Stage 1 (primary digester) the sludge is stabilized to reduce pathogens, eliminate offensive odors, and inhibit the potential for putrification of the sludge material produced during the treatment process. Sludge from Stage 1 is transferred to Stage 2 (secondary digester) for digested sludge storage and gas collection. The gas collected in the secondary digester is utilized by the gas recirculation system or is wasted by the waste gas handling system. Both digesters are similar in mechanical/gas equipment and piping general arrangement configuration, and thus operation capability to facilitate either/or to perform as the primary or secondary unit is provided. Sludge is withdrawn from the secondary digester and flows by gravity to the sludge holding tank located at the Sludge Dewatering Building.

Sludge Dewatering System

The anaerobically digested sludge is pumped from the Sludge Dewatering Building sludge holding tank to the Belt-filter Press. A polymer feed system is utilized to condition the sludge prior to dewatering. The Belt-filter Press consists of three dewatering zones, which includes a gravity drainage section, a mild pressure wedge, and an increasing pressure zone. The sludge is dewatered to approximately 14-18 percent solids and is discharged onto a belt conveyor for transfer into receiving transport roll-off dumpster containers. The dewatered sludge material is hauled by a 3rd party transporter (Waste Pro) to the Putnam County Landfill for final disposal. The filtrate and wash water for the Belt-filter Press operation is transferred back to the WWTP for processing/treatment. As back-up, gravity Sludge Drying Beds are provided to handle Belt-filter Press down-time or maintenance requirements.

The emphasis of this technical memorandum is to present estimated cost information to consider future sludge treatment/processing alternatives identified herein and described following.

ALTERNATIVE A – ANAEROBIC SLUDGE TREATMENT AND DEWATERING SYSTEM(S)

The anaerobic sludge digestion process involves decomposition of organic and inorganic matter by use of microorganisms in the absence of molecular oxygen. This is the process presently in place for the City WWTP. Major applications of this process are in the stabilization of concentrated sludge product from the treatment of municipal and industrial wastewater. Stabilization is performed to reduce health risks the sludge stream poses by destroying pathogens, reducing odors, and converting the sludge to manageable and disposable product. Anaerobic digestion is able to provide solids volume reduction capability and energy conservation by off-gas production recovery and use. Typical advantages/disadvantages include:

Advantages and Disadvantages of Anaerobic Digestion	
Advantages	**Disadvantages**
Less energy/operational costs	Higher capital costs
Less biological sludge produced	May need supplemental natural gas for heating
Methane gas produced – Recoverable energy resource	Less stable after any "toxic shock" occurrence
Mechanical dewatering results better	Susceptible to odors if process upset occurs
Existing process – City WWTP personnel familiar with	Hazards of gas handling/processing

Alternative A will retrofit the existing Anaerobic Sludge Treatment System and includes replacement with applicable new equipment/process technology, piping, miscellaneous appurtenances, and electrical/controls. Discussion with City WWTP staff indicates current sludge processing/treatment includes the following operations.

1. Primary Clarifier settled solids (primary sludge) are conveyed to the Anaerobic Digester(s) for treatment and volume reduction. Option is available to convey primary sludge to the Gravity Sludge Thickener prior to Anaerobic Digester(s), but is not the case at this time.
2. Secondary Clarifier settled solids (activated sludge) is returned to the Aeration Basin(s) (RAS) for additional treatment and/or is wasted (WAS) to the Gravity Sludge Thickener for solids concentration.
3. Gravity Thickener sludge is conveyed to the Anaerobic Digesters for treatment, volume reduction, and additional solids concentration prior to final dewatering operations.
4. Digested sludge is transferred to the Sludge Dewatering Building (Belt-filter Press) or Sludge Drying Beds for final dewatering/solids concentration.
5. Final dewatered sludge solids are captured and transferred for final disposal at the Putnam County Landfill facilities.

Under **Alternative A** it is assumed the overall WWTP wastewater and sludge processing/treatment system(s) flow patterns will remain the same as presently practiced.

Based upon this review, the following primary components related to the existing systems are in need of replacement in order to provide continued reliable and satisfactory sludge treatment and dewatering system(s) performance.

Anaerobic Digester System

The following are the primary components to be replaced/upgraded for the existing Anaerobic Digester System:

1. Replace/provide Anaerobic Digester Heat Exchanger, Covers, Recirculation/Mixer and Transfer/Pumping Systems, Gas and Process Piping, Mechanical and Control Valves, and Miscellaneous Process Appurtenances.
2. Replace/provide the existing Sludge Return Pumps (RAS/WAS) and controls due to age and condition.
3. Replace/provide integrated Electrical and Control System(s) for the above process/equipment components.

This technical memorandum does not include specific planning/design efforts; however, technological and process design advances since the original systems were placed in operation indicate alternative options are available. For the Anaerobic Sludge Treatment System these include, but are not limited, to the following:

- Fixed versus floating digester covers to include steel or concrete materials of construction;
- Membrane gas holder systems to include independent slab or existing tank mounted;
- Alternative mixing systems to include gas mixing, linear motion, mechanical, and draft tube;
- Alternative heat exchanger/boiler systems; and
- Integrated control system for the above equipment components.

Sludge Dewatering System

For the Sludge Dewatering System the following methods are readily available, with typical advantages/disadvantages indicated:

Comparison of Alternative Sludge Dewatering Methods

Dewatering Methods	Advantages	Disadvantages
Centrifuge	Clean appearance, good odor containment, fast startup and shutdown capabilities Produces relatively dry sludge cake Low capital cost-to-capacity ratio High installed capacity to building area ratio	Internals components wear is potentially a high maintenance problem Requires grit removal and possibly sludge grinder in feed stream Skilled maintenance personnel required Moderately high suspended solids content in centrate Higher additive chemical conditioning requirements
Belt-filter Press	Low energy requirements Relatively low capital and operating costs, including additive chemical conditioning requirements Less complex mechanically and is easier to maintain High-pressure machines are capable of producing high dry sludge cake Minimal effort required for system shutdown Existing process – City WWTP personnel familiar with	High odor potential May require sludge grinder in feed system Sensitive to incoming sludge feed characteristics Automatic operation generally not advised

Comparison of Alternative Sludge Dewatering Methods (Cont.)		
Dewatering Methods	**Dewatering Methods**	**Dewatering Methods**
Recessed-plate Filter Press	Highest cake solids concentration Low suspended solids in filtrate	Batch operation required High equipment costs High labor costs Special support structure requirements Large floor area required for equipment Skilled maintenance personnel required Additional solids due to large chemical addition require disposal
Sludge Drying Beds	Lowest capital cost method where land is readily available Small amount of operator attention and skill required Low energy consumption Low to no chemical consumption Less sensitive to sludge variability Higher solids content than mechanical methods	Requires large area of land Requires stabilized sludge Design requires consideration of climatic effects Sludge removal is labor intensive
Sludge Lagoons	Low energy consumption No chemical consumption Low capital cost where land is available Least amount of skill required for operation	Potential for odor and vector problems Potential for groundwater pollution More land-intensive than mechanical methods Appearance may be unsightly Design requires consideration of climatic effects

In consideration of the above and consultation with City WWTP staff, the City is satisfied with its current mechanical Sludge Dewatering System (Belt-filter Press). This is based on previous demonstrated performance and longevity of the Belt-filter Press over the past 29 years of operation. As such, consideration of alternative methods is not presented herein. Due to noted deterioration and typical service life being exceeded, it is recommended the existing system be replaced/upgraded in-kind with similar equipment components to include:

1. Belt-filter Press;
2. Polymer Storage/Feed System;
3. Dewatered Sludge Transfer Conveyor System; and
4. Integrated Electrical and Control System(s) for the above process/equipment components.

The above recommended Sludge Dewatering System equipment components will be typical for the respective Sludge Treatment System alternatives presented herein.

Anaerobic Digester System – Estimated Costs

Budget pricing quotes for the referenced equipment components were solicited and received from multiple process equipment vendors in developing the preliminary opinion of estimated probable costs presented herein. Construction/installation pricing was developed in consultation with an experienced wastewater treatment construction contractor. Annual O&M cost estimates were derived by evaluating the estimated electrical power requirements per proposed equipment horsepower rating, the City's current Utility Fund (Operating Expenses) budget data, and discussion with WWTP operations staff.

Based on the foregoing, the following preliminary opinion of capital and O&M estimated probable costs are presented for the Anaerobic Digester System. The higher overall comparative total capital cost estimate is used as detailed in **Appendix B**.

Anaerobic Digester System – Capital Costs:	$2,857,500
Anaerobic Digester System – Annual O&M Costs:	$78,500

To provide an economic analysis of the considered alternatives a simple present worth (PW) calculation is provided. The preliminary estimated PW for the above capital and annual O&M costs is presented using the following assumptions:

Planning Period (n):	20-years
Planning Period Interest Rate (i):	5%
Equipment/System Salvage Value (s):	$0
Interim Component Major Replacement:	None

The PW is calculated based on the following capital and annual O&M costs relationship:

$$\textbf{PW = Capital Cost + [(Annual O\&M Cost) x (}P/A, i\%, n\textbf{)]}$$

(P/A, $i\%$, n) is the factor applied for a uniform series event whereby the annual O&M costs are assumed to be constant over a specific a period (n) at an interest rate (i), which then determines a PW value for that period.

For this PW calculation the (P/A, $i\%$, n) factor $= \frac{(1+i)^n - 1}{i(1+i)^n} = \frac{(1 + 0.05)^{20} - 1}{.05(1 + .05)^{20}} = 12.46$

In comparing the considered alternatives presented herein, this calculation will be provided for each alternative. The lowest alternative PW cost is the resultant economically preferred alternative.

For **Alternative A**, the preliminary estimated PW value for the Anaerobic Digester System is: $3,835,610.

Sludge Dewatering System – Estimated Costs

Budget pricing quotes for the referenced equipment components were solicited and received from multiple process equipment vendors in developing the preliminary opinion of estimated probable costs presented herein. Construction/installation pricing was developed in consultation with an experienced wastewater treatment construction contractor. Annual O&M cost estimates were derived by evaluating the estimated electrical power requirements per proposed equipment horsepower rating, the City's current Utility Fund (Operating Expenses) budget data, and discussion with WWTP operations staff.

Based on the foregoing, the following preliminary opinion of estimated probable costs are presented for the Sludge Dewatering System. Note, the higher overall comparative total capital cost estimate is used as detailed in **Appendix B**.

Sludge Dewatering System – Capital Costs:	$727,500
Sludge Dewatering System – Annual O&M Costs:	$74,500

For the considered alternatives presented herein, the preliminary estimated PW for the Sludge Dewatering System is: $1,655,770. The calculation method is the same as shown previously for the Anaerobic Sludge Treatment System.

Anaerobic Sludge Treatment and Dewatering System(s) Costs

For **Alternative A**, the overall sludge processing/treatment and dewatering preliminary opinion of estimated probable costs and present worth value is summarized as follows:

Alternative A
Anaerobic Sludge Treatment and Dewatering System(s)
Estimated Costs Summary

System Description	Capital Costs	Annual O&M Costs	Present Worth
Anaerobic Sludge Treatment System	$2,857,500	$78,500	$3,835,610
Sludge Dewatering System	$727,500	$74,500	$1,655,770
Anaerobic Sludge Treatment and Dewatering – Total	**$3,585,000**	**$153,000**	**$5,491,380**

ALTERNATIVE B – AEROBIC SLUDGE TREATMENT AND DEWATERING SYSTEM(S)

Alternative B will replace and convert the existing anaerobic sludge treatment process technology to aerobic sludge treatment process technology. This conversion was previously considered by the City in 2009 but did not proceed to any formal budgetary determination or actions to implement.

Aerobic digestion is typically used to treat (1) waste activated sludge, (2) mixtures of waste activated sludge or trickling filter sludge and primary sludge, or (3) waste sludge from extended aeration process. Aerobic digestion is used cost-effectively for WWTP facilities less than 5 MGD design capacity. Aerobic digestion uses oxygen/mixing methodology for pathogen destruction and stabilization. Typical advantages/disadvantages include:

Advantages and Disadvantages of Aerobic Digestion	
Advantages	**Disadvantages**
Less capital costs	Higher energy/operation costs
Easy to control process, easy start-up	No recoverable energy potential
Better quality return effluent - Low ammonia and $CBOD_5$	Not typically used for primary sludge due to high O_2 demand
Less odor potential	Temperature variability impacts operating performance
Standard process used throughout Florida	Stabilized sludge may be more difficult to dewater

This alternative will require dismantling and removal of the current anaerobic system equipment components and replacement with new aerobic system equipment. It is assumed capability to perform same within the existing anaerobic tank(s) system is available. Alternative aerobic treatment system options considered include the following:

- Surface Bridge and Float Mount Mechanical Mixer/Aeration system(s), and
- Mechanical Blower and Coarse Bubble Diffused Air system.

Under this **Alternative B** it is assumed the overall WWTP wastewater and sludge processing/treatment systems flow pattern will remain the same as for **Alternative A**, which will include utilizing the Primary Clarifier unit for solids and $CBOD_5$ capture/reduction prior to conveyance of the wastewater stream to the aeration process. However, flexibility to optimize/modify the wastewater aeration and aerobic sludge treatment system performance is available via by-pass of the Primary Clarifier unit by diverting flow from the influent Mechanical Bar Screen/Grit Removal unit directly into the Aeration Basin units. This can be accomplished through the existing Primary Clarifier by-pass channel and system of slide gates. This flow pattern is typical for wastewater treatment facilities that utilize aerobic sludge treatment and do not have a primary clarification unit. It is noted that should by-pass of the Primary Clarifier unit be implemented this will likely result in higher energy costs for additional aeration/mixing requirements due to increase of solids/$CBOD_5$ loading to the Aeration Basins.

In addition to the specific aerobic system process components, other facilities/improvements will be required to provide utilization of the existing 2-digster tanks for sludge process/treatment and conveyance to the existing Sludge Dewatering Building. These include, but are not limited to:

1. New Blower Building;
2. Transfer/Pumping Equipment;
3. Replacement of existing Sludge Return Pumps (RAS/WAS) and Controls;

4. Process Piping Modifications; and
5. Related Miscellaneous Equipment, and Controls.

Similar to **Alternative A**, it is assumed specific requirements related to the above will need to be determined during the subsequent planning/design phase.

Aerobic Digester System – Estimated Costs

Budget pricing quotes for the above referenced equipment components were solicited and received from multiple process equipment vendors in developing the preliminary opinion of estimated probable costs presented herein. Construction/installation pricing was developed in consultation with an experienced wastewater treatment construction contractor. Annual O&M cost estimates were derived by evaluating the estimated electrical power requirements per proposed equipment horsepower rating, the City's current Utility Fund (Operating Expenses) budget data, and discussion with WWTP operations staff.

Based on the foregoing, the following preliminary opinion of capital and O&M estimated probable costs are presented for the Aerobic Digester Sludge Treatment System. The higher overall comparative total capital cost estimate is used as detailed in **Appendix B**.

Aerobic Digester System – Capital Costs: $2,280,000
Aerobic Digester System – Annual O&M Costs: $138,500

For **Alternative B**, the preliminary PW value for the Aerobic Digester System is: $4,005,710. The calculation method is the same as shown previously for **Alternative A**.

Sludge Dewatering System – Estimated Costs

The Sludge Dewatering System estimated capital, operation and maintenance, and present worth value costs for **Alternative B** are as detailed and presented for **Alternative A**, summarized as follows:

Sludge Dewatering System – Capital Costs: $727,500
Sludge Dewatering System – Annual O&M Costs: $74,500
Sludge Dewatering System – Present Worth: $1,655,770

Aerobic Sludge Treatment and Dewatering System(s) Costs

For **Alternative B**, the overall sludge processing/treatment and dewatering preliminary opinion of estimated probable costs and present worth value is summarized as follows:

Alternative B
Aerobic Sludge Treatment and Dewatering System(s)
Estimated Costs Summary

System Description	Capital Costs	Annual O&M Costs	Present Worth
Aerobic Sludge Treatment System	$2,280,000	$138,500	$4,005,710
Sludge Dewatering System	$727,500	$74,500	$1,655,770
Aerobic Sludge Treatment and Dewatering – Total	**$3,007,500**	**$213,000**	**$5,661,480**

ALTERNATIVE C – PROPRIETARY CHEMICAL SLUDGE TREATMENT SYSTEM

Alternative C will replace the existing anaerobic sludge treatment process methodology with proprietary chemical sludge treatment technology. BCR Environmental (BCR) previously approached the City proposing its system to replace the current sludge processing/treatment system and is being considered in this evaluation of alternatives. The BCR sludge treatment systems are known as CleanB™, CleanB-AC™, and Neutralizer®. The BCR CleanB™ System is reported to produce Class B quality end-product biosolids. The other two BCR systems produce Class A/EQ quality end-product biosolids. Only the BCR CleanB™ System is evaluated in this technical memorandum. Typical advantages/disadvantages include:

Advantages and Disadvantages of BCR CleanB™ System	
Advantages	**Disadvantages**
Less capital costs	Proprietary / sole source process
Small footprint/space requirement	May reduce WWTP operation/performance flexibility by eliminating existing treatment unit processes
Less mechanical process components	Increased loading conditions to aeration system
Faster stabilization process	No recoverable energy
Potentially less overall operation costs	On-site chemical storage/handling
Eliminates need for typical sludge digestion process	No biological solids volume reduction
Less odor potential	Lower sludge feed concentration to dewatering – Concern for achieved final % solids results
	Not familiar to City WWTP personnel

The BCR CleanB™ Sludge System is reported to treat municipal wastewater sludge that achieves compliance with Class B regulatory requirements for beneficial reuse in accordance with 40 CFR Part 503. The CleanB™ System facilitates sludge treatment by use of two chemicals: sulfuric acid (50%) and sodium Chlorite (15%), which are combined in BCR's patented generating system to produce chlorine dioxide on-site. The chlorine dioxide is injected into the sludge stream for disinfection and deodorization. For comparison purposes the end product results of the CleanB™ process (Class B stabilized sludge material) is at least equivalent to that produced by the previous described anaerobic and aerobic systems methodologies.

The BCR CleanB-AC™ System includes a supplemental second stage to enhance the results of its CleanB™ System by use of an accelerated aerated static pile composting method, producing a stabilized Class A/EQ product. The process provides a recycle composted material product with potential marketable value to various end-users; and eliminates need for hauling to and disposal at the Putnam County Landfill, as presently practiced. Conversely, the end-product would require alternative reuse disposal options to be determined and implemented.

The BCR Neutralizer® System is a two-stage chemical treatment system. Untreated sludge material (WAS) is conveyed through the Neutralizer® System where they are treated with a chemical injection system for treatment/stabilization. The processing time is approximately 8-hrs and the final product yields a treated, odor free stabilized Class A/EQ product suitable for use as a commercial fertilizer material; and similar to the BCR CleanB-AC™ System eliminates need for hauling to and disposal at the Putnam County Landfill, as presently practiced. Conversely, the end-product would require alternative reuse disposal options to be determined and implemented.

As indicated, only the BCR CleanB™ System is included for alternatives comparison under this technical memorandum. Discussions with BCR indicate their other proprietary systems may not be cost-effective for the City at this time. This is based upon present wastewater flow conditions and additional capital and operation/maintenance costs that would be incurred.

In accordance with specified sludge delivery conditions required by BCR to receive/process the City's WWTP waste sludge material for treatment through its CleanB™ System, the following are noted considerations to accommodate same. There is opportunity to modify these considerations during the planning/design phase, which in turn may effect a reduction in the overall estimated costs presented herein to implement this alternative.

1. BCR indicates preference to receive WAS only to its CleanB™ System to achieve optimal performance. This requires the Primary Clarifier unit be by-passed from the Mechanical Bar Screen/Grit Removal unit to the Aeration Basin units, and thus no longer be used for its intended purpose of solids/$CBOD_5$ capture and reduction. Understanding is the BCR CleanB™ System basis of preferred design conditions is to accept WAS material; not primary sludge containing higher solids/$CBOD_5$ concentrations as well as incidental inert sand and/or grit material that can interfere with the BCR chemical treatment process. Typically, primary clarification will remove approximately 50-75% suspended solids and 25-40% $CBOD_5$. Thus, it is anticipated by-passing the Primary Clarifier will increase solids and $CBOD_5$ loading to the Aeration Basin and Secondary Clarifier units, resulting in increased energy costs to provide adequate mixing and dissolved oxygen demand requirements.
2. WAS from the Secondary Clarifier units is currently conveyed to the Gravity Sludge Thickener unit by the existing Sludge Return Pumps (RAS/WAS) located in the Pump, Maintenance and Main Control Building. Thickened WAS is then sent to the Anaerobic Digester System where it is mixed with Primary Clarifier sludge for volatile suspended solids (VSS) volume reduction and stabilization. Information from City WWTP staff indicates solids concentration of 2-3% is being achieved through the existing Anaerobic Digester System prior to dewatering by the existing Belt-filter Press unit; and is without certain equipment components operating as initially designed and constructed due to wear and deterioration. In considering the previous presented sludge treatment system alternatives, an efficiently operated anaerobic sludge treatment system can result in 3-5% solids and aerobic sludge treatment system can achieve 1-2% solids.
3. For the BCR chemical treatment technology WAS influent solids concentration not to exceed 2% will be required for the CleanB™ System. WAS sludge typically ranges from 0.5% to 1% solids. WAS to the Gravity Sludge Thickener, as currently practiced, will be by-passed and not required as recommended by BCR for the CleanB™ system.
4. As previously described, the existing processing/treatment of stabilized sludge solids via anaerobic digestion is conveyed to the Sludge Holding Tank at the Sludge Dewatering Building, and then transferred to the Belt-filter Press unit for final solids dewatering. If the current system is replaced under this alternative whereby WAS is processed directly to the BCR CleanB™ System, the existing Belt-filter Press Feed Pumps will not be required. As such, the existing WAS pumping/piping components will require modification for conveyance directly to the BCR CleanB™ System, and should include, but not be limited to, the following considerations:
   A. The sludge feed source to the BCR CleanB™ System is important as related to impacts upon existing WWTP process and pumping/piping/control systems. For the City WWTP facility and discussion with BCR, it is assumed the CleanB™ System will receive influent waste sludge from the existing Sludge Return Pumps (WAS), as previously described. Replacement of these units with new pumps/controls is recommended due to their age and mechanical

condition. A new piping system will be required to connect these pumps to the BCR CleanB™ System. It is recommended this be further evaluated during the planning/design phase to assure process flow requirements will be achieved for the BCR CleanB™ System influent feed (flow volume and pressure) and simultaneously maintain flexible WAS/RAS transfer and continuous operation conditions for existing other WWTP processes/units.

B. The proposed BCR CleanB™ System for the City is indicated to provide capacity to accept WAS up to 270 GPM at <2% solids. The existing Sludge Return Pumps are horizontal centrifugal variable speed units rated at 1,700 GPM and, according to WWTP staff, currently run continuously in the 600-700 GPM range. This will exceed the maximum influent flow capacity of the BCR CleanB™ System. Therefore, for direct feed of WAS to the BCR CleanB™ System a new pumping/piping configuration will be required, and may include consideration of alternative flow control methods, separate pumps, or combination thereof.

C. Option may include consideration of continued conveyance of the WAS to the Gravity Sludge Thickener, transfer to the Sludge Holding Tank at the Sludge Dewatering Building, and then feed to the BCR CleanB™ System for solids stabilization and the Belt-filter Press unit for final solids dewatering. The existing Belt-filter Press Feed Pumps have been replaced during the past few years and are horizontal progressive cavity variable speed units rated at 100 GPM. For this option to be implemented, additional determinations needed will include, but not limited to, the following:

   I. Sludge Thickener Pumps currently discharge to the Anaerobic Digesters. Digested Sludge Transfer Pump currently discharges from the Anaerobic Digesters to the Dewatering Building Sludge Holding Tank. Thus, new piping system from Sludge Thickener Pumps to Dewatering Building Sludge Holding Tank and determination of adequate flow/pressure available will be required.

   II. Confirm existing Belt-filter Press Feed Pumps are of adequate flow rate and pressure or need replacement to feed through BCR CleanB™ System and Belt-filter Press unit.

   III. Confirm if mixing/aeration is needed at Dewatering Building Sludge Holding Tank and/or if WAS blending is required to maintain BCR requirement of not to exceed 2% feed solids to CleanB™ System.

   This option will need to be further assessed during the planning/design phase to determine overall viability with respect to CleanB™ System performance, overall WWTP operations, and cost savings that may be effected.

D. To expand on 4.C above, option is available to consider utilizing the Gravity Sludge Thickener and/or the Anaerobic Digester tanks for permanent/temporary WAS holding purposes prior to conveyance to the BCR CleanB™ System to facilitate desired sludge feed rate and quality, processing/treatment interruptions, and/or incurred maintenance requirements. Flexibility to simultaneously maintain continuous RAS loading conditions to the wastewater aeration system operation must be maintained per current practice to provide treatment optimization and flexibility. Mixing/aeration may be required in these holding tanks to prevent sludge quality degradation conditions that may occur over extended periods of time of not being able to process/treat the WAS for any reason. Blending of new WAS flow may be required to maintain the <2% solids feed to the BCR CleanB™ System. This option will need to be further assessed during the planning/design phase to determine overall viability with respect to CleanB™ System performance, WWTP operations, and cost savings that may be effected.

E. In discussion with BCR, option of blending primary sludge and WAS prior to feed to the CleanB™ System may be acceptable up to a 50/50 ratio. This option will need to be further assessed during the planning/design phase to determine overall viability with respect to CleanB™ System performance, WWTP operations, and cost savings that may be effected.

5. The WAS material will pass through the BCR CleanB™ System for treatment/stabilization. The resultant stabilized sludge material from the BCR CleanB™ System will be conditioned with polymer and conveyed to the Belt-filter Press unit for final dewatering.
6. By previous discussion herein, the reduced solids feed concentration to the Belt-filter Press unit from the BCR CleanB™ System in processing WAS only may result in lower % solids achieved as compared to the other sludge treatment alternatives. Further, this may affect polymer type and usage rate for conditioning prior to the Belt-filter Press unit application and/or higher dewatered product disposal hauling costs. To the contrary, BCR predicts higher dewatering efficiency will be realized with the resultant BCR CleanB™ System processed/treated sludge product and polymer dosage may actually be reduced. There is option to consider sludge thickening prior to Belt-filter Press unit feed for final dewatering to improve its efficiency. This has not been considered from an additional cost standpoint as BCR has not recommended same as needed to supplement their system, but it remains an option. Conversely, BCR has indicated there will be significantly lower operation and maintenance costs incurred by the CleanB™ System as compared to the other alternatives. This may in turn off-set the additional process/cost concerns of lower % solids feed to the belt-filter press unit from the BCR CleanB™ System. This option will need to be further assessed during the planning/design phase to determine overall viability with respect to CleanB™ System performance, WWTP operations, and cost savings that may be effected.
7. Due to the age and deteriorated condition of the existing Anaerobic Sludge Treatment System, dismantling and removal of the primary/secondary tank mechanical/electrical/control components is recommended to be included under this alternative, as was for the other alternatives. This would include removal/demolition of the tank covers and internals, removal of all solids material, performing tank structure cleaning/repair, and securing of the tank structures in order to maintain for future other use.
8. If the Primary Clarifier and Gravity Sludge Thickener Units are by-passed and not required for the BCR CleanB™ System, consideration to remove all biological materials, clean, and perform required maintenance repair for future other use is recommended.

In summary, per that described above, to provide modification of the existing sludge processing/treatment system to accommodate the BCR proposed CleanB™ System, the following is assumed as required and is reflected by the estimated costs presented herein, unless otherwise noted:

1. Furnish and install of BCR process equipment and associated support systems to include CleanB™ System components, piping, chemical tanks, enclosures, and controls.
2. Furnish and install support building and site work requirements.
3. Furnish and install connection to WAS, to include new/modified piping, pumps, and controls.
4. Furnish and install connection to existing support systems to include WAS access, reclaim/reuse water, potable water, electrical, and communications.
5. Demolition, cleaning, rehabilitation, and abandonment of existing sludge processing/treatment units and tanks.
6. Other possible options include blending of primary sludge/WAS and/or utilize the existing Gravity Sludge Thickener and Anaerobic Digester tanks to facilitate desired feed configuration, sludge quality, and/or flow rate conditions. As stated, these options are not included in the costs presented herein as further evaluation to consider same will be required in consultation with BCR during the planning/design phase.

BCR CleanB™ System – Estimated Costs

Budget pricing quotes for the above referenced equipment components were solicited and received from BCR and other support/equipment vendors in developing the preliminary opinion of estimated probable costs presented herein. Construction/installation pricing was developed in consultation with an experienced wastewater treatment construction contractor. Annual O&M cost estimates were derived by evaluating the estimated electrical power requirements per proposed equipment horsepower rating, the City's current Utility Fund (Operating Expenses) budget data, and discussion with WWTP operations staff.

Based on the foregoing, the following preliminary opinion of capital and O&M estimated probable costs is presented for the BCR proposed CleanB™ System, including anticipated other required WWTP modifications as presented herein:

BCR CleanB™ System – Capital Costs: $2,430,000
BCR CleanB™ System – Annual O&M Costs: $89,500

For **Alternative C**, the preliminary estimated PW value for the BCR CleanB™ System is: $3,545,170. The calculation method is the same as shown previously for **Alternative A**.

Sludge Dewatering System – Estimated Costs

The Sludge Dewatering System estimated capital, operation and maintenance, and net present value costs for **Alternative C** are as detailed and presented for **Alternative A**, summarized as follows:

Sludge Dewatering System – Capital Costs: $727,500
Sludge Dewatering System – Annual O&M Costs: $74,500
Sludge Dewatering System – Present Worth: $1,655,770

BCR CleanB™ Sludge Treatment and Dewatering System(s) Costs

For **Alternative C**, the overall sludge treatment and dewatering preliminary opinion of estimated probable costs and present worth value is summarized following:

Alternative C
BCR CleanB™ Sludge Treatment and Dewatering System(s)
Estimated Costs Summary

System Description	Capital Costs	Annual O&M Costs	Present Worth
BCR CleanB™ Sludge Treatment System	$2,430,000	$89,500	$3,545,170
Sludge Dewatering System	$727,500	$74,500	$1,655,770
BCR CleanB™ System Treatment and Dewatering – Total	**$3,157,500**	**$164,000**	**$5,200,940**

SUMMARY OF SLUDGE TREATMENT AND DEWATERING SYSTEMS PRELIMINARY ESTIMATED OPINION OF PROBABLE COSTS

Following is the overall comparative summary of Sludge Treatment and Dewatering Systems Preliminary Estimated Opinion of Probable Costs and rank by Present Worth Value for the considered alternatives presented herein:

Sludge Treatment System(s) Preliminary Estimated Opinion of Probable Costs Summary				
Alternative	**Capital Costs**	**Annual O&M Costs**	**Present Worth**	**Rank**
Alternative A Anaerobic System	$2,857,500	$78,500	$3,835,610	2
Alternative B Aerobic System	$2,280,000	$138,500	$4,005,710	3
Alternative C BCR CleanB™ System	$2,430,000	$89,500	$3,545,170	1

Sludge Treatment and Dewatering System(s) Preliminary Estimated Opinion of Probable Costs Summary				
Alternative	**Capital Costs**	**Annual O&M Costs**	**Present Worth**	**Rank**
Alternative A Anaerobic System and Dewatering	$3,585,000	$153,000	$5,491,380	2
Alternative B Aerobic System and Dewatering	$3,007,500	$213,000	$5,661,480	3
Alternative C BCR CleanB™ System and Dewatering	$3,157,500	$164,000	$5,200,940	1

CAPITAL COSTS FUNDING OPTIONS

At this time funding options appear to be limited to the State Revolving Fund (SRF) alternative, which encompasses a low interest loan situation. There may be opportunity to pursue grant funds through other agencies. Overall, the following appear to be the most applicable but will need additional research and evaluation to determine respective opportunities available to the City to pursue.

- Clean Water State Revolving Fund Loan Program (CWSRF) – Loans
- Drinking Water State Revolving Fund Loan Program (DWSRF) – Grants and Loans
- Small Community Wastewater Facilities Grants Program – Grants
- Community Budget Issue Requests (CBIR) – Legislative Grants

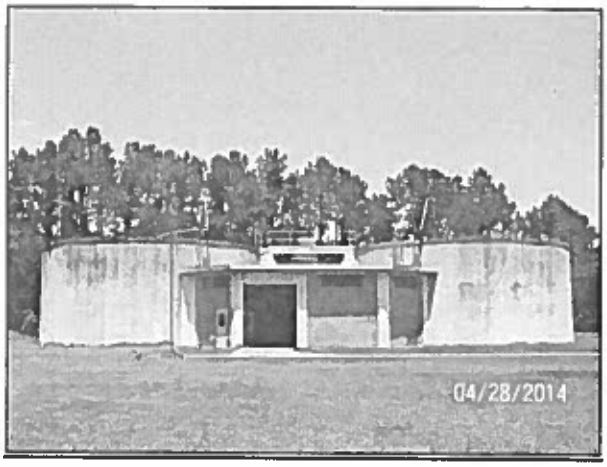
Others may include:

- St. Johns Water Management District (SJRWMD) Cost Sharing
- USDA Rural Development
- Florida State Legislature Special Appropriation Request
- Small Community Grants

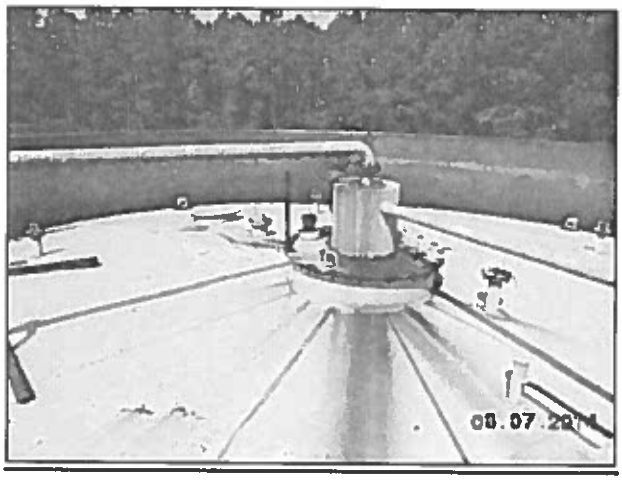
Another source of funding may include the City assessing its ability to increase the current user rate structure to generate matching funds to pursue grants and/or low interest loan alternatives.

APPENDIX A

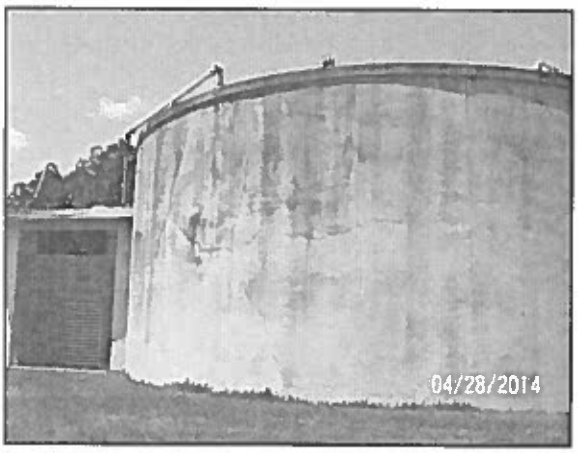
EXISTING SLUDGE PROCESSING / TREATMENT SYSTEM(S) PHOTOS



SLUDGE DIGESTERS / CONTROL BLDG

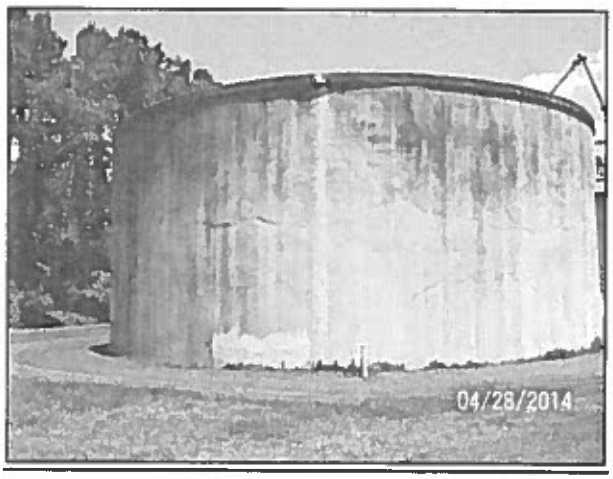


DIGESTER COVER / PIPING

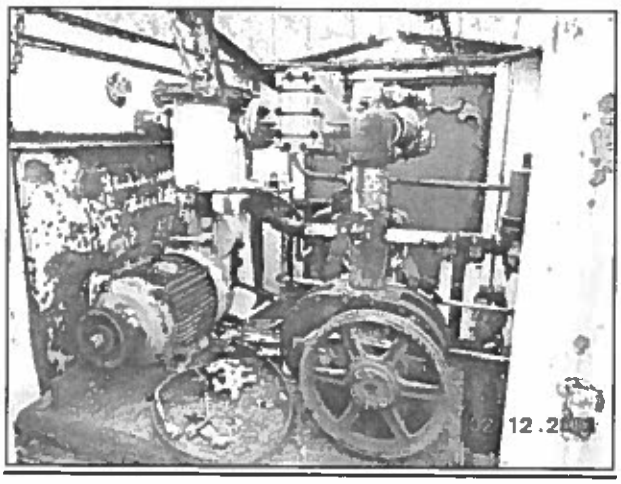


DIGESTER TANK (EAST) EXTERIOR

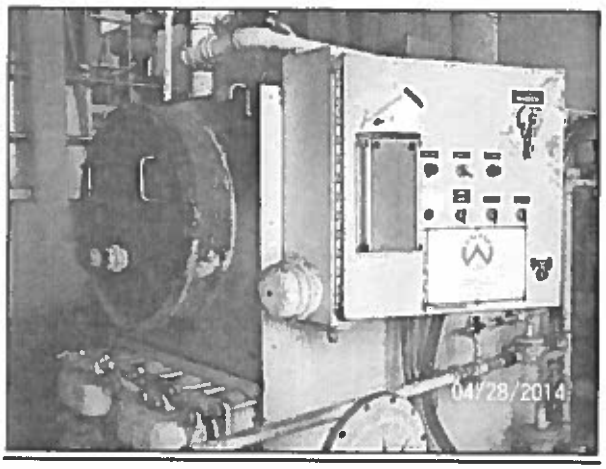
DIGESTER COVER / COMPRESSOR HOUSE



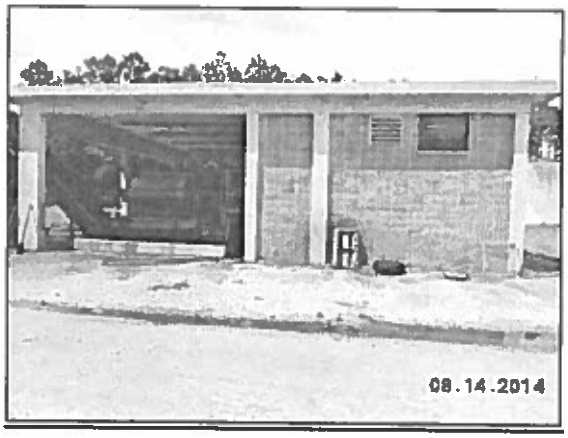
DIGESTER TANK (WEST) EXTERIOR



DIGESTER COMPRESSOR HOUSE (INTERIOR)

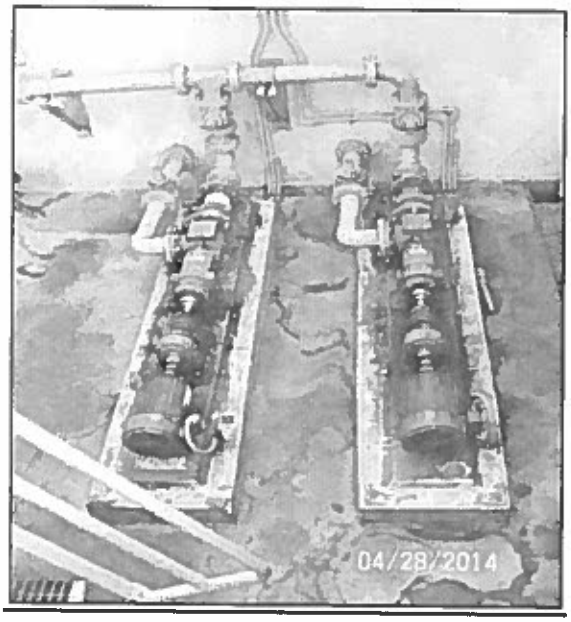


DIGESTER SLUDGE HEATER UNIT

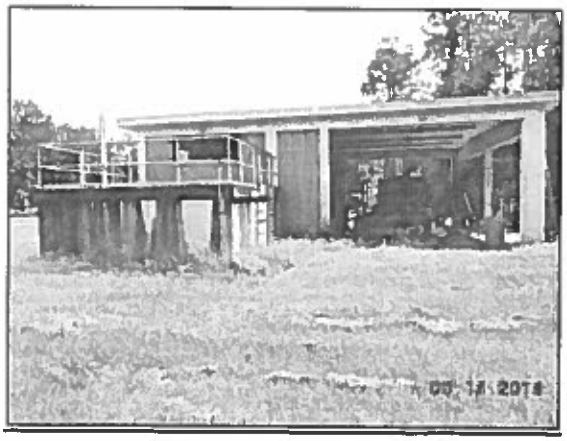


DEWATERING BLDG SOUTH

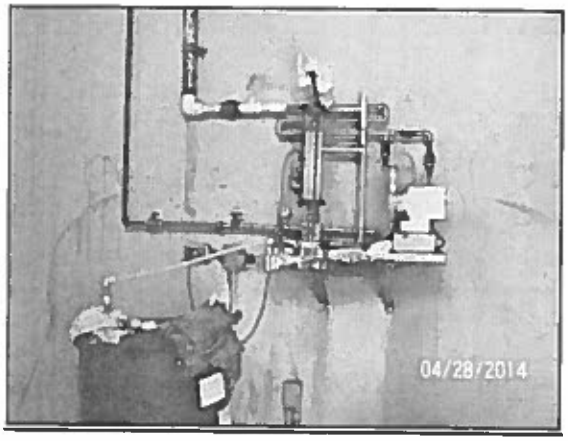
DIGESTER SLUDGE RECIRCULATION PUMP



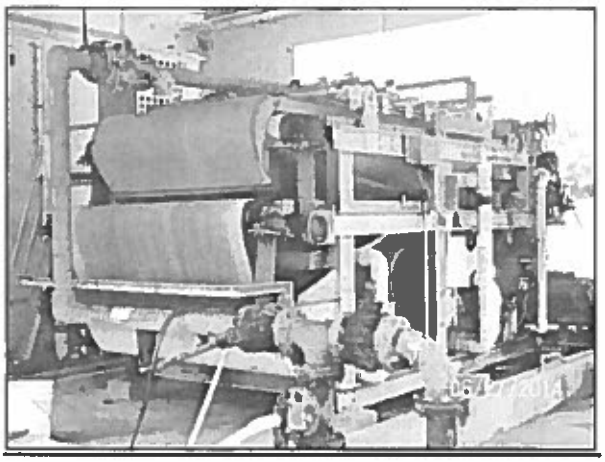
BELT-FILTER PRESS FEED PUMPS



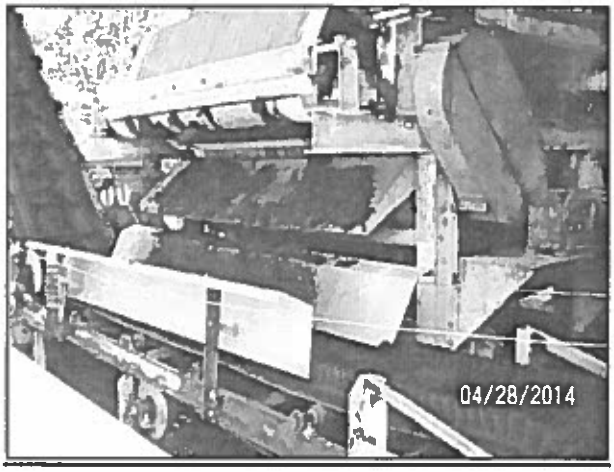
DEWATERING BLDG NORTH



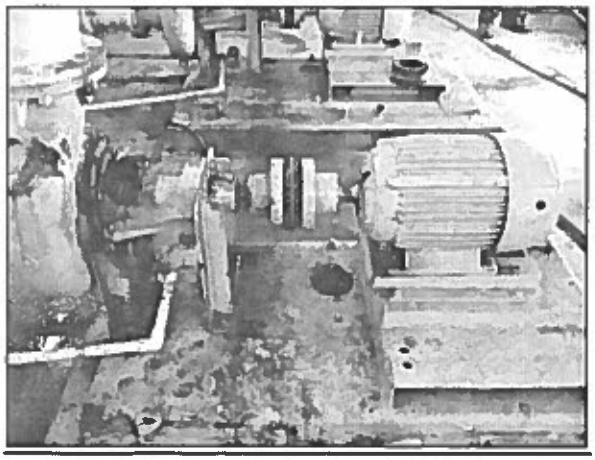
SLUDGE DEWATERING POLYMER FEED SYSTEM



BELT-FILTER PRESS



BELT-FILTER PRESS DEWATERED SLUDGE DISCHARGE TO CONVEYOR



SLUDGE RETURN PUMPS

APPENDIX B

PRELIMINARY OPINION OF PROBABLE COST ESTIMATES

CAPITAL COSTS
OPERATION & MAINTENANCE COSTS

City of Palatka, Florida
Wastewater Treatment Facility
Sludge Treatment Sysytem - Alternatives Cost Analysis
Preliminary Opinion of Estimated Probable Costs - Capital Costs
Alternative A - Anaerobic Treatment System / Alternative B - Aerobic Treatment System
September 19, 2014

TABLE 1
Alternative A - Anaerobic Digester Sludge Treatment System

Item No.	Item Description	Walker Process Equipment	OVIVO
1	Furnish Anaerobic Digester Process Equipment/Controls	$ 500,000	$ 600,000
2	Install Anaerobic Digester Process Equipment & Existing Cover - Removal/Demolition	$ 250,000	$ 250,000
3	Furnish & Install Replacement Sludge Return Pumps (RAS/WAS)	$ 80,000	$ 80,000
4	Existing Sludge/Solids Removal / Clean & Inspect Digester Tank Structures	$ 150,000	$ 150,000
5	Digester Tank Structures Rehab	$ 50,000	$ 50,000
6	Furnish & Install Misc Appurtenances - Removal/Replacement	$ 100,000	$ 100,000
7	Furnish & Install Process/Gas Piping - Removal/Replacement	$ 375,000	$ 375,000
8	Furnish & Install Electrical/Instrumentation - Removal/Replacement	$ 300,000	$ 300,000
9	**Subtotal - Furnish & Install Anaerobic Digester System**	$ 1,805,000	$ 1,905,000
10	Furnish & Install - Contingency (25%)	$ 451,250	$ 476,250
11	**Subtotal - Furnish & Install Anaerobic Digester System + Contingency**	$ 2,256,250	$ 2,381,250
12	Engineering/Construction Administration (20%)	$ 451,250	$ 476,250
13	**Total - Anaerobic Digester System - Capital Costs**	**$ 2,707,500**	**$ 2,857,500**

TABLE 2
Alternative B - Aerobic Digester Sludge Treatment System

Item No.	Item Description	Aeration Industries	Universal Blower / Alfa Laval
1	Furnish Aerobic Digester Process Equipment/Controls	$ 300,000	$ 395,000
2	Aeration System Blower Building	N/A	$ 85,000
3	Install Aerobic Digester Process System/Equipment & Existing Cover Removal/Demolition	$ 200,000	$ 200,000
4	Furnish & Install Replacement Sludge Return Pumps (RAS/WAS)	$ 80,000	$ 80,000
5	Existing Sludge/Solids Removal / Clean & Inspect Digester Tank Structures	$ 150,000	$ 150,000
6	Digester Tank Structures Rehab & Floor Mods for Diffuser System	$ 50,000	$ 60,000
7	Furnish & Install Misc Appurtenances Removal/Replacement	$ 75,000	$ 75,000
8	Furnish & Install New Process Piping & Remove Existing Process/Gas Piping	$ 225,000	$ 225,000
9	Furnish & Install Electrical/Instrumentation - Removal/Replacement	$ 250,000	$ 250,000
10	**Subtotal - Furnish & Install Aerobic Digester System**	$ 1,330,000	$ 1,520,000
11	Furnish & Install - Contingency (25%)	$ 332,500	$ 380,000
12	**Subtotal - Furnish & Install Aerobic Digester System + Contingency**	$ 1,662,500	$ 1,900,000
13	Engineering/Construction Administration (20%)	$ 332,500	$ 380,000
14	**Total - Aerobic Digester System - Capital Costs**	**$ 1,995,000**	**$ 2,280,000**

City of Palatka, Florida
Wastewater Treatment Facility
Sludge Treatment Sysytem - Alternatives Cost Analysis
Preliminary Opinion of Estimated Probable Costs - Capital Costs
Alternative C - BCR CleanB Chemical Sludge Treatment System
September 19, 2014

TABLE 3
Alternative C - BCR CleanB Chemical Sludge Treatment System

Item No.	Item Description	BCR System Only	BCR System + Exist Rehab
1	Furnish & Install CleanB System including Chemical Tanks, Electrical, & Controls	$ 764,000	$ 764,000
2	Furnish & Install CleanB System Support Systems / Pole Barn	$ 116,000	$ 116,000
3	Furnish & Install Replacement Sludge Return Pumps (RAS/WAS)	$ 80,000	$ 80,000
4	Existing Anaerobic Digester Cover - Removal/Demolition	NA	$ 150,000
5	Existing Anaerobic Equipment/Piping System - Removal/Demolition	NA	$ 60,000
6	Existing Sludge/Solids Removal / Clean & Inspect Digester Tank Structures	NA	$ 150,000
7	Digester Tank Structures Rehab for Future Use	NA	$ 50,000
8	Furnish & Install Misc Site Work / Existing Equipment Upgrade/Mods	$ 100,000	$ 100,000
9	Furnish & Install Misc System Support Appurtenances (Utilities/Electrical/Control/Communications)	$ 150,000	$ 150,000
10	**Subtotal - Furnish & Install BCR CleanB Chemical Sludge Treatment System**	$ 1,210,000	$ 1,620,000
11	Furnish & Install - Contingency (25%)	$ 302,500	$ 405,000
12	**Subtotal - Furnish & Install BCR CleanB Chemical Sludge Treatment System + Contingency**	$ 1,512,500	$ 2,025,000
13	Engineering/Construction Administration (20%)	$ 302,500	$ 405,000
14	**Total - BCR CleanB Chemical System - Capital Costs**	**$ 1,815,000**	**$ 2,430,000**

City of Palatka, Florida
Wastewater Treatment Facility
Sludge Treatment Sysytem - Alternatives Cost Analysis
Preliminary Opinion of Estimated Probable Costs - Capital Costs
Alternative(s) A / B / C - Sludge Dewatering System
September 19, 2014

TABLE 4
Alternative(s) A / B / C - Sludge Dewatering System

Item No.	Item Description	Ashbrook Simon-Hartley	PHOENIX Process Equipment
1	Furnish Sludge Belt Filter Press - Replacement/Controls	$ 280,000	$ 360,000
2	Furnish Dewatered Sludge Conveyor System - Replacement/Controls	$ 60,000	$ 15,000
3	Furnish Polymer Storage/Feed System - Replacement/Controls	$ 30,000	$ 5,000
4	Install Belt Press, Conveyor, Polymer Systems - Removal/Replacement	$ 40,000	$ 40,000
5	Furnish & Install Misc Appurtenances - Removal/Replacement	$ 15,000	$ 15,000
6	Furnish & Install Electrical/Instrumentation - Removal/Replacement	$ 50,000	$ 50,000
7	**Subtotal - Furnish & Install Sludge Dewatering System**	$ 475,000	$ 485,000
8	Furnish & Install - Contingency (25%)	$ 118,750	$ 121,250
9	**Subtotal - Furnish & Install Sludge Dewatering System + Contingency**	$ 593,750	$ 606,250
10	Engineering/Construction Administration (20%)	$ 118,750	$ 121,250
11	**Total - Sludge Dewatering System - Capital Costs**	**$ 712,500**	**$ 727,500**

City of Palatka, Florida
Wastewater Treatment Facility
Sludge Treatment Sysytem - Alternatives Cost Analysis
Preliminary Opinion of Estimated Probable Costs - Annual Operation & Maintenence Costs
Alternative A - Anaerobic Treatment System / Alternative B - Aerobic Treatment System
September 19, 2014

TABLE 5
Alternative A - Anaerobic Digester Sludge Treatment System

Item No.	Item Description	Cost
1	Utilities - Electricity	$ 10,000
2	Utilities - Natural Gas/Other	$ 15,000
3	Personnel/Labor	$ 20,000
4	Building Maintenance	$ 2,000
5	Equipment Maintenance - Routine/Daily	$ 20,000
6	Equipment Maintenance - Annual	$ 10,000
7	Chemicals	$ -
8	Training	$ 500
9	Miscellaneous Other	$ 1,000
10	**Total - Anaerobic Digester System - Annual Operation & Maintenance Costs**	**$ 78,500**

TABLE 6
Alternative B - Aerobic Digester Sludge Treatment System

Item No.	Item Description	Cost
1	Utilities - Electricity	$ 65,000
2	Utilities - Natural Gas/Other	N/A
3	Personnel/Labor	$ 25,000
4	Building Maintenance	$ 2,000
5	Equipment Maintenance - Routine/Daily	$ 25,000
6	Equipment Maintenance - Annual	$ 20,000
7	Chemicals	$ -
8	Training	$ 500
9	Miscellaneous Other	$ 1,000
10	**Total - Aerobic Digester System - Annual Operation & Maintenance Costs**	**$ 138,500**

City of Palatka, Florida
Wastewater Treatment Facility
Sludge Treatment Sysytem - Alternatives Cost Analysis
Preliminary Opinion of Estimated Probable Costs - Annual Operation & Maintenence Costs
Alternative C - BCR CleanB Chemical Sludge Treatment System
September 19, 2014

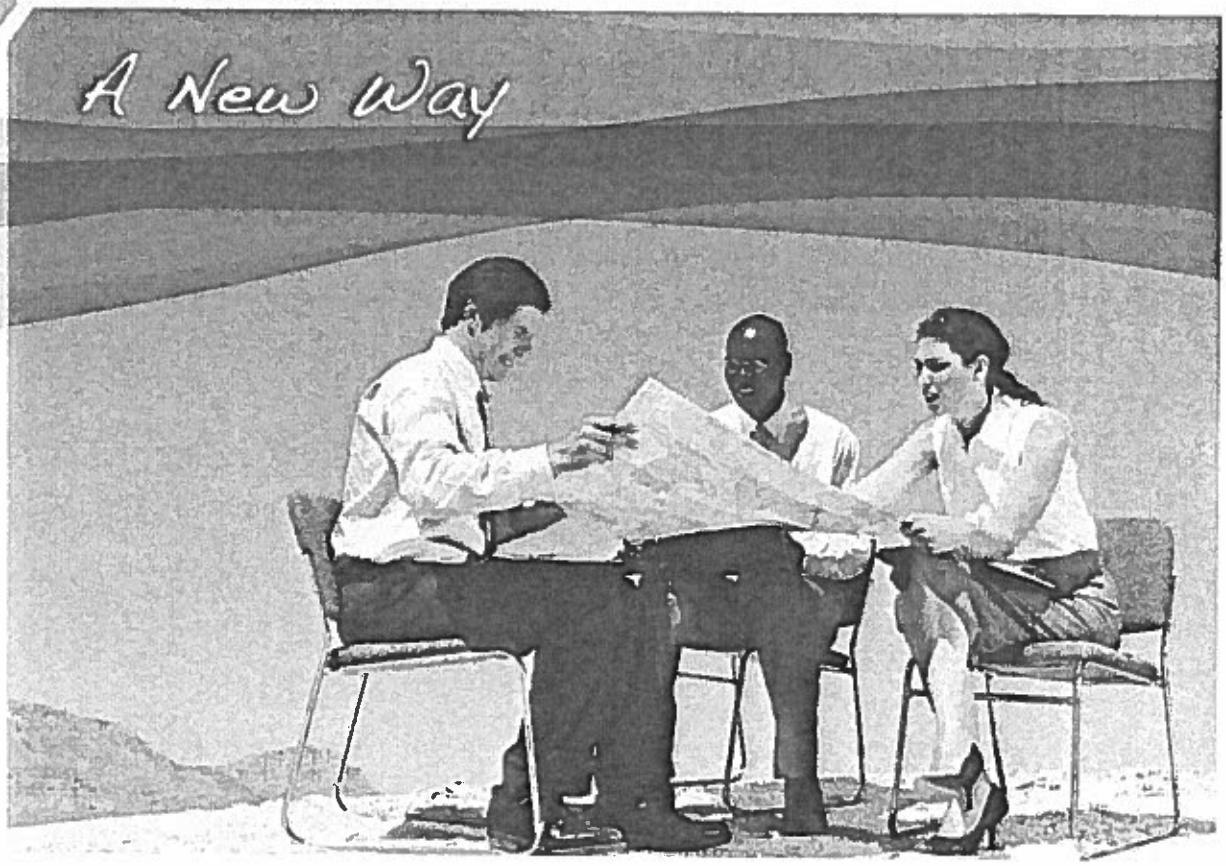
TABLE 7
Alternative C - BCR CleanB Chemical Sludge Treatment System

Item No.	Item Description	Cost
1	Utilities - Electricity	$ 20,000
2	Utilities - Natural Gas/Other	N/A
3	Personnel/Labor	$ 15,000
4	Building Maintenance	$ 2,000
5	Equipment Maintenance - Routine/Daily	$ 15,000
6	Equipment Maintenance - Annual	$ 10,000
7	Chemicals	$ 26,000
8	Training	$ 500
9	Miscellaneous Other	$ 1,000
10	**Total - BCR CleanB Chemical System - Annual Operation & Maintenance Costs**	**$ 89,500**

City of Palatka, Florida
Wastewater Treatment Facility
Sludge Treatment/Processing Sysytem - Alternatives Cost Analysis
Preliminary Opinion of Estimated Probable Costs - Annual Operation & Maintenence Costs
Alternative(s) A / B / C - Sludge Dewatering System
September 19, 2014

TABLE 8
Alternative(s) A / B / C - Sludge Dewatering System

Item No.	Item Description	Cost
1	Utilities - Electricity	$ 3,000
2	Utilities - Natural Gas/Other	N/A
3	Personnel/Labor	$ 25,000
4	Building Maintenance	$ 1,500
5	Equipment Maintenance - Routine/Daily	$ 20,000
6	Equipment Maintenance - Annual	$ 15,000
7	Chemicals	$ 8,500
8	Training	$ 500
9	Miscellaneous Other	$ 1,000
10	**Total - Sludge Dewatering System - Annual Operation & Maintenance Costs**	**$ 74,500**



BCR ENVIRONMENTAL

CITY OF PALATKA

BCR's Solution Offering

August 22, 2014

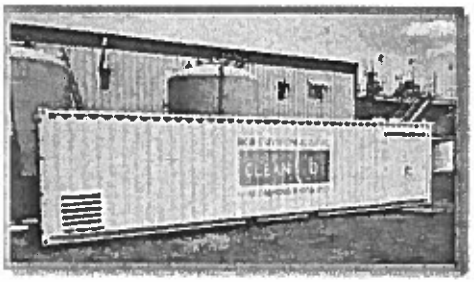
Table of Contents

1.0 Executive Summary

BCR's Understanding of Palatka's Current Biosolids Management Strategy

The City of Palatka currently operates one wastewater treatment plant (WWTP) with a permitted capacity of 3.0 mgd. The average daily flow, based on a three (3) year average is approximately 1.1 mgd. Currently, the City processes the waste activated sludge (WAS) through two anaerobic digesters. The daily average volume of WAS is approximately 35,000 gpd.

The sludge is dewatered on a daily basis using a 1.5 meter belt press which achieves approximately 15% solids. The combined annual dewatered biosolids volume is nearly 1230 wet tons per year. Palatka uses Waste Management to haul and dispose of their biosolids at the Putnam County Landfill. The City values BCR's ability to deliver a long term sludge treatment solution that will reduce capital and operating costs, consistently achieve Class B, reduce the odors associated with sludge, and allow for significant expansion of the City's WWTP, if required.



Economically Superior "Green" Project

BCR Environmental would like to propose an alternative biosolids management solution to the City of Palatka that would ***reduce the cost and risk*** associated with biosolids management by eliminating odors, improving regulatory compliance, reducing energy consumption, and providing a long term, sustainable strategy.

BCR recommends a sludge solution that consists of treating the biosolids with a CleanB™ system at the plant to consistently achieve odor free, Class B sludge on site. Installation of a CleanB™ system at the WWTP allows the City to avoid significant capital expenditures related to anaerobic or aerobic digestion. That capital avoidance also eliminates the need for additional blowers that add significant energy use and operating cost at the WWTP. The BCR solution can therefore deliver immediate operational cost savings to Palatka based on a reduction in energy usage. Furthermore, the CleanB™ system improves the dewaterability of the biosolids, thus reducing hauling and disposition costs by decreasing the volume of residuals.

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Jacksonville FL 32224

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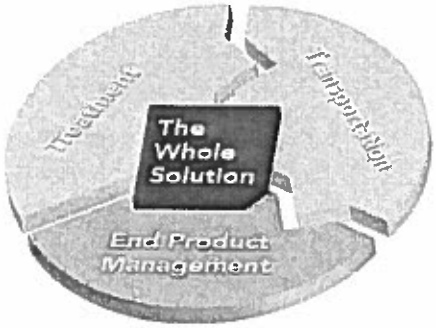
F 904-998-3828

bcrenv.com

BCR will disinfect and deodorize the City's biosolids in approximately 10 minutes of processing time, achieving odor free Class B material on site. As an added benefit, BCR can also offer Palatka the option of collaborating with BCR on the development of an Accelerated Compost facility hub at the WWTP which provides even greater sustainability by converting Palatka's Class B biosolids into a highly desirable and marketable Class AA compost product. It could also potentially provide a revenue stream to the City in the form of host fees and a percentage of the tipping fees paid by other nearby municipalities.

Project Highlights and Key Benefits

BCR's solution achieves the following goals:



- Environmentally beneficial project
- Reduced regulatory risk
- Odor elimination
- Ease of operation
- Decreased energy consumption
- Potential for a long term, sustainable biosolids solution that converts the biosolids to a Class AA premium compost for beneficial reuse.

In addition to reducing the City of Palatka's risks associated with biosolids management, the *BCR solution can also provide a long term operating cost savings to the City.*

Based on discussions with the City staff, it is clear that these financial and environmental benefits are of interest to the City of Palatka. However, the capital funding cycle may create significant delays. In order to assist the City in overcoming this challenge, BCR is proposing a deal structure whereby the **City could avoid a capital investment while still achieving these goals**. This approach is called our Solution Service Package.

Within the Solution Service Package, BCR will provide a fully installed CleanB™ unit under a 10-year service agreement. The City would incur an operational fee that would cover the treatment equipment and operational cost (with the exception of energy and polymer costs, which are minor). BCR will also provide a full parts and labor warranty for the CleanB™ over the course of the 10 year term.

The fees, terms and conditions for BCR's proposed solution are included herein. We look forward to working with the City of Palatka to deliver the future of biosolids management - today! If you have any questions or concerns, please contact Jim Christopher at 904-347-4910 or jchristopher@bcrenv.com.

2.0 BCR Environmental

BCR is a Florida based company focused on integrated solutions for the biosolids treatment industry. BCR's industry-revolutionizing technologies convert biosolids into safe, valuable, and marketable end products. Founded in 2002, BCR has developed more Class A/EQ biosolids facilities in the State of Florida than any other solutions provider. The company and its experienced project team have the expertise and capabilities to provide a state-of-the-art solution resulting in a superior biosolids management program.

BCR provides low capital and operating cost treatment options that reduce or eliminate traditional wastewater treatment infrastructure and operating costs. The proposed CleanB™ system is modular and highly scalable. The City of Palatka will benefit from reduced nuisance odors, reduced infrastructure complexity, a small footprint, and substantially lower energy consumption, in many cases up to 90% less than traditional treatment methods. BCR has obtained regulatory approvals for its technologies, minimizing potential regulatory risks associated with waste stream disposition.

BCR has the expertise and capability to deliver a comprehensive Solution that offers improved economics, greater operational flexibility, improved regulatory compliance, diversification of disposition options, and improved odor control.

Proven Experience

BCR has a *proven* history of delivering successful biosolids management projects and operations capabilities on-time and on-budget. In addition, BCR brings unmatched technical experience to ensure successful execution throughout development and operation.

BCR has an existing install base of nine (9) systems and solutions in the State of Florida with eleven (11) more under construction and development in the Mid-Atlantic and Southeast United States. The systems' operational and economic benefits have been validated by over 28 years of combined operating history with no down time or compliance issues.

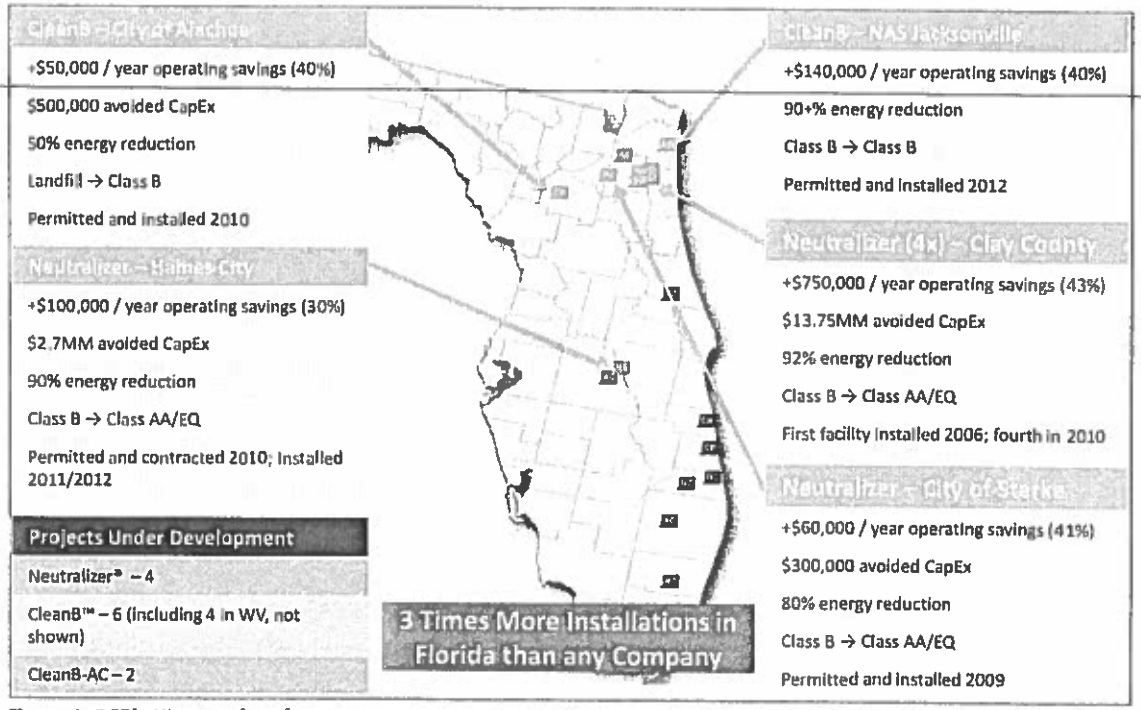


Figure 1. BCR's History of Performance

Safe & Simple Biosolids Treatment

BCR's systems and solutions are specifically designed with safety and reliability in mind. After 28 years of combined operating history, BCR's safety record is exceptional. This safety record is something we are very proud of, and we continue to place safety first in everything we do.

Environmentally Responsible Approach

All of BCR's solutions are simple, efficient, and environmentally responsible. The CleanB™ solution BCR is proposing for the City of Palatka is an environmentally beneficial solution offering several key benefits compared to traditional biosolids management technologies.

CleanB™ requires minimal energy consumption and has delivered substantial energy savings to clients. As a result, a WWTP's energy footprint and greenhouse gas emissions may be dramatically improved by incorporating a CleanB™ system. For example, at the Naval Air Station (NAS) Jacksonville installation, converting to the CleanB™ system has reduced energy consumption from close to one million kilowatt hours (kWh) per year to around 3,000 kWh per year.

In addition, CleanB™ residuals and in particular the premium compost product that could be produced at the City are an environmentally superior option that can reduce or eliminate the need for fossil-derived fertilizers products. The quality compost product can reduce water

consumption and reduce nutrient loading in local watersheds by increasing a soil's ability to retain nutrients and eliminating the need for inorganic, potentially ecologically harmful fertilizers.

3.0 BCR's Proposed Biosolids Management Solution

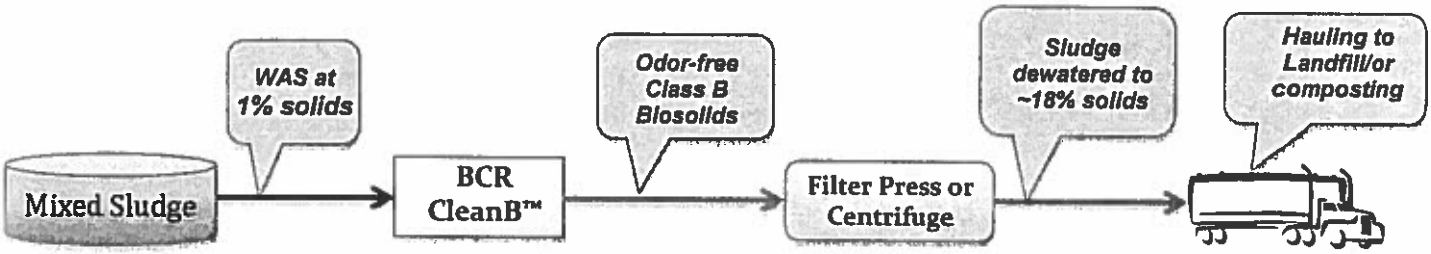


Figure 2: Basic Process Flow Diagram for BCR Biosolids Management Solution at City of Palatka

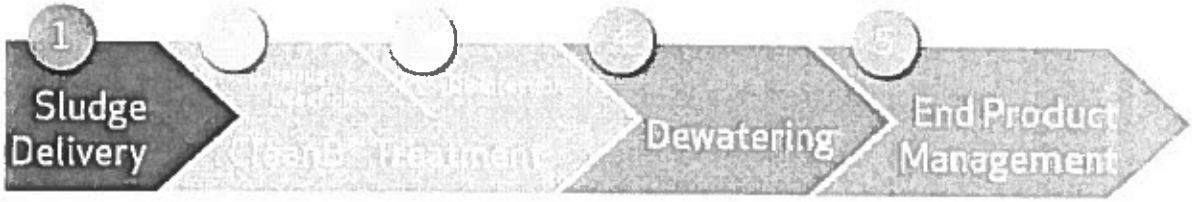
Treatment: The CleanB™ Solution

The CleanB™ system treats biosolids to meet Class B regulatory requirements for beneficial reuse in accordance with 40 Code of Federal Regulations (CFR) Part 503.

CleanB™ treatment uses two chemicals: sulfuric acid (50%) and sodium chlorite (15%), which are combined in BCR's patented Generating System to generate chlorine dioxide onsite. The chlorine dioxide is injected into the sludge stream for disinfection and deodorization.

CleanB™ treatment operations consist of the following five steps, as described below.

Figure 3. CleanB™ Process Flow



Step 1 – Sludge Delivery: The WAS Pump delivers sludge from the clarifier at a maximum of 2% solids into the CleanB™ Process Unit at a monitored and controlled flow rate.

Step 2 – CleanB™ Chemistry Injection: The Chemistry Injection System delivers a flow-controlled dose of chlorine dioxide through BCR's patented Generating System that adjusts to potential variation in the sludge flow rate. BCR's Generating System is an innovative method for maintaining the desired chlorine dioxide concentration. Dosing is handled automatically by the SCADA Process Controls to ensure optimal disinfection and odor elimination.

Step 3 – CleanB™ Disinfection: CleanB™ chemistry mixes with the sludge stream in the Process Contact System, where disinfection occurs and odor-causing compounds are destroyed. The Process Contact System is a custom designed piping system engineered to fit compactly within a small footprint and provide the proper residence time for uniform disinfection. Upon exiting the CleanB™ Process Contact System, treated biosolids are delivered to the dewatering equipment without the need for any additional pumping.

Step 4 – Dewatering: Following CleanB™ Treatment, Class B biosolids are dewatered using standard dewatering technology such as a centrifuge, screw press, or belt press.

Step 5 – End Product Management: As part of our offering, BCR would assume long-term responsibility for the transportation and end product management of all material treated by the City's CleanB™ system. The Class B biosolids would either be taken to the landfill, land applied or used as feedstock for a compost facility at your WWTP.

CleanB™ Benefits

The CleanB™ system treats biosolids to Class B standards and can offer the City a significant cost advantage over conventional methods. CleanB™ is the only viable Class B option that does not rely on digestion or lime stabilization.

The benefits of the CleanB™ system include:

- Low operating costs
- Elimination of odor issues
- Class B biosolids created in 10-12 minutes vs. 30-40 days for digestion
- Enhanced dewatering of biosolids (e.g. up to 20% drier solids) from the existing dewatering device
- Upgradable to Class AA compost

BCR's Proposed Biosolids Accelerated Composting Solution

CleanB-AC™ is a simple, two-stage solution on for producing Class A/EQ (Exceptional Quality) Compost. The CleanB-AC system combines BCR's patented CleanB system with an innovative

Accelerated Composting method to deliver a high-quality compost product in a quarter of the time and using a quarter of the space of traditional composting systems.

The CleanB-AC™ Process

Stage 1: CleanB™

In the first stage of CleanB-AC treatment, BCR's CleanB system conditions and disinfects biosolids onsite at the wastewater treatment plant to meet Class B standards in a matter of minutes and using only a fraction of the energy of typical Class B systems. CleanB eliminates the need for digestion, substantially reducing time and energy requirements for biosolids treatment. Every CleanB system is equipped with control and monitoring devices to simplify operation and ensure consistent biosolids treatment and preparation for Accelerated Composting. CleanB™ biosolids eliminate foul odors.

Stage 2: Accelerated Composting (AC)

In the second stage of CleanB-AC treatment, BCR's Accelerated Composting method treats the disinfected biosolids to produce a cured and stabilized Class A/EQ product in around 30 days through an approved PFRP process. The system achieves significant savings over traditional composting and is ideal for facilities facing odor or space issues.

CleanB-AC uses an innovative Aerated Static Pile (ASP) composting process, known as the Rutgers strategy, to control pile temperature and achieve ideal composting conditions.

- Traditional composting piles typically self-heat to 160°F or greater, which inhibits the composting process.
- BCR's AC method typically achieves temperatures of greater than 131°F within 36 hours.
- BCR's AC method then removes excess heat to prevent temperatures greater than 150°F through on-demand SCADA controlled forced air ventilation.
- **ASP temperature is maintained within an ideal 131-150°F range to achieve disinfection without** inactivating beneficial composting organisms.
- The process is automated and eliminates pile turning, resulting in substantially reduced labor and equipment demands.

CleanB-AC™ Advantages

The CleanB-AC solution provides these key advantages over traditional composting technologies:

- Reduced Cost: CleanB-AC significantly reduces labor and other costs associated with composting.
- Reduced Odors: CleanB treatment prior to composting eliminates odorous compounds by oxidizing sulfides, sulfates, and mercaptans.
- Decreased Processing Time: CleanB conditions the organic waste to improve material handling characteristics prior to composting. The improved treated feedstock, combined with the Accelerated Composting technology, substantially reduces the time to produce a finished product.

- **Decreased Land Requirements:** Accelerating the composting process reduces the amount of land required.
- **Improved Product Quality:** By carefully controlling the composting process, CleanB-AC produces a superior compost product with less odor, higher retained nutrient value, and

4.0 Preliminary Economics for BCR's Solution

At BCR, we hold ourselves to a high standard when it comes to communicating cost information with our Clients and industry partners. We utilize AACE International's Cost Estimate Classification System in order to define the projected capital costs of our solutions and a modified BCR Cost Estimate Classification System for operating costs throughout project development. BCR believes that these systems provide the Client with a more informed understanding of the costs and benefits of a project so that the quality and value of the cost/benefit information is not misinterpreted.

The figures below illustrate the Classification Systems that BCR uses.

At this stage of project development for the City of Palatka and without any pre-established design work, the economic analysis that BCR has provided would be considered a Class 5 estimate. The operating costs are included as a Class 2 estimate based on the information provided by the City's Operations staff as well as assumptions regarding the BCR system operation at the Palatka Wastewater Treatment Plant.

Figure 7. AACE Cost Estimate Classification System

AACE's Cost Estimate Classification System

	Variance by AACE Class		Example	Potential Range Based on Classification	
AACE Class	Downside	Upside	Base Value	Min Value	Max Value
Class 1	(5.0)%	10.0%	$1,000,000	$900,000	$1,050,000
Class 2	(15.0)%	10.0%	$1,000,000	$900,000	$1,150,000
Class 3	(30.0)%	20.0%	$1,000,000	$800,000	$1,300,000
Class 4	(60.0)%	30.0%	$1,000,000	$700,000	$1,600,000
Class 5	(100.0)%	40.0%	$1,000,000	$600,000	$2,000,000

AACE Versus Design Status

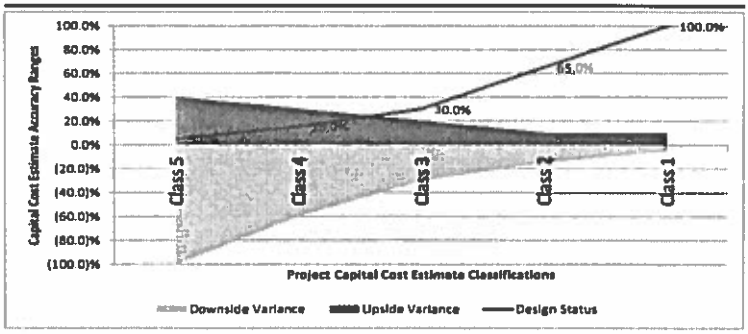
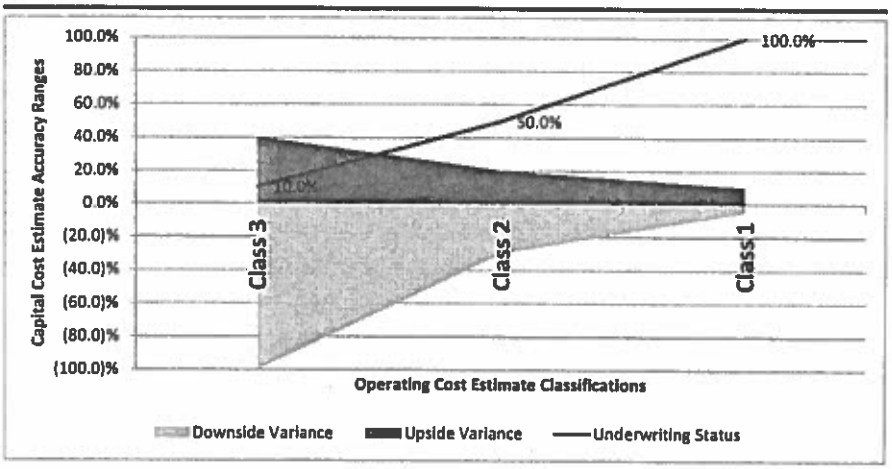


Figure 8. BCR's Estimate Classification System

BCR's Estimate Classification System

	Variance BCR Estimate Class		Example	Potential Range Based on Classification	
BCR Class	Downside	Upside	Base Value	Min Value	Max Value
Class 1	(5.0%)	10.0%	$1,000,000	$900,000	$1,050,000
Class 2	(30.0%)	20.0%	$1,000,000	$800,000	$1,300,000
Class 3	(100.0%)	40.0%	$1,000,000	$600,000	$2,000,000

BCR Versus Design Status



Note: All cost data are based on BCR's standard design and specifications. Any change from BCR's standard design or specifications will affect pricing.

BCR's scope consists of all site work, engineering, construction and equipment installation within 5 feet of the CleanB™ unit. Some additional project costs may be required including civil work to bring utility connections to within 5 feet of the unit.

BCR CleanB™ Project Financing Option with 1.5 Meter Belt Filter Press (Service Solution Package)

Since BCR's original project estimate shown above, the City has requested that BCR provide a CleanB™ and Ashbrooke Belt Filter Press option that requires no capital investment by the City. This BCR estimate includes all of the following components:

Estimated Project Capital	
CleanB™ System including chemical tanks, controls, start-up, and operator training.	$764,000
CleanB™ utility connections with 5 feet, concrete slab, pole barn to cover chemical tanks, and chemical tank separation	$116,000
Building, Site Work, Engineering, GC, etc.	Not included
Total CleanB™ System Capital Financed	**$880,000**
Alfa Laval AS-H 1.5 Meter Belt Press G3 150 (Klampress) including control panel and polymer mix system	$275,000
Belt Press Sludge Conveyor System (BCR has assumed an estimated conveyor cost for the purpose of providing project financing. It is subject to change after completion of design.)	$60,000
Building, Site Work, Engineering, GC, etc.	Not included
Belt Press Capital Financed	**$335,000**
CleanB™ + Belt Press Total Capital Financed	**$1,215,000**
Estimated Project Service Fee Including Financing (BCR's Solution Service Package)	
Estimated Annual BCR Service Fee (including capital charge, chemicals required to operate the CleanB™, full parts and labor warranty on the CleanB™ for the entire contract term (Client is responsible for maintenance & repair of the Belt Press), CleanB™ system performance monitoring, annual system inspection, annual operator training, technical support, dewatered sludge hauling and disposition.	**$155,740 per year**

Terms & Conditions for BCR's Solution Service Package

- 10-year service contract term
- Option to purchase the CleanB system at any time during contract and reduce BCR Base Fee
- BCR Base Fee is based upon current City WWTP flows and loads
- BCR Base Fee escalates annually at a predictable 3% or CPI

BCR Solution Service Package Operating Cost Reconciliation (OCR)

BCR has developed the following OCR to reflect the current City of Palatka WWTP operating costs compared to the operating costs resulting with the BCR Solution Service Package:

Palatka WWTP Operating Cost Reconciliation

STATUS QUO OPERATIONS

Cost Item	Estimated Annual Operating Cost	Note
WAS Pump Energy	$1,887	1
Thickening Energy	$1,887	2
Anaerobic Digester Energy and Gas	$17,617	3
Dewatering Energy	$1,108	4
Dewatering Polymer	$2,412	5
Repair & Maintenance	$18,000	6
Disposal	$18,250	7
Total Annual Operating Expense	$61,161	

Notes: Energy Cost $0.077 per KWH

1) 10.0 HP WAS pump processing 5,072 gallons per day of 1.00% WAS running 9.0 hours per day at 9.4 gallons per minute.
2) 10.0 HP at Thickening running 24.0 hours per day.
3) 7.5 HP at Anaerobic Digestion running 23.0 hours per day. Also includes natural gas expense of $14,000 .
4) 25.0 HP at Dewatering running approximately 2.11 hours per day at 40.0 gallons per minute.
5) Polymer dosage rate of 25.0 pounds per dry ton treating 77.2 dry tons.
6) Assumes $3,000 in annual R&M on current infrastructure and $15,000 on eliminated future infrastructure avoided with BCR solution.
7) Disposing of 488.9 wet tons at 15.0% solids. Disposal expense of $37.33 per wet ton.

BCR OPERATING COSTS

Cost Item	Estimated Annual Operating Cost	Note
WAS Pump Energy	$252	1
Thickening Energy	$252	2
CleanB™ Energy	$240	3
Dewatering Energy	$421	4
Dewatering Polymer	$2,292	5
BCR Base Fee	$155,740	6
Total Annual Operating Expense	$159,195	

Notes: Energy Cost $0.077 per KWH

1) 10.0 HP WAS pump processing 5,072 gallons per day of 1.00% WAS running 1.2 hours per day at 70.4 gallons per minute.
2) 10.00 at thickening running 24.0 hours per day.
3) 0.52 CleanB processing 100.0 gallons per minute of 1.00% WAS running 0.8 hours per day.
4) 25.0 HP for dewatering running approximately 0.80 hours per day at 100.0 gallons per minute.
5) Polymer dosage rate of 25.0 pounds per dry ton treating 73.3 dry tons.
6) Includes CleanB chemical management, hauling & disposal, CleanB M&R, system monitoring, technical support, annual operator training, and annual system inspection.

OPERATING COST RECONCILIATION

Status Quo Operating Expenses	$61,161
BCR Operating Expenses	$159,195
Year One Operating Savings	($98,035)

Please note that although the BCR Whole Solution Package suggests an operating cost increase to the City of Palatka, the project delivers a $1,215,000 capital project to the City with no capital investment required. In addition, the City's current WWTP operating costs are extremely low and likely unsustainable.

BCR Project Financing Option Buyout Schedule

The BCR project financing option offers the City of Palatka to option to purchase the CleanB™ System and Belt Filter Press at any time during the contract in accordance with the following schedule:

Contract Year	Buyout Payment
Within the 1st contract year	$ 1,215,000
Within the 2nd contract year	$ 1,150,000
Within the 3rd contract year	$ 1,085,000
Within the 4th contract year	$ 1,020,000
Within the 5th contract year	$ 955,000
Within the 6th contract year	$ 890,000
Within the 7th contract year	$ 825,000
Within the 8th contract year	$ 760,000
Within the 9th contract year	$ 695,000
Within the 10th contract year	$ 630,000

*In the event that the City of Palatka elects to execute the buyout provision, BCR's annual fee shall be reduced by $60,000 per year for the remained of the contract term (fee reduced to $95,740 if the buyout is exercised in year 1). All other contractual terms and BCR services shall continue for the remainder of the contract term.

Please note that design engineering has yet to be completed and the prices above are subject to change. In addition, the BCR financing option excludes engineering, site work (unless otherwise noted), dewatering building, general contracting, bonding, and sales tax.

Benefits of the BCR Solution

- Capital cost avoidance and reduction of long term operating costs compared to other alternatives
- State of the art biosolids treatment solution
- Consistent production of odor-free Class B biosolids at WWTP
- Existing assets can be repurposed
- Ease of operation
- Reduced regulatory risk
- Decreased energy consumption
- Potential Accelerated Composting hub partnership to provide even greater benefits to the City

5.0 Technical Information

CleanB™ Equipment Specifications

CleanB™ is a modular system requiring a minimal footprint. The major components of the system are built at BCR's manufacturing facility prior to delivery to the client site. The primary system components consist of the CleanB™ Process Unit and the Chemical Storage & Receiving Area. The CleanB™ Process Unit is a self-contained box that includes many of the major systems that make up the CleanB™ process equipment. BCR Environmental has designed the standard CleanB™ system to easily integrate into the majority of client sites and provide the operating simplicity and cost-saving advantages of this Class B system with minimal disruption.

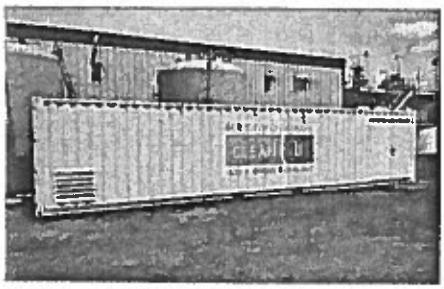


Figure 4. CleanB™ Process Unit

The standard CleanB™ Process Unit is contained in an 8'x40' modular system. The standard Process Unit processes sludge at up to 2.0% total solids at the flow rates up to 120 GPM. BCR also offers a High-Volume Process Unit that processes at flow rates up to 270 GPM. All systems include the Chemistry Injection System, Process Contact System, and SCADA Process Controls.

The Chemical Storage & Receiving Area provides chemical delivery and storage capabilities for the chemicals used in the system. The two chemical storage tanks for the sulfuric acid and sodium chlorite used by the CleanB™ system are typically sized at 5,500 gallons, but the tanks can be sized to fit into the available space at the facility while minimizing the frequency of chemical delivery. Chemical storage can be located outdoors but may require heat tracing and insulation in colder climates.

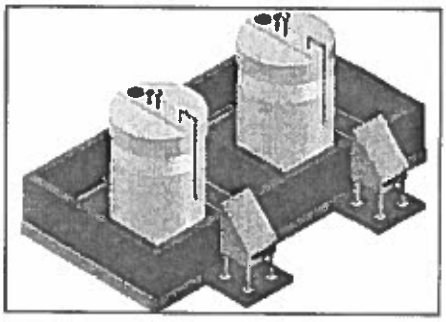


Figure 5. CleanB™ Chemical Storage & Receiving Area

To install a CleanB™ at the plant requires a space of approximately 30'x60', preferably in close proximity to any existing sludge holding tanks or dewatering equipment. Space requirements may vary depending on site-specific capacity options. The entire CleanB™ Process Unit and Chemical Storage Tank arrangement will be placed on a concrete pad prepared in advance to receive the unit. The installation area will require a drain to the head works. The Chemical Storage Tanks may be in the same or a different location from the CleanB™ Process Unit.

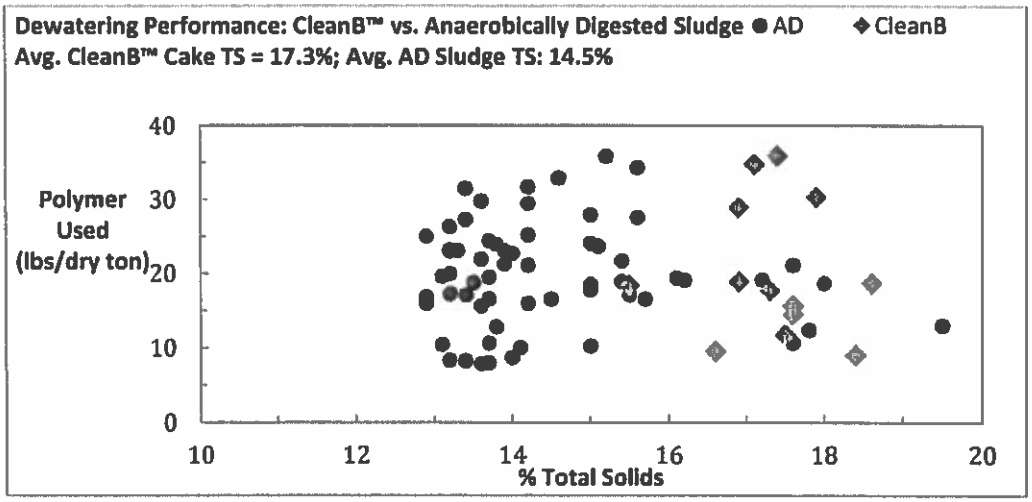
The site must be accessible by a roadway for chemical delivery and sludge hauling. Additional site requirements include access to reclaimed/reuse water, potable water, electrical, and internet connectivity.

CleanB™ Biosolids Dewaterability

CleanB™ installations typically experience improved biosolids dewatering following CleanB™ treatment. To demonstrate enhanced dewaterability, a CleanB™ Process Unit was set up to treat secondary WAS over a six week demonstration period at a 7.5 MGD WWTP that typically operates anaerobic digesters and dewaters via Belt Filter Press.

Figure shows that, following Anaerobic Digestion (AD), the WWTP normally dewaters to an average of 14.50% Total Solids (TS). During the CleanB™ demonstration, treated biosolids were dewatered to an average of 17.3% TS, or a 20% increase in cake solids.

Figure 6. Dewatering Performance: CleanB™ vs. AD Sludge



Average polymer used for AD dewatering was 19.8 lb. /dry ton. Average polymer used for CleanB™ dewatering was 19.1 lb. /dry ton. WAS thickening took place prior to AD, and this additional polymer was not accounted for in the above data. WAS thickening did not take place prior to CleanB™ treatment.

CleanB™ Energy Reduction

CleanB™ requires minimal energy consumption and has delivered substantial energy savings to clients. In addition, wastewater facilities that utilize the CleanB™ system may eliminate the requirement for aerobic digestion, thickening systems, odor control systems and other energy intensive equipment. As a result, a WWTP's energy footprint may be dramatically improved by incorporating a CleanB™ system.

For example, at the NAS Jacksonville installation, converting to the CleanB™ system has reduced energy consumption from close to one million kilowatt hours (kWh) per year to around 3,000 kWh per year. This substantial energy reduction resulted in savings to NAS Jacksonville of around $75,000 in 2013. Based on projected increases in energy costs, the base will save an average of $107,000 per year in energy costs over the next 20 years.

At the City of Alachua, converting to CleanB™ has reduced energy consumption by approximately 126,000 kWh per year. This resulted in estimated savings of approximately $17,000 in 2012. Cumulative projected energy savings to the city are estimated to be approximately $480,000 over the next 20 years.

Proposed Layout of a BCR Solution at Palatka WWTP

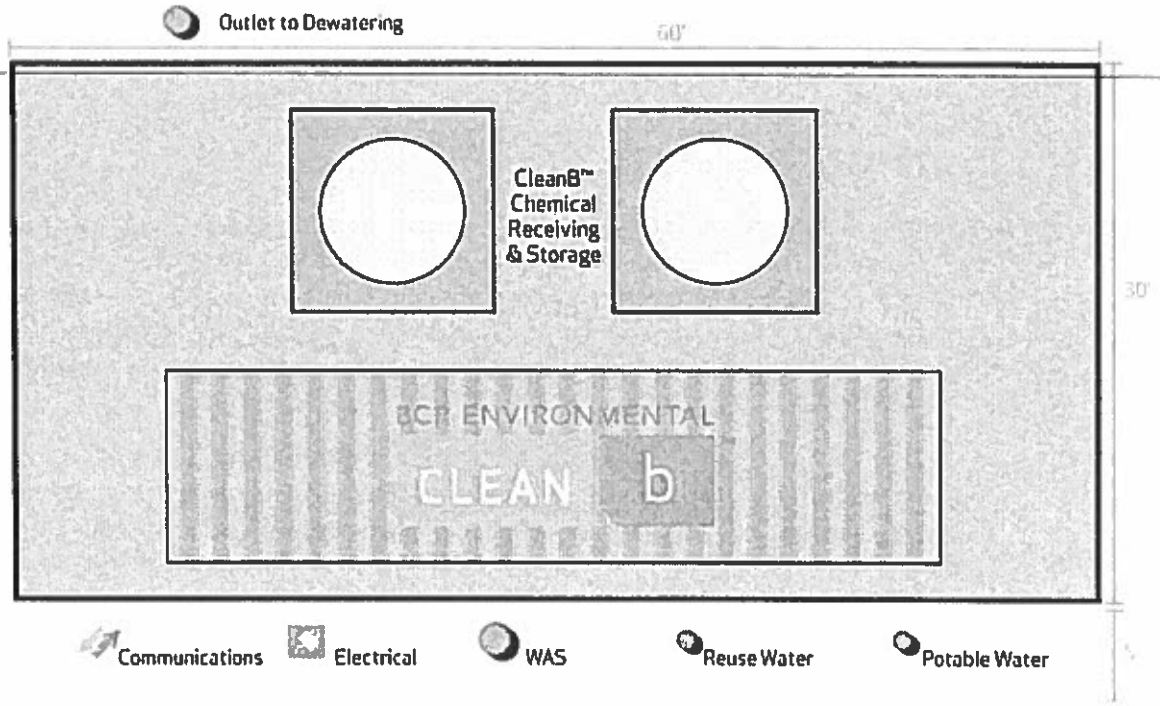
General installation requirements for the CleanB™ system are provided in the section below specifying what the City of Palatka would need to provide to install the proposed CleanB™ system. Note that these are the requirements for typical CleanB™ installations. Local codes may include additional requirements beyond those included here.

CleanB™ Space Requirements & Placement

To install a CleanB™ at the plant requires a space of approximately 30'x60', preferably in close proximity to any existing sludge holding tanks or dewatering equipment. Space requirements may vary depending on site-specific capacity options. The entire CleanB™ Process Unit and Chemical Storage Tank arrangement will be placed on a concrete pad or in a facility prepared in advance to receive the unit. The site must be accessible by a roadway for chemical delivery and biosolids disposition.

Figure 1 depicts a typical CleanB™ installation site layout and the items to be provided for integration of the system.

Figure 1. General CleanB™ Site Layout & Requirements



The following utilities must be provided to within five feet of the CleanB™ concrete pad:

- Sludge (WAS) Access
- Reclaimed/reuse water
- Potable water
- Electrical
- Communications

Sludge (WAS) Access Requirements

The CleanB™ system requires a connection point for sludge feed with a WAS pump capable of delivering sludge from the wastewater plant to the CleanB WAS Inlet System. BCR can provide upgraded WAS pumps if desired by the City. However, this is not currently included in our scope.

Additional sludge delivery requirements include the following:

- Variable Frequency Drive (VFD) WAS pump with a maximum capacity of 120 GPM for a standard CleanB system
- Provide access for sludge delivery and removal from CleanB
- Feed sludge at a maximum of 2.0% solids concentration

Reclaimed/Reuse & Potable Water Requirements

Potable water is required for safety equipment. Potable or disinfected reclaimed water is acceptable for CleanB™ process water. Unfiltered reclaimed water is not acceptable. Note that TDS may have an impact on CleanB™ system operating performance with regard to chemical demand.

Water requirements for a typical CleanB™ system are as follows:

- Reclaimed/reuse water with an effluent quality of 10/10 mg/l 95% or better
  - Minimum Flow rate: 50 gpm
  - Minimum Delivery Pressure: 80 psig
- Potable water
  - Minimum Flow Rate: 50 gpm
  - Minimum Delivery Pressure: 50 psig

Electrical Requirements

The following electrical requirements must be provided for a typical CleanB™ installation:

- One Main Power Service
  - Primary Voltage: 120v/1Φ 30A
  - Primary Conductors: 1-phase, 1-neutral, Minimum #2 Cu w/ 75°C Insulation per NEC Table 310-16; 1-grounding, Minimum #8 Cu per NEC Table 250.122
  - Client to provide disconnect
- Grounding and Bonding: In accordance with NEC 250
- Surge Protection to be supplied by client
- Lightning protection is optional but recommended
- All hardware to be 316 stainless steel

Communications Requirements

Modem and networking equipment for the CleanB™ SCADA system is included in the CleanB™ SCADA Process Controls, PLC, and HMI equipment. Additional communications requirements provided by the City include the following:

- Access and associated cabling to a high speed internet connection
- If the CleanB™ SCADA system is to be integrated with the wastewater facility's main PLC or SCADA system, access and associated cabling must be provided

CleanB™ Chemical Dosing Requirements

The CleanB™ Chemical Generator combines 15% Sodium Chlorite (NaClO2) and 50% Sulfuric Acid (H2SO4) in a 1:1 volumetric proportion to yield a chlorine dioxide (ClO2) solution. The chlorine dioxide solution is then delivered to a flowing stream of WAS.

Chlorine dioxide is an oxidant commonly used in the treatment of municipal drinking water. Through BCR's patented Chemical Generator, chlorine dioxide is generated on-site and consumed as it is generated. Dosing is handled automatically by the SCADA Process Controls to ensure optimal disinfection and odor elimination.

CleanB™ facilities are permitted for compliance with pathogen reduction requirements using Class B Alternative 1 (monitoring of fecal coliform concentrations). When a new facility is brought on-line, testing is performed on-site to determine the optimum dose rate at each facility. BCR has tested WAS in this manner from approximately 15 different facilities, and the standard dose rate that consistently meets disinfection requirements is 4 grams ClO_2/kg dry weight solids (60ppm).

Samples are taken at more frequent intervals (daily or twice per day) at startup to monitor the variance in sludge feed concentrations and demand. Once a 7 sample geometric mean fecal coliform concentration is established at a set dose rate, slight adjustments are made to the dose rate and samples are analyzed. The dose rate is then adjusted gradually to the desired point. This process can continue for 2-3 weeks after startup.

CITY OF PALATKA
CITY OF PALATKA
FLORIDA

Regular meeting 2nd and 4th Thursdays each month at 6:00 p.m.

September 25, 2014

Mr. Aaron Zahn, President & CEO
BCR Environmental Corporation
3740 St Johns Bluff Rd S, Suite 21
Jacksonville, FL 32224

Re: Letter of Intent ("LOI") for an Organic Waste / Biosolids Management Solution, Including the Installation of a BCR Accelerated Compost™ System in, City of Palatka, Florida

Dear Mr. Zahn:

The purpose of this Letter of Intent is to indicate the discussions between the the City of Palatka ("Palatka" or the "City") and BCR Environmental Corporation ("BCR") (collectively, the "Parties") regarding the Parties intent to jointly work on the development of an organic waste / biosolids management solution, which shall include an Accelerated Compost™ facility ("BCR NuTerra™ Facility"), as outlined in this Letter, to process the City's and other 3rd party Feedstock. The BCR NuTerra™ Facility shall be located on the City's wastewater treatment plant ("WWTP") property and shall receive and treat organic material (i.e. biosolids, manure, source separated organics, etc.)("Feedstock") from within the region. The BCR NuTerra™ Facility shall be located at the wastewater facility(ies) that are owned and operated by the City.

1. Background of the BCR Facility

The City understands that BCR intends to develop a Feedstock processing facility in northeast Florida to service the greater northeast Florida region ("Region"). It is the City's belief that a BCR NuTerra™ Facility will provide a long-term economical and environmental responsible solution for organic waste and biosolids management. The BCR NuTerra™ Facility will be designed to receive and process the Region's Feedstock and that of municipalities and private enterprises located within the Region. This BCR NuTerra™ Facility shall serve the Feedstock disposal and management needs of municipalities and private enterprises ("Stakeholders") in the Region in an environmentally and economically sound manner.

3. Anticipated Benefits to the City of Palatka and the Region

BCR has proposed to the City that the City become a Stakeholder in the BCR NuTerra™ Facility and the land provider for the BCR NuTerra™ Facility and accrue certain specific benefits for its participation. The BCR NuTerra™ Facility would address the long term biosolids and Feedstock treatment and management needs of the City and surrounding Stakeholders, including the City's, by providing the following:

- A predictable long-term budget to the Stakeholders, including City, for their Feedstock disposal at a guaranteed tip fee per wet ton, subject only to mutually agreed upon escalations and variable costs;
- A method of providing Stakeholders like City the ability to comply with and/or exceed the solid waste recycling criteria set forth by Florida Statute 403.706 and Florida House Bill 7243;
- A method of biosolids processing that allows each Stakeholder the ability to meet and exceed the new strict regulatory requirements of the Chapter 62-640 F.A.C. by rendering a Class A end product which shall be managed by BCR;
- A method of eliminating biosolids land application programs and associated nutrient management programs;
- The immediate addition of a new revenue stream for the City in the form of host fees from BCR NuTerra™;
- A significant reduction in the City's cost of green waste hauling and disposal cost resulting from significant City green waste being recycled;
- Increased landfill lifespan resulting from the diversion of Feedstock from the landfill to the BCR NuTerra™ Facility;
- The ability for a Stakeholder such as City to reduce overall operating costs and energy consumption at its WWTP by eliminating infrastructure, such as digesters, thickening equipment, DAF, etc., upon installation of the BCR Treatment System at the Stakeholder's facility;
- A strong community outreach program to maintain community involvement and support for the Project;
- Additional jobs in the City and the Region;

4. Purpose of this LOI and General Conditions

The Parties desire to set forth in this LOI certain understandings they have reached with regard to preliminary discussions and BCR's proposal for the desire of the Parties for the construction and long term management of a BCR NuTerra™ Facility at the City's WWTP. The Parties intend this LOI to encourage the evolution of the concepts expressed herein into definitive Agreements establishing the Parties' rights, duties and obligations. This definitive agreement shall be negotiated, in good faith, between BCR and the City's staff and counsel, and subject to City's commission approval. The definitive agreements shall set forth terms and conditions whereby the following General Conditions:

- The City will provide land at the City's WWTP (the "Site") to BCR under a general land lease agreement for an initial term of 20 years ("Master Lease");
- BCR will design, build and finance a BCR NuTerra™ Facility at the Site at no cost to the City;
- The City and BCR will execute a long-term operating agreement ("Operating Agreement") where BCR shall be solely responsible for managing the day-to-day operation of the BCR NuTerra™ Facility in accordance with all laws, regulations, and necessary permits;
- The term of the definitive Operating Agreement would be for an initial term of 20 years;
- The Operating Agreement would provide the City with an initial biosolids tipping fee ("Biosolids Tipping Fee") of $15.00 per ton of CleanB™ treated material. The Biosolids Tipping Fee would increase at the greater of (i) CPI or (ii) two percent (2.0%) per year;
- The Operating Agreement would provide the City with an initial yard waste tipping fee ("Yard Waste Tipping Fee") of $2.00 per ton pre-processed yard material. The Yard Waste Tipping Fee would increase at the greater of (i) CPI or (ii) two percent (2.0%) per year;

- The City would receive a host fee for its Stakeholder interest in the BCR NuTerra™ Facility equal to $1.50 per ton of 3rd party Feedstock processed by the BCR NuTerra™ Facility;

5. Express Conditions and Contingencies

All of the commitments and obligations of the Parties (including, but not limited to, the commitment by the City to enter into an Operating Agreement) are expressly contingent upon the satisfaction of the following conditions and contingencies:

- Execution of a definitive Operating Agreement between the parties, in form and content mutually acceptable to the City and BCR;
- Execution of a definitive Master Lease agreement between the parties, in form and content mutually acceptable to the City and BCR;
- Approval of the Agreements by City's Board;
- Approval of the Agreements by BCR's Board.

Notwithstanding any other provision of this LOI, if at any time the City determines that either (a) BCR NuTerra™ Facility or BCR Treatment System and/or its operation may endanger the health, safety or welfare of City personnel, any person or the public, or (b) the projected operation of the BCR NuTerra™ Facility will interfere with the normal operation or integrity of the City, then the City shall have the right to immediately terminate all negotiations and discussions with BCR under this LOI.

The City is excited about the prospect of participating in the BCR NuTerra™ Facility that will provide our City, the Region and Stakeholders with a simple, cost-effective, diverse and environmentally sound solution to our Feedstock disposal management needs. We look forward to working with you to bring this project to fruition in the immediate future.

Sincerely,

CITY OF PALATKA, FLORIDA

_____

By: Michael J. Czymbor, City Manager

Accepted by and Agreed to by:
BCR ENVIRONMENTAL CORPORATION

_____

Name: Aaron F. Zahn
Title: President and Chief Executive Officer

Betsy Driggers

From: Michael J. Czymbor
Sent: Saturday, September 13, 2014 9:00 AM
To: Betsy Driggers; Brian McCann; Don Holmes
Cc: Vicki Young
Subject: FW: BCR Financed CleanB & Belt Press Offering

Follow Up Flag: Follow up
Flag Status: Flagged

Michael J. Czymbor ICMA-CM
City Manager
City of Palatka, FL
386-329-0104

From: Aaron Zahn [mailto:AZahn@BCRENV.com]
Sent: Thursday, August 28, 2014 2:41 PM
To: Michael J. Czymbor
Cc: Kevin Dunlap; Nelle Dressler
Subject: Re: BCR Financed CleanB & Belt Press Offering

Michael
That's fine. I believe I can make the 25th commission meeting. Will you be presenting the LOI and the CleanB project at the same time? With regard to question below I believe Kevin may have been waiting on our development group for answers. Generally speaking Kevin handles sales of CleanBs, dewater, Neutralizers, our products, etc. Our development group, including me, handle the compost facility development.
The short answer to most of your questions is that we don't have an exact answer at this time.
As discussed, the typical sequence for BCR and Palatka would be to have a Letter of Interest / Understanding, 2) BCR would conduct project feasibility analysis, and 3) if BCR and City like the results of #2 we would proceed together and determine contractual relationships.

However, I am going to answer your questions with general ranges so as to give you an idea of magnitude. All of these answers would need to be affirmed in a feasibility analysis.

What is the estimated construction cost of the BCR NuTerra Facility?
$1.75-$5.0 million
How many new FT and PT jobs will be created?
2-3 FTE
2-3 PT
Have you projected the annual tonnage of bio-solids which will be received at the facility for the twenty year agreement period?
We generally develop facilities that are no smaller than 25,000 wet tons per year of Biosolids. We are currently developing 2 facilities in FL that are greater than 50,000 wet tons per year.
Have you projected the annual tonnage of Feedstock which will be produced at the facility for the twenty year agreement period?
This would be determined by facility size which would be dictated by addressable / interested market. One thing I can say is that we have established off take agreements for materials we might theoretically produce.

In general, these projects gain more traction as the develop. One nice thing is that the City is not at risk until BCR and the City are comfortable with the project viability

That being said, I know our team is ready to move immediately on the CleanB / dewatering project so as to help mitigate some of the current issues at the anaerobic digesters and BFP.

I hope this helps.
Regards
Aaron

Aaron F. Zahn
BCR Environmental Corporation
Phone: (312) 286-1040

On Aug 28, 2014, at 2:06 PM, "Michael J. Czymbor" <mczymbor@palatka-fl.gov> wrote:

> Good afternoon Aaron. We will have to move the consideration by the City Commission of the LOI to the September 25, 2014 City Commission meeting. Are you available on that day to attend the late afternoon meeting?
> Secondly, when can I expect to hear back from Kevin on my questions regarding the proposed LOI?
>
> **Michael J. Czymbor** ICMA-CM
> City Manager
> City of Palatka, FL
> 386-329-0104
>
> ---
>
> **From:** Michael J. Czymbor
> **Sent:** Wednesday, August 27, 2014 9:47 AM
> **To:** 'Kevin Dunlap'
> **Cc:** David Kemp (kempd@ayresassociates.com); Brian McCann (bmccann@palatka-fl.gov); Aaron Zahn (AZahn@BCRENV.com); Donald Holmes (holmes@holmesandyoung.com)
> **Subject:** RE: BCR Financed CleanB & Belt Press Offering
>
> Good morning Kevin and thank you for submitting the proposed LOI. I have reviewed the document and have a few questions:
>
> 1. What is the estimated construction cost of the BCR NuTerra Facility?
> 2. How many new FT and PT jobs will be created?
> 3. Have you projected the annual tonnage of bio-solids which will be received at the facility for the twenty year agreement period?
> 4. Have you projected the annual tonnage of Feedstock which will be produced at the facility for the twenty year agreement period?
>
> Please provide the response at your earliest convenience. Thank you.
>
> **Michael J. Czymbor** ICMA-CM
> City Manager
> City of Palatka, FL
> 386-329-0104
>
> ---
>
> **From:** Kevin Dunlap [mailto:KDunlap@BCRENV.com]
> **Sent:** Friday, August 22, 2014 12:00 PM
> **To:** David Kemp (kempd@ayresassociates.com)

City of Palatka

Wastewater Treatment Facility
Sludge Treatment System – Alternative Cost Analysis
Preliminary Opinion of Estimated Probable Costs
Workshop Meeting

September 25, 2014

CITY of Palatka FLORIDA

AYRES ASSOCIATES

Evaluated Alternatives

- **Alternative A**

  Retrofit Existing Anaerobic Sludge Treatment System

  Decomposition and stabilization of organic/inorganic biosolids in absence of oxygen

- **Alternative B**

  Convert to New Aerobic Sludge Treatment System

  Decomposition and stabilization of organic/inorganic biosolids with oxygen, similar to the activated-sludge process

- **Alternative C**

  Convert to New Chemical Sludge Treatment System

  Stabilization of organic/inorganic biosolids by chemical oxidation

- **Retrofit Existing Sludge Dewatering System**

  Common to All Evaluated Alternatives (A / B / C)

  Belt-filter Press w/Polymer Conditioning (Mechanical Process)

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Existing Anaerobic Digesters

Digester Tanks

Sludge Digesters / Control Building

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Existing Sludge Dewatering

Sludge Dewatering Building

Belt-filter Press Unit

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Alternative A

Retrofit Existing Anaerobic Sludge Treatment System

- **Primary Components to be Replaced / Upgraded**
  - Digester Heat Exchanger
  - Covers
  - Recirculation/Mixer and Transfer/Pumping Systems
  - Gas and Process Piping and Control Valves
  - Miscellaneous Process Appurtenances
  - Sludge Return Pumps (RAS/WAS)
  - Electrical/Control Systems

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Alternative A

Retrofit Existing Anaerobic Sludge Treatment System

Advantages and Disadvantages of Anaerobic Digestion	
Advantages	**Disadvantages**
Less energy/operational costs	Higher capital costs
Less biological sludge produced	May need supplemental natural gas for heating
Methane gas produced – Recoverable energy resource	Less stable after any “toxic shock” occurrence
Mechanical dewatering results better	Susceptible to odors if process upset occurs
Existing process – City WWTP personnel familiar with	Hazards of gas handling/processing

Alternative A Anaerobic Sludge Treatment and Dewatering System(s) Preliminary Opinion of Estimated Probable Costs Summary			
System Description	**Capital Costs**	**Annual O&M Costs**	**Present Worth**
Anaerobic Sludge Treatment System	$2,857,500	$78,500	$3,835,610
Sludge Dewatering System	$727,500	$74,500	$1,655,770
Anaerobic Sludge Treatment and Dewatering – Total	$3,585,000	$153,000	$5,491,380

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Alternative B

New Aerobic Sludge Treatment System

- **Systems Considered**
  - Surface Bridge or Float Mount Aeration/Mixer
  - Mechanical Blower / Coarse Bubble Diffused Air

- **Required Modifications**
  - New Blower Building / Mechanical Blowers/Diffusers
  - Transfer / Pumping Equipment
  - Sludge Return Pumps (RAS/WAS)
  - Process Piping
  - Electrical/Control Systems

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Alternative B

New Aerobic Sludge Treatment System

Advantages and Disadvantages of Aerobic Digestion	
Advantages	**Disadvantages**
Less capital costs	Higher energy/operation costs
Easy to control process, easy start-up	No recoverable energy potential
Better quality return effluent - Low ammonia and $CBOD_5$	Not typically used for primary sludge due to high O_2 demand
Less odor potential	Temperature variability impacts operating performance
Standard process used throughout Florida	Stabilized sludge may be more difficult to dewater

Alternative B Aerobic Sludge Treatment and Dewatering System(s) Preliminary Opinion of Estimated Probable Costs Summary			
System Description	**Capital Costs**	**Annual O&M Costs**	**Present Worth**
Aerobic Sludge Treatment System	$2,280,000	$138,500	$4,005,710
Sludge Dewatering System	$727,500	$74,500	$1,655,770
Aerobic Sludge Treatment and Dewatering – Total	$3,007,500	$213,000	$5,661,480

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Alternative C

New Chemical Sludge Treatment System

- **System Considered**
  - BCR Environmental – Proprietary CleanB™ System

- **Required Modifications**
  - New Process Equipment / Buildings / Structures
  - Chemical Storage Facilities
  - Transfer/Pumping Equipment / Piping Modifications
  - Sludge Return Pumps (RAS/WAS)
  - Electrical/Control Systems

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Alternative C

New Chemical Sludge Treatment System

Advantages and Disadvantages of BCR CleanB™ System	
Advantages	**Disadvantages**
Less capital costs	Proprietary / sole source process
Small footprint/space requirement	May reduce WWTP operation/performance flexibility by eliminating existing treatment unit processes
Less mechanical process components	Increased loading conditions to aeration system
Faster stabilization process	No recoverable energy
Potentially less overall operation costs	On-site chemical storage/handling
Eliminates need for typical sludge digestion process	No biological solids volume reduction
Less odor potential	Lower sludge feed concentration to dewatering – Concern for achieved final % solids results
	Not familiar to City WWTP personnel

Alternative C BCR CleanB™ Sludge Treatment and Dewatering System(s) Preliminary Opinion of Estimated Probable Costs Summary			
System Description	**Capital Costs**	**Annual O&M Costs**	**Present Worth**
BCR CleanB™ Sludge Treatment System	$2,430,000	$89,500	$3,545,170
Sludge Dewatering System	$727,500	$74,500	$1,655,770
BCR CleanB™ System Treatment and Dewatering – Total	$3,157,500	$164,000	$5,200,940

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Sludge Dewatering System

Retrofit Existing Sludge Dewatering System

- **Common to all Sludge Treatment Alternatives (A / B / C)**

- **Primary Components to be Replaced/Upgraded**
  - Belt-filter Press
  - Polymer Storage/Feed System
  - Dewatered Sludge Transfer Conveyor System
  - Electrical/Control Systems

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Cost Estimates Comparison

Sludge Treatment System(s) Preliminary Opinion of Estimated Probable Costs Summary				
Alternative	**Capital Costs**	**Annual O&M Costs**	**Present Worth**	**Rank**
Alternative A Anaerobic System	$2,857,500	$78,500	$3,835,610	2
Alternative B Aerobic System	$2,280,000	$138,500	$4,005,710	3
Alternative C BCR CleanB™ System	$2,430,000	$89,500	$3,545,170	1

Sludge Treatment and Dewatering System(s) Preliminary Opinion of Estimated Probable Costs Summary				
Alternative	**Capital Costs**	**Annual O&M Costs**	**Present Worth**	**Rank**
Alternative A Anaerobic System and Dewatering	$3,585,000	$153,000	$5,491,380	2
Alternative B Aerobic System and Dewatering	$3,007,500	$213,000	$5,661,480	3
Alternative C BCR CleanB™ System and Dewatering	$3,157,500	$164,000	$5,200,940	1

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Project Implementation Period

- **Alternative A**

  Retrofit Existing Anaerobic Sludge Treatment System

  Design / Permitting / Construction: 18-24 Months

- **Alternative B**

  Convert to New Aerobic Sludge Treatment System

  Design / Permitting / Construction: 18-24 Months

- **Alternative C**

  Convert to New Chemical Sludge Treatment System

  Design / Permitting / Construction: 15-18 Months

- **Retrofit Existing Sludge Dewatering System**

  Common to All Evaluated Alternatives (A / B / C)

  Design / Permitting / Construction: Included in Alternatives

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Funding Alternatives

Priority Funding Programs to Consider / Pursue

- **Clean Water State Revolving Fund Loan Program (CWSRF) – Loans**
  - Loan Interest Rate <2.0%
- **Small Communities Wastewater Facilities Grants Program – Grants**
  - 30%-70% Project Grant / Population <10,000 (Typical)
- **USDA Rural Development – Grants**
  - Population <10,000 (Typical)
  - Sometimes Slow Process
- **Community Budget Issue Requests (CBIR) – Legislative Grants**
  - Politically Motivated / Lobbying
  - Legislature Awarded Several in 2014

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Questions

CITY of Palatka FLORIDA

AYRES ASSOCIATES

bcr ENVIRONMENTAL

A New Way

BCR Benefits Overview

Simple, Economically Viable & Environmentally Responsible Solutions

Presented to the City of Palatka

September 25, 2014

BCR Environmental Overview

- U.S. Based Clean Technology Company focused on integrated solutions for organic waste management with current focus on biosolids
- Multiple technologies for converting biosolids/green waste/food waste into safe, valuable, odor free residuals
- Knowledgeable, experienced Management Team
- Proven history of on-time, on-budget project performance
- BCR has developed more Class A/EQ biosolids facilities in the State of Florida than any other solutions provider
- Over 30 years of operating history and nine (9) existing facilities with another ten (10) facilities currently under design and construction
  - BCR has no environmental compliance violations

BCR's History of Performance

CleanB – City of Alachua

+$50,000 / year operating savings (40%)

$500,000 avoided CapEx

50% energy reduction

Landfill → Class B

Neutralizer – City of Haines City

+$100,000 / year operating savings (30%)

$2.7MM avoided CapEx

90% energy reduction

Class B → Class AA/EQ

CleanB – Vero Beach

+$217,000 / year operating savings (40%)

$225,000 avoided CapEx

90+% energy reduction

Less than Class B → Class B

2 x Neutralizer – Martin County

+$500,000 / year operating savings (50%)

$2.6MM avoided CapEx

+90% energy reduction

Less than Class B → Class AA/EQ

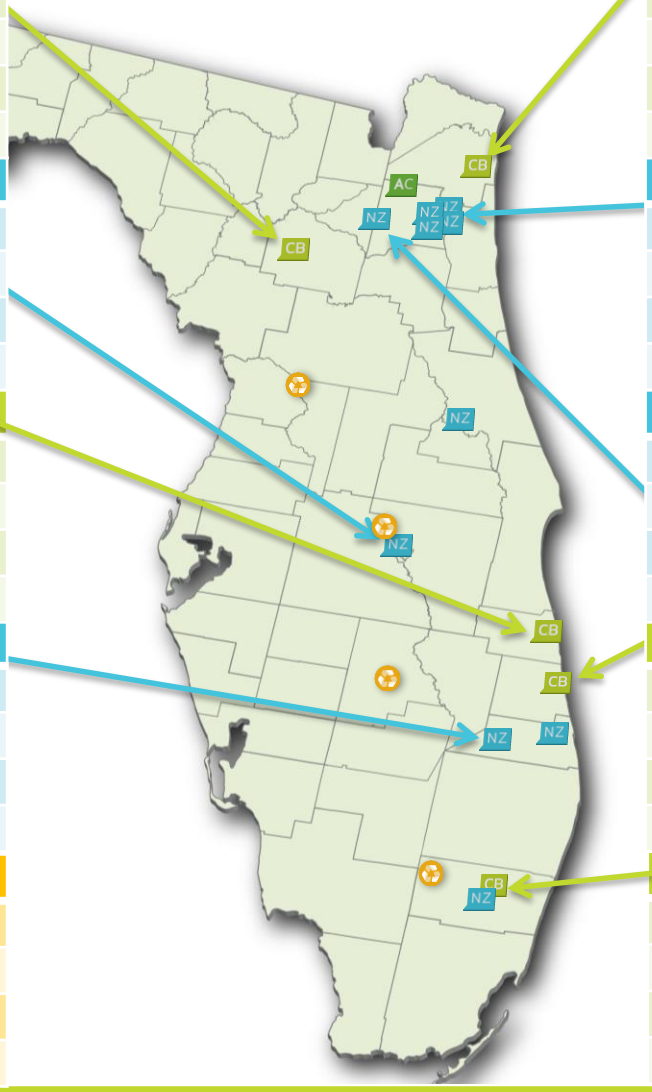
Organics & Compost Facility Projects

NuTerra Haines City Regional Organics Facility (200 tons / day)

NuTerra SE FL Regional Organics Facility (200 tons / day)

Partner – Compost USA Sumter Facility (200 tons / day)

Partner – McGill Brighton Facility (350 tons / day)



CleanB – Naval Air Station Jacksonville

+$140,000 / year operating savings (40%)

$1MM avoided CapEx

90+% energy reduction

Class B → Class B

Neutralizer (4x) – Clay County

+$750,000 / year operating savings (43%)

$13.75MM avoided CapEx

92% energy reduction

Class B → Class AA/EQ

Neutralizer – City of Starke

+$60,000 / year operating savings (41%)

$300,000 avoided CapEx

80% energy reduction

Class B → Class AA/EQ

CleanB – Fort Pierce

+$158,000 / year operating savings (30%)

$500,000 avoided CapEx

70+% energy reduction

Less than Class B → Class B

CleanB – Pembroke Pines (Phase I)

+$150,000 / year operating savings (40%)

>$5.0MM avoided CapEx

50+% energy reduction

Class B → Class B

What We Do: Deliver a Whole Solution

Value to Palatka: We deliver a reliable, long-term solution that reduces the cost and risk of: (1) Treatment, (2) Transportation, and (3) Disposition of organic waste

Treatment at the WWTP

BCR Provides Modular Treatment Onsite at the WWTP to Partner through a Service Agreement

or

BCR Designs and Builds Treatment Projects for Partner Onsite at WWTP


Neutralizer®


CleanB™


Centrifuge


Screw Press


Belt Press

Transportation Services

BCR manages logistics to move treated End Product to the final user with the lowest cost in a local market


Hauling

End Product Management

Control and operate central facilities to manage End Product for Partners to beneficial reuse

Whole Solution Services

Deliver valuable support services to resource constrained <15MGD operations (TCMP, Monitoring, R&M)


Total Chemical Management

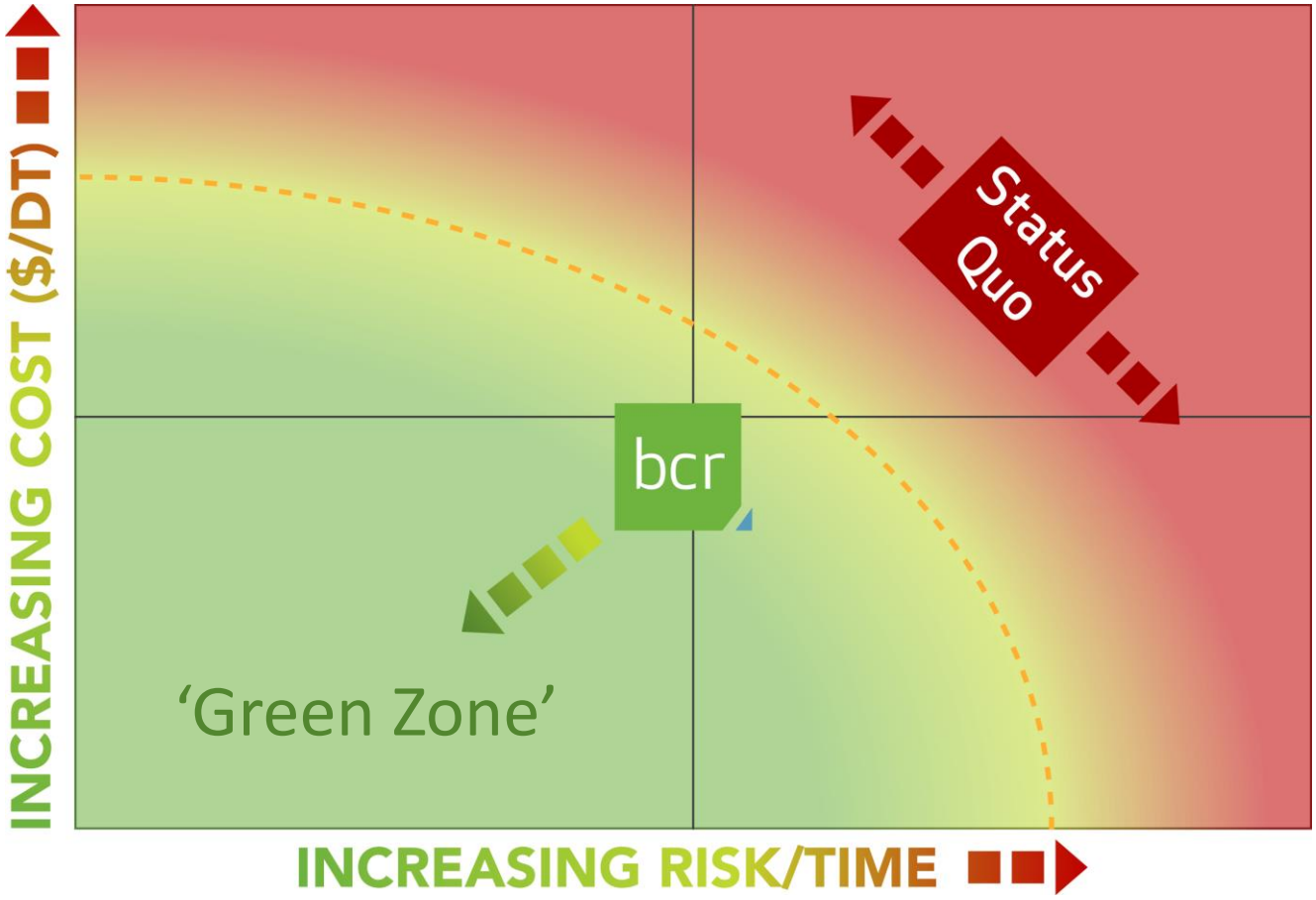

R&M


Monitoring

We solve our Partner's problems by delivering a Whole Solution

BCR's Whole Solution Function

∑(Cost; Risk) = Treatment + Transport + End Product Management (EPM)



BCR is uniquely able to move municipalities into the Green Zone

Front of Mind Pain Points for Clients

Pain Point = Risk + Cost to Client

1 Treatment

- Capital Constraints
- Operating Budget
- Odors
- Regulatory Compliance & Risks
- Capacity Constraints
- Energy Consumption
- Operational Complexity
- Geographic Footprint
- Carbon Footprint

2 Transportation

- Point-to-Point Distance
- Cost
- Odors
- Quantity of Waste
- Carbon Footprint

3 End Product Management

- Hassel Factor
- Unpredictable Costs
- Odors
- Regulatory Compliance & Risks
- Value of Product
- Diversification of outputs

'Pain Points' in Each Step Are Difficult to Quantify and Solve For the Client

The Impact We Have

Residential / Commercial Consumption & Production

Organic Waste Generation

Advanced Organic Waste Treatment

(Our Technology)

bcr

Organic Waste Disposal **or** **Reuse**

Traditional Outlets

Landfills

Restricted Land

Management & Product Distribution (Our Infrastructure & Know-How)

bcr NuTerra Management

bcr McGILL

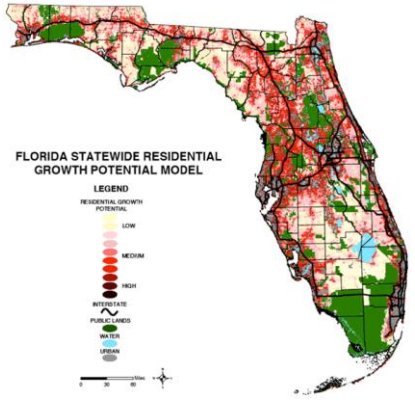
Organic / Nutrient Replenishment

Energy Substitute

Waste Diversion & Beneficial Reuse

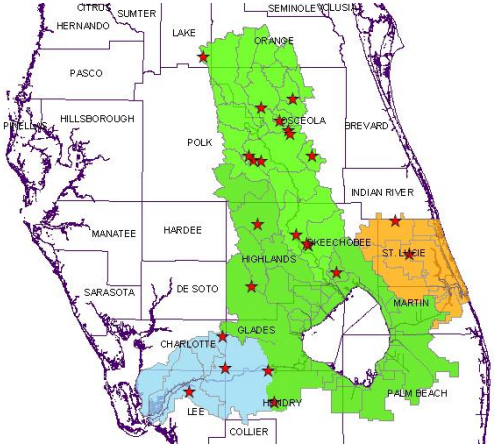
Our technology and infrastructure provide total waste reutilization

Specific Florida Issues Addressed by BCR



Florida's Increasing Recycling Goal 2012-2020

40% by 2012 → 50% by 2014 → 60% by 2016 → 70% by 2018 → 75% by 2020



- Nutrient Pollution Control
- 2020 Organic Waste Recycling Goals
- Urban Encroachment & Population Growth
- CO_2 Offsets
- FDEP 62-640 Risk Reduction

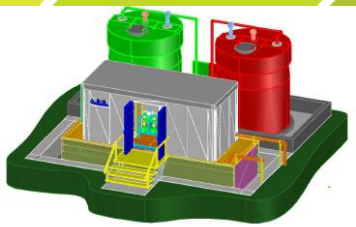
BCR provides Palatka with a long-term sustainable solution

bcr ENVIRONMENTAL *A New Way*

Wastewater Treatment Plant Upgrade for Palatka

The CleanB™ Process

Sludge → Patented Chemical Treatment → Monitor ORP & pH → Dynamic Demand Based Dosing → Dewater → Class B Odor Free Residuals



Centrifuge

Screw Press

Belt Press

The CleanB™ solution is a simple one-step process for rapidly achieving Class B residuals.

- High volume treatment process / highly scalable
- Significant reduction in pathogens (Class B)
- Odor control
- Elimination of infrastructure (e.g. digesters, gravity belt thickeners, lime, etc.)
- Reduced operating and maintenance costs (e.g. energy consumption, etc.)
- Enhanced dewatering of sludge (e.g. higher cake solids & less polymer)

CleanB™ Unit

- The Unit includes chemical delivery, processing, and control equipment for the CleanB™ process
- CleanB™ can be mobilized for simple integration with an existing wastewater treatment plant

CleanB™ Biosolids

CLEANB™ BIOSOLIDS CHARACTERISTICS	
PARAMETER	VALUE
Percent Solids	22 - 26%
Appearance of Solids	Light brown granular cake
pH	6.5 - 7.5
Odor	Earthy
Lime content	N/A
Total N	4-6%
Total P	2-3%
Total K	N/A
Typical Distribution Method	Truck and spreader
Ground Water Impact	Low nutrient leaching
Water Conservation	Provides water retention in soil

bcr ENVIRONMENTAL *A New Way*

Palatka & BCR Public Private Partnership

Accelerated Composting Indoor Facility Design and Process

- Facilities process ~4x faster than traditional systems
- Process controls adjust to fluctuations in waste streams to produce consistent high quality material

Floor system

- Floor system is a proprietary design specific to the McGill process
- Perforated aeration piping is installed in the floor's concrete channels to deliver air to the composting mass

Typical facility layout

Typical Feedstocks for NuTerra™ Regional Facility

TYPICAL FEEDSTOCKS	
	Yard Waste Generated by households, landscapers, storm debris and land clearing projects; Consists of brush, tree limbs, leaves and grass clippings; Provides carbon, structure and porosity to the compost pile, has low moisture.
	Food Waste (and Non-recyclable Paper) Generated by grocery stores, restaurants, institutional kitchens, food processors and manufacturers. Two categories exist that provide nutrients and high moisture. [1] Pre-consumer – consists of fruits, vegetables, breads, grains, & kitchen prep waste, etc. that have not come into contact with the end user. [2] Post-consumer – plate scrapings.
	Biosolids Generated by wastewater treatment plants; Nutrient-rich organic materials resulting from the treatment of domestic sewage; Polymer is added to solidify the material for transportation; Usually has a moisture content of over 80%; provides a good source of nitrogen, iron and high moisture.
	Manure Generated by farms, feedlots, horse stables and zoos; Combination of nutrient-rich manure and carbon based bedding materials (straw, shavings, sawdust); Provides both nitrogen and carbon, relatively dry and absorbent.

NuTerra™ Premium Compost

NUTERRA™ COMPOST CHARACTERISTICS	
PARAMETER	VALUE
Percent Solids	55-65%
Appearance of Solids	Soil
pH	6.5 - 7.5
Lime content	N/A
Total N	1-1.5%
Total P	1-1.5%
Total K	.2-.4%
Typical Distribution Method	Truck and spreader
Ground Water Impact	Low nutrient leaching
Water Conservation	Provides water retention in soil

NuTerra™ Premium Compost Products

NuTerra™ Premium Compost

NuTerra™ Compost is a premium Class A/EQ (Exceptional Quality) compost suitable for a variety of beneficial uses as a soil conditioner and topdressing. Produced by BCR's Accelerated Composting (AC) system, NuTerra™ is a nutrient-dense compost that rebuilds soil by increasing organic matter, replenishing soil microbes, and improving water conservation.

NuTerra™ Compost Benefits

NuTerra Compost and the AC system offer key advantages compared to traditional biosolids composting:

- Eliminate Odor Issues: NuTerra™ has a pleasant, earthy smell. The compost is approved for unrestricted usage.
- Improve Product Quality: BCR's innovative, computer-controlled AC process produces a compost with vigorous microbial populations that revitalize soils.
- Simplify Regulatory Compliance: NuTerra™ meets Title 40 CFR Part 503 Class A/EQ requirements. BCR maintains open communication with the U.S. EPA and state environmental agencies to ensure NuTerra™ achieves current and future regulatory compliance.
- Improve Plant Survival and Growth Rates: Organic matter improves the aggregate strength of soils, making the soil more resistant to compaction and improving root penetration. The organic matter in NuTerra™ helps plants establish and sustain growth.
- Reduce Nutrient Loss: Light textured (sandy) soils possess a low cation exchange capacity (CEC), resulting in nutrient loss. Adding NuTerra™ to the soil raises the CEC and enables the soil to better hold onto nutrients like potash and nitrogen which would otherwise leach out of the soil.

NuTerra™ Compost Characteristics

PARAMETER	VALUE
Percent Solids	55-65%
Appearance	Soil
pH	6.5-7.5
Odor	Earthy/soil
C/N Ratio	~14:1
Total N	1-1.5%
Total P	1-1.5%
Total K	0.2-0.4%
Typical Distribution	Truck & spreader
Ground Water Impact	Low nutrient leaching
Water Conservation	Water retention in soils

Expanded Outlets for Beneficial Use

NuTerra™ compost increases soil nutrient content, improves the soil's ability to retain moisture, and can help boost crop yields. The product is ideal for a variety of applications, including:

- Turf grass maintenance
- Landscape projects
- DOT projects
- Wetland restoration
- Component of potting soil manufacture



NuTerra™ AG Blend

A profitable season starts with healthy soil. When farmers return composted organic matter and active soil microbes to fields, good things happen. So good, in fact, that at the end of the season, you'll return more money to your pocket.

NuTerra™ AG Blend

BCR's NuTerra™ AG Blend is specifically formulated for agricultural use. NuTerra™ AG Blend rebuilds depleted soils and promotes healthy crop yields. It controls erosion and pollutant runoff, conserves energy and returns carbon to the soil instead of allowing it to become air pollution, so you can feel as good about the way you grow food as you do about feeding people and turning a profit. Try BCR's NuTerra™ AG Blend on your worst field and you'll be convinced.

- See results with as little as 4-8 tons per acre or about a 1/8-inch layer of compost
- Apply with standard spreaders
- Use no more than 30% in blends and mixes — compost is a concentrate
- Base your application rate on soil tests and compost analysis for best results

Conventional
NuTerra™ AG
simple reason

NuTerra™ SoilBuilder Blend

Give your soil what it wants! BCR's NuTerra™ SoilBuilder Blend is a premium product ideal for use as a topdressing, soil amendment or mix ingredient. It rebuilds poor soil by increasing organic matter, replenishing soil microbes responsible for nutrient uptake, and improving water management.

NuTerra™ SoilBuilder Blend

NuTerra™ SoilBuilder is specifically blended to meet a wide range of landscaping and gardening needs. Manufactured from 100% recycled content, NuTerra™ SoilBuilder is a product you can feel good about—make lawns, turfgrass, gardens, and ornamentals look great while helping the planet.

NuTerra™ SoilBuilder Blend is cost effective and offers outstanding performance:

- Reduces irrigation requirements up to 50%
- Reduces stormwater runoff up to 50%
- Reduces pollutant loads in stormwater runoff

NuTerra™ ErosionControl Blend

BCR's NuTerra™ ErosionControl Blend is formulated for control projects specifying blankets, berms and socks. It meets DOT-type specifications for erosion control products, offering a blend of particle sizes to absorb rainfall energy and help water percolate.

Stormwater Management that Actually Works

Two thirds of sediment loss is a result of human activities like agriculture and development, and the volume of water rolling off developed landscapes can be almost five times the amount shed by undisturbed soil.

Common measures for managing the impacts of stormwater don't really work—a drive past any construction site where they're used provides ample proof—because they only address symptoms. Loss of organic matter in the soil is the cause.

Finished projects using NuTerra™ ErosionControl look better and blend better with the landscape when compared to traditional control methods. In clay soils, drainage is improved by increasing porosity. In sandy soils, water-holding capacity and soil aggregation are increased.

Compost blankets, berms and socks can be vegetated and remain as a permanent feature of the landscape. For pneumatic applications, seed can be blown with the compost. No labor is required to remove temporary measures and there are no landfill disposal fees.

Sedimentation is a symptom. Chemical and nutrient runoff is a symptom. The problem is loss of soil organic matter. The solution is NuTerra™ ErosionControl.

Recommended Applications

NuTerra™ ErosionControl is blended for superior performance in a range of applications:

- Highway construction and roadside vegetation
- Development and landfill cover
- Streambanks and engineered wetlands
- Stormwater retention and filtration ponds
- Landscaping and rooftop gardens

Why Choose NuTerra™ ErosionControl Blend?

- Increase water retention: Reduce run-off while preventing sheet and rill erosion.
- Create a protective buffer: Absorb rainfall energy to prevent dislodging soil particles. Prevent soil compaction while facilitating infiltration.
- Remove pollutants from stormwater: Filter and degrade pollutants to improve downstream water quality.
- Establish vegetation cover faster: Improve microbial activity, nutrient availability, and soil structure.
- Save on labor and landfill costs: Unlike other forms of erosion control, nothing needs to be removed from the site once a project is complete.

NuTerra™ SportsTurf Blend

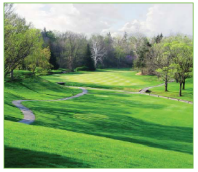
BCR's NuTerra™ SportsTurf Blend offers all the benefits of our SoilBuilder Blend in a product formulated for active playing surfaces like athletic fields and golf courses. Made from 100% recycled content, you'll love SportsTurf not just because it's green, but because it works.

Superior Performance

NuTerra™ SportsTurf Blend is specially formulated for superior performance on high-traffic playing surfaces. In addition to saving you time and money, SportsTurf Blend will do great things for your turf management program:

- Improve percolation
- Reduce irrigation requirements
- Reduce chemical use
- Reduce compaction
- Protect players

To keep fields and fairways in peak condition, apply NuTerra™ SportsTurf Blend on an annual basis, up to 2 inches per year in multiple applications.



Recommended Applications

APPLICATION	
Golf Courses	Use for rough, fairways and landscaping. Good for divot mixes, too. Reduce fertilizer loss by increasing soil cation exchange capacity (CEC).
Athletic Fields	Apply prior to seeding or sod installation to add organic matter. Improves nutrient uptake. Top-dress regularly to maintain healthy soil ecosystems.
Commercial/Industrial Sod	Improve turf rooting while fixing soil structure over the long-term.
Water Management	Improve field recovery after storm events. Reduce stormwater and pollution runoff. Control sediment loss and erosion. Compost acts like a sponge to hold many times its weight in water. It also relieves soil compaction, improving pore space and allowing excess water to percolate.
Injury Reduction	Reduce compaction for softer playing surfaces to reduce impact injuries while remaining within a desired range, even in dry weather. Eliminate heat stress associated with artificial turf. Reduced chemical requirements mean reduced athlete exposure.
Landscaping	Improve soil structure for better root and water penetration. Retain more fertilizer at the root zone where you need it. Reduce plant replacements. Make your own topsoil and planting mixes.


Component of potting soil manufacture


Landscaping Projects


Wetland Restoration & Construction


DOT Projects

Turf Grass Maintenance

BCR Wastewater Treatment Plant Upgrade Benefits to Palatka

- BCR CleanB produces odorless Class B sludge in only 10 minutes
- CleanB and belt press offered to Palatka with no capital investment
- CleanB offered to Palatka with full maintenance & repair warranty for the 10 year contract term
- CleanB solution offers significant operational flexibility, including the ability to process a combination of primary and secondary sludge
- CleanB and belt press can be operational in Palatka in less than 180 days from NTP (considerably faster than any other alternative)
- CleanB can accommodate considerable Palatka WWTP expansion with no additional capital investment
- Environmentally friendly, long term solution with a partner located nearby
  - BCR will be responsible for the biosolids once they leave the WWTP
    - Biosolids land applied at BCR permitted Class B land app sites
    - Or converted to Class AA compost at BCR Regional Compost Facility

BCR Public Private Partnership Benefits to Palatka

- Sustainable, 'green' solution for the City and the region
  - Making beneficial reuse of at least 2 organic waste streams currently filling Florida landfills: Biosolids and Yard Waste
- Reduced City WWTP operating costs resulting from discounted tipping fees at the compost facility
- Potential for revenue generation for the City in the form of compost facility host fees
- Several jobs added in the form of compost facility employees

Next Steps and Estimated Projected Schedule

- Wastewater Treatment Plant Upgrade Project
  - Commission recommends pursuing Alternative C from Technical Memorandum (9/25/14)
    - Ayres submits engineering services contract to begin securing funding (10/15/14)
    - BCR and Ayres submit Wastewater Treatment Plant (WWTP) Upgrade contracts to City (10/15/14)
      - Contingent upon City securing funding (no City obligation if funding cannot be secured)
      - Locks in BCR scope pricing for the City through 6/30/15
    - City, BCR, and Ayres execute WWTP upgrade project contracts (11/15/14)
    - City and Ayres execute contract to secure WWTP upgrade project funding (11/15/14)
    - Ayres and BCR begin WWTP upgrade design and grant/loan funding requests (12/1/14)
    - Ayres and BCR submit preliminary design with grant/loan applications (1/10/15)
    - Project grant/loan funding received (approximately 6/30/15)
    - Ayres and BCR begin execution of WWTP upgrade project (7/1/15)
    - WWTP upgrades complete and operational (1/31/16)
- Composting Public Private Partnership
  - Execution of the Compost Partnership Letter of Intent (9/25/14)
    - BCR presents feasibility project plan and schedule (10/15/14)
    - BCR completion and delivery of feasibility study (approximately 4/15/15)

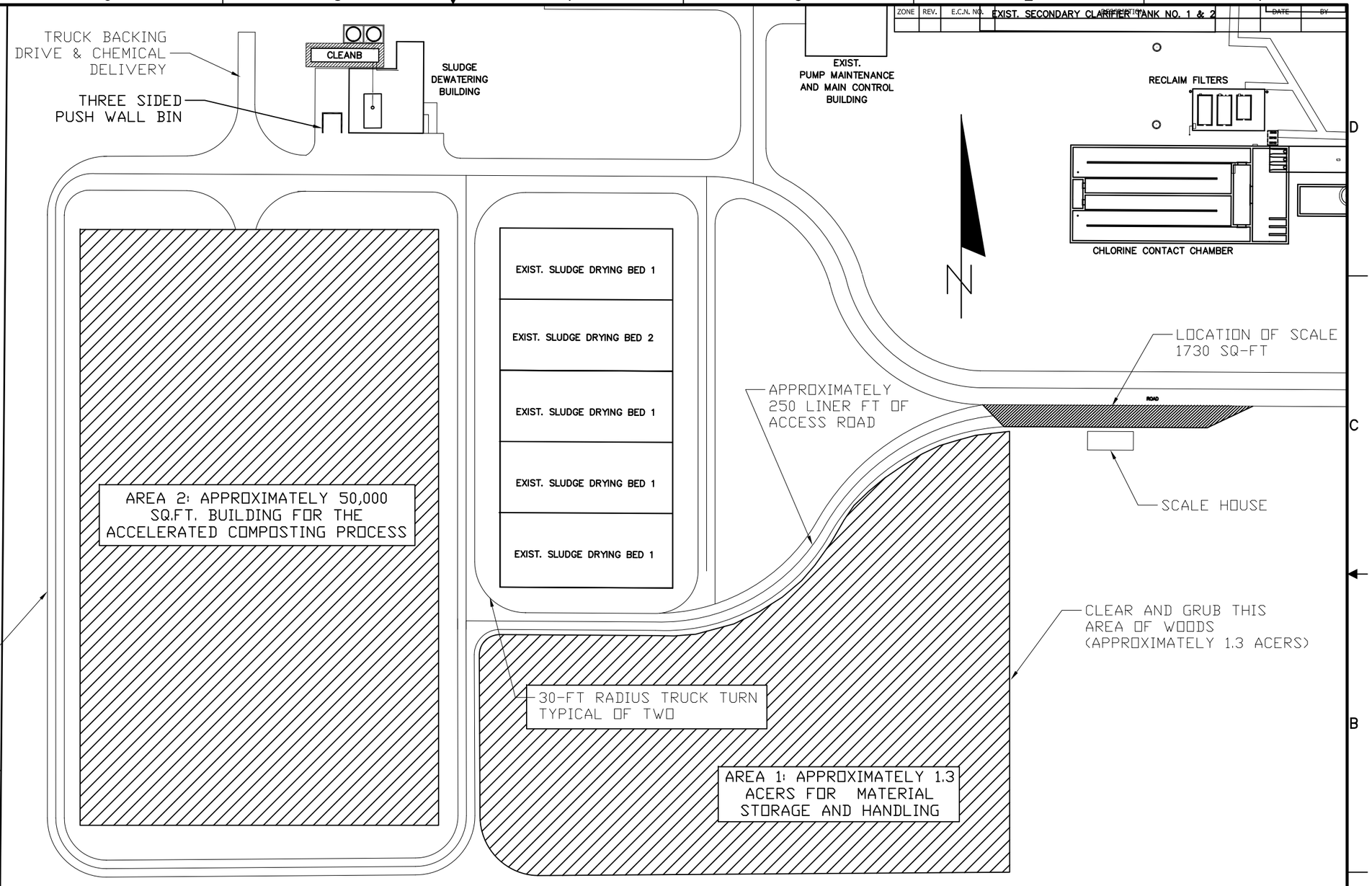
bcr ENVIRONMENTAL *A New Way*

BCR Environmental Corporation
3740 St Johns Bluff Rd South,
Suite 21
Jacksonville, FL 32224
904-819-9170

Thank you.

PROPOSED OPERATION:

1. TRUCKS ENTER THE SITE AND COME ACROSS THE SCALE. TRUCKS CARRYING GREEN WASTE PROCEED TO AREA 1. TRUCKS CARRYING BIOSOLIDS BACK INTO THE BUILDING AT AREA 2. TRUCKS PICKING UP FINISHED PRODUCT ALSO PROCEED TO AREA 1.
2. INSIDE THE BUILDING AT AREA 2, BIOSOLIDS ARE MIXED WITH GREEN WASTE AND PLACED IN ONE OF THIRTY ACCELERATED COMPOSTING ROWS.
3. AIR BLOWERS EXTERNAL TO THE BUILDING PROVIDE THE NECESSARY AIR FLOW VIA FLOOR VENT PIPES TO MAINTAIN THE PROPER TEMPERATURE IN A GIVEN PILE. THE BLOWERS ARE CONTROL BY A PLC IN THE OPERATIONS BUILDING LOCATED NEAR THE COMPOSTING BUILDING.
4. THE BUILDING EXHAUST IS VENTED THROUGH A BIOFILTER EXTERNAL TO THE STRUCTURE.
5. FINISHED PRODUCT IS MOVED TO AREA 1 FOR PICK-UP.
6. TRUCKS MOVING TO AREA 1 TRAVEL CLOCKWISE AROUND THE DRYING BEDS. TRUCKS MOVING TO AREA 2 TRAVEL THE MAIN ROAD EACH WAY.



ZONE	REV.	E.C.N. NO.	DESCRIPTION	DATE	BY

UNLESS OTHERWISE SPECIFIED
DIM ARE IN INCHES
TOL ANGLE ± .3°
2 PL ± .01 3 PL ± .050
INTERPRET DIM AND TOL PER AMSE Y14.5M-2009

THIRD ANGLE PROJECTION

DRAWN	JWH	6/18/14
CHECKED		
CCB:		
O&M:		
ENG APPROVED:		

THIS IS AN AUTOCAD® GENERATED DRAWING.
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bcr ENVIRONMENTAL
3740 St. Johns Bluff Road S. Suite 21, Jacksonville, Florida 32224

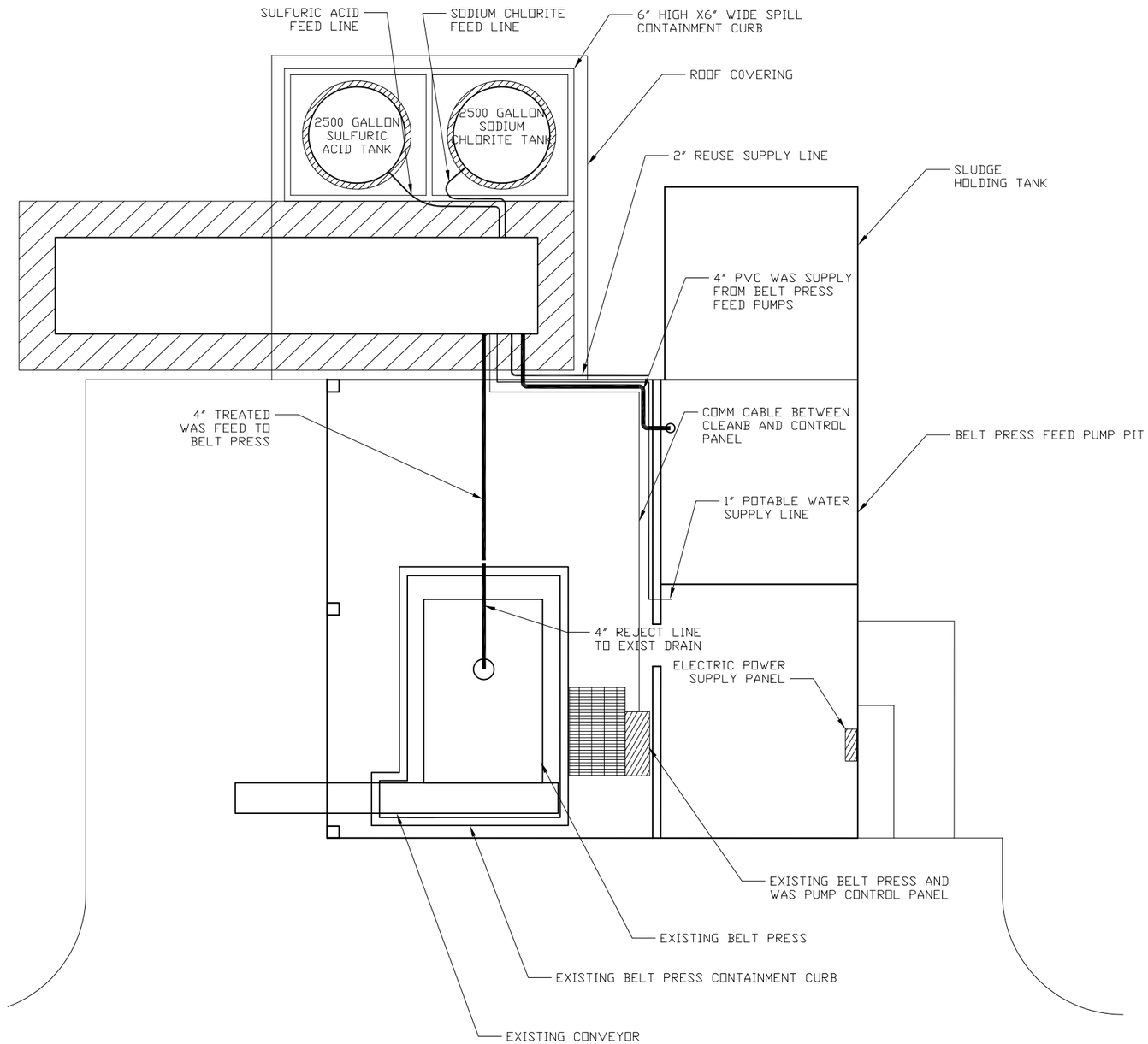
CITY OF PALATKA
CLEANB
EQUIPMENT LAYOUT

SIZE	DWG NO	REV
D	1547-G-10001	-

SCALE 1/2"=1'-0" | WT.(LBS.) NA | SHEET 1 OF 1

PROPOSED BILL OF MATERIALS:

1. WAS SUPPLY LINE: 4" DI FLANGED TEE W/2@ DI UNI-FLANGE ADAPTERS, 1@ 4" DI ECC PLUG VALVE, 2@ 4" SCH 80 PVC ELLS, 3@ 4" SCH 80 VAN STONE FLANGE, APPROXIMATELY 30-FT OF SCH 80PVC PIPE.
2. EXISTING WAS SUPPLY PUMP'S REQUIRE TWO NEW ALLAN BRADLEY POWER FLEX 525 VFD's, AND 100-FT NEW COMM CABLE CONNECTION TO THE CLEANB CONTROL PANEL.
3. TREATED WAS: 2@ 4" VANSTONE FLANGE, 2@ 4" SCH 80 PVC 45-BEND, APPROXIMATELY 20-FT 4" SCH 80 PVC PIPE.
4. REJECT LINE: 1@ 4" VANSTONE FLANGE, 3@ 45-BEND, APPROXIMAETLY 30 FEET 4" SCH 80 PVC PIPE.
5. THICKENED SLUDGE PICK-UP AREA: APPROXIMATELY 40-FT OF JERSEY WALL BARRIERS.
6. POTABLE WATER: APPROXIMATELY 40-FT OF 1" SCH 80 PVC PIPE AND 3@ 1" SCH 80 ELLS.
7. REUSE WATER: APPROXIMATELY 20-FT OF 2" SCH 80PVC PIPE AND 2@ 2" SCH 80 ELLS.
8. ELECTRICAL: NEW 30-AMP BREAKER IN EXISTING SERVICE PANEL AND APPROXIMATELY 100-FT OF NEW CONDUIT AND WIRING.
9. NO REMOTE COMM IS CURRENTLY REQUIRED, AND MAY NOT BE AVAILABLE.



bcr ENVIRONMENTAL
3740 St. Johns Bluff Road S, Suite 23, Jacksonville, Florida 32224

SIZE	DWG NO	REV
D	1547-G-10002	-
SCALE 1/2"=1'-0"	WT.(LBS.) NA	SHEET 1 OF 1