Professional

Engineering

Services

Engineering Design Services for Town Branch WWTP Primary Digester Complex Improvements

RFP#58-2015

Proposal for

Lexington-Fayette Urban County Government

January 14, 2016

STRAND ASSOCIATES®

Firm Submitting Proposal: Strand Associates, Inc.

Complete Address: 1525 Bull Lea Road, Suite 100, Lexington, KY 40511
Street City Zip

Contact Name: Michael Davis Title: Senior Associate

Telephone Number: (859)225-8500 Fax Number: (859)225-8501

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Appendix

Addendums

Lexington-Fayette Urban County Government
DEPARTMENT OF FINANCE & ADMINISTRATION

Jim Gray
Mayor

William O'Mara
Commissioner

ADDENDUM #2

RFP Number: 58-2015

Date: December 18, 2015

Subject: Design Services for Town Branch WWTP Primary Digester Complex Improvements

Address inquiries to:
Brian Marcum
(859) 258-3320

TO ALL PROSPECTIVE SUBMITTERS:

Please be advised of the following clarifications to the above referenced RFP:

Review meetings notes.

Pre-Bid Sign In sheet.

Mississippi State Report.

Question Deadline has been extended until Wednesday December 23, 2015 at 10:00 AM.

Todd Slatin, Director
Division of Central Purchasing

All other terms and conditions of the Bid and specifications are unchanged.
This letter should be signed, attached to and become a part of your Bid.

COMPANY NAME: Strand Associates, Inc.

ADDRESS: 1525 Bull Lea Road, Suite 100, Lexington, KY 4051

SIGNATURE OF BIDDER: matt schiel

12/17/2015
Notes
10:00 AM &
2:00PM Pre-Proposal Meeting

1. It was asked to quantify the number of hours for inspections, due to the difficulty we are changing that request to: Please provide a hourly rate for inspections. The number of hours will be negotiated in the contract.

2. Change Dates in Schedule and Completion for the Digester Complex Improvements

Digester Complex Improvements

Award Design Contract	January 2016
Meeting to Review Final Design – 90% Completion	~~June 2016~~ January 2017
Bid Opening	~~August 2016~~ April 2017
Award of GC Contract	~~October 2016~~ June 2017

3. Sherita Miller is the new Minority Business Enterprise Liaison for the Lexington-Fayette Urban County Government her phone number is 859-258-3323 and her email is smiller@lexingtonky.gov. Please contact her for assistance with DBE compliance.

4. Defined expectations of the detailed design for the alternate:

To further clarify the additive alternative portion of this RFP it is the desire the LFUCG Division of Water Quality for the consultant to base the detailed design on a new lean burn internal combustion engine, capable of being fueled by primary digester produced combustible gas, natural gas and/or a combination of both fuels, with an attached generator appropriately sized to provide electrical power to the primary digester complex and/or the solids processing building via power connections in and through the electrical substation(s) as required. The system should also recover the heat/steam produced to be used within the process.

5. Question was asked about Section 3, first paragraph last sentence. What is meant by "waste to energy group's energy recovery systems."?

Tiffany explained that there are different energy groups that sell complete systems. We would like a comparison of a complete system to using our existing structures and replacing with individual equipment. Is there a complete system that would be more efficient?

6. The question was asked if the original buildings and equipment were designed and installed as explosion proof. Mark answered that where explosion proof equipment is required the rooms and equipment are designed as explosion proof.

7. Mark stated that the biggest issue with the digester complex is his ability to mix as the sludge gets to 2.5 – 3%.

8. The question was asked why such a long construction period? My concern is with construction sequencing this will need to be evaluated closely. However I did change the dates as shown in #2. 18 months is the minimum construction time.

9. At the end of the meeting Mark mentioned that he would want the consultant to look at adding Primary Digester #3 into the loop with Primary Digesters #1 and #2. Right now he can co-mingle #1 and #2 but he doesn't have the capability with #3.

10. CHP completion date may be different from the digester and must not interfere with meeting our Consent Decree deadlines.

11. Preliminary engineering report will be required.

12. Construction Administration services have been increased in this proposal comparative to other please review appropriately.

13. We would like the gas analyzed and discuss cleaning of our system.

14. Mississippi State report will be included with addendum related to the CHP solution.

15. Please provide a narrowly defined solution for CHP using the existing building, this fee component will not be used in the evaluation of the proposal.

16. Record drawings are available for review call Tiffany Rank.

17. Have you drained and cleaned the grit from the digester? Yes all digesters have been drained and cleaned in the last 6 years.

18. What type of primary covers do we have? Floaters

19. Do we have any scum problems? In recent repairs not scum problems have been detected.

20. Do we currently accept grease? Yes, at the scum facility but are not currently reusing it.

21. We prefer ½ size prints during the review process.

SIGN-IN SHEET

Pre-Proposal #58-2015 Design Services for Town Branch WWTP Primary Digester Complex Improvements

December 17, 2015 @ 10:00 AM

Representative	Company Name	Phone#	Email Address
Brian Marcum	LFUCG	859-258-3320	brianm@lexingtonky.gov
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Charlie Begley	LFUCG - Town Branch	859-425-2414	Cbegley@Lexingtonky.gov
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JERRY McCLARY	HOR	859-629-4830	JERRY.MCCLARY@HOBJM.com
Tiffany Rank	LFUCG - DWQ	859-425-2400	tiffanyr@lexingtonky.gov
	December 17, 2015 @ 2:00pm		
Tiffany Rank	LFUCG - DWQ	859-425-2406	tiffanyr@lexingtonky.gov
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Clean Heat and Power Options for Town Branch Waste Water Treatment Plant Lexington, KY

Final Report

Prepared by the Southeast Clean Energy Application Center at Mississippi State University

August 12, 2011

SOUTHEAST
U.S. DOE
CLEAN ENERGY APPLICATION CENTER

DEPARTMENT OF ENERGY • UNITED STATES OF AMERICA •

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Executive Summary

Town Branch Waste Water Treatment Plant (Lexington, KY) has met with representatives of the US Department of Energy Southeast Clean Energy Application Center (CEAC) to investigate the possibility of utilizing a Clean Heat and Power (also known as Combined Heat and Power, CHP) application that would provide electricity and process heat for Town Branch.

As part of the CEAC technical assistance and outreach program, the CEAC has analyzed the Town Branch Waste Water Treatment Plant to evaluate the technical and economic feasibility of a CHP application.

This report examines the use of one CHP technology: an anaerobic digester gas fueled internal combustion engine. The system was selected due to the engine already being installed at the facility. Though currently not operational, the engine would be used for a CHP system at this facility.

This report analyzed the installation of a 400 kW generator for the internal combustion engine, along with a waste heat recovery system for the engine. This system could produce 1,752,000 kWh of electricity per year. Without the Federal renewable energy tax incentive (Investment Tax Credit), the payback period for the 400 kW generator and waste heat recovery system operating with 80% availability is less than one year. The project has a net present value of $808,532.49 with an internal rate of return of 160.102%. Since the system will produce over 30 kW of electricity, the electricity that is produced will be sold back to Kentucky Utilities for $.015/kWh. This preliminary assessment indicates an excellent opportunity for a CHP system at Town Branch Waste Water Treatment Plant. The CEAC recommends that Town Branch Waste Water Treatment Plant should immediately seek to initiate a more detailed engineering analysis to further investigate the technical, economic, and permitting issues related to the installation of a CHP system.

What is Clean Heat and Power?

CHP is an integrated energy system located at or near the point of use at a facility to provide at least a portion of the electrical or mechanical load while utilizing the waste/reject heat from the power application to provide heating, process heat, cooling, and/or dehumidification.[1]

Conventional electricity production as it exists today in the United States has an efficiency of only 33%.[2] The waste of nearly two-thirds of the internal energy from a fuel is generally accounted for by thermal losses resulting from the thermodynamic cycle used in standard electricity production. CHP systems capture and utilize these heat losses by applying thermal energy to existing needs.

Common thermal loads for CHP technology applications can be cooling, heating, and humidity control systems for buildings; steam production for industrial processes; and supply hot water where the need exists. CHP can also utilize opportunity fuels such as LFG, biomass, and digester gas. Many industrial processes in the pulp and paper industry recycle waste heat from processes and utilize thermal energy elsewhere in production. Landfill and agriculture applications that capture methane gas can also be used to fuel CHP generators. These systems can be utilized to meet power and thermal requirements of the facilities.

CHP Technology Applicable to Town Branch Waste Water Treatment Plant

CHP Equipment Selection

Selection of a system's CHP equipment is often dependent on the particular needs of a facility. Many CHP applications differ with respect to thermal loads, the electrical needs of the facility, and site requirements.

Generally, it is preferable to size the system based on thermal loads. Thermal loads are comparatively dynamic and greatly influence the size and type of heat recovery equipment required. Thermal requirements also vary in the type of thermal energy required.[3]

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[1] Department of Energy. "Combined Heat and Power (CHP) Regional Application Center Guidebook." Midwest CHP Application Center. January, 2003.

[2] "Basics." CHP Basics and Benefits. South East CHP Application Center. 27 July, 2007. <http://www.chpcenterse.org/03-00_chp.html>.

[3] "Thermal Design Approach." Combined Heat and Power of Cooling, Heating and Power systems. Integrated CHP Systems Corp. 27 July, 2007. <http://www.ichps.com/index.html>.

In some cases, the facility may not be able to utilize all of the electricity produced by the CHP system. Systems designed and engineered with the intention to sell energy back to the local utility differ from systems using all energy produced "inside the fence." Thermal energy may also be exported from the facility, influencing the size and configuration of prime mover technology.

Emissions, noise control, and aesthetics are examples of site requirements which may influence the selection of prime mover, recovery, exhaust treatment, and other equipment. These factors must all be considered when assessing a potential CHP application.

The Town Branch Waste Water Treatment Plant

According to facility personnel, the facility operates for 8,760 hours per year. The facility has an approximate annual electrical usage of 12.9 million kWh. The blended electrical energy cost, based on Kentucky Utilities' rate, is estimated to be $0.056/kWh. Kentucky Utilities will buy back electricity produced by the plant at the cost avoided rate of $0.015/kWh. Due to net metering policy, Kentucky Utilites will only buy back electricity at the cost avoided rate for any system that produces more than 30 kW. Production of electricity at 30 kW with the currently installed engine would be greatly inefficient and would not be beneficial. For this reason, this report investigates the production of 400 kW of electricity.

CHP System Selection

The system considered for Town Branch Waste Water Treatment Plant consisted of a 6 cylinder internal combustion engine capable of meeting a small portion of the facility's electrical load. The engine would be fueled by digester gas produced by anaerobic digesters at the plant. The plant produces enough gas within the digestors to fuel the engine everyday for 16 hours. A generator would be installed to produce 400 kW of electricity. . Currently, excess digester gas is flared due to a lack of storage for the gas. The waste heat from the engine would be supplied to two heat exchangers, which supply heat to the anaerobic digestion process. The heat obtained from the engine exhaust would thus replace a portion of the heat supplied by natural gas usage that is currently suppied to the heat exchangers.

Incentives for Green Power

Federal Incentives

There are two Federal incentives for biomass-fueled CHP projects: 1) the Production Tax Credit (PTC) and 2) the Investment Tax Credit (ITC). The PTC and ITC are mutually exclusive options. The Production Tax Credit offers a benefit of $0.021 per kilowatt-hour (kWh) for each kilowatt-hour delivered to the grid over the year. The Production Tax Credit is non-refundable, so any benefit that exceeds the facility's tax liability is forfeited. The Investment Tax Credit is a credit of 30% of the total installed cost of a biomass cogeneration facility or 10% of the total installed cost for a natural gas fired cogeneration facility. Unlike the Production Tax Credit, the Investment Tax Credit is a refundable tax credit. However, the refunded amount is taxable in the next tax year. Since the focus of this analysis is not placed on net-metering, only the Investment Tax Credit will be considered. Due to Town Branch being a part of the City of Lexington, the plant will not be able to use the Federal Tax Incentives. However, through the use of a third party with a leaseback arrangement, the tax credits may be implemented.

Economic Analysis Results

Table 1 presents the simple payback, implementation cost and annual savings for the CHP alternative. A preliminary assessment of a 30 kW generator was completed to compare to the proposed 400 kW generator.

Table 1 – CHP Alternative

Option	Annual Cost Savings($)	Implementation Cost ($)	Simple Payback (yr)	Internal Rate of Return	Net Present Value($)
Generator w/ Waste Heat Recovery System (400 kW)	194,963.46	121,752	0.624	160.02%	808,532.49
Generator w/ Waste Heat Recovery System (30 kW)	171,114.36	121,752	.712	149.49%	694,734.51
*Values above do not consider the Investment Tax Credit					

Option	Annual Cost Savings($)	Implementation Cost ($)	Simple Payback (yr)	Internal Rate of Return	Net Present Value ($)
Generator w/ Waste Heat Recovery System (400 kW)	194,963.46	86,472	.444	225.50%	843,812.49
Generator w/ Waste Heat Recovery System (30 kW)	171,114.36	86,472	.505	197.87%	730,014.51
*Values above do consider the Investment Tax Credit					

With the selection of the most favorable tax incentives, this option has a simple payback less than one year. Currently the value of the carbon emission credit does not appreciably affect the economic analysis. If federal regulations are placed on carbon emissions in the future, the carbon credits could become a significant portion of the project economics.

The following estimates for the system were made for the study:

- Installed Cost for 400 kW Generator $45,000
- Installed Cost for Waste Heat Recovery System $75,000
- Engine Inspection cost $4,152

This study utilizes a continuous operation scenario with 80% maximum availability, which has the effect of providing a realistic financial scenario by reducing the project payback.

CHP Emissions

Carbon Emissions Credits

Multiple computer applications exist to model the reduction in emissions achieved by the installation of CHP systems. The EPA provides a "CHP Emissions Calculator" that yields real world equivalents of reduced emissions. The EPA also provides emissions modeling assistance through their CHP program. Table 2 shows the emission reductions for the proposed system. Implementation of this CHP system would reduce emissions that would be equivalent the existence of 628 acres of forest or to the removal of 503 cars from the roads. The table describes the amount of emissions offsets from utilizing CHP technology at Town Branch over conventional grid supplied electricity. These estimates were derived from the EPA's CHP Emissions Calculator.

Table 2 - Emissions Reductions for CHP System Options

	Emissions Reductions
Annual Emissions	**Internal Combustion Engine (400 kW)**
NOx (tons/year)	-3.89*
CO2 (tons/year)	3,046
Carbon (metric tons/year)	753
Acres of Forest Equivalent	628
Number of Cars Removed	503

**Indicates a NOx emissions gain with the implementation of the CHP system.*

Currently, the carbon emissions credits may be sold on a voluntary basis with organizations such as the Chicago Climate Exchange[4]. The current price of carbon emissions on the Chicago Climate Exchange is $0.10 per metric ton. If federal regulations are placed on carbon emissions, the value of these carbon emissions credits could dramatically increase.

[4] http://www.chicagoclimateexchange.com/

Air Permitting

Although CHP systems reduce overall emission outputs, the current regulation that governs the operation of emissions producing equipment is based on fuel input instead of energy output. Therefore, a CHP installation's emissions output is modeled with respect to emissions produced under the maximum amount of operation hours per year. A CHP system must be analyzed to determine which permit is appropriate for the characteristics of a particular operation. In general, biomass fueled CHP systems are considered to be non-polluting sources and air permits are not required. This analysis is provided to support this claim.

A "Major Source" is defined by the EPA as "any source that emits or has the potential to emit 100 tons per year or more of any criteria air pollutant." Criteria air pollutants include "particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead." Under the 1990 Clean Air Act any major source is required to obtain a Title V permit. A Title V permit allows a party to operate a major source emitter but also outlines emissions monitoring, record keeping, and compliance. A preconstruction permit is also required if the source to be constructed qualifies as a major source. Under the New Source Review program differing types of permits may be distributed depending on whether or not the construction is taking place in an area of attainment or non attainment.[5]

The state of the Town Branch's air permit requirements is currently unknown. Although the addition of an anaerobic digester gas-fired CHP system is unlikely to affect the current environmental permitting requirements for the facility, a further analysis of the current air permits required by the facility should be conducted by the design engineer before installation of a CHP system.

[5] Information on Air Permitting requirement and procedures was obtained from the EPA's Air Permits website. For more information concerning Air Permitting access to the EPA Air Permitting website may be found at http://www.epa.gov/ebtpages/airairpopermits.html.

Conclusion

After an initial investigation, Town Branch Waste Water Treatment Plant has been shown to be an ideal candidate for an anaerobic digester gas CHP system. This assessment finds the installation of a 400 kW generator and waste heat recovery system for the previously installed internal combustion engine to be an economically attractive and viable option based on the performance parameters considered. The simple payback for this system was shown to be less than one year. If the Investment Tax Credit is to be obtained, the assistance of a third party will be required. Based on these findings, Town Branch Waste Water Treatment Plant should conduct a more detailed engineering study to further examine the technical and economic viability of this opportunity in the immediate future.

Appendix A – Economic Analysis

Initial Cost

The initial costs of installing the proposed system consists of the cost for the generator and heat recovery system for the already installed engine. Also included is the cost for an engine inspection by Kraft Power.

Generator := 42600 $

HeatRecoverySystem := 75000 $

Engine Inspection

Three nights lodging at $150 per night	$150 \cdot 3 = 450$
16 hours of work at $110 per hour	$16 \cdot 110 = 1.76 \times 10^3$
311 miles at $2 per mile	$311 \cdot 2 = 622$
12 hours of drive time at $110 per hour	$110 \cdot 12 = 1.32 \times 10^3$

EngineInspection := $450 + 1.76 \cdot 10^3 + 622 + 1.32 \cdot 10^3 = 4152$ $

IC := Generator + HeatRecoverySystem + EngineInspection = 121752 $ Total Initial Cost

Determine Electrical Energy Savings

Based on the amount of digester gas available, the hours of operation for the proposed system was determined to be approximately 16.5 hours per day.

Hr := $16.5 \cdot 365 = 6.022 \times 10^3$ Operating Hours Per Year

A suitable generator for the installed engine was rated at 400 kW. This was set as the proposed systems generating capacity. Using the generating capacity, a load factor of 80% and the annual operating hours, the annual electrical energy savings was determined

GenCapacity := 400 kW

LF := .8 Load Factor

$EnergySaving_{elect}$:= GenCapacity · Hr · LF

$EnergySaving_{elect} = 1.927 \times 10^6$ kWh/yr Annual Electrical Energy Savings

Based on data for the installed engine, the amount of energy that could be recovered annually from the exhaust was determined. The heat recovery system for this engine could recover 75% of the exhaust

Energy from Exhaust = 3.315 x 10^6 BTU/hr

$$EnergySavings_{thermal} := \frac{3.315 \cdot 10^6}{10^6} \cdot Hr \cdot .75 \qquad EnergySavings_{thermal} = 1.497 \times 10^4 \text{ MMBTU/yr}$$

Determine annual cost savings based on an electrical utility rate of $0.015/kWh and a natural gas rate of $11.09/MMBTU.

URE := .015 $/kWh Usage rate of electricity from local utility

URNG := 11.09 $/MMBTU Usage rate of natural gas

The total cost savings is the sum of the electrical and thermal energy savings multiplied by their respective rate.

$$CS := EnergySaving_{elect} \cdot (URE) + EnergySavings_{thermal} \cdot URNG$$

$\boxed{CS = 194963.46}$ Total annual cost savings

Determine Payback with and without Federal Incentive

The Simple Payback is the Initial Cost divided by the Cost savings.

$$SimplePayback := \frac{IC}{CS}$$

$\boxed{SimplePayback = 0.624}$ Years Simple Payback without Federal Incentive

$TaxCredit := (IC - EngineInspection) \cdot .3 = 35280$ The 30% Credit for Installed Cost

$ICTax := IC - TaxCredit = 86472$ Initial Cost ($) with Federal Incentive

$$SimplePayback_{Tax} := \frac{ICTax}{CS}$$

$\boxed{SimplePayback_{Tax} = 0.444}$ Years Simple Payback with Federal Incentive

r := 1 (initial guess for internal rate of return for given/find solve block)

Given

$$-IC + \sum_{n=1}^{9} \frac{CS}{(1+r)^n} = 0$$

$IRR := Find(r)$ $IRR = 160.102 \cdot \%$ The option has an internal rate of return of 160.102%

$$NPV := -IC + \sum_{n=1}^{9} \frac{CS}{(1 + 0.15)^n}$$

$NPV = 808532.49$ Therefore, the option has a net present value of $808,532.49

The net present value estimate above assumes that the facility could receive an interest rate of 15.0% if they were to invest the implementation and operating costs in another option. While this value might seem high, it helps to ensure that the net present value quoted is a conservative estimate.

$r := 1$ (initial guess for internal rate of return for given/find solve block)

Given

$$-ICTax + \sum_{n=1}^{9} \frac{CS}{(1 + r)^n} = 0$$

$IRR := Find(r)$ $IRR = 225.459 \cdot \%$ The option with the federal incentive has an internal rate of return of 225.459%

$$NPV := -ICTax + \sum_{n=1}^{9} \frac{CS}{(1 + 0.15)^n}$$

$NPV = 843812.49$ Therefore, the option with the federal incentive has a net present value of $843,812.49

Appendix B – EPA CHP Emissions Calculator Models

Appendix C – Supporting Documentation

CHP Results

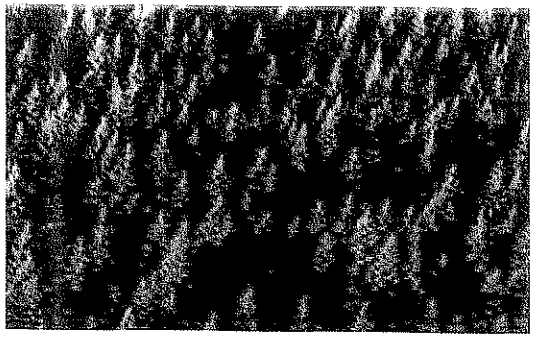
The results generated by the CHP Emissions Calculator are intended for eductional and outreach purposes only; it is not designed for use in developing emission inventories or preparing air permit applications.

Annual Emissions Analysis					
	CHP System	Displaced Electricity Production	Displaced Thermal Production	Emissions/Fuel Reduction	Percent Reduction
NOx (tons/year)	7.79	3.29	0.61	(3.89)	-100%
SO2 (tons/year)	-	9.07	0.00	9.07	100%
CO2 (tons/year)	-	2,337	709	3,046	100%
Carbon (metric tons/year)	-	578	175	753	100%
Fuel Consumption (MMBtu/year)	29,232	25,224	12,150	8,142	22%
Acres of Forest Equivalent				628	
Number of Cars Removed				503	

This CHP project will reduce emissions of Carbon Dioxide (CO2) by 3,046 tons per year

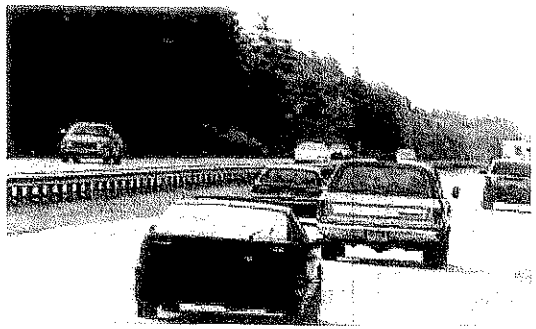
This is equal to 753 metric tons of carbon equivalent (MTCE) per year

This reduction is equal to removing the carbon that would be absorbed by 628 acres of forest



OR

This reduction is equal to removing the carbon emissions of 503 cars



CHP Results

CHP Technology:	Recip Engine - Lean Burn	
Fuel:	Other (including renewables)	
Unit Capacity:	400	kW
Number of Units:	1	
Total CHP Capacity:	400	kW
Operation:	5,840	hours per year
Heat Rate:	12,514	Btu/kWh HHV
CHP Fuel Consumption:	29,232	MMBtu/year
Duct Burner Fuel Consumption:	-	MMBtu/year
Total Fuel Consumption:	**29,232**	**MMBtu/year**
Total CHP Generation:	**2,336**	**MWh/year**
Useful CHP Thermal Output:	9,720	MMBtu/year for thermal applications (non-cooling)
	-	MMBtu/year for electric applications (cooling and electric heating)
	9,720	**MMBtu/year Total**
Displaced On-Site Production for Thermal (non-cooling) Applications:		Existing Gas Boiler
	0.10	lb/MMBtu NOx
	0.00%	sulfur content
Displaced Electric Service (cooling and electric heating):	There is no displaced cooling service	
Displaced Electricity Profile:	eGRID Average Fossil 2005	
Egrid State:	US Average	
Distribution Losses:	8%	
Displaced Electricity Production:	2,336	MWh/year CHP generation
	-	MWh/year Displaced Electric Demand (cooling)
	-	MWh/year Displaced Electric Demand (electric heating)
	203	MWh/year Transmission Losses
	2,539	**MWh/year Total**

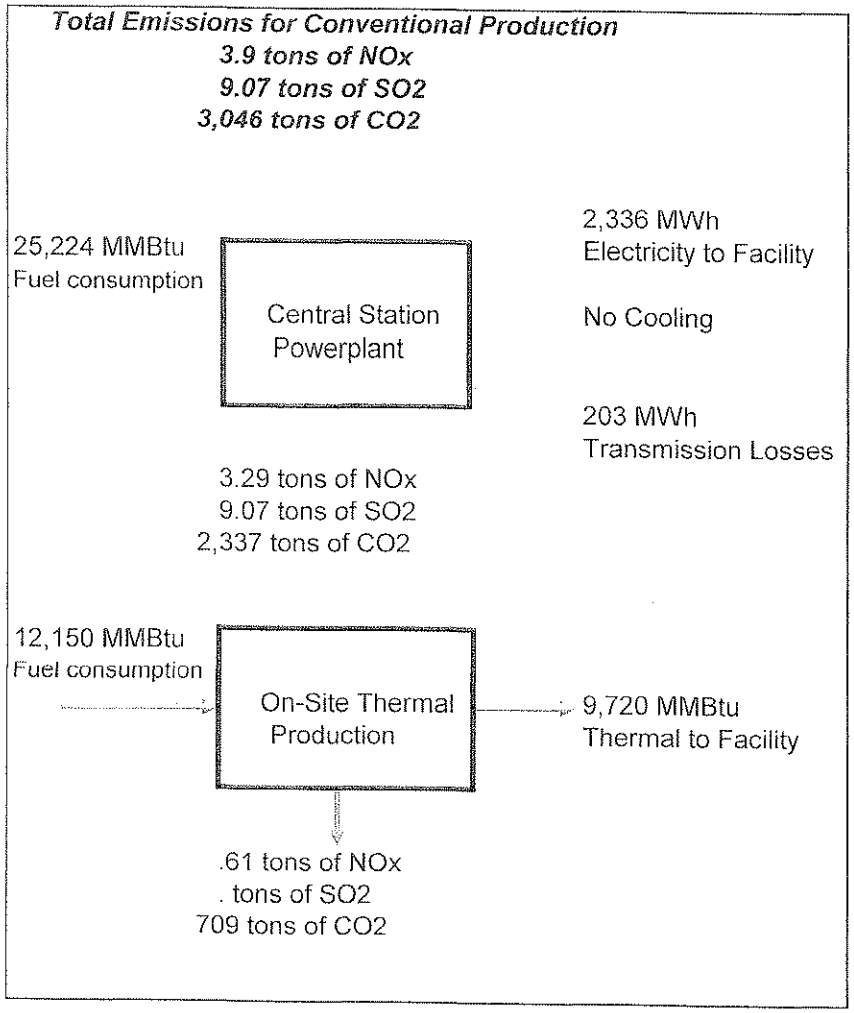
CHP Results

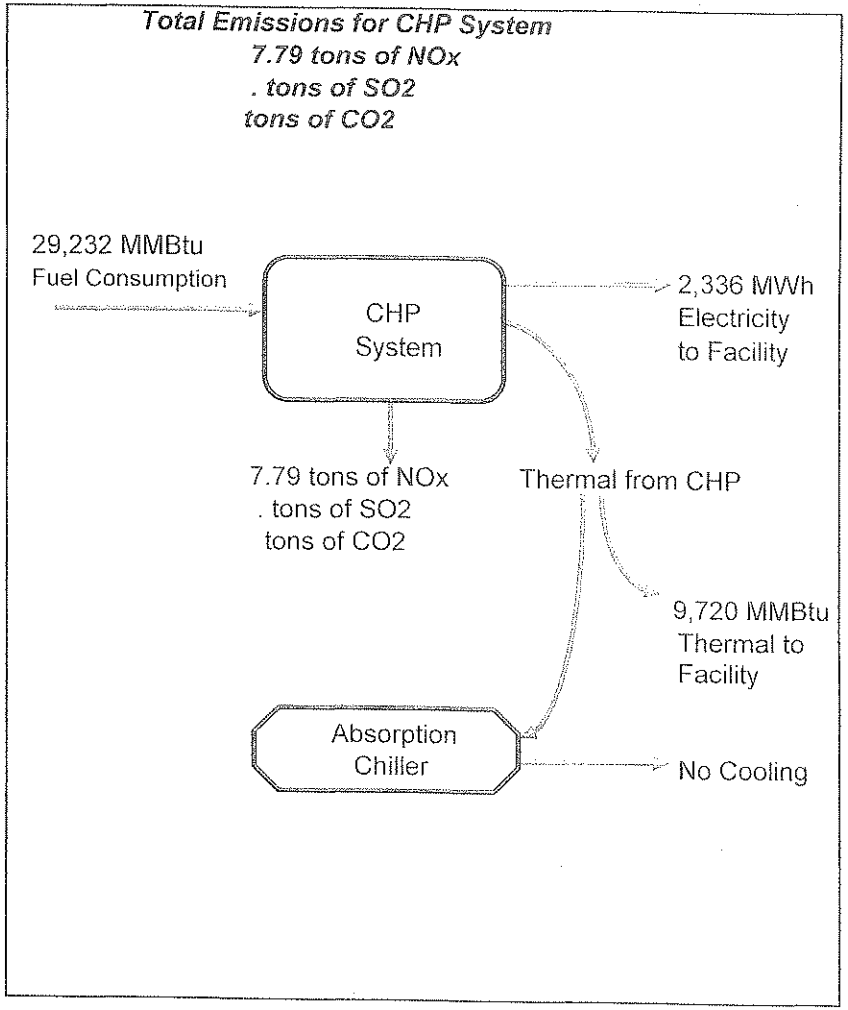
Annual Analysis for CHP				
	CHP System: Recip Engine - Lean Burn			Total Emissions from CHP System
NOx (tons/year)	7.79	-		7.79
SO2 (tons/year)	-	-		-
CO2 (tons/year)	-	-		-
Carbon (metric tons/year)	-	-		-
Fuel Consumption (MMBtu/year)	29,232	-		29,232

Annual Analysis for Displaced Production for Thermal (non-cooling) Applications				
				Total Displaced Emissions from Thermal Production
NOx (tons/year)				0.61
SO2 (tons/year)				0.00
CO2 (tons/year)				709
Carbon (metric tons/year)				175
Fuel Consumption (MMBtu/year)				12,150

Annual Analysis for Displaced Electricity Production					
	Displaced CHP Electricity Generation	Displaced Electricity for Cooling	Displaced Electricity for Heating	Transmission Losses	Total Displaced Emissions from Electricity Generation
NOx (tons/year)	3.03	-	-	0.26	3.29
SO2 (tons/year)	8.34	-	-	0.73	9.07
CO2 (tons/year)	2,150	-	-	186.98	2,337
Carbon (metric tons/year)	532	-	-	46	578
Fuel Consumption (MMBtu/year)	23,206	-	-	2,018	25,224

CHP Results


Total Emissions for Conventional Production
3.9 tons of NOx
9.07 tons of SO2
3,046 tons of CO2
25,224 MMBtu
Fuel consumption
Central Station
Powerplant
2,336 MWh
Electricity to Facility
No Cooling
203 MWh
Transmission Losses
3.29 tons of NOx
9.07 tons of SO2
2,337 tons of CO2
12,150 MMBtu
Fuel consumption
On-Site Thermal
Production
9,720 MMBtu
Thermal to Facility
.61 tons of NOx
. tons of SO2
709 tons of CO2


Total Emissions for CHP System
7.79 tons of NOx
. tons of SO2
tons of CO2
29,232 MMBtu
Fuel Consumption
CHP
System
2,336 MWh
Electricity
to Facility
7.79 tons of NOx
. tons of SO2
tons of CO2
Thermal from CHP
9,720 MMBtu
Thermal to
Facility
Absorption
Chiller
No Cooling

CHP Results

Emission Rates			
	CHP System including Duct Burners	Recip Engine - Lean Burn Alone	Displaced Electricity
NOx (lb/MWh)	6.67	6.67	2.59
SO2 (lb/MWh)	-	-	7.14
CO2 (lb/MWh)	-	-	1,841

Emission Rates	
	Displaced Thermal Production
NOx (lb/MMBtu)	0.10
SO2 (lb/MMBtu)	0.00059
CO2 (lb/MMBtu)	117

Appendix C – Supporting Documentation

Untitled

From: Rob Hovanec [mailto:rhovanec@kraftpower.com]
Sent: Tue 6/15/2010 7:13 AM
To: Chad Wheeley
Subject: RE: Waukesha Engine info

Chad, As per our conversation last week about a quote on the 3521 in Ky. I would suggest an inspection of the engine, which would include bore-scope of all cylinders, leak test cooling system, and checking main and rod bearings. Kraft's hourly rate $110.00, per diem and lodging $150.00, mileage $2.00 per mile, 16 hours plus drive time should cover it.

Thank-you Rob Hovanec Kraft Power

-----Original Message-----
From: Chad Wheeley [mailto:wheeley@me.msstate.edu]
Sent: Friday, June 11, 2010 11:44 AM
To: Rob Hovanec
Subject: Waukesha Engine info

Rob,

My name is Chad Wheeley and I am a research associate with the US DOE Southeast Clean Energy Application Center at Mississippi State University. We spoke on the phone this morning regarding a Waukesha engine to be run of anaerobic digester gas. Information from the engine nameplate is as follows:

Model # F3521GSIU
Size: 9-3/8 x 8-1/2
Spec: G48835
Serial # 400923
Gov. Speed: 1000 L.D.

The facility we are working with has not run the engine for a number of years but is considering bringing it back online in the near future. If possible, can you forward me a spec sheet as well as any other technical data on operation of the engine (i.e. anaerobic digester gas fuel input rate, available energy that can be recovered from waste heat, etc.)?
Also, could you provide an unofficial quote for the cost of overhauling the engine as well as the annual cost of a service contract? As I mentioned, the facility stated that there was a "blower" operated by the engine that was used to transport waste heat from the exhaust to another building on site. What they are interested in doing now is generating as much power as they can from the digester gas and using the waste heat from the exhaust to offset some of the heat exchanger loads they have from the digester gas production process. I have attached some photos of the engine as well.

Thanks for your time,

Chad Wheeley

Research Associate II
DOE Clean Energy Application Center - Southeast Mississippi State University
(662) 325-3716
(662) 325-0102 - fax
wheeley@me.msstate.edu

From:	Jim Sayre [jsayre@kraftpower.com]
Sent:	Tuesday, July 27, 2010 9:58 AM
To:	James Welsh
Cc:	Bob Schleifer; Rob Hovanec
Subject:	RE: Generator info for Waukesha engine.
Attachments:	DOC072710.pdf

Mr. Welsh,

Rob Hovanec asked me if I could assist you on this project. We recently priced out a generator for a similar application, so I'm going to share that with you to get you a quick answer.

First of all, I notice that your unit is running at 1,000 RPM. This would have to be changed to either 900 or 1,200 for 60Hz power generation. I recommend 1,200RPM because of better engine output as well as generator availability. A 900RPM generator would be hard to find for this HP range. Below is the pricing for the generator. You could probably go with a larger generator (450-500KW) depending on how comfortable you are with the condition of your unit. If you bump it to 1,200 RPM, you would have about ~700 BHP to work with depending on the exact component configuration of your unit. However, this does give you an idea of the magnitude of the pricing you are looking at.

A suitable generator end for this engine would be as follows (if you are looking to generate power at 480/277V AC, 3PH):

Leroy Somer, synchronous brushless revolving field generator with direct connected rotating brushless exciter:

6 pole, 1,200RPM, Model MTG626 generator: $42,594.00 (Plus any taxes and freight).

Rated: 400KW
Power Factor: 0.8
KVA: 500
Voltage: 480/277
Frequency: 60Hz
Connection: 6/ Wye
Temp Rise: 80C over 40C ambient, continuous duty
Insulation: Class H
Enclosure Type: IP22
Bearing: Sealed Anti-friction
LS6512B Voltage Regulator, ±.5% accuracy, 3 phase sensing UFL regulation
2/3 Stator Winding Pitch
Form Wound Stator Coils
Permanent Magnet Generator (PMG)
Terminal Stand-Offs
Droop Paralleling Kit
Commercial Space Heater, (4) Wire 120 / 240 volt

Options:
(6) Stator RTD's, (2) per Phase 100 Ohm Platinum, $1300 each.
(2) Bearing RTD's, (1) per bearing 100 Ohm Platinum, $500 each.

Keep in mind that additional research will be needed to determine how your engine is setup exactly, and if any engine component or system modifications are needed in order to achieve proper performance at 1200 RPM. The only issues that come to mind would be the fuel system, governor, and/or turbo/intercooler setup. Also your cooling system would have to be looked at to make sure you had enough heat reduction for the additional HP you would be making at 1,200 RPM (provided you actually have enough plant load to utilize the available engine BHP).

For heat balance information, please see the attached scanned section of an older tech data book which should be similar to your unit.

For BMEP you will want to use the 138psi rows, that's pretty much the maximum BMEP for continuous duty ratings.

If you have any questions, please advise.

Have a good day,

Jim Sayre

Kraft Power Corp. - Ohio
4039 Millennium Blvd, SE
Massillon, OH 44646-9606

Tel: (330) 830-4158
Fax: (330) 830-5175

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From: Jim Sayre [jsayre@kraftpower.com]
Sent: Wednesday, August 18, 2010 10:10 AM
To: James Welsh
Subject: RE: Generator info for Waukesha engine.

James,

If you are just looking for round numbers, I just did a heat recovery system for a 375KW unit that would be similar. The system on those produced 210 degree water using about 75% of the recoverable heat from the exhaust and jacket water circuits. Ballpark pricing on it was around $75k.

Jim Sayre

2009 Data

SENT BY TOWN BRANCH PERSONNEL

	A	B	C	D	E	F
1						
2			Pri Dig 1 Gas	Pri Dig 2 Gas	Pri Dig 3 Gas	Total Dig Gas
3			Production	Production	Production	Production
4						
5		01/01/09	76,400	106,800	69,800	253,000.00
6		01/02/09	72,700	103,800	62,600	239,100.00
7		01/03/09	75,400	106,300	64,500	246,200.00
8		01/04/09	79,200	111,200	68,000	258,400.00
9		01/05/09	79,280	107,920	65,940	253,140.00
10		01/06/09	73,530	99,430	66,910	239,870.00
11		01/07/09	85,500	120,200	79,500	285,200.00
12		01/08/09	83,400	116,900	81,300	281,600.00
13		01/09/09	75,200	102,100	73,900	251,200.00
14		01/10/09	80,400	108,000	71,800	260,200.00
15		01/11/09	75,300	104,600	69,800	249,700.00
16		01/12/09	72,730	95,440	62,430	230,600.00
17		01/13/09	78,960	106,060	69,060	254,080.00
18		01/14/09	73,900	101,600	65,800	241,300.00
19		01/15/09	81,000	108,300	73,700	263,000.00
20		01/16/09	79,570	103,650	72,410	255,630.00
21		01/17/09	78,600	105,600	71,700	255,900.00
22		01/18/09	74,500	99,000	66,700	240,200.00
23		01/19/09	69,790	90,030	59,190	219,010.00
24		01/20/09	79,850	101,450	70,470	251,770.00
25		01/21/09	72,800	104,200	70,000	247,000.00
26		01/22/09	85,000	113,300	76,800	275,100.00
27		01/23/09	85,800	114,100	73,400	273,300.00
28		01/24/09	80,800	109,500	69,800	260,100.00
29		01/25/09	74,800	99,000	65,700	239,500.00
30		01/26/09	72,170	95,710	60,860	228,740.00
31		01/27/09	72,610	96,570	62,090	231,270.00
32		01/28/09	75,780	102,270	67,200	245,250.00
33		01/29/09	81,500	107,710	72,090	261,300.00
34		01/30/09	64,500	79,700	50,400	194,600.00
35		01/31/09	66,000	81,200	53,400	200,600.00
36		02/01/09	62,500	75,100	40,400	178,000.00
37		02/02/09	66,570	83,940	50,460	200,970.00
38		02/03/09	62,060	79,550	50,890	192,500.00
39		02/04/09	58,100	75,200	51,300	184,600.00
40		02/05/09	62,700	80,900	53,800	197,400.00
41		02/06/09	68,600	92,600	61,000	222,200.00
42		02/07/09	83,800	113,700	72,200	269,700.00
43		02/08/09	70,000	109,200	64,800	244,000.00
44		02/09/09	72,670	98,750	60,610	232,030.00
45		02/10/09	73,700	95,430	58,940	228,070.00
46		02/11/09	73,900	100,600	65,900	240,400.00
47		02/12/09	61,900	95,700	51,400	209,000.00
48		02/13/09	77,700	108,100	59,800	245,600.00
49		02/14/09	82,500	117,000	69,100	268,600.00
50		02/15/09	70,200	99,370	61,760	231,330.00
51		02/16/09	67,680	97,500	61,840	227,020.00
52		02/17/09	76,560	103,100	62,350	242,010.00
53		02/18/09	87,000	124,100	76,600	287,700.00
54		02/19/09	85,000	115,100	73,500	273,600.00
55		02/20/09	80,000	109,700	73,500	263,200.00
56		02/21/09	79,300	105,600	64,900	249,800.00
57		02/22/09	75,810	105,540	67,000	248,350.00
58		02/23/09	80,030	113,360	74,230	267,620.00
59		02/24/09	81,090	114,980	73,680	269,750.00
60		02/25/09	74,000	110,300	66,000	250,300.00

	A	B	C	D	E	F
61		02/26/09	84,200	126,000	76,400	286,600.00
62		02/27/09	86,100	129,900	80,200	296,200.00
63		02/28/09	83,200	128,900	81,700	293,800.00
64		03/01/09	48,200	111,700	69,700	229,600.00
65		03/02/09	26,740	80,760	50,760	158,260.00
66		03/03/09	49,190	122,530	72,730	244,450.00
67		03/04/09	81,000	125,500	78,600	285,100.00
68		03/05/09	84,800	124,900	73,300	283,000.00
69		03/06/09	79,100	122,000	69,800	270,900.00
70		03/07/09	84,500	119,000	73,700	277,200.00
71		03/08/09	76,300	129,300	69,200	274,800.00
72		03/09/09	78,810	121,920	71,640	272,370.00
73		03/10/09	83,460	124,180	72,840	280,480.00
74		03/11/09	78,700	117,400	74,200	270,300.00
75		03/12/09	78,800	116,200	81,600	276,600.00
76		03/13/09	82,700	118,500	78,200	279,400.00
77		03/14/09	79,900	116,800	71,700	268,400.00
78		03/15/09	77,600	112,000	63,400	253,000.00
79		03/16/09	86,250	126,270	68,270	280,790.00
80		03/17/09	67,820	105,800	55,240	228,860.00
81		03/18/09	75,500	118,100	67,900	261,500.00
82		03/19/09	83,400	126,400	77,900	287,700.00
83		03/20/09	82,100	120,000	74,400	276,500.00
84		03/21/09	75,100	109,000	64,700	248,800.00
85		03/22/09	78,900	114,700	68,600	262,200.00
86		03/23/09	79,800	117,330	73,390	270,520.00
87		03/24/09	79,880	124,510	76,000	280,390.00
88		03/25/09	93,100	151,300	86,300	330,700.00
89		03/26/09	91,800	147,100	89,600	328,500.00
90		03/27/09	84,800	137,300	81,500	303,600.00
91		03/28/09	72,300	112,500	63,900	248,700.00
92		03/29/09	71,600	104,700	59,200	235,500.00
93		03/30/09	73,180	106,910	59,180	239,270.00
94		03/31/09	66,540	105,780	59,620	231,940.00
95		04/01/09	70,800	114,500	67,800	253,100.00
96		04/02/09	74,900	116,800	69,300	261,000.00
97		04/03/09	73,100	115,200	67,100	255,400.00
98		04/04/09	73,200	114,000	70,100	257,300.00
99		04/05/09	67,500	109,900	63,700	241,100.00
100		04/06/09	70,030	111,310	66,650	247,990.00
101		04/07/09	67,140	101,940	65,150	234,230.00
102		04/08/09	70,710	112,660	70,740	254,110.00
103		04/09/09	76,320	128,100	79,620	284,040.00
104		04/10/09	78,560	133,890	84,650	297,100.00
105		04/11/09	78,100	134,100	84,300	296,500.00
106		04/12/09	64,800	109,000	65,000	238,800.00
107		04/13/09	66,160	110,660	64,430	241,250.00
108		04/14/09	62,290	104,220	61,970	228,480.00
109		04/15/09	69,500	107,800	66,700	244,000.00
110		04/16/09	74,500	113,900	68,800	257,200.00
111		04/17/09	77,800	126,400	72,700	276,900.00
112		04/18/09	81,500	139,800	78,900	300,200.00
113		04/19/09	75,300	133,500	75,000	283,800.00
114		04/20/09	83,730	143,440	86,850	314,020.00
115		04/21/09	80,490	130,170	78,260	288,920.00
116		04/22/09	75,240	122,800	68,090	266,130.00
117		04/23/09	75,150	124,340	68,520	268,010.00
118		04/24/09	83,100	137,200	78,700	299,000.00
119		04/25/09	78,840	138,100	74,000	290,940.00
120		04/26/09	73,800	134,200	74,800	282,800.00

	A	B	C	D	E	F
121		04/27/09	73,580	134,020	73,370	280,970.00
122		04/28/09	68,960	121,800	68,600	259,360.00
123		04/29/09	77,700	135,400	80,100	293,200.00
124		04/30/09	72,300	126,800	82,700	281,800.00
125		05/01/09	77,800	132,700	84,500	295,000.00
126		05/02/09	92,200	148,000	87,500	327,700.00
127		05/03/09	76,200	125,700	71,900	273,800.00
128		05/04/09	67,280	108,170	60,320	235,770.00
129		05/05/09	77,000	127,240	71,420	275,660.00
130		05/06/09	89,200	147,000	79,700	315,900.00
131		05/07/09	91,700	147,600	80,900	320,200.00
132		05/08/09	96,100	156,100	89,700	341,900.00
133		05/09/09	84,200	139,100	81,100	304,400.00
134		05/10/09	74,400	126,600	70,100	271,100.00
135		05/11/09	60,640	103,000	53,450	217,090.00
136		05/12/09	72,640	122,830	64,240	259,710.00
137		05/13/09	83,100	143,100	77,600	303,800.00
138		05/14/09	78,900	133,500	75,300	287,700.00
139		05/15/09	80,200	134,100	76,000	290,300.00
140		05/16/09	76,100	130,800	73,000	279,900.00
141		05/17/09	70,200	121,400	66,100	257,700.00
142		05/18/09	73,560	122,370	69,100	265,030.00
143		05/19/09	76,960	130,410	72,180	279,550.00
144		05/20/09	85,700	144,800	84,900	315,400.00
145		05/21/09	85,200	148,200	85,600	319,000.00
146		05/22/09	82,400	143,000	79,100	304,500.00
147		05/23/09	78,700	138,000	73,200	289,900.00
148		05/24/09	70,000	124,900	63,900	258,800.00
149		05/25/09	66,670	118,290	58,680	243,640.00
150		05/26/09	66,270	114,300	58,160	238,730.00
151		05/27/09	71,600	116,100	60,300	248,000.00
152		05/28/09	76,000	122,900	65,000	263,900.00
153		05/29/09	83,500	136,000	73,200	292,700.00
154		05/30/09	84,900	140,200	77,000	302,100.00
155		05/31/09	83,300	136,200	72,900	292,400.00
156		06/01/09	85,030	137,060	69,480	291,570.00
157		06/02/09	79,230	132,540	71,220	282,990.00
158		06/03/09	76,700	136,200	74,600	287,500.00
159		06/04/09	71,500	125,900	72,800	270,200.00
160		06/05/09	81,800	135,000	83,000	299,800.00
161		06/06/09	82,500	131,160	76,360	290,020.00
162		06/07/09	81,300	122,900	69,600	273,800.00
163		06/08/09	74,680	109,010	58,360	242,050.00
164		06/09/09	79,080	113,740	60,850	253,670.00
165		06/10/09	73,700	110,100	61,200	245,000.00
166		06/11/09	92,700	141,600	82,300	316,600.00
167		06/12/09	87,600	141,500	74,200	303,300.00
168		06/13/09	75,230	123,860	58,670	257,760.00
169		06/14/09	59,300	90,600	40,000	189,900.00
170		06/15/09	66,410	96,050	45,790	208,250.00
171		06/16/09	83,050	93,980	66,720	243,750.00
172		06/17/09	75,300	149,500	60,800	285,600.00
173		06/18/09	67,300	108,900	53,900	230,100.00
174		06/19/09	86,700	136,400	71,100	294,200.00
175		06/20/09	72,300	117,900	53,300	243,500.00
176		06/21/09	64,400	106,600	45,400	216,400.00
177		06/22/09	71,300	115,700	79,500	266,500.00
178		06/23/09	77,540	128,210	30,400	236,150.00
179		06/24/09	74,700	121,200	59,500	255,400.00
180		06/25/09	80,300	128,400	64,900	273,600.00

	A	B	C	D	E	F
181		06/26/09	89,800	141,500	72,900	304,200.00
182		06/27/09	94,100	150,800	78,900	323,800.00
183		06/28/09	81,900	133,300	63,700	278,900.00
184		06/29/09	74,590	118,790	50,410	243,790.00
185		06/30/09	64,430	104,230	43,360	212,020.00
186		07/01/09	67,700	111,000	47,700	226,400.00
187		07/02/09	81,600	130,900	59,900	272,400.00
188		07/03/09	77,000	124,100	55,600	256,700.00
189		07/04/09	70,900	114,500	50,700	236,100.00
190		07/05/09	64,690	99,310	44,890	208,890.00
191		07/06/09	75,140	114,230	51,820	241,190.00
192		07/07/09	76,220	117,050	54,650	247,920.00
193		07/08/09	68,140	104,910	52,880	225,930.00
194		07/09/09	80,370	134,170	62,660	277,200.00
195		07/10/09	85,610	134,200	66,640	286,450.00
196		07/11/09	83,060	133,630	65,580	282,270.00
197		07/12/09	74,910	121,000	55,640	251,550.00
198		07/13/09	71,260	113,300	47,190	231,750.00
199		07/14/09	62,690	102,270	42,110	207,070.00
200		07/15/09	64,300	107,000	44,800	216,100.00
201		07/16/09	72,100	116,100	50,200	238,400.00
202		07/17/09	85,000	133,800	65,000	283,800.00
203		07/18/09	87,200	136,900	69,200	293,300.00
204		07/19/09	77,400	123,100	49,400	249,900.00
205		07/20/09	70,220	112,120	23,060	205,400.00
206		07/21/09	73,320	120,130	31,700	225,150.00
207		07/22/09	73,800	121,600	40,600	236,000.00
208		07/23/09	88,300	139,300	55,600	283,200.00
209		07/24/09	89,900	145,900	60,800	296,600.00
210		07/25/09	84,400	137,200	53,900	275,500.00
211		07/26/09	82,200	132,400	50,500	265,100.00
212		07/27/09	85,880	134,800	45,700	266,380.00
213		07/28/09	71,270	117,430	37,020	225,720.00
214		07/29/09	70,100	113,200	35,200	218,500.00
215		07/30/09	69,200	114,800	28,000	212,000.00
216		07/31/09	69,400	117,100	31,200	217,700.00
217		08/01/09	80,000	132,600	47,700	260,300.00
218		08/02/09	72,800	123,000	35,500	231,300.00
219		08/03/09	65,130	109,840	9,900	184,870.00
220		08/04/09	58,780	93,700	2,570	155,050.00
221		08/05/09	66,400	108,000	16,600	191,000.00
222		08/06/09	73,800	125,600	32,400	231,800.00
223		08/07/09	76,900	130,700	32,900	240,500.00
224		08/08/09	78,700	135,000	41,100	254,800.00
225		08/09/09	73,100	125,300	29,800	228,200.00
226		08/10/09	72,470	123,910	17,230	213,610.00
227		08/11/09	75,480	125,360	18,060	218,900.00
228		08/12/09	91,500	147,200	0	238,700.00
229		08/13/09	91,000	149,100	20	240,120.00
230		08/14/09	96,100	154,400	28,600	279,100.00
231		08/15/09	105,600	165,900	6,600	278,100.00
232		08/16/09	82,400	135,300	47,600	265,300.00
233		08/17/09	74,560	125,980	52,860	253,400.00
234		08/18/09	66,070	121,940	56,060	244,070.00
235		08/19/09	78,900	135,000	67,300	281,200.00
236		08/20/09	79,100	133,300	68,300	280,700.00
237		08/21/09	75,700	130,200	66,300	272,200.00
238		08/22/09	86,800	144,100	76,800	307,700.00
239		08/23/09	74,100	138,900	61,500	274,500.00
240		08/24/09	72,780	122,910	58,780	254,470.00

	A	B	C	D	E	F
241		08/25/09	75,580	124,490	59,450	259,520.00
242		08/26/09	71,600	119,800	57,900	249,300.00
243		08/27/09	77,100	127,300	62,700	267,100.00
244		08/28/09	76,800	127,800	65,100	269,700.00
245		08/29/09	92,800	152,200	85,100	330,100.00
246		08/30/09	75,600	127,600	65,400	268,600.00
247		08/31/09	63,420	106,220	50,180	219,820.00
248		09/01/09	62,280	106,300	50,060	218,640.00
249		09/02/09	73,900	126,600	63,200	263,700.00
250		09/03/09	85,700	139,400	72,900	298,000.00
251		09/04/09	83,200	136,500	72,200	291,900.00
252		09/05/09	75,300	125,300	64,300	264,900.00
253		09/06/09	69,500	114,600	57,700	241,800.00
254		09/07/09	68,340	112,770	55,450	236,560.00
255		09/08/09	77,620	130,060	67,310	274,990.00
256		09/09/09	73,600	124,000	63,700	261,300.00
257		09/10/09	85,400	143,700	77,900	307,000.00
258		09/11/09	74,400	130,500	65,100	270,000.00
259		09/12/09	75,800	125,000	60,700	261,500.00
260		09/13/09	86,100	137,800	71,400	295,300.00
261		09/14/09	74,590	119,390	58,670	252,650.00
262		09/15/09	77,060	123,850	59,770	260,680.00
263		09/16/09	73,300	122,900	62,500	258,700.00
264		09/17/09	72,100	120,500	61,900	254,500.00
265		09/18/09	82,400	135,000	71,500	288,900.00
266		09/19/09	84,200	137,400	75,700	297,300.00
267		09/20/09	74,500	125,100	66,000	265,600.00
268		09/21/09	78,050	132,060	70,890	281,000.00
269		09/22/09	84,310	133,880	74,490	292,680.00
270		09/23/09	85,000	139,900	74,900	299,800.00
271		09/24/09	93,900	151,600	85,000	330,500.00
272		09/25/09	98,000	155,200	90,000	343,200.00
273		09/26/09	97,900	154,100	91,800	343,800.00
274		09/27/09	81,120	134,400	72,270	287,790.00
275		09/28/09	75,930	135,390	73,030	284,350.00
276		09/29/09	75,130	115,310	59,590	250,030.00
277		09/30/09	73,100	121,700	62,800	257,600.00
278		10/01/09	81,560	134,000	72,400	287,960.00
279		10/02/09	83,540	137,500	75,300	296,340.00
280		10/03/09	85,300	141,600	80,900	307,800.00
281		10/04/09	74,400	123,900	66,000	264,300.00
282		10/05/09	73,990	123,600	63,630	261,220.00
283		10/06/09	67,680	113,930	59,890	241,500.00
284		10/07/09	70,400	117,500	61,000	248,900.00
285		10/08/09	72,900	121,900	64,300	259,100.00
286		10/09/09	91,500	148,500	86,100	326,100.00
287		10/10/09	105,300	166,100	103,700	375,100.00
288		10/11/09	82,500	138,300	78,000	298,800.00
289		10/12/09	79,080	130,720	71,630	281,430.00
290		10/13/09	74,710	123,520	60,380	258,610.00
291		10/14/09	92,300	149,000	12,900	254,200.00
292		10/15/09	94,300	150,500	60,800	305,600.00
293		10/16/09	80,500	129,100	71,800	281,400.00
294		10/17/09	76,900	121,100	67,900	265,900.00
295		10/18/09	77,800	122,200	71,100	271,100.00
296		10/19/09	78,720	122,200	71,690	272,610.00
297		10/20/09	76,730	123,370	74,400	274,500.00
298		10/21/09	72,400	121,400	66,900	260,700.00
299		10/22/09	74,900	123,200	71,200	269,300.00
300		10/23/09	89,300	142,900	88,900	321,100.00

	A	B	C	D	E	F
301		10/24/09	98,820	158,750	100,900	358,470.00
302		10/25/09	84,200	137,400	80,700	302,300.00
303		10/26/09	85,500	140,090	78,520	304,110.00
304		10/27/09	79,580	128,850	73,710	282,140.00
305		10/28/09	82,600	135,200	82,700	300,500.00
306		10/29/09	93,400	149,900	93,700	337,000.00
307		10/30/09	99,000	155,100	100,700	354,800.00
308		10/31/09	97,700	152,900	99,020	349,620.00
309		11/01/09	94,600	152,300	102,980	349,880.00
310		11/02/09	78,130	126,310	78,960	283,400.00
311		11/03/09	77,550	126,220	78,090	281,860.00
312		11/04/09	73,500	120,950	72,900	267,350.00
313		11/05/09	81,100	127,500	76,500	285,100.00
314		11/06/09	79,400	120,800	75,800	276,000.00
315		11/07/09	84,400	135,600	87,300	307,300.00
316		11/08/09	80,800	131,000	82,200	294,000.00
317		11/09/09	81,310	132,560	84,160	298,030.00
318		11/10/09	78,730	128,310	79,010	286,050.00
319		11/11/09	80,000	127,200	83,000	290,200.00
320		11/12/09	86,200	138,800	95,100	320,100.00
321		11/13/09	79,300	125,600	80,200	285,100.00
322		11/14/09	79,300	131,200	84,700	295,200.00
323		11/15/09	74,800	121,100	74,600	270,500.00
324		11/16/09	76,560	124,590	76,430	277,580.00
325		11/17/09	75,410	120,250	75,900	271,560.00
326		11/18/09	78,500	125,600	78,700	282,800.00
327		11/19/09	82,300	131,700	84,200	298,200.00
328		11/20/09	82,800	136,200	86,700	305,700.00
329		11/21/09	81,200	135,600	93,800	310,600.00
330		11/22/09	76,500	125,900	80,000	282,400.00
331		11/23/09	72,230	116,130	71,850	260,210.00
332		11/24/09	79,500	130,160	82,500	292,160.00
333		11/25/09	75,500	122,950	82,500	280,950.00
334		11/26/09	79,730	128,240	83,340	291,310.00
335		11/27/09	65,040	102,180	63,780	231,000.00
336		11/28/09	66,100	102,430	64,580	233,110.00
337		11/29/09	67,480	109,920	64,440	241,840.00
338		11/30/09	81,850	131,180	79,430	292,460.00
339		12/01/09	84,060	132,830	85,650	302,540.00
340		12/02/09	84,800	134,200	95,000	314,000.00
341		12/03/09	95,100	149,600	109,500	354,200.00
342		12/04/09	93,300	145,400	103,200	341,900.00
343		12/05/09	83,900	130,200	84,900	299,000.00
344		12/06/09	70,000	111,500	66,100	247,600.00
345		12/07/09	72,490	114,480	69,320	256,290.00
346		12/08/09	77,670	126,420	80,120	284,210.00
347		12/09/09	90,800	146,300	104,700	341,800.00
348		12/10/09	100,100	156,000	117,300	373,400.00
349		12/11/09	79,100	130,000	84,300	293,400.00
350		12/12/09	73,900	119,500	73,500	266,900.00
351		12/13/09	67,800	112,300	66,200	246,300.00
352		12/14/09	71,690	119,000	69,160	259,850.00
353		12/15/09	75,750	127,100	76,200	279,050.00
354		12/16/09	69,500	116,400	77,600	263,500.00
355		12/17/09	59,100	148,000	104,800	311,900.00
356		12/18/09	51,400	160,100	114,800	326,300.00
357		12/19/09	43,260	139,620	103,900	286,780.00
358		12/20/09	45,240	157,100	119,240	321,580.00
359		12/21/09	46,660	164,670	117,500	328,830.00
360		12/22/09	38,060	142,820	94,500	275,380.00

	A	B	C	D	E	F
361		12/23/09	30,430	115,470	71,950	217,850.00
362		12/24/09	51,320	150,380	94,290	295,990.00
363		12/25/09	49,460	126,490	79,320	255,270.00
364		12/26/09	50,200	121,200	78,900	250,300.00
365		12/27/09	50,600	119,300	74,200	244,100.00
366		12/28/09	48,640	113,870	72,750	235,260.00
367		12/29/09	53,170	121,590	77,230	251,990.00
368		12/30/09	52,200	117,000	78,600	247,800.00
369		12/31/09	56,900	128,100	85,800	270,800.00

2010 Data

SENT BY TOWN BRANCH PERSONNEL

	A	B	C	D	E	F
1						
2			Pri Dig 1 Gas	Pri Dig 2 Gas	Pri Dig 3 Gas	Total Dig Gas
3			Production	Production	Production	Production
4						
5		01/01/10	57,100	127,700	87,500	272,300.00
6		01/02/10	56,000	121,800	82,400	260,200.00
7		01/03/10	52,800	114,900	75,800	243,500.00
8		01/04/10	54,510	116,700	78,670	249,880.00
9		01/05/10	48,430	106,720	69,880	225,030.00
10		01/06/10	52,900	115,900	74,800	243,600.00
11		01/07/10	57,800	125,600	82,000	265,400.00
12		01/08/10	62,100	131,100	95,200	288,400.00
13		01/09/10	59,600	128,000	89,900	277,500.00
14		01/10/10	58,300	123,100	73,300	254,700.00
15		01/11/10	54,960	115,190	79,960	250,110.00
16		01/12/10	60,060	122,630	82,110	264,800.00
17		01/13/10	57,900	124,200	83,900	266,000.00
18		01/14/10	62,600	124,100	81,200	267,900.00
19		01/15/10	63,500	130,600	83,700	277,800.00
20		01/16/10	68,300	130,100	81,400	279,800.00
21		01/17/10	69,300	125,900	79,900	275,100.00
22		01/18/10	78,310	138,830	89,190	306,330.00
23		01/19/10	70,620	126,900	83,600	281,120.00
24		01/20/10	72,890	134,500	88,300	295,690.00
25		01/21/10	67,510	121,500	84,100	273,110.00
26		01/22/10	64,000	120,300	78,000	262,300.00
27		01/23/10	65,100	124,100	79,800	269,000.00
28		01/24/10	64,500	118,300	74,900	257,700.00
29		01/25/10	75,620	125,290	86,930	287,840.00
30		01/26/10	70,900	125,450	80,520	276,870.00
31		01/27/10	67,800	117,200	72,800	257,800.00
32		01/28/10	63,100	109,300	71,800	244,200.00
33		01/29/10	72,100	118,100	80,000	270,200.00
34		01/30/10	74,500	114,500	85,300	274,300.00
35		01/31/10	68,000	116,900	76,700	261,600.00
36		02/01/10	64,660	113,960	72,770	251,390.00
37		02/02/10	65,490	116,500	76,700	258,690.00
38		02/03/10	58,800	114,600	70,600	244,000.00
39		02/04/10	69,500	131,800	88,200	289,500.00
40		02/05/10	68,900	136,900	89,800	295,600.00
41		02/06/10	76,900	149,500	111,400	337,800.00
42		02/07/10	66,100	131,500	90,700	288,300.00
43		02/08/10	58,210	111,160	70,660	240,030.00
44		02/09/10	51,260	104,030	64,800	220,090.00
45		02/10/10	52,800	115,900	77,400	246,100.00
46		02/11/10	49,400	112,400	64,600	226,400.00
47		02/12/10	54,300	113,600	69,200	237,100.00
48		02/13/10	59,600	121,000	75,500	256,100.00
49		02/14/10	59,800	116,800	74,900	251,500.00
50		02/15/10	59,590	110,760	75,650	246,000.00
51		02/16/10	56,110	101,430	70,970	228,510.00
52		02/17/10	53,700	101,300	71,100	226,100.00
53		02/18/10	51,600	98,200	64,800	214,600.00
54		02/19/10	59,300	117,300	77,500	254,100.00
55		02/20/10	61,700	130,400	87,500	279,600.00
56		02/21/10	56,150	121,000	78,450	255,600.00
57		02/22/10	69,150	148,630	102,260	320,040.00
58		02/23/10	66,730	135,560	98,540	300,830.00
59		02/24/10	58,650	116,660	83,300	258,610.00
60		02/25/10	59,280	120,170	80,660	260,110.00

	A	B	C	D	E	F
61		02/26/10	64,600	125,880	83,560	274,040.00
62		02/27/10	72,200	140,900	93,900	307,000.00
63		02/28/10	56,800	114,700	75,600	247,100.00
64		03/01/10	49,130	102,370	67,730	219,230.00
65		03/02/10	59,210	124,410	84,070	267,690.00
66		03/03/10	68,500	142,000	97,800	308,300.00
67		03/04/10	65,100	131,100	84,300	280,500.00
68		03/05/10	70,000	138,400	98,300	306,700.00
69		03/06/10	72,200	128,000	84,000	284,200.00
70		03/07/10	69,400	120,200	71,700	261,300.00
71		03/08/10	69,180	122,760	69,220	261,160.00
72		03/09/10	62,010	110,000	64,770	236,780.00
73		03/10/10	94,100	157,000	98,500	349,600.00
74		03/11/10	82,300	140,800	85,000	308,100.00
75		03/12/10	83,200	142,400	87,000	312,600.00
76		03/13/10	82,000	135,300	84,300	301,600.00
77		03/14/10	69,700	115,200	69,500	254,400.00
78		03/15/10	61,360	97,440	58,030	216,830.00
79		03/16/10	78,610	126,450	80,670	285,730.00
80		03/17/10	83,700	136,700	81,700	302,100.00
81		03/18/10	74,000	114,400	72,900	261,300.00
82		03/19/10	80,000	129,000	75,700	284,700.00
83		03/20/10	88,800	145,200	90,400	324,400.00
84		03/21/10	77,000	131,000	73,600	281,600.00
85		03/22/10	62,280	105,390	55,130	222,800.00
86		03/23/10	89,520	144,730	93,320	327,570.00
87		03/24/10	97,400	153,100	95,100	345,600.00
88		03/25/10	81,200	131,200	77,700	290,100.00
89		03/26/10	84,100	138,000	89,700	311,800.00
90		03/27/10	83,000	137,000	90,500	310,500.00
91		03/28/10	74,600	124,000	76,900	275,500.00
92		03/29/10	68,890	112,050	70,290	251,230.00
93		03/30/10	81,780	129,920	80,600	292,300.00
94		03/31/10	89,400	141,100	82,800	313,300.00
95		04/01/10	81,000	131,700	70,300	283,000.00
96		04/02/10	95,500	157,100	94,600	347,200.00
97		04/03/10	85,200	140,900	78,900	305,000.00
98		04/04/10	83,700	139,500	84,400	307,600.00
99		04/05/10	65,700	115,740	61,530	242,970.00
100		04/06/10	78,810	131,250	83,800	293,860.00
101		04/07/10	91,200	152,900	88,300	332,400.00
102		04/08/10	84,200	131,700	76,300	292,200.00
103		04/09/10	87,500	135,600	76,400	299,500.00
104		04/10/10	91,300	145,500	89,100	325,900.00
105		04/11/10	76,500	129,200	76,100	281,800.00
106		04/12/10	63,340	106,620	58,290	228,250.00
107		04/13/10	86,390	141,590	88,210	316,190.00
108		04/14/10	93,850	158,700	96,000	348,550.00
109		04/15/10	75,800	135,300	72,400	283,500.00
110		04/16/10	78,500	132,600	69,100	280,200.00
111		04/17/10	84,500	138,200	81,800	304,500.00
112		04/18/10	84,500	138,000	86,900	309,400.00
113		04/19/10	67,640	112,400	67,060	247,100.00
114		04/20/10	79,200	130,780	80,390	290,370.00
115		04/21/10	90,600	143,500	90,000	324,100.00
116		04/22/10	86,500	141,000	88,700	316,200.00
117		04/23/10	78,800	133,500	82,900	295,200.00
118		04/24/10	74,100	126,000	75,500	275,600.00
119		04/25/10	81,000	133,700	85,000	299,700.00
120		04/26/10	72,130	115,520	74,020	261,670.00

	A	B	C	D	E	F
121		04/27/10	82,790	135,130	86,120	304,040.00
122		04/28/10	114,800	173,900	126,500	415,200.00
123		04/29/10	91,200	149,000	96,300	336,500.00
124		04/30/10	82,200	138,000	84,600	304,800.00
125		05/01/10	81,400	135,900	82,900	300,200.00
126		05/02/10	82,400	136,300	83,300	302,000.00
127		05/03/10	68,810	115,640	67,080	251,530.00
128		05/04/10	48,680	69,500	25,710	143,890.00
129		05/05/10	63,200	93,600	38,400	195,200.00
130		05/06/10	66,000	110,600	58,200	234,800.00
131		05/07/10	80,380	134,000	74,800	289,180.00
132		05/08/10	77,100	128,800	74,900	280,800.00
133		05/09/10	65,300	110,100	66,000	241,400.00
134		05/10/10	59,720	99,400	59,770	218,890.00
135		05/11/10				
136		05/12/10				
137		05/13/10				
138		05/14/10				
139		05/15/10				
140		05/16/10				
141		05/17/10				
142		05/18/10				
143		05/19/10				
144		05/20/10				
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	A	B	C	D	E	F
1						
2			Pri Dig 1 Gas	Pri Dig 2 Gas	Pri Dig 3 Gas	Total Dig Gas
3			Production	Production	Production	Production
4						
5		01/01/10	57,100	127,700	87,500	272,300.00
6		01/02/10	56,000	121,800	82,400	260,200.00
7		01/03/10	52,800	114,900	75,800	243,500.00
8		01/04/10	54,510	116,700	78,670	249,880.00
9		01/05/10	48,430	106,720	69,880	225,030.00
10		01/06/10	52,900	115,900	74,800	243,600.00
11		01/07/10	57,800	125,600	82,000	265,400.00
12		01/08/10	62,100	131,100	95,200	288,400.00
13		01/09/10	59,600	128,000	89,900	277,500.00
14		01/10/10	58,300	123,100	73,300	254,700.00
15		01/11/10	54,960	115,190	79,960	250,110.00
16		01/12/10	60,060	122,630	82,110	264,800.00
17		01/13/10	57,900	124,200	83,900	266,000.00
18		01/14/10	62,600	124,100	81,200	267,900.00
19		01/15/10	63,500	130,600	83,700	277,800.00
20		01/16/10	68,300	130,100	81,400	279,800.00
21		01/17/10	69,300	125,900	79,900	275,100.00
22		01/18/10	78,310	138,830	89,190	306,330.00
23		01/19/10	70,620	126,900	83,600	281,120.00
24		01/20/10	72,890	134,500	88,300	295,690.00
25		01/21/10	67,510	121,500	84,100	273,110.00
26		01/22/10	64,000	120,300	78,000	262,300.00
27		01/23/10	65,100	124,100	79,800	269,000.00
28		01/24/10	64,500	118,300	74,900	257,700.00
29		01/25/10	75,620	125,290	86,930	287,840.00
30		01/26/10	70,900	125,450	80,520	276,870.00
31		01/27/10	67,800	117,200	72,800	257,800.00
32		01/28/10	63,100	109,300	71,800	244,200.00
33		01/29/10	72,100	118,100	80,000	270,200.00
34		01/30/10	74,500	114,500	85,300	274,300.00
35		01/31/10	68,000	116,900	76,700	261,600.00
36		02/01/10	64,660	113,960	72,770	251,390.00
37		02/02/10	65,490	116,500	76,700	258,690.00
38		02/03/10	58,800	114,600	70,600	244,000.00
39		02/04/10	69,500	131,800	88,200	289,500.00
40		02/05/10	68,900	136,900	89,800	295,600.00
41		02/06/10	76,900	149,500	111,400	337,800.00
42		02/07/10	66,100	131,500	90,700	288,300.00
43		02/08/10	58,210	111,160	70,660	240,030.00
44		02/09/10	51,260	104,030	64,800	220,090.00
45		02/10/10	52,800	115,900	77,400	246,100.00
46		02/11/10	49,400	112,400	64,600	226,400.00
47		02/12/10	54,300	113,600	69,200	237,100.00
48		02/13/10	59,600	121,000	75,500	256,100.00
49		02/14/10	59,800	116,800	74,900	251,500.00
50		02/15/10	59,590	110,760	75,650	246,000.00
51		02/16/10	56,110	101,430	70,970	228,510.00
52		02/17/10	53,700	101,300	71,100	226,100.00
53		02/18/10	51,600	98,200	64,800	214,600.00
54		02/19/10	59,300	117,300	77,500	254,100.00
55		02/20/10	61,700	130,400	87,500	279,600.00
56		02/21/10	56,150	121,000	78,450	255,600.00
57		02/22/10	69,150	148,630	102,260	320,040.00
58		02/23/10	66,730	135,560	98,540	300,830.00
59		02/24/10	58,650	116,660	83,300	258,610.00
60		02/25/10	59,280	120,170	80,660	260,110.00

	A	B	C	D	E	F
61		02/26/10	64,600	125,880	83,560	274,040.00
62		02/27/10	72,200	140,900	93,900	307,000.00
63		02/28/10	56,800	114,700	75,600	247,100.00
64		03/01/10	49,130	102,370	67,730	219,230.00
65		03/02/10	59,210	124,410	84,070	267,690.00
66		03/03/10	68,500	142,000	97,800	308,300.00
67		03/04/10	65,100	131,100	84,300	280,500.00
68		03/05/10	70,000	138,400	98,300	306,700.00
69		03/06/10	72,200	128,000	84,000	284,200.00
70		03/07/10	69,400	120,200	71,700	261,300.00
71		03/08/10	69,180	122,760	69,220	261,160.00
72		03/09/10	62,010	110,000	64,770	236,780.00
73		03/10/10	94,100	157,000	98,500	349,600.00
74		03/11/10	82,300	140,800	85,000	308,100.00
75		03/12/10	83,200	142,400	87,000	312,600.00
76		03/13/10	82,000	135,300	84,300	301,600.00
77		03/14/10	69,700	115,200	69,500	254,400.00
78		03/15/10	61,360	97,440	58,030	216,830.00
79		03/16/10	78,610	126,450	80,670	285,730.00
80		03/17/10	83,700	136,700	81,700	302,100.00
81		03/18/10	74,000	114,400	72,900	261,300.00
82		03/19/10	80,000	129,000	75,700	284,700.00
83		03/20/10	88,800	145,200	90,400	324,400.00
84		03/21/10	77,000	131,000	73,600	281,600.00
85		03/22/10	62,280	105,390	55,130	222,800.00
86		03/23/10	89,520	144,730	93,320	327,570.00
87		03/24/10	97,400	153,100	95,100	345,600.00
88		03/25/10	81,200	131,200	77,700	290,100.00
89		03/26/10	84,100	138,000	89,700	311,800.00
90		03/27/10	83,000	137,000	90,500	310,500.00
91		03/28/10	74,600	124,000	76,900	275,500.00
92		03/29/10	68,890	112,050	70,290	251,230.00
93		03/30/10	81,780	129,920	80,600	292,300.00
94		03/31/10	89,400	141,100	82,800	313,300.00
95		04/01/10	81,000	131,700	70,300	283,000.00
96		04/02/10	95,500	157,100	94,600	347,200.00
97		04/03/10	85,200	140,900	78,900	305,000.00
98		04/04/10	83,700	139,500	84,400	307,600.00
99		04/05/10	65,700	115,740	61,530	242,970.00
100		04/06/10	78,810	131,250	83,800	293,860.00
101		04/07/10	91,200	152,900	88,300	332,400.00
102		04/08/10	84,200	131,700	76,300	292,200.00
103		04/09/10	87,500	135,600	76,400	299,500.00
104		04/10/10	91,300	145,500	89,100	325,900.00
105		04/11/10	76,500	129,200	76,100	281,800.00
106		04/12/10	63,340	106,620	58,290	228,250.00
107		04/13/10	86,390	141,590	88,210	316,190.00
108		04/14/10	93,850	158,700	96,000	348,550.00
109		04/15/10	75,800	135,300	72,400	283,500.00
110		04/16/10	78,500	132,600	69,100	280,200.00
111		04/17/10	84,500	138,200	81,800	304,500.00
112		04/18/10	84,500	138,000	86,900	309,400.00
113		04/19/10	67,640	112,400	67,060	247,100.00
114		04/20/10	79,200	130,780	80,390	290,370.00
115		04/21/10	90,600	143,500	90,000	324,100.00
116		04/22/10	86,500	141,000	88,700	316,200.00
117		04/23/10	78,800	133,500	82,900	295,200.00
118		04/24/10	74,100	126,000	75,500	275,600.00
119		04/25/10	81,000	133,700	85,000	299,700.00
120		04/26/10	72,130	115,520	74,020	261,670.00

	A	B	C	D	E	F
121		04/27/10	82,790	135,130	86,120	304,040.00
122		04/28/10	114,800	173,900	126,500	415,200.00
123		04/29/10	91,200	149,000	96,300	336,500.00
124		04/30/10	82,200	138,000	84,600	304,800.00
125		05/01/10	81,400	135,900	82,900	300,200.00
126		05/02/10	82,400	136,300	83,300	302,000.00
127		05/03/10	68,810	115,640	67,080	251,530.00
128		05/04/10	48,680	69,500	25,710	143,890.00
129		05/05/10	63,200	93,600	38,400	195,200.00
130		05/06/10	66,000	110,600	58,200	234,800.00
131		05/07/10	80,380	134,000	74,800	289,180.00
132		05/08/10	77,100	128,800	74,900	280,800.00
133		05/09/10	65,300	110,100	66,000	241,400.00
134		05/10/10	59,720	99,400	59,770	218,890.00
135		05/11/10				

Lexington-Fayette Urban County Government
DEPARTMENT OF FINANCE & ADMINISTRATION

Jim Gray
Mayor

William O'Mara
Commissioner

ADDENDUM #3

RFP Number: 58-2015

Date: December 28, 2015

Subject: Design Services for Town Branch WWTP Primary Digester Complex Improvements

Address inquiries to:
Brian Marcum
(859) 258-3320

TO ALL PROSPECTIVE SUBMITTERS:

Please be advised of the following clarifications to the above referenced RFP:

- Provide Age of the pumps, covers, boilers, heat exchangers, flare etc.
  There are 3 transfer pumps that were changed out about 8 years ago to Boerger Pumps. The rest of the major equipment is around 30 years old.

- Provide the Manufacturer of the covers, boilers, heat exchangers, pumps
  Covers, boilers, and heat exchangers are Envirex. Transfer pumps are Boerger. Plunger pumps are Komline Sanderson.

- Provide Digester gas quantities, if available. Two years of recent data should be sufficient.
  See attached file – Digester Gas Quantities

- Provide Solids/volatile solids loading to the digesters. Two years of recent data should be sufficient.
  See attached file – Solids-Volatile Solids

- After co-thickening of WAS and Primary Sludge, how does LFUCG currently process flow through the digesters?
  The sludge is process is as follows: Thickeners – Primary Digesters – Secondary Digesters – Dewatering.

- What is % TS of feed sludge (Co-thickened)?
  Between 2-2.5%

- Please provide digester design criteria including volumes and depths.
  From the 1989 Town Branch WWTP Pocket Manual:

Number:	3
Type:	3
Dimensions:	75'dia X 29'swd
Volume:	960,375 Gallons (Total)

Design Volatile Solids Loading:	21,500 lbs/day
Design Volatile Solids Reduction:	45%
Design Detention Time:	20 Days
Operating Temperature:	95 Degrees F
Type of Mixing:	gas

- Does LFUCG expect the consultant to do the gas sampling/analytical work? Would LFUCG be willing to either add an allowance for the analytical portion or contract the lab directly?
  LFUCG will expect the consultant to do the gas sampling/analytical work for any gas testing. LFUCG will expect the cost to be included in the contract. Also, attached are gas sampling results from 2012.

- Can LFUCG describe the location of and nature of leaking within the building? Is this limited to roof leaks?
  The leaks are happening mostly at pipe penetrations. There is also a possible side wall leak. If you would like to come and take a look at the areas just call to schedule a time.

- Should we assume that all doors and windows will require replacement?
  Yes, assume all doors and windows.

Attached Documents:
Digester Gas & Solids Reports
Gas Sampling Analysis

Todd Slatin

Todd Slatin, Director
Division of Central Purchasing

All other terms and conditions of the Bid and specifications are unchanged.
This letter should be signed, attached to and become a part of your Bid.

COMPANY NAME: Strand Associates, Inc.

ADDRESS: 1525 Bull Lea Road, Suite 100, Lexington, KY 4051

SIGNATURE OF BIDDER: _____

Digester Gas Quantities

YEARLY MONTHLY OPERATION REPORT SUMMARY
TOWNBRANCH

	RAW SLUDGE FLOW TO THICKENER	RAW THICKENED SL FLOW	WASTE THICKENED SL FLOW	TOTAL THICKENED SL FLOW TO DIGESTERS	METERED FLOW TO Digester 1	METERED FLOW TO Digester 2	METERED FLOW TO Digester 3	TOTAL METERED FLOW TO DIGESTERS	METERED DIGESTERS SL FLOW TO SEC DIG	PRI DIG 1 GAS Production	PRI DIG 2 GAS Production	PRI DIG 3 GAS Production	SEC DIG GAS Production	
	GALLONS	GALLONS	GALLONS	GALLONS	GALLONS	GALLONS	GALLONS	GALLONS	GALLONS	CF	CF	CF	CF	
MONTHS	7001	8001	8011	9001	9101	9201	9301	9011	9601	9191	9291	9391	9691	
Jan '14	12,387,300			3,628,000	1,135,350	1,209,380	1,283,270	3,628,000	3,541,060	2,345,760	3,428,550	3,037,730	0	
Feb '14	10,977,500			3,082,040	969,820	1,026,070	1,086,150	3,082,040	3,002,700	2,141,210	3,161,280	2,220,810	0	
Mar '14	12,569,300			4,131,530	1,409,010	1,209,590	1,512,930	4,131,530	4,339,110	2,721,740	3,843,260	2,764,960	0	
Apr '14	12,501,400			3,562,660	1,272,680	1,013,350	1,376,630	3,662,660	3,932,890	2,757,560	4,113,910	2,855,840	0	
May '14	13,969,400			3,883,940	1,456,860	1,258,960	1,168,070	3,883,890	4,027,250	2,648,230	4,270,460	1,888,190	0	
Jun '14	13,576,600			3,672,580	1,247,570	1,137,270	1,287,740	3,672,580	3,701,730	2,345,430	3,720,770	2,175,300	0	
Jul '14	13,587,000			3,792,100	1,227,690	1,191,370	1,373,040	3,792,100	3,793,400	2,298,350	3,624,080	2,341,380	0	
Aug '14	13,756,700			3,846,690	1,237,800	1,229,510	1,379,380	3,846,690	3,886,920	2,317,460	3,573,640	2,367,360	0	
Sep '14	13,304,100			3,942,420	1,198,750	1,301,210	1,442,460	3,942,420	3,945,430	2,372,640	3,686,440	2,295,860	0	
Oct '14	11,587,800			4,635,830	1,494,940	1,573,940	1,566,950	4,635,830	4,768,140	2,608,590	3,665,390	2,381,850	0	
Nov '14	11,911,600			4,198,700	1,345,380	1,402,440	1,450,880	4,198,700	4,259,040	2,545,040	3,106,480	2,266,920	0	
Dec '14	10,883,000			4,139,300	1,319,360	1,390,810	1,429,130	4,139,300	4,187,760	2,634,680	3,010,800	2,373,760	0	
AVERAGE	12,584,308			3,876,316	1,276,268	1,245,325	1,363,053	3,884,645	3,948,786	2,478,058	3,600,422	2,414,163	0	
MINIMUM	10,883,000			3,082,040	969,820	1,013,350	1,086,150	3,082,040	3,002,700	2,141,210	3,010,800	1,888,190	0	
MAXIMUM	13,969,400			4,635,830	1,494,940	1,573,940	1,566,950	4,635,830	4,768,140	2,757,560	4,270,460	3,037,730	0	
TOTALS	151,011,700			46,515,790	15,315,210	14,943,900	16,356,630	46,615,740	47,385,430	29,736,690	43,205,060	28,969,960	0.00	

Digester Gas Quantities

YEARLY MONTHLY OPERATION REPORT SUMMARY
TOWNBRANCH

	Total digester Gas Production	Gas Compressor 1Runtime	Gas Compressor 2 Runtime	Gas Compressor 3 Runtime	Gas to Sphere	Gas to Heat Exchanger	Natural Gas to Heat Exchanger	Natural Gas Used	Natural Gas Used in Plant	Residual Chorine-Contact Chamber	PTE Residual Chlorine,Titr	Plant Water Flow	Weather Contact C Rainfail	
	CF	Hrs	Hrs	Hrs	CF	CF	CF	CF	CF	mg/L	mg/L	MG	Inches	
MONTHS	9091	9021	9022	9023	9029	9031	9041	9051	9061	5116	5111	1801	604	
Jan '14	8,812,040.00	0.00	0.00	0.00	0.00	4,397,130.00	72,200.00	330,600.00	258,400.00	14.98	0.310	27.6820	1.68	
Feb '14	7,523,300.00	0.00	0.00	0.00	0.00	3,662,790.00	69,030.00	259,900.00	190,870.00	13.66	0.280	24.7750	4.28	
Mar '14	9,329,960.00	0.00	0.00	0.00	0.00	4,238,580.00	82,290.00	241,400.00	159,110.00	15.50	0.310	27.6470	1.77	
Apr '14	9,727,310.00	0.00	0.00	0.00	0.00	3,801,420.00	102,460.00	93,000.00	-9,460.00	15.23	0.300	25.8040	6.35	
May '14	8,806,880.00	0.00	0.00	0.00	0.00	3,066,740.00	123,600.00	25,000.00	-98,600.00	15.87	0.310	26.2140	2.88	
Jun '14	8,241,500.00	0.00	0.00	0.00	0.00	2,929,460.00	128,090.00	7,100.00	-120,990.00	14.95	0.300	23.5070	3.05	
Jul '14	8,263,810.00	0.00	0.00	0.00	0.00	2,515,770.00	122,470.00	6,200.00	-116,270.00	14.59	0.310	32.8644	2.86	
Aug '14	8,258,460.00	0.00	0.00	0.00	0.00	2,547,140.00	122,190.00	5,600.00	-116,590.00	15.17	0.310	29.7720	7.83	
Sep '14	8,354,940.00	0.00	0.00	0.00	0.00	2,753,580.00	67,980.00	5,200.00	-62,780.00	14.99	0.300	25.9650	4.29	
Oct '14	8,655,830.00	0.00	0.00	0.00	0.00	3,077,390.00	59,425.00	30,600.00	-28,825.00	15.35	0.310	31.3660	4.82	
Nov '14	7,918,440.00	0.00	0.00	0.00	0.00	3,350,810.00	100,453.00	169,200.00	68,747.00	15.12	0.300	27.7340	2.21	
Dec '14	8,019,240.00	0.00	0.00	0.00	0.00	3,842,050.00	108,546.00	187,600.00	79,054.00	15.76	0.310	26.6320	3.10	
AVERAGE	8,492,642.50	0.00	0.00	0.00	0.00	3,348,571.67	96,561.17	113,450.00	16,888.83	15.10	0.30	27.50	3.76	
MINIMUM	7,523,300.00	0.00	0.00	0.00	0.00	2,515,770.00	59,425.00	5,200.00	-120,990.00	13.66	0.28	23.51	1.68	
MAXIMUM	9,727,310.00	0.00	0.00	0.00	0.00	4,397,130.00	128,090.00	330,600.00	258,400.00	15.87	0.31	32.86	7.83	
TOTALS	101,911,710.00	0.00	0.00	0.00	0.00	40,182,860.00	1,158,734.00	1,361,400.00	202,666.00	181.17	3.65	329.96	45.12	

Digester Gas Quantities

YEARLY MONTHLY OPERATION REPORT SUMMARY
TOWNBRANCH

	RAW SLUDGE FLOW TO THICKENER	RAW THICKENED SL FLOW	WASTE THICKENED SL FLOW	TOTAL THICKENED SL FLOW TO DIGESTERS	METERED FLOW TO Digester 1	METERED FLOW TO Digester 2	METERED FLOW TO Digester 3	TOTAL METERED FLOW TO DIGESTERS	METERED DIGESTERS SL FLOW TO SEC DIG	PRI DIG 1 GAS Production	PRI DIG 2 GAS Production	PRI DIG 3 GAS Production	SEC DIG GAS Production	
	GALLONS	GALLONS	GALLONS	GALLONS	GALLONS	GALLONS	GALLONS	GALLONS	GALLONS	CF	CF	CF	CF	
MONTHS	7001	8001	8011	9001	9101	9201	9301	9011	9601	9191	9291	9391	9691	
Jan '15	41,931,449			4,147,010	1,309,760	1,368,560	1,468,690	4,147,010	4,240,040	2,520,910	2,817,350	2,227,100	0	
Feb '15	25,428,631			3,469,520	1,144,150	1,154,380	1,170,990	3,469,520	3,468,360	2,432,610	2,795,660	2,099,400	0	
Mar '15	12,175,800			4,284,460	1,515,180	1,345,750	1,423,530	4,284,460	4,062,480	2,528,390	3,002,340	2,211,480	0	
Apr '15	12,904,500			4,944,590	1,815,920	1,571,780	1,556,890	4,944,590	4,721,620	2,529,560	2,958,430	2,348,850	0	
May '15	13,741,500			5,080,730	1,862,770	1,624,000	1,593,960	5,080,730	4,748,260	2,637,350	3,274,150	2,342,400	0	
Jun '15	12,344,939			4,723,164	1,753,714	1,495,316	1,474,134	4,723,164	4,365,580	2,426,486	3,011,705	2,168,398	0	
Jul '15	13,691,688			5,272,644	1,925,838	1,880,187	1,466,619	5,272,644	4,607,820	2,455,917	3,118,258	2,247,370	0	
Aug '15	12,361,937			3,897,637	1,427,243	1,398,527	1,071,867	3,897,637	3,326,510	2,374,355	3,230,190	2,142,783	0	
Sep '15	12,639,339			3,059,028	1,106,775	1,108,010	844,243	3,059,028	2,495,900	2,378,397	3,122,534	2,041,036	0	
Oct '15	11,706,710			3,768,155	1,374,309	1,376,524	1,017,322	3,768,155	3,106,150	2,688,654	3,325,616	2,092,080	0	
Nov '15	12,176,300			3,528,660	1,325,100	1,018,830	1,184,730	3,528,660	3,207,180	2,693,193	3,548,293	2,505,657	0	
Dec '15	10,740,970			3,283,570	1,171,945	1,109,797	1,001,828	3,283,570	202,906,240	2,505,578	3,572,882	2,363,680	0	
AVERAGE	15,986,980			4,121,597	1,477,725	1,370,972	1,272,900	4,121,597	20,438,012	2,514,283	3,148,117	2,232,520	0	
MINIMUM	10,740,970			3,059,028	1,106,775	1,018,830	844,243	3,059,028	2,495,900	2,374,355	2,795,660	2,041,036	0	
MAXIMUM	41,931,449			5,272,644	1,925,838	1,880,187	1,593,960	5,272,644	202,906,240	2,693,193	3,572,882	2,505,657	0	
TOTALS	191,843,764			49,459,168	17,732,704	16,451,661	15,274,803	49,459,168	245,256,140	30,171,400	37,777,408	26,790,234	0.00	

Digester Gas Quantities

YEARLY MONTHLY OPERATION REPORT SUMMARY
TOWNBRANCH

	Total digester Gas Production	Gas Compressor 1Runtime	Gas Compressor 2 Runtime	Gas Compressor 3 Runtime	Gas to Sphere	Gas to Heat Exchanger	Natural Gas to Heat Exchanger	Natural Gas Used	Natural Gas Used in Plant	Residual Chorine-Contact Chamber	PTE Residual Chlorine,Titr	Plant Water Flow	Weather Contact C Rainfall	
	CF	Hrs	Hrs	Hrs	CF	CF	CF	CF	CF	mg/L	mg/L	MG	Inches	
MONTHS	9091	9021	9022	9023	9029	9031	9041	9051	9061	5116	5111	1801	604	
Jan '15	7,565,360.00	0.00	0.00	0.00	0.00	3,984,850.00	112,548.00	262,500.00	149,952.00	15.89	0.310	32.0350	1.28	
Feb '15	7,327,670.00	0.00	0.00	0.00	0.00	3,890,516.00	88,077.00	271,700.00	183,623.00	14.01	0.280	27.9950	2.45	
Mar '15	7,742,210.00	0.00	0.00	0.00	0.00	4,328,560.00	113,905.00	184,700.00	70,795.00	14.23	0.310	30.4880	4.04	
Apr '15	7,836,840.00	0.00	0.00	0.00	0.00	4,072,800.00	119,145.00	54,600.00	-64,545.00	13.77	0.300	26.5050	11.46	
May '15	8,253,900.00	0.00	0.00	0.00	0.00	3,701,610.00	146,331.00	11,000.00	-135,331.00	14.76	0.310	30.6530	1.87	
Jun '15	7,606,589.00	0.00	0.00	0.00	0.00	3,218,220.00	145,644.00	3,900.00	-141,744.00	13.81	0.300	28.2374	6.08	
Jul '15	7,821,545.00	0.00	0.00	0.00	0.00	3,441,880.00	142,310.00	2,500.00	-139,810.00	13.93	0.310	23.9663	9.11	
Aug '15	7,747,328.00	0.00	0.00	0.00	0.00	2,303,780.00	348,907.65	1,700.00	-347,207.65	17.20	0.310	22.7744	2.61	
Sep '15	7,541,967.00	0.00	0.00	0.00	0.00	1,803,550.00	154,623.00	2,600.00	-152,023.00	16.26	0.300	23.0330	3.42	
Oct '15	8,106,350.00	0.00	0.00	0.00	0.00	2,775,240.00	157,804.00	36,100.00	-121,704.00	18.77	0.310	24.2299	4.13	
Nov '15	8,747,143.00	0.00	0.00	0.00	0.00	3,159,940.00	150,856.00	101,700.00	-49,156.00	16.78	0.300	22.4086	3.11	
Dec '15	8,442,140.00	0.00	0.00	0.00	0.00	3,226,460.00	139,259.00	88,000.00	-18,313.00	12.99	0.270	19.4542	6.00	
AVERAGE	7,894,920.17	0.00	0.00	0.00	0.00	3,325,617.17	151,617.47	85,083.33	-63,788.64	15.20	0.30	25.98	4.63	
MINIMUM	7,327,670.00	0.00	0.00	0.00	0.00	1,803,550.00	88,077.00	1,700.00	-347,207.65	12.99	0.27	19.45	1.28	
MAXIMUM	8,747,143.00	0.00	0.00	0.00	0.00	4,328,560.00	348,907.65	271,700.00	183,623.00	18.77	0.31	32.04	11.46	
TOTALS	94,739,042.00	0.00	0.00	0.00	0.00	39,907,406.00	1,819,409.65	1,021,000.00	-765,463.65	182.40	3.61	311.78	55.56	

Solids – Volatile Solids

TOWN BRANCH LABORATORY
YEARLY REPORT
2015

Month	#1 PRIMARY DIGESTER						#2 PRIMARY DIGESTER						#3 PRIMARY DIGESTER					
	pH su	Volatile Acids mg/L	Total Alkalinity mg/L	VA/TA Ratio Ratio	% Total Solids %	% Volatile Solids %	pH su	Volatile Acids mg/L	Total Alkalinity mg/L	VA/TA Ratio Ratio	% Total Solids %	% Volatile Solids %	pH su	Volatile Acids mg/L	Total Alkalinity mg/L	VA/TA Ratio Ratio	% Total Solids %	% Volatile Solids %
Jan 2015	6.96	27.45	2,580.5	0.01	1.32	71.02	6.94	30.83	2,595.2	0.01	1.28	65.89	6.86	31.45	2,328.2	0.01	1.28	68.96
Feb 2015	6.95	42.86	2,476.8	0.02	1.48	73.62	6.93	42.57	2,570.3	0.02	1.38	67.30	7.00	43.29	2,778.8	0.01	1.38	66.64
Mar 2015	7.01	40.49	2,874.4	0.01	1.48	71.94	6.95	38.86	2,721.9	0.01	1.35	66.52	7.02	32.36	2,755.1	0.01	1.08	67.06
Apr 2015	6.88	34.10	2,619.8	0.01	1.39	70.65	7.03	30.10	2,601.9	0.01	1.33	63.32	6.97	33.43	2,609.5	0.01	1.05	62.51
May 2015	6.92	33.88	2,496.4	0.01	1.43	68.54	6.88	41.13	2,391.9	0.02	1.20	63.21	6.92	33.38	2,416.8	0.01	1.17	60.38
Jun 2015	6.88	38.56	2,330.8	0.02	1.31	71.63	6.88	36.67	2,410.2	0.02	1.40	63.97	6.90	36.11	2,516.7	0.01	1.35	58.57
Jul 2015	6.95	33.00	2,475.1	0.01	1.42	69.30	6.94	26.44	2,547.8	0.01	1.44	63.43	6.98	30.33	2,710.0	0.01	1.48	59.00
Aug 2015	7.03	31.10	2,740.1	0.01	1.41	69.78	7.01	34.48	2,782.6	0.01	1.44	68.24	7.03	41.23	2,796.4	0.01	1.31	65.78
Sep 2015	7.13	43.97	3,223.7	0.01	1.57	70.92	7.11	49.19	3,227.9	0.02	1.72	69.83	7.13	47.63	3,347.4	0.01	1.62	69.82
Oct 2015	7.15	40.48	3,855.4	0.01	1.66	71.55	7.14	43.14	3,865.7	0.01	1.75	69.44	7.13	34.81	3,863.8	0.01	1.70	69.99
Nov 2015	7.16	53.27	3,724.0	0.01	1.69	70.62	7.13	58.99	3,752.3	0.02	1.93	69.01	7.13	63.56	3,873.6	0.02	1.79	69.83
Dec 2015	7.20	55.51	2,800.3	0.01	1.70	70.60	7.18	49.51	2,789.1	0.01	1.72	68.33	7.19	50.80	2,765.6	0.01	1.75	70.65
Average	7.02	39.55	2,849.8	0.01	1.49	70.85	7.01	40.16	2,854.7	0.01	1.49	66.54	7.02	39.86	2,896.8	0.01	1.41	65.76
Minimum	6.88	27.45	2,330.8	0.01	1.31	68.54	6.88	26.44	2,391.9	0.01	1.20	63.21	6.86	30.33	2,328.2	0.01	1.05	58.57
Maximum	7.20	55.51	3,855.4	0.02	1.70	73.62	7.18	58.99	3,865.7	0.02	1.93	69.83	7.19	63.56	3,873.6	0.02	1.79	70.65

Solids - Volatile Solids

TOWN BRANCH LABORATORY
YEARLY REPORT
2014

	#1 PRIMARY DIGESTER						#2 PRIMARY DIGESTER						#3 PRIMARY DIGESTER					
Month	pH su	Volatile Acids mg/L	Total Alkalinity mg/L	VA/TA Ratio Ratio	% Total Solids %	% Volatile Solids %	pH su	Volatile Acids mg/L	Total Alkalinity mg/L	VA/TA Ratio Ratio	% Total Solids %	% Volatile Solids %	pH su	Volatile Acids mg/L	Total Alkalinity mg/L	VA/TA Ratio Ratio	% Total Solids %	% Volatile Solids %
Jan 2014	7.10	19.05	3,637.4	0.01	1.60	70.54	7.14	18.44	3,668.5	0.01	1.28	64.59	7.16	16.61	4,366.7	0.00	1.42	58.06
Feb 2014	7.06	21.17	3,524.1	0.01	1.51	64.49	7.07	21.34	3,644.6	0.01	1.32	62.32	7.14	15.77	4,703.8	0.00	1.60	51.80
Mar 2014	6.97	21.69	2,987.3	0.01	1.53	69.03	7.02	20.40	3,140.9	0.01	1.20	64.70	7.05	19.80	3,427.5	0.01	1.30	59.99
Apr 2014	7.01	19.88	3,143.5	0.01	1.72	70.21	7.05	18.21	3,291.9	0.01	1.32	64.31	7.08	16.61	3,759.0	0.00	1.46	60.01
May 2014	7.07	20.50	3,634.2	0.01	1.90	69.13	7.09	18.29	3,824.2	0.01	1.36	62.92	7.08	17.75	3,980.4	0.00	1.48	62.80
Jun 2014	7.08	18.86	3,156.8	0.01	1.68	67.07	7.06	20.06	3,200.5	0.01	1.39	63.99	7.10	19.37	3,370.5	0.01	1.66	64.16
Jul 2014	7.04	18.31	3,095.5	0.01	1.60	66.47	7.07	18.38	3,162.0	0.01	1.41	63.57	7.09	19.06	3,312.8	0.01	1.51	62.10
Aug 2014	6.97	21.26	3,374.3	0.01	1.77	67.20	7.07	18.00	3,538.1	0.01	1.39	63.00	7.08	18.26	3,893.1	0.01	1.70	61.98
Sep 2014	7.01	16.61	3,216.9	0.01	1.90	65.82	7.04	17.45	3,196.8	0.01	1.44	62.18	7.06	15.47	3,379.2	0.00	1.79	60.67
Oct 2014	6.96	24.54	2,880.0	0.01	1.65	65.99	7.03	27.31	3,024.0	0.01	1.47	62.50	7.05	23.92	3,165.4	0.01	1.73	60.41
Nov 2014	6.92	40.71	2,725.8	0.01	1.62	68.07	7.00	38.57	2,830.4	0.01	1.43	63.98	6.98	41.00	2,708.7	0.02	1.49	64.83
Dec 2014	7.01	36.88	2,848.0	0.01	1.41	67.86	7.01	38.75	2,939.2	0.01	1.30	65.09	6.95	37.50	2,808.5	0.01	1.49	65.95
Average	7.02	23.29	3,185.3	0.01	1.66	67.66	7.05	22.93	3,288.4	0.01	1.36	63.60	7.07	21.76	3,573.0	0.01	1.55	61.06
Minimum	6.92	16.61	2,725.8	0.01	1.41	64.49	7.00	17.45	2,830.4	0.01	1.20	62.18	6.95	15.47	2,708.7	0.00	1.30	51.80
Maximum	7.10	40.71	3,637.4	0.01	1.90	70.54	7.14	38.75	3,824.2	0.01	1.47	65.09	7.16	41.00	4,703.8	0.02	1.79	65.95

Microbac Laboratories, Inc.
KENTUCKY TESTING LABORATORY DIVISION
3323 Gilmore Industrial Blvd. Louisville, KY 40213 502.962.6400 Fax: 502.962.6411
Lexington 859.276.3506 • Paducah 270.898.3637 • Evansville 812.464.9000 • Hazard 606.487.0511

Chemical, Biological, Physical, Molecular, and Toxicological Services

CERTIFICATE OF ANALYSIS

1208-01450

LEXINGTON FAYETTE URBAN COUNTY
MARK STAGER
301 LISLE IND. AVENUE
LEXINGTON, KY 40511

GAS MONITORING

Date Reported	10/05/2012
Date Due	09/12/2012
Date Received	08/29/2012
Date Sampled	08/29/2012
Invoice No.	25260
Customer #	6148
Customer P.O.	LF00074086

Analysis	Out of Spec	Qualif	Result	Unit	Min	Max	Method	PQL or Std Limit	Date	Time	Tech
Sample: 001 **DIGESTER GAS**								Sampled	08/29/2012	@ 10:00	
GAS, STANDARD SCAN / CYL.			SEE ATTACHED	---			ASTM D1945		09/10/12	0:00	ETL
SHIPPING AND HANDLING			---	---			---			0:00	

ETL = ANALYSIS SUBCONTRACTED: MICROBAC ERIE DIVISION

THIS REPORT HAS BEEN REVIEWED AND APPROVED FOR RELEASE: A. Clifton

TECHNICAL DIRECTOR, KENTUCKY DIVISION

As regulatory limits change frequently, Microbac advises the recipient of this report to confirm such limits with the appropriate Federal, state, or local authorities before acting in reliance on the regulatory limits provided.

For any feedback concerning our services, please contact Andrew Clifton, the Technical Director at 502.962.6400. You may also contact Sean Hyde, Chief Operating Officer at sean.hyde@microbac.com or James Nokes, President at james.nokes@microbac.com

Microbac Laboratories, Inc.
Erie Division
1962 Wager Road • Erie, PA 16509 • Phone: 814-825-8533 • Fax: 814-825-9254
Larry Lewis, Managing Director • E-mail: erie@microbac.com • http://www.microbac.com

CERTIFICATE OF ANALYSIS

Work Order Number:

12I1350

Microbac Lexington
2520 Regency Road
Lexington, KY 40503

Date Reported 09/11/2012
Date Received 09/05/2012
Account Number 000000099034

Purchase Order:

Subject: 1208-1450-001, Lexington Fayette Urban County

SMP	TEST	METHOD	RESULT	UNITS	ANALYSIS DATE	TIME	TECH	NOTES
01	**1208-1450-001 (2 small cylinders) Sample Date: 08/29/2012**							
	BTU, Dry (High Heat Value)	ASTM D1945-91/D3588-98	502.30	BTU/ft³	09/10/12	9:53	cap	
	BTU, Net, Dry (Low Heat Value)	ASTM D1945-91/D3588-98	456.04	BTU/ft³	09/10/12	9:53	cap	
	BTU, Net, Saturated (Low Heat Value)	ASTM D1945-91/D3588-98	448.10	BTU/ft³	09/10/12	9:53	cap	
	BTU, Saturated (High Heat Value)	ASTM D1945-91/D3588-98	493.56	BTU/ft³	09/10/12	9:53	cap	
	Density, g/ml	ASTM D1945-91/D3588-98	0.0011925	g/ml	09/10/12	9:53	cap	
	Density, lbs/ft³	ASTM D1945-91/D3588-98	0.0744541	lbs/ft³	09/10/12	9:53	cap	
	LHV Compounds, Fuel	ASTM D1945-91/D3588-98						
	Iso-Butane		<0.01	% (mole)	09/10/12	9:53	cap	
	Methane		23.88	% (mole)	09/10/12	9:53	cap	
	Ethane		14.75	% (mole)	09/10/12	9:53	cap	
	Propane		<0.01	% (mole)	09/10/12	9:53	cap	
	n-Butane		<0.01	% (mole)	09/10/12	9:53	cap	
	Iso-Pentane		<0.01	% (mole)	09/10/12	9:53	cap	
	N-Pentane		<0.01	% (mole)	09/10/12	9:53	cap	
	Hexanes		<0.01	% (mole)	09/10/12	9:53	cap	
	Carbon Dioxide		14.75	% (mole)	09/10/12	9:53	cap	
	Nitrogen		37.19	% (mole)	09/10/12	9:53	cap	
	Nitrogen	ASTM D1945-91/D3588-98	37.0	Wt. %	09/10/12	9:53	cap	
	Specific Gravity, LHV	ASTM D1945-91/D3588-98	0.9734146		09/10/12	9:53	cap	

All samples received in proper condition and results conform to ISO 17025 unless otherwise noted

Some or all of the samples were collected by the customer. The verifiability of the final results are therefore limited by the customer's reported values. Microbac Laboratories, Inc. assumes that all sampling instructions are followed, and the data upon which these final results are based, have been accurately supplied by the client.

Notes and Definitions

Microbac Laboratories, Inc.
Erie Division
1962 Wager Road • Erie, PA 16509 • Phone: 814-825-8533 • Fax: 814-825-9254
Larry Lewis, Managing Director • E-mail: erie@microbac.com • http://www.microbac.com

CERTIFICATE OF ANALYSIS

Work Order Number:

12I1350

Microbac Lexington
2520 Regency Road
Lexington, KY 40503

Date Reported 09/11/2012
Date Received 09/05/2012
Account Number 000000099034

Purchase Order:

Subject: 1208-1450-001, Lexington Fayette Urban County

SMP	TEST	METHOD	RESULT	UNITS	ANALYSIS DATE	TIME	TECH	NOTES

Reviewed and Approved By:

Date Reviewed and Approved:

09/11/2012

Jeff Porte For Cheri Estes
Lab Manager/QAO, Microbac Laboratories, Inc./Erie Division
Report released by Jeff Porte For Cheri Estes

Any questions regarding this report, please contact your account manager, .

As Regulatory limits frequently change, Microbac Laboratories, Inc. advises the recipient of this report to confirm such limits with the appropriate Federal, state or local authorities before acting on the data provided. For feedback concerning our services, please contact the Managing Director, or James Nokes, President, at president@microbac.com.

Lexington-Fayette Urban County Government
DEPARTMENT OF FINANCE & ADMINISTRATION

Jim Gray
Mayor

William O'Mara
Commissioner

ADDENDUM #4

RFP Number: 58-2015

Date: December 30, 2015

Subject: Design Services for Town Branch WWTP Primary Digester Complex Improvements

Address inquiries to:
Brian Marcum
(859) 258-3320

TO ALL PROSPECTIVE SUBMITTERS:

Please be advised of the following clarifications to the above referenced RFP:

Opening date has been extended until January 14, 2016 at 2:00 PM.

Todd Slatin

Todd Slatin, Director
Division of Central Purchasing

All other terms and conditions of the Bid and specifications are unchanged.
This letter should be signed, attached to and become a part of your Bid.

COMPANY NAME: Strand Associates, Inc.

ADDRESS: 1525 Bull Lea Road, Suite 100, Lexington, KY 4051

SIGNATURE OF BIDDER: Matt Schiebel

A. Cover Letter

Strand Associates, Inc.®
1525 Bull Lea Road, Suite 100
Lexington, KY 40511
(P) 859-225-8500
(F) 859-225-8501

January 14, 2016

Mr. Todd Slatin, Purchasing Director
Lexington-Fayette Urban County Government
Room 338, Government Center
200 East Main Street
Lexington, KY 40507

Re: RFP #58-2015 Engineering Design Services for Town Branch WWTP Primary Digester Complex Improvements

Dear Mr. Slatin:

Thank you for the opportunity to submit this proposal for the above referenced project. **Selecting Strand Associates for the Town Branch WWTP Primary Digester Complex Improvements Project Results in an On-Time, Well-Conceived Upgrade With Minimal Plant Impacts.** Listed below are major factors that support this statement and distinguish our Project Team as a perfect match to the project needs.

- **Strand's Understanding of Existing Town Branch Treatment, SCADA and Electrical Systems Results in Seamless Incorporation of Primary Digester Complex Improvements**
- **Our Proven Service and Commitment to LFUCG Demonstrates Our Ability to Serve LFUCG Effectively on this Project**
- **Experience Implementing Primary Digester Complex Improvements Leads to the Optimal Solution for Town Branch WWTP**
- **Strand's Collaborative Approach Addresses Operation Staff Concerns for a User-Friendly Facility and Minimal Plant Impacts During Construction**
- **Strand's Project Approach and Attention to Schedule Delivers an On-Time Remedial Measures Project**
- **Strand's DBE Participation Provides Project Consistency and Meets LFUCG Goal**

We look forward to the opportunity to continue our service on behalf of the Lexington-Fayette Urban County Government.

Sincerely,

STRAND ASSOCIATES, INC.®

Michael L. Davis, P.E.
Senior Associate

STRAND ASSOCIATES, INC.®

Mark A. Sneve, P.E., BCEE
Senior Associate

B. Scope/Fee

Scope/Fee

Strand's Unmatched Knowledge of Project Requirements and Existing Facilities Results in a Comprehensive Scope that Matches LFUCG's Needs

Strand's project scope includes both the base Digester Complex Improvements and the Gas Master Plan/CHP Additive Alternative. The project will begin with an evaluation of upgrade alternatives for the process and equipment. After planning is complete, design of a complete overhaul will achieve the objectives of improving reliability, enhancing performance and reducing operating costs. A gas cleaning system will be included in the base project. Bidding and construction-phase services will complete the project.

Approach

Strand's approach relies on our long-term investment in projects at Town Branch WWTP.

Scope of Engineering Services - Base Project

Strand's Scope of Services is tailored to meet the requirements contained within LFUCG's RFP, and to address specific project needs that we have identified through our investigation. The Scope of Services is described below, following the format contained in the RFP. Our approach to project design and implementation includes significant and timely interaction with plant staff. This collaboration starts with the initial operations review and extends through project completion.

Our familiarity with project details and our proposed scope of services are outlined below.

Project Overview

The Town Branch WWTP has a 30 MGD design capacity and peak flow capacity of 64 MGD. The anaerobic digestion facilities include three primary digesters and related equipment. Strand (formerly PEH Engineers) provided engineering services to LFUCG when the existing digester complex was last upgraded in the late 1980s.

Town Branch WWTP.

The Remedial Measures Plan includes this primary digester improvements project, which is intended to result in an upgrade and renewal of your existing primary digester complex. The existing complex includes three primary digesters with Pearth mixing systems and floating covers. Ancillary equipment includes boilers/heat exchangers, pumps, digester gas safety equipment, gas flare and electrical gear and controls. The project will begin with a condition assessment of the existing facilities and equipment, followed by an evaluation of upgrade alternatives for these processes and equipment. After planning is complete, design of a comprehensive digestion process overhaul will achieve the objectives of improving reliability, enhancing performance and reducing operating costs. A gas cleaning system will be included in the base project. LFUCG may opt to include a gas master plan and combined heat and power design in the project. Bidding and construction-phase services will complete the project, and because of our extensive experience with your staff and familiarity with the plant, our services will provide the right level of involvement throughout.

Task 1: Existing Primary Digesters Operations Review

Strand will conduct a kick-off meeting followed by an interview with Town Branch operations and management staff regarding operation, maintenance and control of the Primary Digester Complex. Through this process, Strand will obtain information regarding the daily operation and maintenance of existing facilities, which we will use to further evaluate the condition and remaining life for process equipment. Our team will utilize information available from prior Town Branch studies and design activities completed by Strand. These include the original 1988 design, 2005 Phosphorus study, 2007 Electrical Condition

Assessment, and 2012 Electrical/SCADA improvements project. Strand will also collect any additional information and data needed for the project.

Task 2: Develop Equipment and Process Replacement Concepts and Schedules

The Town Branch WWTP process currently utilizes three primary anaerobic digesters to stabilize thickened waste-activated and primary sludge solids. Digesters are operated in the mesophilic temperature range and are mixed using a Pearth gas lance system. The mixing system is ineffective, and the industry has moved away from gas mixing systems over the last 20 years. Digester gas beyond that used for digester heating is currently flared in a waste gas burner, but had been designed to be compressed, stored and beneficially reused. One boiler/heat exchanger per digester is employed to keep the digester operating temperature at 95 degrees. The system also relies on sludge withdrawal/transfer pumps and sludge recirculation pumps. The digesters have floating steel covers, without the capability of storing digester gas.

We have analyzed data supplied by LFUCG in Addendum 3 to conclude the following:

- The influent sludge flow to the digesters is thin (2-2.5%), likely due to concerns over the ability to mix the digesters.
- Mechanically thickened waste-activated sludge (WAS) and/or primary sludge could be fed at ~5% TS and cut the heating load in half or more, which leaves more gas for potential cogeneration. This would double the detention time and improve volatile solids destruction as well. A different digester mixing system would be required to operate the digesters at a higher concentration.
- LFUCG buys a fair amount of natural gas to supplement digester gas just for sludge heating. The gas burned in the boilers/heat exchangers is much less than is produced, likely due to a lack of useable gas storage.

Using a collaborative approach, working with LFUCG operations and engineering staff, Strand will evaluate equipment replacement concepts for all equipment in the primary digester complex. A list of the key equipment used in the primary digester complex is included in the following table. The table also includes new equipment we will consider for your upgrade and lists recent projects where we have worked with the same equipment.

The adjacent table summarizes major equipment and likely replacement alternatives.

Equipment Item	No.	Existing Equipment Manufacturer and Type	Existing Equipment Age and Condition	Replacement Alternatives	Strand Experience with Replacement Alternatives
Sludge Withdrawal Pumps	3	Boeger Rotary Lobe	8 Years Old Good Condition	Presume we can keep these	We have worked with each of these components and manufactures on designs for the following clients: Waukesha, Brookfield, Dubuque, Fond du Lac, Paynesville, KRMA, FRWD, Thorn Creek, Glenbard, Parkersburg, Prichard, Joliet, Stooughton
Back-up Sludge Withdrawal Pumps	2	Komline Sanderson Plunger 250 gpm @170 ft TDH	25 Years Old End of Design Life	Rotary Lobe - Boeger Progressing Cavity - Moyno, Netzsch	
Sludge Recirculation Pumps	3	Wemco Vertical Centrifugal 350 gpm @ 29 ft TDH	25 Years Old End of Design Life	Rotary Lobe - Boeger Screw Centrifugal - Wemco, Hayward Gordon	
Sludge Grinders	3	JWC Environmental Muffin Monster	1 Year Old Good Condition	JWC Environmental	
Heat Exchangers	3	Envirex 1,125,000 Btu/Hr 350 gpm sludge flow Natural Gas/Digester Gas	25 Years Old Good Condition	Walker Process, OTI, Westech	
Digester 1,2 and 3 Covers	3	Envirex 75 ft Diameter Floating Cover	25 Years Old Fair Condition	Floating, gas holding, or double membrane Evoqua.Envirex OTI Westtech Walker Process	
Digester Mixing System	3	Envirex Pearth Mixing System	25 Years Old Poor Condition End of Design Life	Vaughan - Pumped Recirc Ovivo - Draft Tube OTI - Draft Tube Ovivo - Linear Motion Walker - Vertical Mixer	

Waste Gas Burner	1	Envirex 6-inch 20,000 scfh sludge gas	25 Years Old End of Design Life	Shand & Jurs Groth Varec	
Motor Control Center	1	Westinghouse MCC	25 Years Old In Good Condition End of Design Life	Replace with new MCC in existing location. MCC to match existing with hard-wired I/O to existing SCADA system. Specify MCCs from Square D and Eaton/Cutler-Hammer to match other new MCCs at TBWWTP.	Strand was the Engineer for the recently completed Electrical/SCADA project that replaced MCCs within the plant, providing consistency with previous projects.
Sludge Withdrawal Pump VFDs	3	Allen-Bradley	Enclosure is 25 Years Old VFDs Replaced in Last 8 Years	Replace with new VFDs in existing locations. VFDs to match existing with hard-wired I/O to existing SCADA system. Specify VFDs from Square D to match other new VFDs at TBWWTP.	
Process Control and SCADA System	1	ControlTouch Systems Integrator	1 Year Old In Excellent Condition Placed in Service in 2015	Existing SCADA system to remain, with modifications to graphics, reports and alarms based on replacement equipment and process flow. Specify ControlTouch as systems integrator to be consistent with existing system.	

Evaluating 3 aerobic digestion processes results in the most cost-efficient operator-friendly selection.

The evaluation will also consider alternative digestion processes. We will evaluate up to three alternative concepts. Based on our familiarity with anaerobic digestion, we plan to evaluate the following alternatives:

1) Traditional Mesophilic Digestion (replacing what you have today),
2) Temperature Phased Digestion (TPAD) using thermophilic/mesophilic digestion, and
3) Acid/Gas Phased Digestion.

Alternatives 2 and 3 would provide excess capacity to accept supplemental waste and generate higher gas volumes. Capital costs, as well as 20-year life cycle costs will be developed for comparison. Life cycle costs will include equipment replacement, energy usage and estimated maintenance requirements for alternative equipment. Other non-monetary considerations will be evaluated. Results of this evaluation will be summarized in a preliminary report. This evaluation will be used to chart the direction of facility improvements.

Our understanding of the future needs of the Town Branch plant will allow for a more relevant alternatives analysis of primary digestion alternatives. For instance, we understand plant impacts resulting from future phosphorus regulations. If LFUCG implements enhanced biological phosphorus removal, the thickening of WAS will have to be revised to avoid a release of phosphate and digested sludge may not dewater as well. Using EBPR will increase the potential for struvite formation within the anaerobic digestion piping and equipment. While struvite formation has not been a problem at Town Branch, planning for the future concern is warranted during this digester upgrade project. If chemical phosphorus removal is pursued, there will be more sludge flow to the digesters and digestion efficiency may reduce.

We will include a digester gas cleaning system with the base project, a long-term benefit for the boilers/heat exchangers and any future uses of digester gas. If LFUCG elects not to pursue the Gas Master Plan/CHP project, our understanding of future needs will be addressed within the design of base improvements, namely providing ample gas storage in the covers will improve LFUCG's ability to use digester gas. Our scope includes analytical biogas testing for siloxanes, reduced sulfur compounds (H2S and others), VOCs, % methane. This sampling will provide information needed to determine gas cleaning requirements.

LFUCG currently accepts grease at your scum removal facility, but does not feed the grease to your digesters. We will include a connection location to feed this waste stream to the digesters. Enhancing the ability to accept other hauled wastes will also be considered and planned for with a connection location. Should LFUCG wish to include new facilities for grease feed to the digesters or to accept other hauled waste in this project, an amendment to our scope will be required.

The proposed construction of improvements will have to be very carefully sequenced to reduce the impacts to ongoing operation of the Town Branch WWTP. We will identify a sequence of construction to work on one digester at a time to maximize the ability to continue effective digestion. Troy Larson will participate in discussions on sequencing construction and will help LFUCG anticipate and minimize operational impacts. Troy is a licensed operator who has become widely regarded for his intuitive insight related to construction sequencing during the rehabilitation of WWTPs.

We will meet with LFUCG to discuss the alternatives and identify the selected alternative and equipment prior to advancing into detailed design.

Task 3: Detailed Design

Detailed design drawings and bid alternatives allow LFUCG to minimize project costs and optimize the project budget.

Design will be based on results from the previous evaluation. Detailed drawings and specifications will be provided for bidding and construction. Where possible, bid alternatives will be identified that will enhance competition among equipment suppliers resulting in lower project costs. Our recent Town Branch/West Hickman WWTP Electrical/SCADA/Blower project is a good example of structuring bid alternatives to maximize project funding.

We will meet with LFUCG at the 25%, 50% and 90% stages of completion to review the design, solicit input and discuss costs and schedule. For the sake of developing a cost proposal prior to the study, our scope includes replacing the current equipment and continuing to employ a traditional mesophilic digestion process. If alternative processes are selected, we will negotiate a change to our contract. Our proposal includes:

1) **Equipment Replacement**

   We will replace the primary digester covers with covers that provide for some gas storage, mixing equipment for each digester, boilers/heat exchangers that employ digester gas and natural gas fuels, sludge recirculation pumps, sludge withdrawal pumps, digester gas safety equipment, waste gas flare, valves, hydrants, digester gas piping and other related equipment in the primary digester complex. We will take care in designing around efficient, proven and reliable equipment to extend the life of the upgraded facility.

2) **Electrical, Control and Instrumentation System**

Strand's knowledge of the Town Branch SCADA Control System results in consistency between new and existing systems.

   The electrical system will be modified to support new digester. This includes a source of 480 volt power to the new equipment, and modifications to existing control systems to coordinate the operation digesters, gas collection, and ancillary systems. The new systems will be coordinated with the existing plant SCADA system. New I/O points will be connected to the SCADA system through the termination cabinet located in the primary digester operating floor. The SCADA system graphics will be updated to remove eliminated equipment and to add the new systems. 3-D and 2-D graphics will be modified by the construction contractor's systems integrator.

3) **Mechanical Improvements**

   From a field observation it appears ventilation systems meet the 2012 version of NFPA 820, the governing standard for ventilation for this type of facility. Supply and exhaust fans and heaters appeared to be operating; however, we did not confirm that all fans, heaters and damper motors were operating. The pump room is ventilated by two rooftop supply fans and a rooftop gravity ventilator. Fresh air from the supply fans is unheated. In the lower level pump room supply air is distributed from two ducts at a high velocity and is not tempered. There are two large gas heaters nearby to prevent the space from freezing. Although this system has been used for many years and meets current codes, the blast of cold air could be made warmer by installing a heat recovery unit on the roof in place of the two supply fans and gravity ventilator. The heat recovery unit would temper supply air simply by warming room air passing through a heat wheel or air to air (plate) heat exchanger before it is exhausted from the space. Supplementary heat which is installed in most heat recovery units would not be necessary, because the heat exchanger would warm supply air a sufficient amount. In addition to warming of supply air the heat recovery unit would save a considerable amount of energy that is presently used by gas unit heaters.

4) **Structural/Architectural Improvements**

   We have included replacement of all doors and windows in the digester complex, replacement of the membrane roof on the building and repair of the leaks in the digester walls.

Drawings will be developed during the final design phase. We anticipate the drawing set will include approximately 30 sheets, addressing demolition and new construction for process, structural, electrical and instrumentation disciplines.

Specifications will also be developed during the design phase. Strand will provide technical specifications, including Divisions 1 through 16. Division 0, including Parts I through IX will be based on LFUCG standard specifications. Strand is familiar with LFUCG specification requirements, and understands how these documents are interfaced with the technical specifications.

Task 4: Bidding Services

Strand will assist LFUCG during the bidding phase of this project. Strand understands LFUCG's requirements, and is experienced providing these types of services for LFUCG projects. Bidding phase services include all items contained in the RFP.

Task 5: Construction Services

Strand's experience supporting LFUCG through bidding and construction will streamline these phases of project development.

Strand will support LFUCG during the construction phase of this project. Strand has recent experience providing these services to LFUCG on other wastewater improvements projects, and has developed good working relationships with staff that complement our ability to provide these services. Construction phase services include all items contained in the RFP. We will provide regular site visits to monitor the progress of construction. We anticipate being on site for 2 to 3 days per week for an average of 8 hours per week. The proximity of our office to the Town Branch site makes these visits very efficient and flexible.

Additive Alternative Scope – Digester Gas Master Plan/ CHP Project

LFUCG is soliciting an additive alternative proposal to prepare a digester gas master plan to consider a combined heat and power (CHP) system.

Background

The Digester Gas Master Plan, if included in the project scope, will help direct and guide both short-term and long-term capital improvements related to the anaerobic digesters and the digester gas utilization strategy. Based on data provided by LFUCG, it appears that about 40 percent of the digester gas produced is used in the digester heat exchangers for process heat. In addition, some purchased natural gas is also used to heat the digesters, presumably because of the lack of digester gas storage at the site or possibly because of limitations in the gas piping and distribution system. The digesters produce about 280,000 ft^3/day of digester gas, which is enough gas to generate about 600 kW of electricity on a continuous basis, assuming adequate gas storage and a methane concentration of about 50 percent. Note, however, the gas meter at Digester No. 2 has recorded higher gas flows than the meters from Digester Nos. 1 and 3, even though all three digester receive about the same load. Therefore, the digester gas metering data will need to be carefully evaluated during the master planning process.

The digesters are being loaded at or near the original design conditions of about 21,000 lbs VS/day and feed sludge flow of about 125,000 gpd. The three primary digesters have a total volume of about 2.9 million gallons (mgal), resulting in a HRT of about 22 days and a volatile solids loading rate of about 55 lbs VS/1,000 ft3/day. Influent feed sludge is co-thickened and fed at a fairly thin solids concentration of about 2.0-2.5 percent. The volatile solids load to the digesters is quite low, indicating that the digesters have considerable capacity available as long as the HRT doesn't fall below about 20 days.

Key Considerations and Opportunities

The existing Pearth gas mixing system in the primary digesters should be replaced with a more robust and efficient mixing system, such as pumped recirculation, draft tubes, or linear motion mixing. These mixing systems will improve digester performance and volatile solids destruction, and will also allow the plant to feed the digesters at a high solids concentration. The existing feed sludge is very thin compared to most anaerobic digestion plants, and if the feed solids were thickened to about 5.0 percent (or higher), additional digestion capacity would be available. This digestion capacity could be utilized to codigest grease or other high-strength wastes and produce considerably more digester gas from the same volume of digestion. For example:

- Assume the feed sludge is thickened to 5.0 percent TS
- The resulting digester HRT would increase to more than 40 days and the volatile solids load would be unaffected at about 55 lb/1000 ft3/day. These values indicate that the effective flow and loads to the digester could potentially double and still stay within acceptable design conditions.
- If the loadings were doubled, the digester gas would increase proportionately, resulting in adequate digester gas to generate about 1,200 kW of electricity. Note with some high-strength wastes, the digester gas and generation capacity could be significantly more than this.
- In addition, an added benefit of thickening the digester feed sludge is a large reduction in digester sludge heating costs. As mentioned previously, about 40 percent of the digester gas is used for heating. If the sludge were thickened to 4 or 5 percent solids prior to feeding, the heating load would be cut in about half, and it is very likely that the waste heat from the cogeneration engines would be adequate to fully heat the digestion process.

Scope of Services - Digester Gas Master Plan

Task 1: Data Collection and Kick-off Meeting

Our initial efforts will be to request and review plant operational data, reports, and related documents in addition to those we already have in our files. For efficiency, we would hold the kick-off meeting in conjunction with the kick-off meeting for the equipment replacement project. At that meeting, we would meet with LFUCG staff to discuss the work plan (scope, schedule, and other details) for the project and the key issues.

Task 2: Conduct a Cursory Review of Applicable Regulations

Essentially all of our Master Plans and Facilities Plans include some level of regulatory review. For the LFUCG's Digester Gas Master Plan, we suggest this review and summary include, at a minimum, the following:

- Current and potential future nutrient (phosphorus and nitrogen) regulations and total maximum daily load or other watershed plans that could affect biosolids production and biogas generation.
- Regulations pertaining to nutrient management issues for biosolids land application, including phosphorus-based land application requirements.
- Potential future regulations related to Class A and Class B biosolids.
- Regulations and air permitting requirements associated with digester gas utilization on-site, including with cogeneration systems.
- Regulations related to compressed natural gas (CNG) and biogas (bioCNG) utilization.

Projection of current and future plant process changes and loadings impacts digester alternative evaluations.

Task 3: Project Future Flows, Loadings, and Biosolids Production

To develop a Digester Gas Master Plan, the future conditions need to be projected to determine future loadings, digester gas production, and related parameters. We will develop such projections using available population growth projections as well as through discussions with LFUCG to identify growth plans within the service area. This analysis will consider the widely variable sludge production from future phosphorus removal facilities. For example, if chemical phosphorus removal is implemented in the future to meet a 1 mg/L limit, the sludge production could increase by 20 percent or more. Such conditions need to be accounted for, and we have been providing similar projections to our clients in many states that already have effluent phosphorus limits.

In addition, the projections will account for the potential increase of digester gas through co-digestion of grease and other high-strength feedstocks. Our experience with numerous installations will allow us to efficiently develop these projections, which will provide the basis for the remaining tasks.

High-Strength Waste Market Study – Our firm is experienced at both identifying potential sources of high-strength wastes (HSW) as well as determining the potential increase of biogas and energy recovery from those materials. As an optional task, we will conduct a cursory market study to identify potential sources, volumes, and characteristics of feedstocks, such as industrial wastes and fats, oils and grease (FOG). We will develop a summary of nearby sources, nearby competition for those sources, likely tipping fees, and potential benefit to LFUCG. If such an analysis is not commissioned, we will simply develop HSW co-

digestion scenarios with a range of HSW feedstock assumptions to provide LFUCG with a range of options in the future.

Task 4: Identification and Preliminary Evaluation of Alternatives

This portion of the Digester Gas Master Plan will include identification and high-level evaluations screening of alternatives to meet both near-term and long-term challenges. This task will identify several potential alternatives, screen these alternatives based on high-level costs and nonmonetary evaluations, and then develop a shortlist for more detailed analyses. Included below is a summary of the main process alternatives that we anticipate evaluating. These evaluations will include development of an energy and solids balance through the solids processing facilities to assist in sizing the potential digester gas end use options. **For each of these options, we will include a base case (no grease or high-strength wastes), mid-loading case assuming some grease and high-strength waste, and a high-level case assuming loading the digesters to their maximum capacity.** The following options are planned to be considered (all include the required digester gas cleaning systems):

1) Combined heat and power system using engines,
2) Combined heat and power system using microturbines (not as efficient as engines), and
3) BioCNG for vehicle fuel.

Task 5: Detailed Evaluation of 20-year Biosolids and Biogas Alternatives

The short-listed alternatives to be considered in the 20-year plan will be evaluated during this task. The evaluation of alternatives will include energy and mass balances, capital costs, operating costs, maintenance costs, future equipment replacement costs, and salvage costs over the 20-year life of the project. The various costs will be included in a present-worth evaluation to better compare the various alternatives on an equal monetary basis.

Digester gas plan and report will be completed with interactive input from LFUCG staff.

Task 6: Draft and Final Master Plan Report

The draft report will be developed throughout the planning process and will be delivered to LFUCG for review as each section is developed. The full draft report will be developed and submitted to LFUCG for review following Task 5, after which we will meet with LFUCG to discuss the recommendations, costs, and other content of the draft plan. After incorporating the required updates and changes, we will finalize the plan and submit four (4) copies of the Master Plan to LFUCG.

Scope of Services -Concept Design, Detailed Design, Bidding and Construction Phases

We have included engineering costs in our proposal to design new facilities based on your request from Addendum 2:

To further clarify the additive alternative portion of this RFP it is the desire the LFUCG Division of Water Quality for the consultant to base the detailed design on a new lean burn internal combustion engine, capable of being fueled by primary digester produced combustible gas, natural gas and/or a combination of both fuels, with an attached generator appropriately sized to provide electrical power to the primary digester complex and/or the solids processing building via power connections in and through the electrical substation(s) as required. The system should also recover the heat/steam produced to be used within the process.

If authorized by LFUCG, Strand will provide engineering services for design, bidding and construction phases. Depending on LFUCG's implementation schedule, and desire to proceed with a CHP construction project, these services can be combined with the base project, or can be completed separately.

We will also include improvements for acceptance of grease to enable you to send this waste to the digester and reap the benefits of increased gas production. We will include debris removal from the grease to keep trash out of your digesters. Enhancing the ability to accept other hauled wastes will be considered and planned for with a connection location. Should LFUCG wish to include new facilities to accept hauled waste in this project, a scope will be negotiated.

All requested scope elements from the RFP are included in our engineering costs.

We are excited to have the opportunity to continue working with LFUCG, and specifically the staff at the Town Branch WWTP, with whom we have developed a partnership approach to creating feasible, efficient solutions over many projects. We are dedicated to their success, as well as the ability for LFUCG to serve our community with dependable, cost-effective wastewater treatment services.

Investigation/Design Services for Town Branch WWTP
Primary Digester Complex Improvements and Digester Gas Master Plan (Additive Alternative)

Fee Schedule

(For a description of each section and task refer to Section 2 and 3 of the RFP)

Section 2

Scope of Work: Primary Digester Complex Improvements

A.	Task 1: Existing Primary Digesters Operations Review		
		Cost Task 1:	$ 9,000
B.	Task 2: Develop Equipment/Process Replacement Concepts		
		Cost Task 2:	$ 35,000
C.	Task 3: Detailed Desgin		
		Cost Task 3:	$180,000
D.	Task 4: Bidding Services		
		Cost Task 4:	$ 18,000
E.	Task 5: Construction Administration Services		
		Cost Task 5:	$ 150,000
	Estimated Total Hours for Inspections (Task 5.5):		600
	(18-Month Construction)		
		Section 2 Total Cost:	$ 392,000

Section 3

Scope of Work: Digester Gas Master Plan/CHP Project (Additive Alternative)

A.	Task 1: Kick-Off Meeting to Verify Project Scope		
		Cost Task 1:	$ 14,000
B.	Task 2: Develop Digester Gas Master Plan		
		Cost Task 2:	$ 35,000
C.	Task 3: Develop Equipment/Process CHP Concepts		
		Cost Task 3:	$ 30,000
D.	Task 4: Detailed design for CHP		
	(1) Complete 25% Design	$ 35,000	
	(2) Complete 50% Design	$ 30,000	
	(3) Complete 90% Design	$ 35,000	
	(4) Complete 100% Design	$ 25,000	
		Cost Task 4:	$ 125,000
E.	Task 5: Bidding Services		
		Cost Task 5:	$ 18,000
E.	Task 6: Construction Administration Services		
		Cost Task 6:	$ 110,000
	Estimated Total Hours for Inspections (Task 5.5):		460
	(12-Month Construction)		
		Section 3 Total Cost:	$ 332,000

C. Estimated Schedule

Estimated Schedule

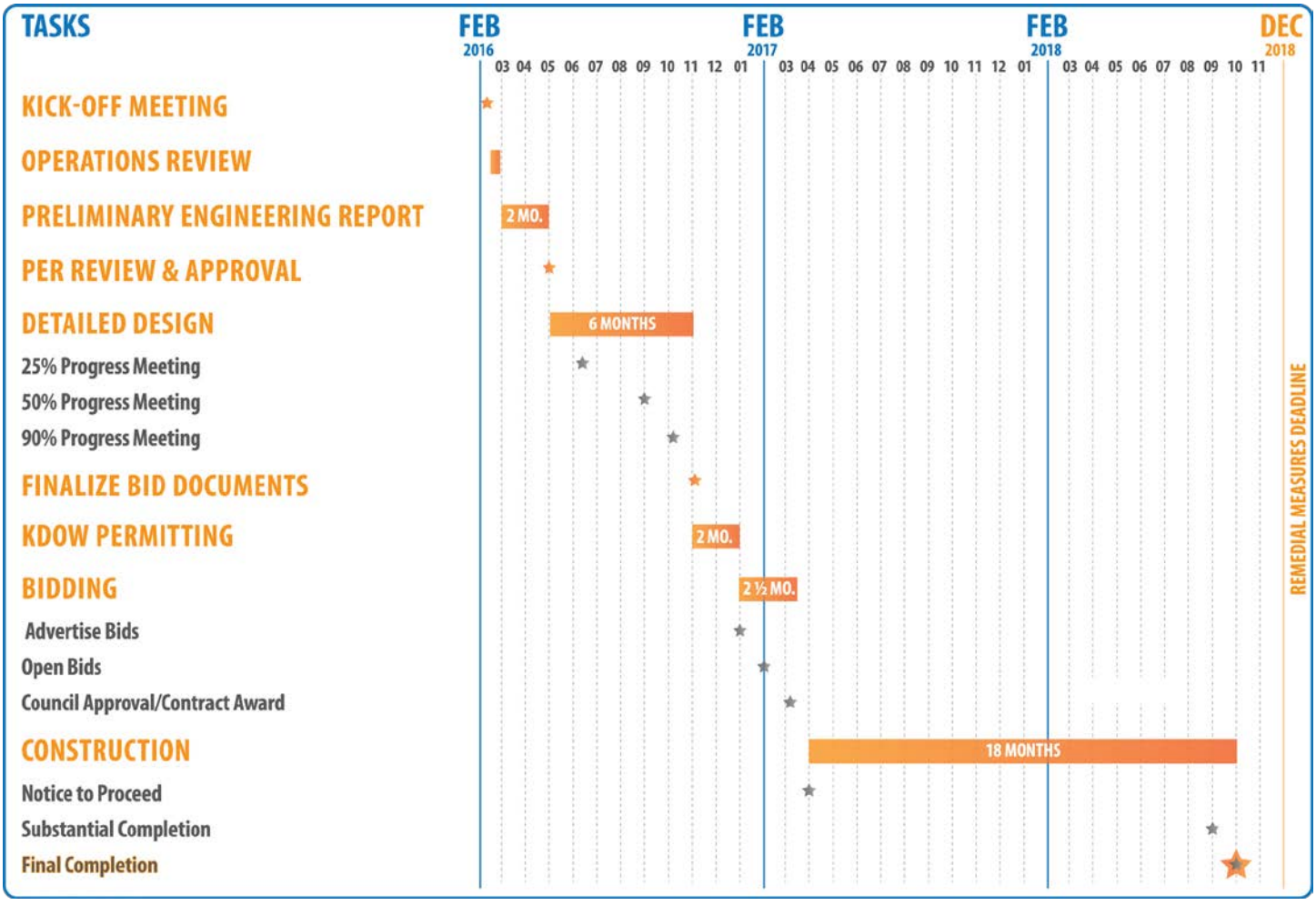
Strand's Project Schedule and Staffing Plan Provide Engineering Support to Meet December 2018 Consent Decree Completion Date

Strand project schedule meets EPA Remedial Measures Plan completion schedule.

The Primary Digester Complex project must be completed prior to December 2018 to meet EPA Consent Decree requirements. We understand the critical nature of completing the project on time and have developed a project schedule and staffing plan to meet critical project milestones. Strand's Project Team fully understands project requirements, and is available to begin work immediately.

The following schedule shows project substantial completion by September 2018, with engineering evaluation beginning in February 2016. The schedule allows three months to complete operations and review and the Preliminary Engineering Report (PER). Once adopted, the PER will become the roadmap to efficiently implement design and produce bidding documents. The schedule allows six months for design. Our recent experience with KDOW permitting indicates the approval process will take approximately two months. Once KDOW approval is obtained, bid documents will be issued to solicit bids from contractors. The bid process will take approximately 2-1/2 months to receive bids and obtain LFUCG Council approval. Once awarded, the construction contract duration is 18 months.

The 18 month construction period is based on the lead time for major equipment delivery, and keeping two digesters in service at all times. This requires digester cover replacement and renovation to be performed sequentially, with each digester renovation taking approximately four months.



The Gas Master Plan and CHP project schedule will be determined by LFUCG after proposals are evaluated. At LFUCG's option, these components can be completed parallel to the base project, or can be completed with a different schedule. We understand this additive alternative cannot adversely impact the schedule to complete Remedial Measures improvements.

Degree of Local Employment

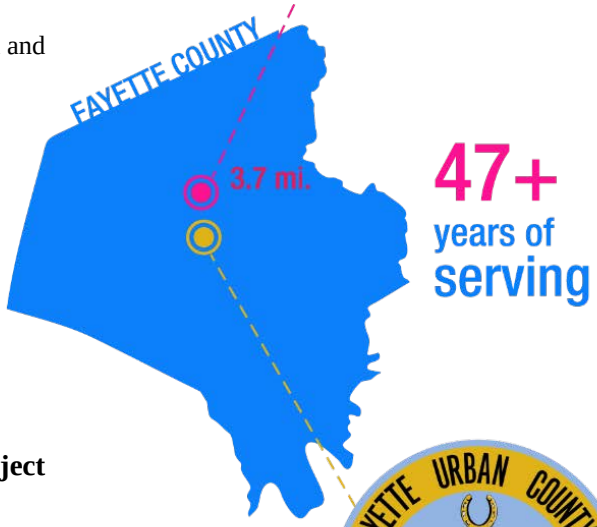
Our Lexington-Based Project Team will Maximize Local Employment

Our Lexington-based Project Team maximizes LFUCG's local employment objectives.

Selection of Strand for this project will maximize local employment utilizing our Lexington office to manage and deliver the project. Our Project Team is local, and invested in many aspects of our community. We have established working relationships with LFUCG DWQ engineering and plant operations personnel. The following illustrates that our Lexington office and Project Team is local with team members that live in Lexington and have supported LFUCG initiatives for over 30+ years.

Our Lexington Office Is Local

- ✓ Founded in 1968 (6 Years before Lexington and Fayette County Governments merged).
- ✓ Provided continuous record of service to Lexington since 1968.
- ✓ Local Design Team members have over 30 years of project experience at Town Branch WWTP.
- ✓ 4 miles from the Lexington Office to Town Branch Wastewater Treatment Plant.



Our Project Team is structured to meet LFUCG's DBE participation goal utilizing experienced professionals.

Strand's DBE Participation Provides Project Consistency and Meets LFUCG Goal

As a firm that supports initiatives of our local government, we endeavor, where practical to incorporate MWDBE participation goals in our contracting opportunities. Toward this end, our Project Team includes Magna Engineers (Magna), a Lexington-based WBE firm who is frequently a Strand partner on other wastewater treatment projects. Magna's participation supplements the Strand Project Team's local employment. We also will employ Cornerstone Engineering (Cornerstone), an MBE firm that has an office in Lexington. Strand frequently works with Cornerstone on projects similar to the Town Branch project. We are introducing LFUCG to two highly competent MWDBE firms on this project.

Capacity to Perform Work

Our Team is Available to Start Work Immediately and has Capacity to Meet LFUCG's Schedule

Strand coordinates staff assignments corporatewide through a scheduling system. This allows us to make sure the right staff are available at the right time for each of our projects. The following table shows staff availability and project requirements for the next 12 months. This indicates that our Project Team has the required hours available to meet LFUCG's needs. Both subconsultants, Magna and Cornerstone, have the also have the required capacity.

Months	Mike Davis		Scott Stearns		Randy Wirtz		Mark Sneve		Troy Larson		Emily Epperson	
	Required	Available	Required	Available	Required	Available	Required	Available	Required	Available	Required	Available
Feb-16		45		56		97		40		15		40
Mar-16		34		57		107		45		15		48
Apr-16		96		107		116		40		15		64
May-16		98		107		133		45		65		144
Jun-16		121		117		136		35		83		145
Jul-16		115		122		138		101		114		173
Aug-16		132		142		139		95		149		173
Sep-16		129		150		133		115		157		133
Oct-16		123		150		144		115		133		133
Nov-16		143		158		152		115		125		133
Dec-16		149		163		154		108		149		173
Jan-17		137		164		161		96		151		173
Total	***360***	***1,322***	***80***	***1,493***	***250***	***1,610***	***450***	***950***	***24***	***1,171***	***800***	***1,532***

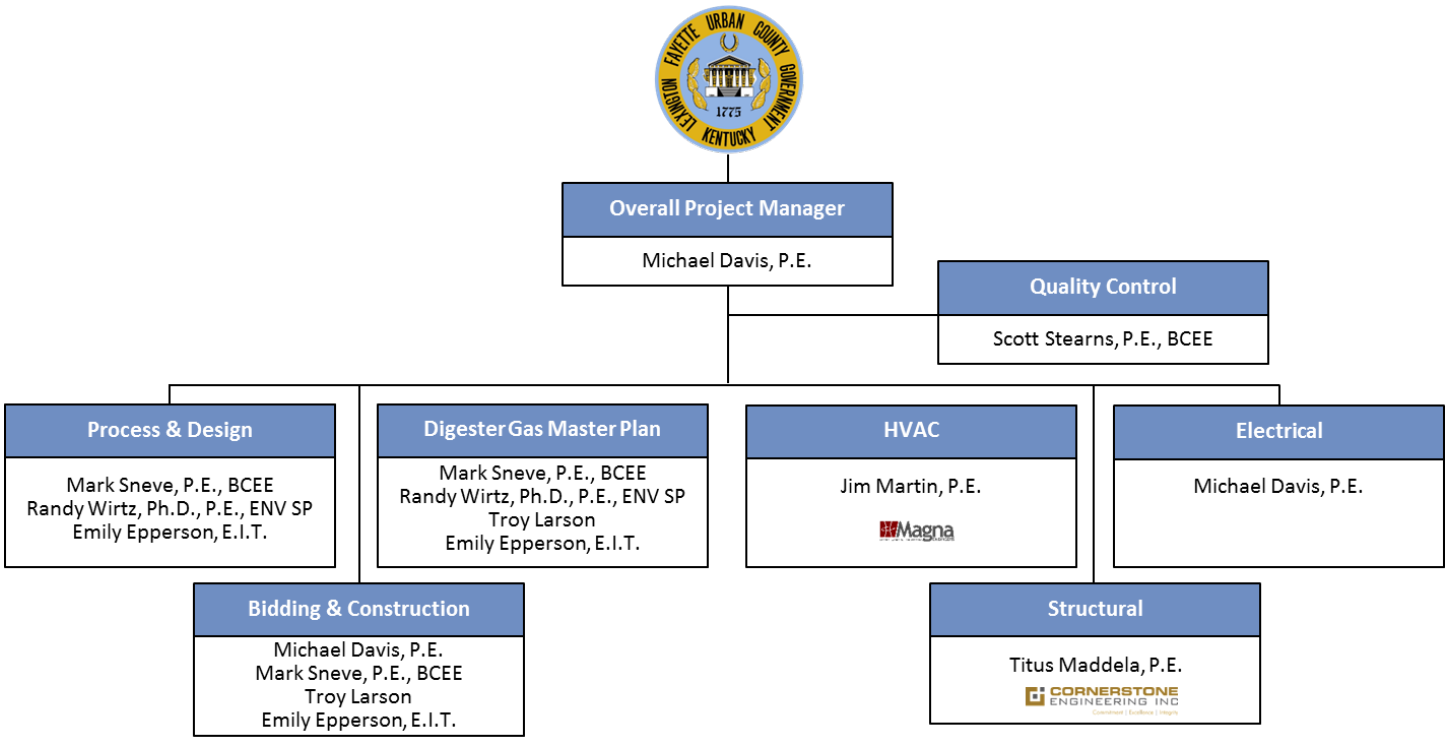
Project Team

Strand's Project Team Provides the Resources Required to Complete This Important Project

Our Team has the requisite credentials and capabilities, and is committed to the successful completion of this project.

Our Project Team was assembled to provide all the technical expertise required to see this project through to completion. Our Team includes individuals who have an overall understanding of wastewater treatment process, anaerobic digestion facilities, and have lengthy professional careers successfully providing these services for Lexington-Fayette Urban County Government (LFUCG) and other municipal utilities.

In addition to technical expertise, we selected Team Members that have availability to provide the level of service required in the available project time schedule. Our organization chart is structured to take advantage not only of expertise, but available time. Our Project Team is organized to share tasks in an efficient manner, resulting in on-time project completion. One-page resumes of key team members follow after page 3.



QUALIFICATIONS OF KEY PROJECT TEAM MEMBERS

Michael L. Davis, P.E. – *Overall Project Manager*

Mike has over 31 years of experience serving LFUCG on numerous wastewater treatment projects. He has served as Strand Project Manager for many LFUCG projects, including the recently completed pump station condition assessment, the Town Branch/West Hickman WWTP Utility Dual Feed Project and the Town Branch/West Hickman WWTP Electrical/SCADA Improvements project. Mike was a project engineer during the original 1988 primary digester construction project, giving him a unique perspective for completing this primary digester complex improvements project. Mike will be assisted through design, bidding and construction by Team Members that are familiar with LFUCG project administration. ***Elizabeth A. Kuypers, P.E.*** will assist Mike by providing technical expertise, attending project meetings with Mike, and processing the various documents required during construction. Mike will also serve as the electrical and SCADA project engineer.

Scott W. Stearns, P.E., BCEE – *Quality Control*

Scott will be responsible for the **Quality Control** of this project. Scott is a licensed professional engineer with 21 years of project experience. Scott has been responsible for planning, design, and construction projects for wastewater facilities serving populations of 1,000 to 300,000 and with costs ranging from $10,000 to $42.5 million. Scott managed the anaerobic Digestion process improvements for the Parkersburg WV and KRMA, IL projects.

Mark A. Sneve, P.E., BCEE – *Planning and Design Project Manager*

Mark will manage the **planning and design phases** and serve as a key resource during the **bidding and construction phases**. Mark is a licensed professional engineer, with 27 years of project experience. Mark has extensive experience providing engineering services for major wastewater plant expansions. Mark is very familiar with the Town Branch WWTP. In 2005, he completed a phosphorus removal study that identified plant modifications that would be required to comply with potential phosphorus limits. He was the project manager for the chlorination/dechlorination system improvements completed in 2009. He also performed a blower/aeration system evaluation to determine modifications that would improve overall plant operation and efficiency. Mark's experience with anaerobic digestion dates back to his Master's degree research where he studied toxic effects to methanogens. Mark has worked on anaerobic digestion projects for Joliet, IL and Prichard AL (Brooks and Morris Plants). Mark is currently serving as the wastewater task lead for the Louisville MSD Comprehensive Facilities Plan which includes the 120 mgd Morris Forman WQTC which employs anaerobic digestion.

Randy A. Wirtz, Ph.D, P.E. – *Design Resource and Digester Gas Master Plan Project Manager*

Randy will assist Mark with any **process design engineering services** as required. Randy will also manage the **additive alternative Digester Gas Master Plan** and **CHP design**, if awarded. Randy has a Doctorate degree from the Iowa State University, with over 21 years of experience in anaerobic digestion, cogeneration, energy recovery, and energy efficiency projects. Randy has overseen all of our firm's anaerobic digestion and gas utilization projects over the past 21 years and offers unmatched anaerobic digestion expertise in the region. His has delivered similar digestion and cogeneration planning, design, and construction services for clients at Dubuque, IA; Fond du Lac, WI; Brookfield, WI; KRMA, IL; Thorn Creek Basin Sanitary District, IL; and many others.

Emily Epperson, E.I.T. – *Process Design/Contract Administration*

Emily will serve as **Process Engineer** through **design, bidding and construction** on this project. Emily has recent LFUCG wastewater experience providing RPR services for the West Hickman Blower Improvements project, and design for the current Town Branch Headworks Improvements project. She has also completed studies to evaluate operation and treatment efficiencies of water and wastewater treatment facilities. She will assist with drawing and specification development, and will provide on-site services during construction.

Troy A. Larson - *Operations*

Troy will be the **plant operations specialists** for this project. Troy received his B.S. degree in Biology and has 20 years of broad experience in the wastewater operations field, including plant operations. He has operated treatment facilities, worked as a soils technician, and currently works to support our wastewater treatment facility planning, design, and construction-related projects with input from the operator's perspective. Troy has an extensive background in the optimization and control of wastewater treatment processes. He has performed in a similar role for LFUCG projects, providing operator-focused input for wastewater system design, and providing follow-up services to help optimize treatment operation. Troy has been involved with design, start-up and training for all of our anaerobic digestion projects included those with advanced digester gas utilization for the last 15 years. He brings a unique operations perspective to improve design and streamline start-up.

Subconsultant Participation

Magna Consultants, a Lexington-based woman-owned business, is a regular participant on Strand Project Teams, and will provide mechanical engineering planning, design and construction-related services. This is a role Magna recently performed as part of our team on the the MSD Hite Creek hydraulic improvements project. We have developed a successful working relationship with Magna through collaborating on five projects.

Cornerstone Engineering, Inc., will assist our team with structural and architectural engineering services. Cornerstone will participate in planning, design and construction phases. We have partnered with Cornerstone to complete similar improvements on the MSD Hite Creek WQTC project that is under construction. Cornerstone is a minority owned business based in Louisville, but with an office in Lexington.

Magna and Cornerstone provide our Team with DBE subcontracting opportunities in line with LFUCG's 10% participation goal.

Character, Integrity, Reputation, Judgment, Experience And Efficiency

Strand's History of Success is Fostered by Helping Our Clients Succeed through Excellence in Engineering

Excellence in engineering is a hallmark of our business philosophy.

We are proud of our reputation for quality work, technical expertise, and efficiency of production, which is complemented by the character and integrity of our respective employees. Strict adherence to an attitude of professionalism and objectivity toward all of our clients has brought us success over the years, as evidenced by the longstanding history of our firm. Our record of success is firmly supported by this history and the volume of work we have been entrusted to administer on behalf of our clientele, many of whom we have maintained longstanding relationships spanning decades.

Our work experience includes a wide variety of engineering projects, including wastewater treatment, stormwater management, environmental regulatory compliance, water supply projects, municipal engineering, transportation, structural, electrical, surveying and mechanical projects. As a full-service engineering firm, it is our practice to follow our projects through to construction completion and beyond, providing the necessary staff to perform office and field activities alike.

Our Character, Integrity, Reputation, Judgment, Experience and Efficiency are demonstrated by our years of consistent services to LFUCG.

The adjacent table highlights the volume of construction projects designed and bid by Strand. In addition, Strand provides a large volume of client service that does not result in construction for studies and other related field activities. We remain firm believers that the growth of this volume is indicative of our commitment to meeting client needs. ***For calendar year 2014, Strand was ranked in the Engineering News Record as 184th of the Top 500 Design Firms nationally.***

Strand-Designed Construction
Contracts since 2003

Year	Contracts	Bid Amount
2014	84	$144,909,000
2013	120	$193,032,766
2012	126	$161,900,000
2011	126	$193,600,000
2010	84	$218,802,494
2009	122	$238,300,000
2008	104	$101,600,000
2007	128	$138,300,000
2006	168	$168,300,000
2005	176	$229,700,000
2004	157	$129,600,000
2003	162	$126,500,000

Strand has been a part of the Lexington community for more than 46 years. During this time, we have served LFUCG on numerous major wastewater treatment projects, including the last Town Branch WWTP expansion that constructed the existing headworks facility. Our ***Character, Integrity, Reputation, Judgment, Experience and Efficiency*** are demonstrated by our long-standing working relationship with LFUCG, and the interaction of our Project Team members with DWQ and Town Branch WWTP staff.

Michael L. Davis, P.E.

Senior Associate

AREAS OF EXPERTISE

- Electrical Distribution
- Instrumentation and Control
- Site Utilities
- Sewer System Rehabilitation
- Traffic Signalization and Roadway Lighting

PROFESSIONAL EXPERIENCE

Wastewater Treatment Facilities experience includes project management and design for treatment plants up to 30 mgd. Responsibilities include management during the design, bidding, and construction administration phases of the project.

Sanitary Sewer Modeling experience includes project management for study and modeling of sanitary sewers within three major water sheds within Fayette County. Activities include setting modeling guidelines, developing field investigation techniques, and reviewing results to make recommendations for system improvements.

Site Utilities experience includes design and construction-phase services in support of municipal and commercial projects. Municipal project responsibilities included design and coordination with utility companies to provide appropriate services for water, sanitary sewer, natural gas, and electric services.

Sewer System Rehabilitation experience includes project management and design to rehabilitate sewer systems using a variety of rehabilitation methods including pipe bursting, slip-lining, and cured-in-place lining, in addition to traditional excavation types of repairs. Responsibilities include project planning, evaluation of existing pipe conditions, applying the different rehabilitation strategies and construction administration.

Electrical Instrumentation and Control experience includes design and construction-phase services for numerous projects including water and wastewater treatment plants, pumping stations, commercial office buildings, signals and lighting. Projects include distribution systems with voltages ranging from 120/240 volts to 12,470 volts. Instrumentation control experience includes PC-based SCADA systems with up to 60 remote sites, and PLC-based control systems and treatment process monitoring/control equipment to provide plant automatic control.

Pumping Station experience includes project management and design experience for wastewater pumping stations and force mains. Pump station sizes range from 35 to 15,000 gpm. Force mains range in diameter up to 30 inches, and lengths up to 24,000 feet.

Lexington-Fayette Urban County Government Town Branch/West Hickman WWTP Electrical, SCADA and Blower Improvements, Lexington, Kentucky – Project Manager and Electrical Engineer for $17 Million major electrical and SCADA improvements project. Project included SCADA replacement of Town Branch and West Hickman treatment facilities, and major electrical renovation at West Hickman.

Lexington-Fayette Urban County Government Town Branch and West Hickman WWTP WWTP Redundant Power, Lexington, Kentucky – Project Manager and Electrical Engineer for $500,000 electrical upgrade to provide dual electrical services to both wastewater treatment plants.

Lexington-Fayette Urban County Government – South Limestone, West Main Street, Vine Street, and East Main Street Streetscape Design, Lexington, Kentucky – Streetscape design project includes signal replacement, signing, sidewalk, delivery zones, on-street parking, pedestrian amenities, and landscaping. Led efforts for the electrical design for lighting and signal, including photometrics.

YEARS OF EXPERIENCE

32

YEARS WITH FIRM

32

EDUCATION

B. S. Electrical Engineering – University of Kentucky, Lexington, 1984

REGISTRATION

Professional Engineer in Kentucky, Alabama, and Mississippi

STRAND ASSOCIATES®

Scott W. Stearns, P.E., BCEE

Senior Associate

AREAS OF EXPERTISE

- Water and Wastewater Treatment Unit Processes
- Biosolids Digestion, Thickening and Handling System
- Membrane Bioreactor Systems
- Conveyance System Evaluations
- Project and Construction Management

PROFESSIONAL EXPERIENCE

Water and Wastewater Treatment experience includes facility planning, design, construction, and project management ranging from small plant expansions to a multimillion Greenfield projects. Scott has served as Project Manager for the following:

- Logan Todd Regional Water Treatment Plant, a 10 mgd, $25 million project.
- Parkersburg Utility Board, West Virginia 10 mgd, $42.3 million wastewater treatment plant expansion.
- Kankakee River Metropolitan Agency, Illinois 25 mgd, $65 million wastewater treatment plant expansion.
- City of Waukesha, Wisconsin 14 mgd, $41 million plant expansion.
- The Morgantown Utility Board, West Virginia, 22 mgd, $70 million plant expansion.

Specific areas of process expertise include, membrane bioreactors, wastewater treatment processes such as screening, grit removal, sedimentation processes, activated sludge processes, digestion, sludge thickening and dewatering. Water treatment expertise includes membrane filtration piloting and design, flocculation, sedimentation, lime softening, water treatment residuals management. Additional experience in process instrumentation, control strategies, and system commissioning and start-up. Experience in permit and regulatory issues, user-charge development, sludge regulations, operator training and system startup, planning, design and startup for water and wastewater plants. Research experience includes radium and radon fate and transport in water distribution systems.

CSO/SSO Systems experience includes project management, quality control, peak excess flow treatment, and blending. Scott's project management CSO/SSO-related project includes:

- City of Aurora, IL
- Charleston Sanitary Board – Charleston, WV
- Parkersburg Utility Board – Parkersburg, WV
- Morgantown Utility Board – Morgantown, WV
- Huntington Sanitary Board – Huntington, WV

AWARDS

- Commissioned as a Kentucky Colonel by the Governor of Kentucky for the outstanding service provided during planning, design and construction of the Logan Todd Regional Water Commission WTP. This award honors those who have made significant contributions to the betterment of the Commonwealth of Kentucky.

- The American Council of Engineering Companies of Wisconsin "Best in State" Award for the Logan Todd Regional Water Treatment Plant in the 2004 Engineering Excellence Award Competition.

PRESENTATIONS (Partial Listing)

- Options for meeting stricter, new ammonia limits, presented at Illinois Association of Wastewater Agencies Technical meeting, 2015, Utica, Illinois.
- An aging treatment plant and new neighbors and challenges, presented at the South East Ohio Water Environment Federation meeting, 2015, Athens, Ohio.

- Evaluating equipment with the end in mind - How do we get the equipment we want for an affordable price? presented at WATERCON Total Water Conference 2014, Springfield, Illinois.

YEARS OF EXPERIENCE

23

YEARS WITH FIRM

23

EDUCATION

M.S. Civil/Environmental Engineering – University of Iowa, Iowa City, 1993

B.S. Civil/Environmental Engineering – University of Iowa, Iowa City, 1991

REGISTRATION

Professional Engineer in Wisconsin, West Virginia, Ohio, and Illinois

STRAND ASSOCIATES®

Randall A. Wirtz, Ph.D., P.E., ENV SP

Senior Associate

AREAS OF EXPERTISE

- Biological Wastewater Treatment
- Chemical/Physical Wastewater Treatment
- Municipal and Industrial Wastewater Treatment
- Solids Stabilization and Management
- Disinfection Odor Control

PROFESSIONAL EXPERIENCE

Municipal Wastewater Treatment experience includes planning and design of biological treatment facilities, biosolids stabilization facilities, cogeneration and co-digestion facilities, energy recovery and efficiency projects, odor control facilities, chemical treatment systems, sludge dewatering systems, disinfection facilities, and pumping and conveyance facilities.

Industrial Wastewater Treatment experience includes anaerobic and aerobic biological treatment processes, pH control, equalization, flotation/clarification, chemical processes, residuals/solids stabilization and management, odor control, and permitting assistance. Industrial wastewater experience includes dairy and cheese processing, meat processing, vegetable processing, snack food production, bakeries, dessert and candy processing, pharmaceutical, and chemical production.

Water Treatment experience includes design of pumping facilities, granular media filtration units, chlorination, fluoridation, and sludge dewatering and handling facilities.

PRESENTATIONS

Partial Listing

- Dubuque Water Pollution Control Plant – Conversion from Sludge Incineration to Anaerobic Digestion with Tom Foltz and Jonathan Brown, to be presented at the Iowa Water Pollution Control Association Annual Technical Conference, Clinton, IA, on June 10 – 12, 2009
- Effluent Phosphorus Limits – Impact on Plant Design and Operations, presented at the Ohio Water Environment Association Plant Operations Seminar, Columbus, OH, September 25 – 26, 2007
- MOP FD-3 – Industrial Wastewater Management, Treatment, and Disposal primary author for pH Control Chapter, Water Environment Federation, 2008
- Managing and Projecting a Significant Industrial Load Increase at an Enhanced Nutrient Removal POTW with D. Ward and R. Javier, presented at the Industrial Water Quality 2007 Conference, Providence, RI, July 30 – August 1, 2007
- Two-Stage Activated Sludge with High-Purity Oxygen – Analyzing a Dinosaur presented at the 79th Annual Conference of the CSWEA, Charleston City, IL, May 2006

PROFESSIONAL AFFILIATIONS

- Central States Water Environment Association
- Water Environment Federation
- Wisconsin Wastewater Operators Association

YEARS OF EXPERIENCE

21

YEARS WITH FIRM

21

EDUCATION

Ph.D. Civil/Environmental Engineering – Iowa State University, Ames, 1994

M.S. Civil/Environmental Engineering – Iowa State University, Ames, 1992

B.S. Civil/Environmental Engineering – University of Wisconsin-Platteville, 1990

REGISTRATION

Professional Engineer in Wisconsin, Ohio, Missouri, Iowa, Illinois, and Arizona

STRAND ASSOCIATES®

Mark A. Sneve, P.E., BCEE

AREAS OF EXPERTISE

- Wastewater Collection and Treatment Facilities
- Solids Handling Processes
- Biological Processes
- Combined Sewer System Studies
- Advanced Nutrient Removal
- Infiltration and Inflow Studies

PROFESSIONAL EXPERIENCE

Consulting experience in the field of environmental engineering with emphasis on wastewater treatment process selection, planning, treatment system design, construction coordination, startup and operator training

Wastewater Treatment experience includes serving as project engineer, assistant project manager, or project manager for efforts in facilities planning of major additions and upgrades for municipal wastewater treatment plants, process design for wastewater treatment facilities, additions to wastewater treatment plants with high industrial flows, **anaerobic digestion processes**, coordinator of construction efforts, serving as resident project representative, contributing to operation and maintenance manuals for various municipal wastewater treatment facilities, instructing staff on wastewater facility operation, and user charge system studies.

Combined Sewer Systems experience includes preparing CSO Operational Plans, Long-Term Control Plans, investigating solids and floatable control, water quality sampling, monitoring and data evaluation, Citizen Advisory Committees and negotiating Enforcement Actions with Agencies.

Specialized Field Service experience includes efforts in the area of litigation support, managing compliance with enforcement actions, industrial pretreatment permitting, industrial discharge monitoring, groundwater investigations, solids processing equipment evaluations, industrial sampling auditing, priority pollutant sampling, and coordination of WWTP effluent biomonitoring.

Laboratory experience includes serving as Director of Technical Activity for private laboratory. Responsible for laboratory quality assurance plan, troubleshooting, personnel, and financial aspects.

PUBLICATIONS
(Partial Listing)

- Simple Early Steps Toward Meeting Lower Phosphorus Effluent Limits with Randy Wirtz, Ph.D., P.E., presented at Ohio WEA 87th Annual Meeting, June 2013.
- Phosphorus Removal – Planning and Operational Strategies for Biological and Chemical Phosphorus Removal Facilities with Scott Stearns and Troy Larson, presented as a Webinar for Ohio WEA, September 2013.
- West Hickman Creek WWTP Blower Upgrade Reduces Power Consumption with Tiffany Rank, Jane Worton, and Mike Davis, presented at the Water Professional Conference, July 2013.
- Phosphorus & Nitrogen Removal in Wastewater, presented at the Kentucky Rural Water33rd Annual Conference, August 2012, and the Central Kentucky Water & Wastewater Operators Association Fall Conference, September 2012.
- Existing Water Quality Standards and Wet Weather Compliance are Mutually Exclusive, Why? presented at the Water Professionals Conference, July 2011.

YEARS OF EXPERIENCE
26

YEARS WITH FIRM
26

EDUCATION
M.S. Civil/Environmental Engineering – University of Iowa, 1989

B.S. Civil/Environmental Engineering – University of Iowa, 1987

REGISTRATION
Professional Engineer in Kentucky, Indiana, Ohio, Alabama, Mississippi, and Wisconsin

Board Certified Environmental Engineer, American Academy of Environmental Engineers and Scientists

STRAND ASSOCIATES®

Troy A. Larson

AREAS OF EXPERTISE

- Wastewater Operations Specialist
- Wastewater Process Control
- Wastewater Treatment Plant Operator Training
- Wastewater System Date Management
- Wastewater Laboratory Analysis
- Biological Wastewater Treatment

PROFESSIONAL EXPERIENCE

Operations Specialist experience includes start-up services, operator training, microscopy evaluations, and troubleshooting.

Wastewater Treatment Operator experience includes operating, monitoring, and controlling a high-rate anaerobic and aerobic wastewater treatment system for a high-strength dairy wastewater.

Wastewater Treatment Plant Start-Up and Operator Training experience includes monitoring and controlling a wastewater treatment plant during major upgrades.

Lab Analysis experience includes performing an analysis on wastewater and groundwater including quality control, and reporting of the data following the analysis.

Waste Removal experience includes safe and proper application of wastewater treatment sludge and industrial and crop wastes to farmland.

Wastewater System Data Management experience includes assistance with the organization and set up of data management databases.

Utility Construction Observation on various municipal projects.

Project Management experience related to planning studies, wastewater operations, and groundwater monitoring-related services.

Industrial Wastewater Characterization experience includes evaluation of products, raw materials, cleaning chemicals, and other factors that might impact wastewater treatment and pretreatment systems.

Pollutant Minimization Project experience includes industry and community involvement in mercury source control projects.

PRESENTATIONS (Partial Listing)

- Delivered presentation on Energy Optimization in activated sludge at the 2000 WWOA Annual Conference in Green Bay, Wisconsin.
- Presented an overview of the phosphorous rule updates and the impact expected at municipal wastewater treatment plants to the League of WI Municipalities 2010 Annual Conference.
- Presented Succession Planning at the 2010 WWOA Annual Conference. Wrote an article for the organizations magazine (The Clarifer) at the request.
- Presented an overview of the phosphorus rule updates and he impact expected at municipal wastewater treatment plant to the League of Wisconsin Municipalities 2010 annual conference.
- Presented succession planning presentation at the 2010 WWOA Annual Conference.

CONTRIBUTING AUTHOR

- Biological Nutrient Removal Operation in Wastewater Treatment Plants. Published as Manual of Practice 29 by the Water Environmental Federation (WEF), American Society of Civil Engineers (ASCE) and Environmental and Water Resources Initiative (EWRI).

PROFESSIONAL AFFILIATIONS

- Water Environment Federation
- Central States Water Environment Association (Wisconsin Section Operations Chair)
- Wisconsin Wastewater Operators Association (Technical Committee Member)

YEARS OF EXPERIENCE

20

YEARS WITH FIRM

19

EDUCATION

B.S. Biology – University of Wisconsin-Whitewater, 1995

REGISTRATION

Certified Wastewater Operator in Wisconsin

STRAND ASSOCIATES®

Emily L. Epperson, E.I.T.

AREAS OF EXPERTISE

- Water Distribution Systems
- Wastewater Collection Systems
- Intersection Safety
- Topographic Surveying
- MicroStation and AutoCAD Drafting

PROFESSIONAL EXPERIENCE

Water Distribution experience includes design for Jackson Energy Authority in Jackson, Tennessee. She was responsible for plan and profile design of water line extensions and relocations throughout the system.

Wastewater Collection experience includes design for Jackson Energy Authority in Jackson, Tennessee. She was responsible for plan and profile design of sewer line installations throughout the system. Additional experience in Mercer County, Kentucky with design of low pressure sewer systems.

Intersection Safety experience includes recommendation of corrective measures to remedy high-crash counts at stop-controlled intersections. Recommendations were submitted to the Tennessee Department of Transportation.

Field experience includes GPS mapping of existing and proposed water and wastewater mains, and field safety audits of high-crash, stop-controlled intersections.

PROFESSIONAL AFFILIATIONS

- American Society of Civil Engineers
- American Water Works Association

YEARS OF EXPERIENCE

2

YEARS WITH FIRM

2

EDUCATION

B.S. Civil Engineering – Tennessee Tech University, Cookeville, Tennessee, 2013

REGISTRATION

Engineer-in-Training

STRAND ASSOCIATES®

James L. Martin, P.E.
Chief Mechanical Engineer

Education

University of Kentucky, 1977
Bachelor of Science,
Mechanical Engineering

Lain Technical Institute, 1966
Associate of Science,
Architectural Drafting

Registration & Professional Affiliations

Professional Engineer - Mechanical, KY #10384
Professional Engineer - Mechanical, IN #60900205
Professional Engineer - Mechanical, OH #E-58679
Professional Engineer - Mechanical, WV #15491
American Society of Heating, Refrigeration, & Air Conditioning Engineers (ASHRAE)
National Society of Professional Engineers (NSPE)
Society of Fire Protection Engineers

Experience and Qualifications

Mr. Martin has over 40 years of experience with design of plumbing, medical gases, HVAC and fire suppression systems for new construction as well as renovations of existing facilities. Mr. Martin's experience includes design and construction supervision of a wide variety of HVAC systems including variable air volume, geothermal, heating and cooling central plant generating systems, facility condition surveys and energy performance studies.

Relevant Project Experience

- **New Lower Howards Creek Wastewater Treatment Plant, Winchester, KY** – Mechanical engineer in charge of HVAC and plumbing for this new $28M wastewater treatment plant, which includes indoor process areas, control rooms, and a new administration building. The design included ventilation as required per NFPA 820 for operator safety and to reduce the level of required hazardous area classifications. The design was closely coordinated with odor control systems for the facility.
- **Muddy Fork Interceptor SSO Storage Basin**, **Louisville, KY** – Mechanical engineer responsible for HVAC and plumbing design for a new wet weather storage facility for Louisville MSD. The project included below grade storage basin, pump station, and control building. The design included tipping bucket wash down and spray wash systems for the storage basin. The storage basin includes mechanical ventilation for operator safety. The control building is conditioned to accommodate variable frequency drives which serve the pumps.
- **Wastewater Treatment Plant Improvements, Irvine, KY** - Mechanical engineer in charge of HVAC and plumbing for a major upgrade to an existing wastewater treatment plant. The design included ventilation as required per NFPA 820 for operator safety and to reduce the level of required hazardous area classifications. The design included HVAC to accommodate a new indoor 1,000 KW diesel generator.
- **Return Sludge Pump Station Improvements, Derek Guthrie Wastewater Treatment Plant, Louisville, KY** – Mechanical engineer for improvements at the existing return activated sludge pump station. The project includes replacement of the existing pump variable frequency drives, and relocation to a dedicated electrical room. HVAC replacement was required to accommodate the new electrical room, and includes a ductless split system dedicated to the electrical room.
- **Morehead WWTP and WTP Energy Audit** – Mechanical engineer for an energy audit report which addresses the existing water and wastewater treatment plants, including recommended improvements, an estimated cost of the initial investment, along with the estimated savings in energy costs, for a total life cycle cost for each recommendation.

CORNERSTONE ENGINEERING INC
Commitment | Excellence | Integrity

Titus Maddela, P.E.
Project Manager

QUALIFICATIONS

EDUCATION

2007, B.S., Civil Engineering, The State University of New York, University at Buffalo

YEARS OF EXPERIENCE

9

SPECIALIZATIONS

Structural Design: Steel, Concrete, Timber

Structural Inspection

Special Inspection

Structural Analysis

Repair and Rehabilitation Design

Proficient in codes such as: ACI 318-08, ACI 350, ASIC Steel Manual, ASCE 07-10, IBC 2012, PTI Manual, NDS

PROFESSIONAL REGISTRATIONS

P.E. – *NY*
P.E. - KY

TECHNOLOGY SKILLS

AutoCAD
SAP2000
MathCAD
STAAD
RISA 3D
Bentley RAM
Microsoft Office

Mr. Maddela has 9 years of experience in structural engineering. He has been involved a variety of work including structural inspections, analysis & design, drafting, shop drawing review, cost estimating (for projects ranging from $250,000 to $5,000,000), field supervision, field surveys, and various types of testing procedures. He has worked on many types of structures and buildings including deteriorated reinforced concrete, pre-stressed concrete, post-tensioned, steel, wood, roofs, and high rises. He is currently acting as Project Manager for several projects with Louisville MSD.

Mr. Maddela's Current Projects:

- MSD-Hite Creek Treatment Plant Expansion: Construction phase project manager
- MSD-Clifton CSO Basin: Perform structural design and produce construction documents.
- MSD-Muddy Fork Basin: Perform shop drawing reviews and coordinate RFI responses.
- MSD- Nightingale CSO Basin: Assist in shop drawings review and RFI clarifications as required.
- MSD- CSO 093 & 140- elimination design and construction inspection-just completed

Mr. Maddela's project management experience includes:

- Review and approve payment request applications, change orders, submittals, release of liens, warranties, and schedules
- Conduct construction meetings and prepare meeting minutes
- Coordinate meetings and inspections with manufactures' representatives during life of project
- Supervise field inspectors

Mr. Maddela's design and inspection experience includes:

- Structural calculations for reinforced concrete and steel structures
- Design of composite floor systems
- Connection design
- Supervision of drafters
- Review shop drawings and submittals
- Threshold structural inspections for reinforced concrete buildings
- Fieldwork involving building inspection and documentation of existing structural conditions for various types of buildings
- Produce condition assessment reports with repair budget estimates
- Independently conduct field surveys of existing structures via suspended stages, man lifts, and boom lifts
- Gable truss and other wood structures analysis and inspections
- Investigation and repair of deteriorated reinforced concrete, pre-stressed concrete, post tensioned and steel structures
- Oversee roofing reinstallations projects including built up coal tar, cold applied, and sprayed foam membranes

Mr. Maddela is also familiar with post tension repair, water proofing, structural repair specification and plans, nondestructive testing, thermal imaging, and destructive testing.

E. Similar Projects

Similar Projects

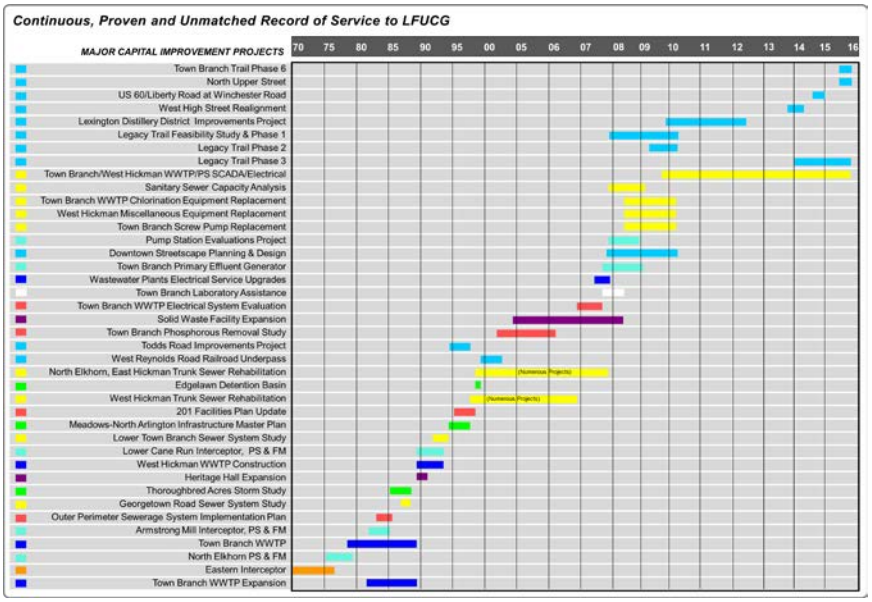
Strand's Proven Service and Commitment to LFUCG Demonstrates Our Ability to Serve LFUCG Effectively on this Project

Strand has provided engineering services for Town Branch WWTP projects for over 30 years.

Strand Associates, Inc.® has been providing consistent and dependable engineering services for public and private sector clients since 1946. To serve our national client base, we have 380 staff in 10 offices throughout the country, including our office in Lexington, Kentucky. Our Lexington-based staff have an established track record serving LFUCG since 1968. Wastewater is a major area of specialized experience for our company. Wastewater and biosolids engineering has been a core service of ours since the 1940s. After nearly 70 years of success, we have grown into a significant wastewater engineering firm that is ranked ***among ENR's Top 20 Wastewater Firms, which we were ranked 17 in 2014***. Our Project Team provides the capabilities of a nationally recognized firm, with service from our local Lexington staff. Our Project Team brings the following key attributes to this important LFUCG project.

Past Record of Performance

Strand has served LFUCG continuously and successfully since 1970. We are proud of our record of performance and the privilege to be of service to the Urban County Government and to the community. Strand has provided a broad range of wastewater engineering services from initial planning through design and construction. Members of the Strand Project Team worked on the original primary digester complex design and construction in the late 1980s. More recently we provided engineering services for the Primary Effluent Pump Station Improvements project, Town Branch Electrical and SCADA Improvements Project, and the on-going Grit and Screenings Removal Project. Strand also completed the Town Branch Phosphorus Study in 2005, which provides the basis for meeting future phosphorus removal requirements, and will influence the ultimate recommendation for improvements to the primary digesters.



Strand's 40+ year history of serving LFUCG

Specialized Experience

Strand's Understanding of the Town Branch Treatment Process, SCADA and Electrical Systems Results in Seamless Anaerobic Digestion Upgrades

Digester Complex improvements are required to address remedial measures plan and consider beneficial use of digester gas.

The Town Branch WWTP has a 30 MGD design capacity and peak flow capacity of 64 MGD. The anaerobic digestion facilities include three primary digesters and related equipment. Strand provided engineering services for LFUCG when the existing digester complex was last upgraded, and for many subsequent plant projects.

For a project of this nature to be successful, it must incorporate input from LFUCG staff that are responsible for these facilities on a daily basis. Strand's approach to project development emphasizes owner input.

Beginning with the project kick-off meeting and continuing through all phases of project development, Strand will engage LFUCG operations and engineering staff to obtain input regarding equipment and process upgrades. This input, combined with Strand's engineering expertise, will result in efficient, cost-effective systems. Strand has demonstrated this approach through prior projects completed with the LFUCG Division of Water Quality.

Strand's Experience Implementing Anaerobic Digestion Upgrades for Existing Facilities Leads to the Optimal Solution for Town Branch

Strand's anaerobic digester experience results in cost-effective implementation.

Strand's Project Team has significant experience implementing upgrades to anaerobic digestion facilities for wastewater treatment plants with similar capacities to the Town Branch WWTP. Strand's experience includes the original design for the Town Branch WWTP. Our Project Manager provided design and construction services for the original facilities, and is intimately familiar with the existing primary digestion process.

The table below lists the wealth of our firm's anaerobic digestion experience, including the nature of our project work and the comparable size of the facility. We would be happy to provide additional information regarding these projects at LFUCG's request.

Client/Location	Project ID	Plant Size (mgd)	Biosolids Planning	Biosolids Disposal	Anaerobic Digestion	Biogas Use Analysis	Cogen	High-Strength Waste
Lexington-Fayette Urban County Gov't	Town Branch WWTP Expansion	30	●	●	●	●		
Louisville MSD, KY	Biosolids Planning and Preliminary Design	120	●	●	●			
Madison Metropolitan Sewerage District, WI	Energy Master Plan	50			●	●	●	●
FRWRD, IL	Biosolids and Biogas Master Plan	38	●	●	●	●	●	●
KRMA, IL	Planning, Design, and Construction	20	●	●	●	●	●	●
Glenbard, IL	Planning, Design, and Construction	16.2	●	●	●	●	●	●
Joliet, IL (East Plant)	Anaerobic Digestion Expansion and upgrade	18.2			●			
Manitowoc, WI	Operation and Needs Review	15.5	●	●	●	●	●	●
Parkersburg, WV	Planning, Design, and Construction	15	●	●	●	●		
Prichard, AL (Morris WWTP)	Anaerobic Digestion Equipment Replacement	4			●			
Prichard, AL (Brooks WWTP)	Anaerobic Digestion Equipment Replacement	1.5			●			
Waukesha, WI	Planning and Design	14	●	●	●	●	●	●
Brookfield, WI	Facilities and Biogas Use Plan	12.5	●	●	●	●	●	●
Fond du Lac, WI	Planning, Design, and Construction	10	●	●	●	●	●	●
Dubuque, IA	Facilities Plan, Design and Construction	11	●	●	●	●	●	●
RMMSD, WI	Facilities Plan	4.5	●	●	●			
Whitewater, WI	Biosolids/Biogas Study, Design, and Construction	3.5	●	●	●	●	●	●
Cedar Rapids, IA	Anaerobic Treatment for High-Strength Industrial Waste Plan	3.5			●	●	●	●
Stoughton, WI	Biosolids Studies, Designs, and Construction	2.1	●	●	●	●		
Howard County, MD	Anaerobic Treatment for High-Strength Industrial Waste Plan	0.4			●	●	●	●
Dane County, WI	Manure Management Study and Facility Plan	5,800 animal units	●	●	●	●	●	●

We have included detailed project descriptions on the following pages to highlight similar project experience through the projects we recently completed for Parkersburg, WV, Dubuque, IA, Fond du Lac, WI, Kankakee, IL, and Elgin IL. ***Team members for the LFUCG's project worked directly on the projects listed below.***

19th Street WWTP Facility Planning and Anaerobic Digestion Upgrades – Parkersburg, WV

Reference:
Eric Bennett, General Manager
125 19th Street
Parkersburg, WV 26101
(304) 424-8469

Year Completed:
Ongoing

The Parkersburg Utility Board (PUB) provides wastewater services for the Cities of Parkersburg and Vienna, West Virgina, and for several unincorporated areas outside of the city limits. Our firm's history with PUB extends back more than 30 years during which we have provided engineering services for multiple WWTP improvements projects, including Phase 1 and Phase 2 improvements.

Parkersburg Utility Board's 19th St. WWTP.

In 2012, facilities planning for Phase 2 improvements began. As part of the Phase 2 planning process, we completed detailed evaluations of six digestion alternatives and four biogas utilization alternatives to help the City determine the best approach to address long-term sludge treatment needs. The digestion alternatives ranged from utilization of existing aerobic digestion and maximization of anaerobic digestion capacity to complete conversion to aerobic digestion. The biogas utilization alternatives ranged from flaring of waste biogas to conditioning and use of biogas in an energy generation system, such as microturbines. The planning report evaluated the alternatives based on a 20-year net present worth, including initial capital and replacement costs, operational and maintenance costs, and potential energy production and the associated natural gas and electric energy savings. Operational flexibility and process consistency were also taken into account during the evaluations.

The age of the anaerobic digestion facilities, including the poor condition of the existing biogas collection and handling system, and lack of digester mixing were important factors to consider during the evaluation. The best digestion alternative selected for the City included adding primary digester mixing equipment to increase anaerobic digestion capacity; piping modification to transfer thickened WAS to the anaerobic digesters, capitalizing on the expanded anaerobic digestion capacity in lieu of constructing additional aerobic digestion; and replacing the aged gas safety equipment. Reuse of biogas in boilers, to provide building and digester heating, was selected as the best biogas utilization alternative. After the digestion alternative was determined, an additional evaluation of pumped mixing, draft tube mixing, and linear motion mixing alternatives was completed.

Construction of the $12.2 million Phase 2 project is nearly complete. It includes a TWAS holding tank with submersible jet-ring mixers and medium bubble membrane diffusers that can provide process flexibility by doubling as an aerobic digester; a linear motion mixing system in the three, 55-foot primary digesters; new air-operated diaphragm primary and thickened WAS sludge pumps; a new 2 MMBTU biogas/natural gas boiler; completely new digester gas collection and handling system, including all new digester gas piping, flow monitoring, foam sensing and separation equipment, waste gas burner, biogas storage monitoring, biogas wasting controls, and biogas safety equipment; and additional forward flow improvements.

Water and Resource Recovery Plant Upgrade Facilities Planning – Dubuque, IA

Reference:
Steve Sampson Brown, Ph.D., P.E., Project Manager
50 West 13th St.
Dubuque, IA 52001
(563) 589-4270

Year Completed:
2014

The City of Dubuque is widely considered to be a model "sustainable" community. Nowhere is this more apparent than with the City's decisions related to wastewater biosolids digestion and follow-up projects and studies related to renewable energy, biogas conditioning and cogeneration, codigestion, and food residuals management. We were hired in 2007 to conduct long-range planning for the aging wastewater treatment plant, which was built in the 1960s and 1970s.

Dubuque anaerobic digesters and biogas conditioning.

The plant has historically incinerated wastewater sludge followed by landfilling of the ash, and one of the goals of this project was to determine whether a more sustainable approach for solids management could be implemented. Throughout the planning effort, the City's sustainable goals were incorporated in the

evaluations through carbon footprint and greenhouse gas emission analyses, energy evaluations, and related measures. In the end, anaerobic digestion of the City's biosolids was recommended and ultimately implemented.

Our 2009 project included updating nearly everything at the plant, with the major portion of the project devoted to replacing the aging sludge incinerators with new anaerobic digestion facilities for solids stabilization.

In our most recent follow-up project with the City, we designed the following biogas-related components:

- Hydrogen sulfide removal using "sulfa-treat" media vessels.
- Mechanical chilling for moisture removal.
- Siloxane removal using activated carbon-based technology.
- Cogeneration of conditioned biogas using microturbines (three at 200-kW each).
- Heat recovery for digester and building heat.

Anaerobic Digestion Upgrades, Biogas Conditioning, and Cogeneration – Fond du Lac, WI

Reference:
Jeremy Cramer, WW Operations Manager
700 Doty Street
Fond du Lac, WI 54936
(920) 322-3662

Year Completed:
2013

The City of Fond du Lac operates a water pollution control plant that treats wastewater from the City and 15 outlying communities. Since the 1970s, the plant used energy-intensive, high-purity oxygen-activated sludge and Zimpro sludge conditioning with dewatered sludge being landfilled. In 2002, process upsets occurred at the plant causing permit violations.

Fond du Lac WWTP.

Our recommended plan included plant improvements and upgrades, with the largest part of the upgrades being for biosolids management changes. The Zimpro equipment was expensive to operate and becoming more maintenance-intensive as the equipment began to wear out and odors were significant. Landfilling, although relatively low cost at the time, was becoming more expensive.

We conducted detailed evaluations of a wide range of biosolids stabilization and management alternatives, including helping the City set the direction for biosolids management, including continuing with Zimpro, anaerobic digestion (Class A and Class B), pasteurization, composting, and combinations of these alternatives. Anaerobic digestion was selected as the best alternative for the City and design and construction of the facilities commenced. Centrifuges were included for digested biosolids dewatering, and off-site storage with contract hauling was selected as the preferred biosolids disposal option. We designed a cogeneration system with biogas conditioning to provide more efficient energy recovery throughout the year.

Anaerobic Digestion Upgrades, Biogas Conditioning and Cogeneration – Kankakee River Metropolitan Agency – Kankakee, IL

Reference:
Richard Simms,
Executive Director
1600 West Brookmont
Kankakee, IL 60901
(815) 936-1462

Year Completed:
Ongoing

The Kankakee River Metropolitan Agency (KRMA) provides wastewater services for the City of Kankakee and Villages of Bradley, Bourbonnais, and Aroma Park, Illinois. The facility has an average daily flow of 20 mgd and a peak flow of 85 mgd. We have been providing nearly continuous services to the KRMA regional wastewater treatment facility since 2001. Four major projects are the result of our long-range planning and subsequent design services to KRMA. The largest of these is the biosolids management upgrade project.

Biological H_2S scrubbers.

In December 2010, an explosion in the digester building at the KRMA WWTP completely destroyed the main digester control building and effectively shut down biosolids digestion at the plant. KRMA hired our firm to conduct fast-track biosolids master planning to determine whether the anaerobic digestion system should be

rebuilt or whether another direction should be considered for biosolids management, stabilization, and disposal.We evaluated numerous biosolids stabilization technologies, including several forms of anaerobic digestion, autothermal aerobic digestion, and drying. We evaluated 20-year present-worth costs to determine the lowest cost and overall best option for KRMA. Continuing with mesophilic anaerobic digestion was selected and a fast-track design project was completed.

We were hired to provide fast-track biosolids planning after an explosion at KRMA's WWTP destroyed the plant's ability to process sludge.

The five digesters (three primary and two secondary) were reused and refurbished. New boilers, heat exchangers, draft tube mechanical digester mixing equipment, and sludge and biosolids pumping equipment were provided, and a new control building was constructed to house the equipment. Sludge handling prior to digestion was improved to address digester foaming issues. DAF-thickened WAS and primary sludge are blended and stored prior to digestion to equalize the loadings to the digesters.

In addition, new foam separation scrubbers were provided on the gas lines from the digesters to mitigate foaming concerns.

Biosolids and Biogas Facilities Master Plan – Elgin IL

Reference:
Robert Trueblood,
Executive Director
1957 North LaFox
South Elgin, IL 60177
(847) 742-2068

Year Completed:
Ongoing

The Fox River Water Reclamation District (FRWRD) has three water reclamation facilities (WRFs) in Elgin with a combined treatment capacity of approximately 38 mgd. Biosolids from the north and west WRFs are treated at the main (Albin D. Pagorski) WRF. Most of the biosolids and biogas facilities are at or beyond their expected service life. A Master Plan was commissioned to address both immediate and future needs.

FRWRD's Albin D. Pagorski WRF.

The Master Plan included an evaluation of the existing capacity and condition of equipment, review of phosphorus and other pending regulations that could impact biosolids production and beneficial reuse, review of established and innovative technologies, ranking of potential technologies based on cost and nonmonetary factors, detailed review of shortlisted alternatives, development of a 5-year capital improvements plan and 20-year facilities plan, and determination of future "road signs" (e.g., energy costs) that may drive selection of one alternative over another.

Master planning recommends anaerobic digestion with cogeneration.

The recommended plan includes continued use of anaerobic digestion with cogeneration of heat and power from the biogas. Digested biosolids will continue to be dewatered, and when the existing belt filter presses reach the end of their service life they may be replaced with centrifuges. Covered on-site storage was recommended for the dewatered biosolids. Alternatives that were retained for potential future implementation, depending on effluent limits and other factors, include recovery of phosphorus and removal of ammonia from biosolids side-streams, implementation of temperature-phased anaerobic digestion if Class A biosolids are required, and acceptance of grease or other hauled wastes for digestion and additional energy generation. Biosolids drying could be reconsidered if vehicle fuel prices increase significantly or Class A biosolids production becomes necessary.

FRWRD has begun to implement the recommended 5-year capital improvement program, starting with covering of biosolids storage areas and changes to the struvite control chemical feed system. Other short-term projects will include digester mixing and biogas handling systems improvements, and replacement of heating and ventilating systems in select buildings.

Digester Gas Utilization and Storage

Our firm has engineered digester gas utilization and storage facilities for 50 years dating back to the 1960s. In recent years, we have planned and designed numerous digester gas beneficial reuse projects (including gas storage) at Dubuque, Iowa; Fond du Lac and Brookfield, Wisconsin; and for the Kankakee River Metropolitan Agency (KRMA) and Fox River Water Reclamation District (FRWRD), Illinois, among others. We have experience with a wide range of primary energy generation systems (engines and microturbines), as well as digester gas storage (steel gas holders, membrane style, and spheres).

Appendix – Required Forms

AFFIDAVIT

Comes the Affiant, Matthew S. Richards, and after being first duly sworn, states under penalty of perjury as follows:

1. His/her name is Matthew S. Richards and he/she is the individual submitting the proposal or is the authorized representative of Strand Associates, Inc.®, the entity submitting the proposal (hereinafter referred to as "Proposer").

2. Proposer will pay all taxes and fees, which are owed to the Lexington-Fayette Urban County Government at the time the proposal is submitted, prior to award of the contract and will maintain a "current" status in regard to those taxes and fees during the life of the contract.

3. Proposer will obtain a Lexington-Fayette Urban County Government business license, if applicable, prior to award of the contract.

4. Proposer has authorized the Division of Central Purchasing to verify the above-mentioned information with the Division of Revenue and to disclose to the Urban County Council that taxes and/or fees are delinquent or that a business license has not been obtained.

5. Proposer has not knowingly violated any provision of the campaign finance laws of the Commonwealth of Kentucky within the past five (5) years and the award of a contract to the Proposer will not violate any provision of the campaign finance laws of the Commonwealth.

6. Proposer has not knowingly violated any provision of Chapter 25 of the Lexington-Fayette Urban County Government Code of Ordinances, known as "Ethics Act."

Continued on next page

7. Proposer acknowledges that "knowingly" for purposes of this Affidavit means, with respect to conduct or to circumstances described by a statute or ordinance defining an offense, that a person is aware or should have been aware that his conduct is of that nature or that the circumstance exists.

Further, Affiant sayeth naught.

matthew richards

STATE OF Wisconsin

COUNTY OF Dane

The foregoing instrument was subscribed, sworn to and acknowledged before me by Matthew S. Richards on this the 13th day of January, 2016

My Commission expires: June 30, 2017

Rachel A Frieders

NOTARY PUBLIC, STATE AT LARGE

RACHEL A. FRIEDERS
NOTARY
PUBLIC
STATE OF WISCONSIN

GENERAL PROVISIONS

1. Each Respondent shall comply with all Federal, State & Local regulations concerning this type of service or good.

   The Respondent agrees to comply with all statutes, rules, and regulations governing safe and healthful working conditions, including the Occupational Health and Safety Act of 1970, *29 U.S.C. 650 et. seq.*, as amended, and KRS Chapter 338. The Respondent also agrees to notify the LFUCG in writing immediately upon detection of any unsafe and/or unhealthful working conditions at the job site. The Respondent agrees to indemnify, defend and hold the LFUCG harmless from all penalties, fines or other expenses arising out of the alleged violation of said laws.

2. Failure to submit ALL forms and information required in this RFP may be grounds for disqualification.

3. Addenda: All addenda, if any, shall be considered in making the proposal, and such addenda shall be made a part of this RFP. Before submitting a proposal, it is incumbent upon each proposer to be informed as to whether any addenda have been issued, and the failure to cover in the bid any such addenda may result in disqualification of that proposal.

4. Proposal Reservations: LFUCG reserves the right to reject any or all proposals, to award in whole or part, and to waive minor immaterial defects in proposals. LFUCG may consider any alternative proposal that meets its basic needs.

5. Liability: LFUCG is not responsible for any cost incurred by a Respondent in the preparation of proposals.

6. Changes/Alterations: Respondent may change or withdraw a proposal at any time prior to the opening; however, no oral modifications will be allowed. Only letters, or other formal written requests for modifications or corrections of a previously submitted proposal which is addressed in the same manner as the proposal, and received by LFUCG prior to the scheduled closing time for receipt of proposals, will be accepted. The proposal, when opened, will then be corrected in accordance with such written request(s), provided that the written request is contained in a sealed envelope which is plainly marked "modifications of proposal".

7. Clarification of Submittal: LFUCG reserves the right to obtain clarification of any point in a bid or to obtain additional information from a Respondent.

8. Bribery Clause: By his/her signature on the bid, Respondent certifies that no employee of his/hers, any affiliate or Subcontractor, has bribed or

attempted to bribe an officer or employee of the LFUCG.

9. Additional Information: While not necessary, the Respondent may include any product brochures, software documentation, sample reports, or other documentation that may assist LFUCG in better understanding and evaluating the Respondent's response. Additional documentation shall not serve as a substitute for other documentation which is required by this RFP to be submitted with the proposal,

10. Ambiguity, Conflict or other Errors in RFP: If a Respondent discovers any ambiguity, conflict, discrepancy, omission or other error in the RFP, it shall immediately notify LFUCG of such error in writing and request modification or clarification of the document if allowable by the LFUCG.

11. Agreement to Bid Terms: In submitting this proposal, the Respondent agrees that it has carefully examined the specifications and all provisions relating to the work to be done attached hereto and made part of this proposal. By acceptance of a Contract under this RFP, proposer states that it understands the meaning, intent and requirements of the RFP and agrees to the same. The successful Respondent shall warrant that it is familiar with and understands all provisions herein and shall warrant that it can comply with them. No additional compensation to Respondent shall be authorized for services or expenses reasonably covered under these provisions that the proposer omits from its Proposal.

12. Cancellation: If the services to be performed hereunder by the Respondent are not performed in an acceptable manner to the LFUCG, the LFUCG may cancel this contract for cause by providing written notice to the proposer, giving at least thirty (30) days notice of the proposed cancellation and the reasons for same. During that time period, the proposer may seek to bring the performance of services hereunder to a level that is acceptable to the LFUCG, and the LFUCG may rescind the cancellation if such action is in its best interest.

    A. Termination for Cause

    (1) LFUCG may terminate a contract because of the contractor's failure to perform its contractual duties

    (2) If a contractor is determined to be in default, LFUCG shall notify the contractor of the determination in writing, and may include a specified date by which the contractor shall cure the identified deficiencies. LFUCG may proceed with termination if the contractor fails to cure the deficiencies within the specified time.

(3) A default in performance by a contractor for which a contract may be terminated shall include, but shall not necessarily be limited to:

(a) Failure to perform the contract according to its terms, conditions and specifications;

(b) Failure to make delivery within the time specified or according to a delivery schedule fixed by the contract;

(c) Late payment or nonpayment of bills for labor, materials, supplies, or equipment furnished in connection with a contract for construction services as evidenced by mechanics' liens filed pursuant to the provisions of KRS Chapter 376, or letters of indebtedness received from creditors by the purchasing agency;

(d) Failure to diligently advance the work under a contract for construction services;

(e) The filing of a bankruptcy petition by or against the contractor; or

(f) Actions that endanger the health, safely or welfare of the LFUCG or its citizens.

B. At Will Termination

Notwithstanding the above provisions, the LFUCG may terminate this contract at will in accordance with the law upon providing thirty (30) days written notice of that intent, Payment for services or goods received prior to termination shall be made by the LFUCG provided these goods or services were provided in a manner acceptable to the LFUCG. Payment for those goods and services shall not be unreasonably withheld.

13. Assignment of Contract: The contractor shall not assign or subcontract any portion of the Contract without the express written consent of LFUCG. Any purported assignment or subcontract in violation hereof shall be void. It is expressly acknowledged that LFUCG shall never be required or obligated to consent to any request for assignment or subcontract; and further that such refusal to consent can be for any or no reason, fully within the sole discretion of LFUCG.

14. No Waiver: No failure or delay by LFUCG in exercising any right, remedy, power or privilege hereunder, nor any single or partial exercise thereof, nor the exercise of any other right, remedy, power or privilege shall operate as a waiver hereof or thereof. No failure or delay by LFUCG in exercising any right, remedy, power or privilege under or in respect of this Contract shall affect the rights, remedies, powers or privileges of LFUCG hereunder or shall operate as a waiver thereof.

15. Authority to do Business: The Respondent must be a duly organized and authorized to do business under the laws of Kentucky. Respondent must be in good standing and have full legal capacity to provide the services specified under this Contract. The Respondent must have all necessary right and lawful authority to enter into this Contract for the full term hereof and that proper corporate or other action has been duly taken authorizing the Respondent to enter into this Contract. The Respondent will provide LFUCG with a copy of a corporate resolution authorizing this action and a letter from an attorney confirming that the proposer is authorized to do business in the State of Kentucky if requested. All proposals must be signed by a duly authorized officer, agent or employee of the Respondent.

16. Governing Law: This Contract shall be governed by and construed in accordance with the laws of the Commonwealth of Kentucky. In the event of any proceedings regarding this Contract, the Parties agree that the venue shall be the Fayette County Circuit Court or the U.S. District Court for the Eastern District of Kentucky, Lexington Division. All parties expressly consent to personal jurisdiction and venue in such Court for the limited and sole purpose of proceedings relating to this Contract or any rights or obligations arising thereunder. Service of process may be accomplished by following the procedures prescribed by law.

17. Ability to Meet Obligations: Respondent affirmatively states that there are no actions, suits or proceedings of any kind pending against Respondent or, to the knowledge of the Respondent, threatened against the Respondent before or by any court, governmental body or agency or other tribunal or authority which would, if adversely determined, have a materially adverse effect on the authority or ability of Respondent to perform its obligations under this Contract, or which question the legality, validity or enforceability hereof or thereof.

18. Contractor understands and agrees that its employees, agents, or subcontractors are not employees of LFUCG for any purpose whatsoever. Contractor is an independent contractor at all times during the performance of the services specified.

19. If any term or provision of this Contract shall be found to be illegal or unenforceable, the remainder of the contract shall remain in full force and such term or provision shall be deemed stricken.

Matthew Ribel
Signature

1/13/16
Date

LFUCG MWDBE PARTICIPATION FORM

Bid/RFP/Quote Reference # RFP#58-2015 Town Branch Primary Digester Complex Improvements

The MWDBE subcontractors listed have agreed to participate on this Bid/RFP/Quote. If any substitution is made or the total value of the work is changed prior to or after the job is in progress, it is understood that those substitutions must be submitted to Central Purchasing for approval immediately.

MWDBE Company, Name, Address, Phone, Email	Work to be Performed	Total Dollar Value of the Work	% Value of Total Contract
1. Magna Engineers T. Michelle Howlett, P.E., LEED AP 861 Corporate Dr., Suite 210 Lexington, KY 40503 (859) 309-2990 mhowlett@magnaengineers.com	HVAC	*see note below	5%
2. Cornerstone Engineering, Inc. Chella Subram, P.E., SECB 1890 Star Shoot Pkwy. Lexington, KY 40509 (859) 685-2181 chella@cei-engineering.com	Structural	*see note below	5%
3.			
4.			

The undersigned company representative submits the above list of MWDBE firms to be used in accomplishing the work contained in this Bid/RFP/Quote. Any misrepresentation may result in the termination of the contract and/or be subject to applicable Federal and State laws concerning false statements and false claims.

Strand Associates, Inc.
Company

Matt Richt
Company Representative

01/14/2016
Date

Corporate Secretary
Title

* Note: Strand is committed to meeting the 10% DBE participation goal with required listed subconsultant as noted and others as may by required based on actual project assignments.

LFUCG STATEMENT OF GOOD FAITH EFFORTS

Bid/RFP/Quote # RFP#58-2015 Town Branch Primary Digester Complex Improvements

By the signature below of an authorized company representative, we certify that we have utilized the following Good Faith Efforts to obtain the maximum participation by MWDBE business enterprises on the project and can supply the appropriate documentation.

_____ Advertised opportunities to participate in the contract in at least two (2) publications of general circulation media; trade and professional association publications; small and minority business or trade publications; and publications or trades targeting minority, women and disadvantaged businesses not less than fifteen (15) days prior to the deadline for submission of bids to allow MWDBE firms to participate.

_____ Included documentation of advertising in the above publications with the bidders good faith efforts package

_____ Attended LFUCG Central Purchasing Economic Inclusion Outreach event

_____ Attended pre-bid meetings that were scheduled by LFUCG to inform MWDBEs of subcontracting opportunities

_____ Sponsored Economic Inclusion event to provide networking opportunities for prime contractors and MWDBE firms

_X_ Requested a list of MWDBE subcontractors or suppliers from LFUCG Economic Engine and showed evidence of contacting the companies on the list(s).

_____ Contacted organizations that work with MWDBE companies for assistance in finding certified MWBDE firms to work on this project. Those contacted and their responses should be a part of the bidder's good faith efforts documentation.

_____ Sent written notices, by certified mail, email or facsimile, to qualified, certified MWDBEs soliciting their participation in the contract not less that seven (7) days prior to the deadline for submission of bids to allow them to participate effectively.

_X_ Followed up initial solicitations by contacting MWDBEs to determine their level of interest.

X Provided the interested MWBDE firm with adequate and timely information about the plans, specifications, and requirements of the contract.

X Selected portions of the work to be performed by MWDBE firms in order to increase the likelihood of meeting the contract goals. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate MWDBE participation, even when the prime contractor may otherwise perform these work items with its own workforce

_____ Negotiated in good faith with interested MWDBE firms not rejecting them as unqualified without sound reasons based on a thorough investigation of their capabilities. Any rejection should be so noted in writing with a description as to why an agreement could not be reached.

_____ Included documentation of quotations received from interested MWDBE firms which were not used due to uncompetitive pricing or were rejected as unacceptable and/or copies of responses from firms indicating that they would not be submitting a bid.

_____ Bidder has to submit sound reasons why the quotations were considered unacceptable. The fact that the bidder has the ability and/or desire to perform the contract work with its own forces will not be considered a sound reason for rejecting a MWDBE quote. Nothing in this provision shall be construed to require the bidder to accept unreasonable quotes in order to satisfy MWDBE goals.

_____ Made an effort to offer assistance to or refer interested MWDBE firms to obtain the necessary equipment, supplies, materials, insurance and/or bonding to satisfy the work requirements of the bid proposal

X Made efforts to expand the search for MWBE firms beyond the usual geographic boundaries.

_____ Other - any other evidence that the bidder submits which may show that the bidder has made reasonable good faith efforts to include MWDBE participation.

Failure to submit any of the documentation requested in this section may be cause for rejection of bid. Bidders may include any other documentation deemed relevant to this requirement. Documentation of Good Faith Efforts are to be submitted with the Bid, if the participation Goal is not met.

The undersigned acknowledges that all information is accurate. Any misrepresentations may result in termination of the contract and/or be subject to applicable Federal and State laws concerning false statements and claims.

Strand Associates, Inc.	Matt Schiebel
Company	**Company Representative**
1/13/16	Corporate Secretary
Date	**Title**

Strand Associates, Inc.®
1525 Bull Lea Road, Suite 100
Lexington, KY 40511
(P) 859-225-8500
(F) 859-225-8501

Equal Employment Opportunity Policy Statement

Strand Associates, Inc.® is committed to a policy of equal opportunity for all employees. It is our policy to seek and employ the best qualified personnel in all positions, to provide equal opportunity for advancement to all employees, including upgrading, promotion and training, and to administer these activities in a manner which will not discriminate against or give preference to any person because of race, color, religion, age, sex, national origin, handicap, marital status, or any other discriminatory basis prohibited by state or federal law.

Strand is further committed to providing a work environment in which employees are treated with courtesy, respect, and dignity. As part of this commitment, we will not tolerate any form of harassment, verbal or physical, with regard to an individual's race, sex, national origin, or any other protected characteristics Therefore, all employees are encouraged to bring forth any concerns or complaints in this regard to the attention of management by contacting Human Resources, Shawn Cannon, or Ted Richards.

All complaints of sexual harassment, or harassment of any kind, will be investigated promptly and, where necessary, immediate and appropriate action will be taken to stop and remedy any such conduct. Any employee found in violation of this policy will be subject to disciplinary action which could include discharge.

EQUAL OPPORTUNITY AGREEMENT

The Law

- Title VII of the Civil Rights Act of 1964 (amended 1972) states that it is unlawful for an employer to discriminate in employment because of race, color, religion, sex, age (40-70 years) or national origin.

- Executive Order No. 11246 on Nondiscrimination under Federal contract prohibits employment discrimination by contractor and sub-contractor doing business with the Federal Government or recipients of Federal funds. This order was later amended by Executive Order No. 11375 to prohibit discrimination on the basis of sex.

- Section 503 of the Rehabilitation Act of 1973 states:

  The Contractor will not discriminate against any employee or applicant for employment
  because of physical or mental handicap.

- Section 2012 of the Vietnam Era Veterans Readjustment Act of 1973 requires Affirmative Action on behalf of disabled veterans and veterans of the Vietnam Era by contractors having Federal contracts.

- Section 206(A) of Executive Order 12086, Consolidation of Contract Compliance Functions for Equal Employment Opportunity, states:

  The Secretary of Labor may investigate the employment practices of any Government
  contractor or sub-contractor to determine whether or not the contractual provisions specified in Section 202 of this order have been violated.

****

The Lexington-Fayette Urban County Government practices Equal Opportunity in recruiting, hiring and promoting. It is the Government's intent to affirmatively provide employment opportunities for those individuals who have previously not been allowed to enter into the mainstream of society. Because of its importance to the local Government, this policy carries the full endorsement of the Mayor, Commissioners, Directors and all supervisory personnel. In following this commitment to Equal Employment Opportunity and because the Government is the benefactor of the Federal funds, it is both against the Urban County Government policy and illegal for the Government to let contracts to companies which knowingly or unknowingly practice discrimination in their employment practices. Violation of the above mentioned ordinances may cause a contract to be canceled and the contractors may be declared ineligible for future consideration.

Please sign this statement in the appropriate space acknowledging that you have read and understand the provisions contained herein. Return this document as part of your application packet.

Bidders

I/We agree to comply with the Civil Rights Laws listed above that govern employment rights of minorities, women, Vietnam veterans, handicapped and aged persons.

Matt Schick — *Signature*

Strand Associates, Inc. — *Name of Business*

WORKFORCE ANALYSIS FORM

Name of Organization: Strand Associates, Inc.

Date: 01 / 14 / 16

Categories	Total	White		Latino		Black		Other		Total	
		M	F	M	F	M	F	M	F	M	F
Administrators	11	9	1						1	9	2
Professionals	264	213	42	3		2		4		222	42
Superintendents										-	-
Supervisors										-	-
Foremen										-	-
Technicians	48	40	6	1		1				42	6
Protective Service										-	-
Para-Professionals										-	-
Office/Clerical	49	9	34	1	1		2	1	1	11	38
Skilled Craft										-	-
Service/Maintenance	3	1				2				3	-
Total:	375	272	83	5	1	5	2	5	2	287	88

Prepared by: Audra Wells, H/R Coordinator

Name & Title

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 7/9/2015

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Ansay & Associates, LLC. MSN 702 N High Point Road Suite 201 Madison WI 53717	**CONTACT NAME:** sue.simoneau@ansay.com **PHONE (A/C, No, Ext):** 800-643-6133 **FAX (A/C, No):** 608-831-4777 **E-MAIL ADDRESS:** sue.simoneau@ansay.com
INSURED STRAASS-01 Strand Associates, Inc 910 W. Wingra Drive Madison WI 53715	**INSURER(S) AFFORDING COVERAGE** / **NAIC #** **INSURER A :** CNA Insurance Companies 35289 **INSURER B :** **INSURER C :** **INSURER D :** **INSURER E :** **INSURER F :**

COVERAGES **CERTIFICATE NUMBER:** 1398411903 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	**GENERAL LIABILITY** X COMMERCIAL GENERAL LIABILITY [ ] CLAIMS-MADE [X] OCCUR X XCU cov. incl. GEN'L AGGREGATE LIMIT APPLIES PER: [ ] POLICY [X] PRO-JECT [ ] LOC			5099170076	1/1/2015	1/1/2016	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG $	$1,000,000 $10,000 $5,000 $1,000,000 $2,000,000 $2,000,000 $
A	**AUTOMOBILE LIABILITY** X ANY AUTO ALL OWNED AUTOS [ ] SCHEDULED AUTOS X HIRED AUTOS X NON-OWNED AUTOS			5099170062	1/1/2015	1/1/2016	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident) $	$1,000,000 $ $ $ $
A	X **UMBRELLA LIAB** X OCCUR **EXCESS LIAB** [ ] CLAIMS-MADE DED X RETENTION $ 10,000			5099170059	1/1/2015	1/1/2016	EACH OCCURRENCE AGGREGATE $	$2,000,000 $2,000,000 $
A	**WORKERS COMPENSATION AND EMPLOYERS' LIABILITY** Y / N ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? [ ] **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		WC595126844	1/1/2015	1/1/2016	X WC STATU-TORY LIMITS [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $1,000,000 $1,000,000 $1,000,000
A	Professional Liability & Pollution Liability			AEH113974097	7/11/2015	7/11/2016	Each Claim Aggregate Full Prior Acts	2,000,000 2,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

CERTIFICATE HOLDER

Blank Certificate

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE