MEETING

FOR

WASTEWATER TREATMENT FACILITY PLAN

WEST BRANCH, IOWA

June 7, 2019

VEENSTRA & KIMM, INC.

Meeting for Wastewater Facility Plan
West Branch, Iowa
June 7, 2019

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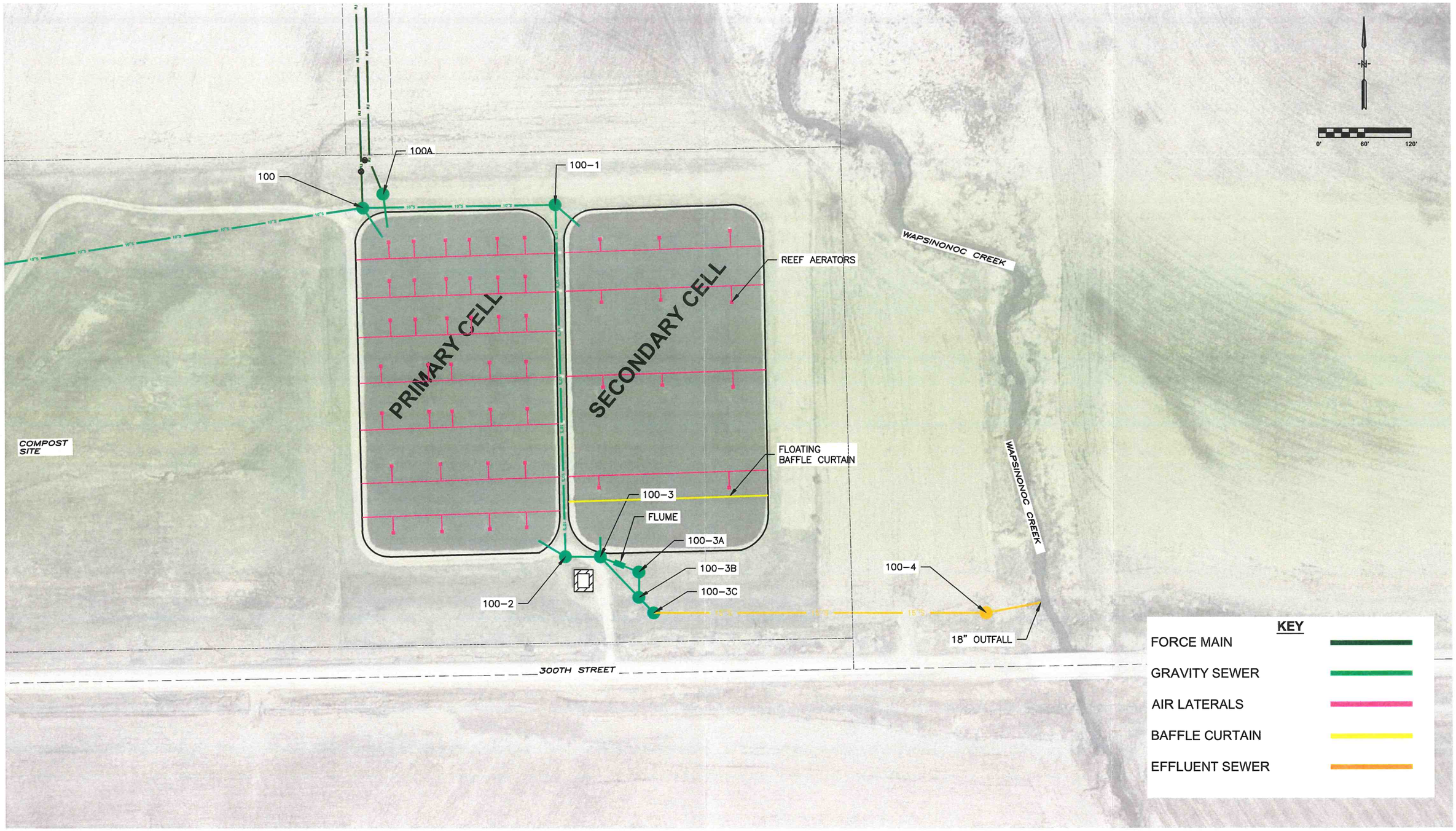
EXISTING WASTEWATER TREATMENT FACILITY



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EXISTING FACILITY
WEST BRANCH, IOWA
FIGURE 3-2

SUMMARY OF FLOWS & LOADINGS
WEST BRANCH, IOWA

Wastewater Treatment Facility Design Criteria

	2017			2040		
Population	459	2,037	2,496	602	2,565	3,167
Flow, mgd	**MHV**	**WWTP**	**WWTP+MHV**	**MHV**	**WWTP**	**WWTP+MHV**
Average Daily Flow	0.025	0.331	0.356	0.039	0.384	0.423
ADW	0.023	0.244	0.267	0.037	0.297	0.334
AWW 30	0.125	0.732	0.857	0.139	0.785	0.924
MWW	0.125	2.785	2.910	0.139	2.838	2.977
PHWW	0.125	5.790	5.790	0.139	5.790	5.790
Organic Loadings lbs./day						
BOD_5	78	433	511	103	523	626
TSS	92	513	605	121	619	740
TKN	17	82	99	22	101	123

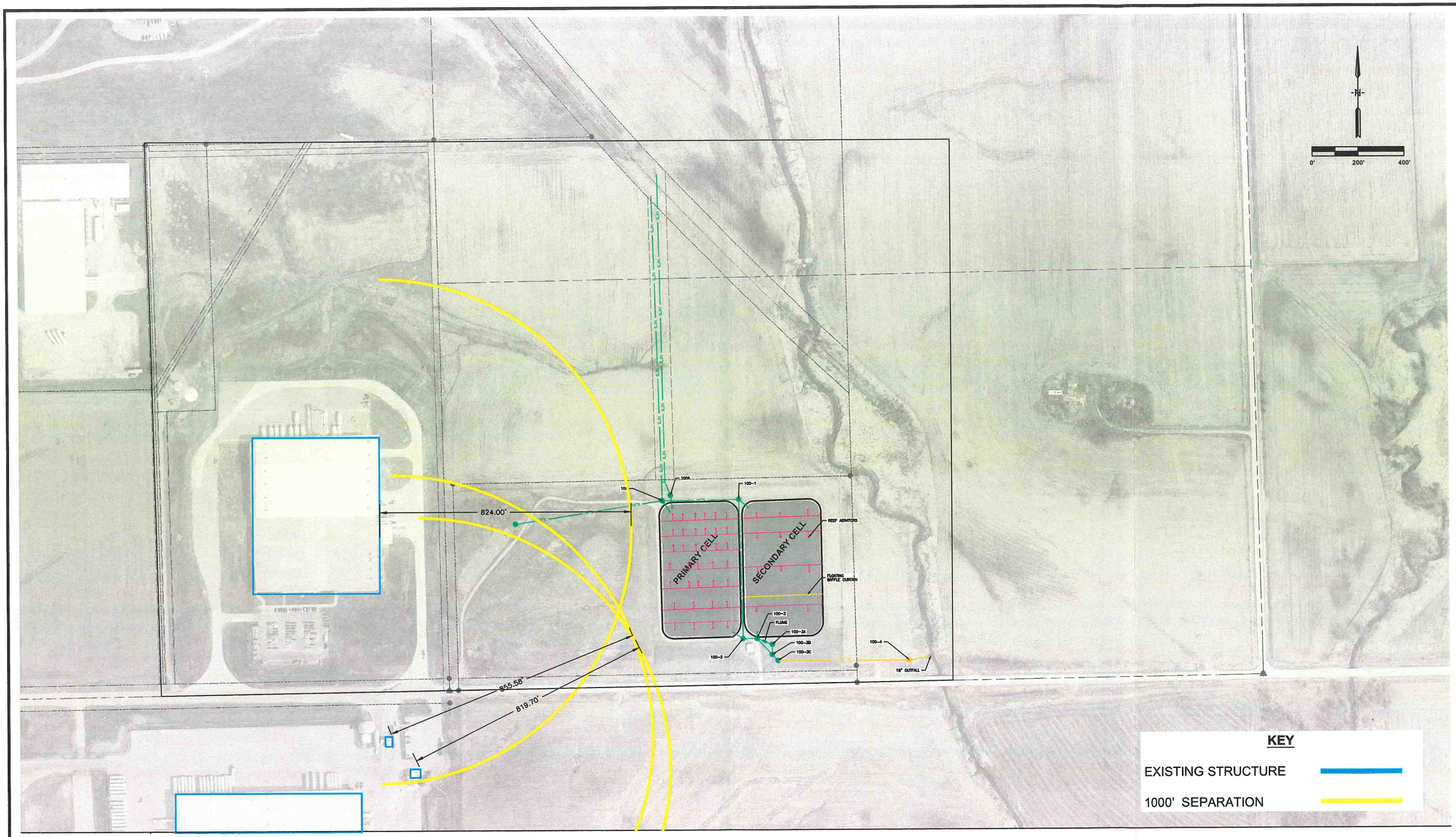
Maximum Day Organic Loading Design Criteria

	2017			2040		
Max. Day Organic Loadings lbs./day	**MHV**	**WWTP**	**WWTP+MHV**	**MHV**	**WWTP**	**WWTP+MHV**
BOD_5	78	779	857	103	941	1,044
TSS	92	872	964	121	1,052	1,173
TKN	17	148	164	22	182	204

NPDES PERMIT LIMITS
WEST BRANCH, IOWA

Parameter	Current	Future		
	30-Day Avg. (mg/L)	Aerated Lagoon Option 30-Day Avg. (mg/L)	Enhanced Aerated Lagoon Option 30-Day Avg. (mg/L)	Mechanical Option 30-Day Avg. (mg/L)
TSS	80	80	30	30
$CBOD_5$	25	25	25	25
E.coli				
Mar.-Nov.	---	630 org/100 mL	630 org/100 mL	630 org/100 mL
Ammonia				
January	29.6	3.4	3.4	3.4
February	32.0	4.0	4.0	4.0
March	27.3	3.4	3.4	3.4
April	14.2	1.5	1.5	1.5
May	13.2	1.7	1.7	1.7
June	11.4	1.3	1.3	1.3
July	12.2	1.0	1.0	1.0
August	11.0	1.0	1.0	1.0
September	11.9	1.1	1.1	1.1
October	16.8	1.6	1.6	1.6
November	23.2	2.3	2.3	2.3
December	25.2	2.5	2.5	2.5

SITE SEPARATION REQUIREMENTS



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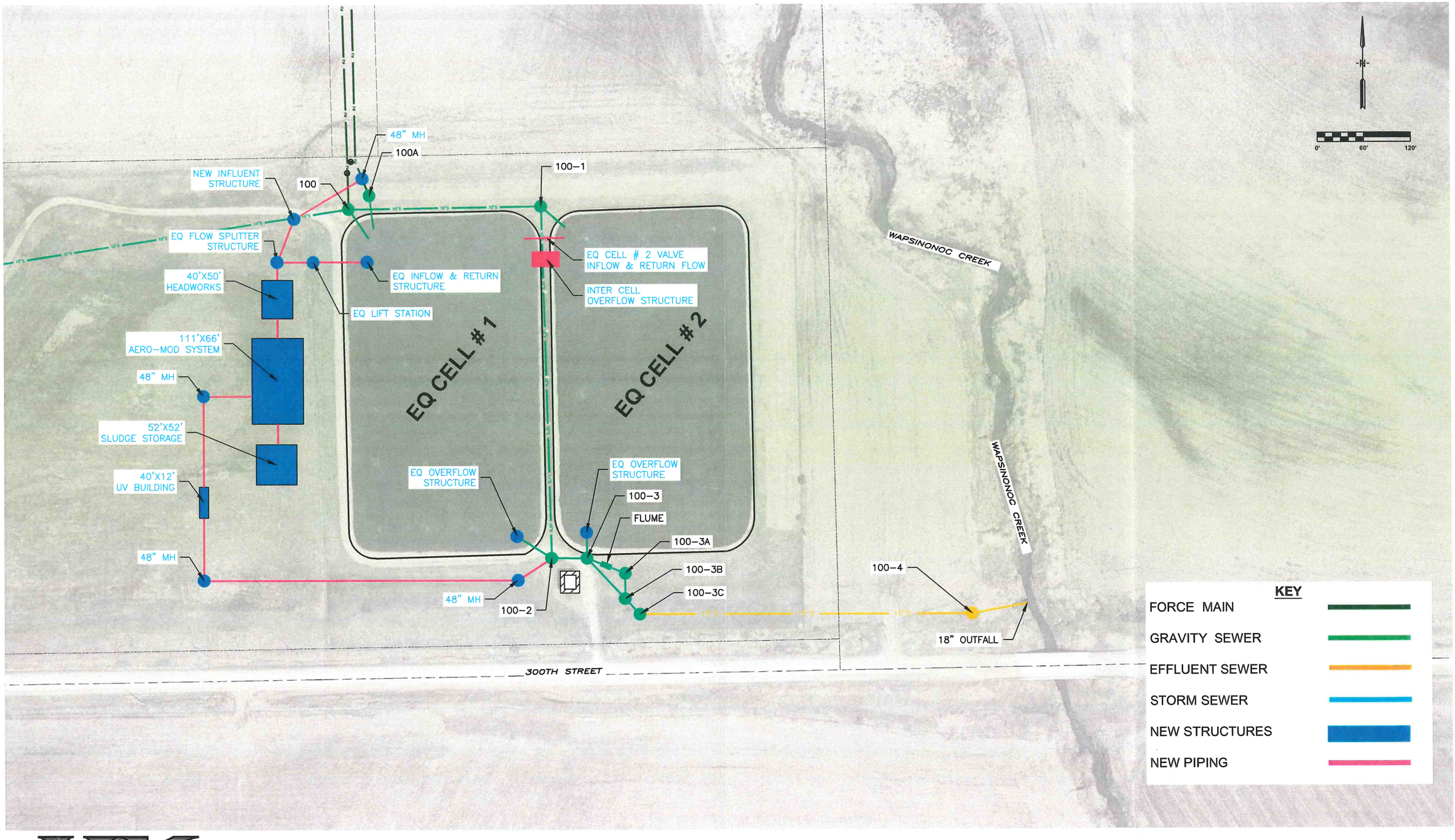
SITE SEPARATION
WEST BRANCH, IOWA
FIGURE 3-1

WASTEWATER FACILITY OPTIONS

OPTION 1
MECHANICAL PLANT: AERO-MOD



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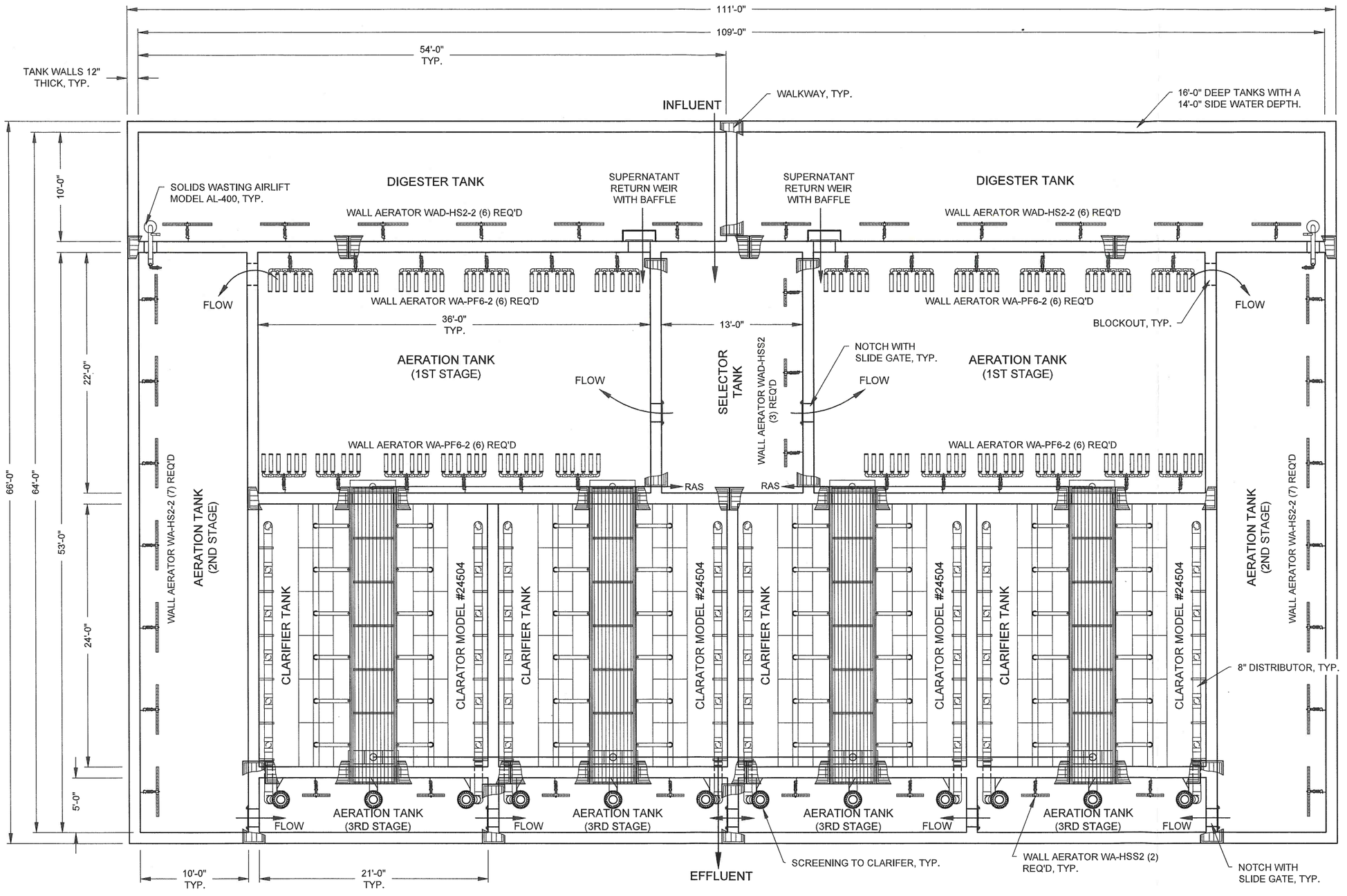
AREO-MOD SITE PLAN
WEST BRANCH, IOWA
FIGURE 4-X



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Scale: NTS
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Drawn by: JB
Title:

WEST BRANCH, IOWA
WASTE WATER TREATMENT PLANT

Aero - Mod, Inc.

7927 U.S. Highway 24
Manhattan, Kansas 66502

PHONE: (785) 537-4995
FAX : (785) 537-0813

Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa

Aero-Mod
5/1/2019

No.	Description	Price
1	Headworks	$834,000
2	Aero-Mod Treatment System	$2,984,000
3	UV System	$239,000
4	EQ Lift Station & Piping	$235,000
5	Site Work & Piping	$1,025,000
6	Generator (150 kW) & Transfer Switch	$160,000
7	Electrical & Controls	$530,000
	SUB-TOTAL	$6,007,000
	Contingency (15%)	$902,000
	CONSTRUCTION TOTAL	$6,909,000
	Land Acquisition	$0
	Eng., Leg., Adm. (18%)	$1,244,000
	PROJECT TOTAL	$8,153,000
	EXPECTED O&M (20 YR PRESENT WORTH)	$2,331,000
	20 YEAR PRESENT WORTH VALUE OF PROJECT	**$10,484,000**

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

OPTION 2
MECHANICAL PLANT: SEQUENCING BATCH REACTOR

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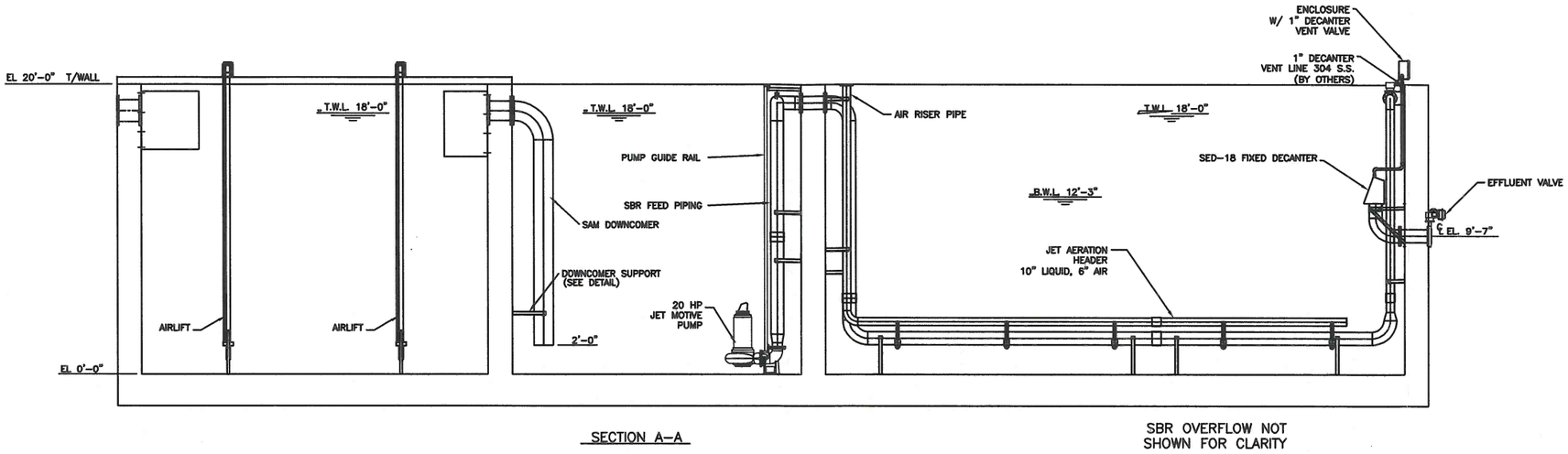
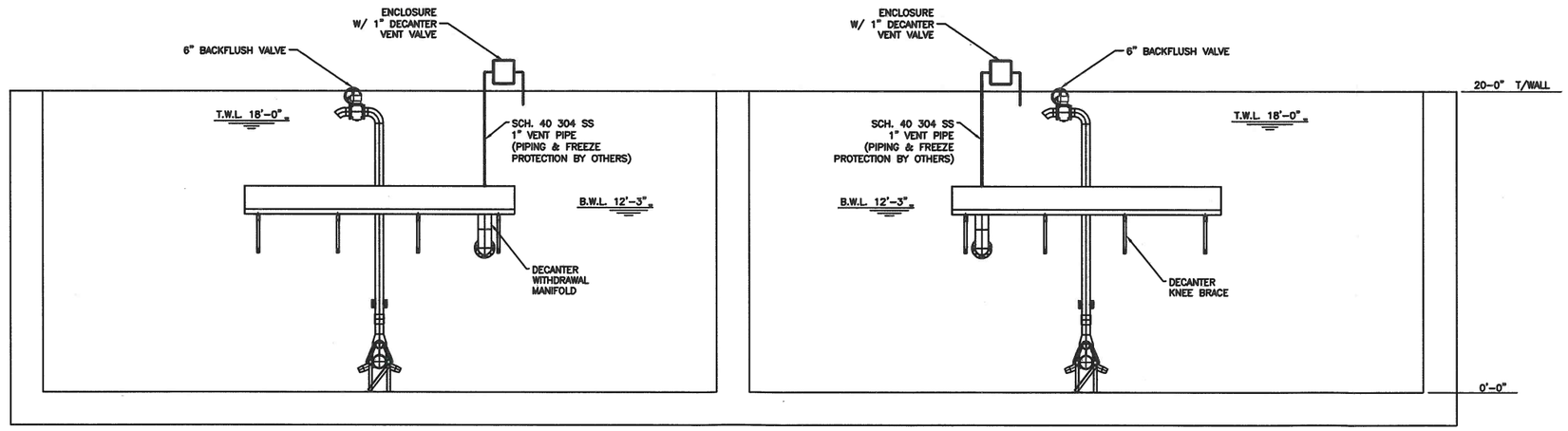
SBR SITE PLAN
WEST BRANCH, IOWA
FIGURE 4-X

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED



SECTION A–A

SBR OVERFLOW NOT SHOWN FOR CLARITY



SECTION B–B

NOTES:

1. THOROUGHLY REVIEW INSTALLATION INSTRUCTIONS PRIOR TO BEGINNING FIELD WORK. IF YOU HAVE ANY QUESTIONS PLEASE CONSULT FACTORY.
2. ALL NOZZLES TO BE LEVELED AND AT THE SAME ELEVATION ± 1/4".
3. (FJ) MAY REQUIRE CUT–TO–FIT OR ADDITIONAL PIPE FOR FIELD ADJUSTABILITY.
4. SEE INSTALLATION INSTRUCTIONS FOR PROPER PREPARATION TO ENSURE PROPER FITTING OF ALL COMPONENTS BEFORE F.R.P. FIELD WELDING AND FIELD LAMINATING.
5. ALL PUMP GUIDE RAILS BY OTHERS.
6. FREEZE PROTECT ALL EXPOSED PIPING, FITTINGS AND VALVES.

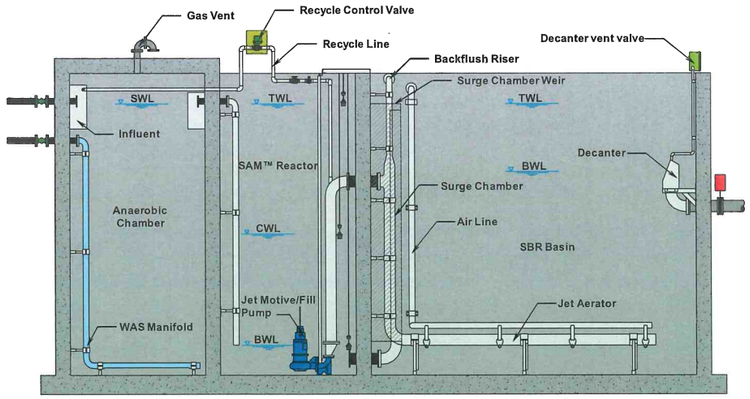
FLUIDYNE

WEST BRANCH, IA – 2 – SECTION VIEWS

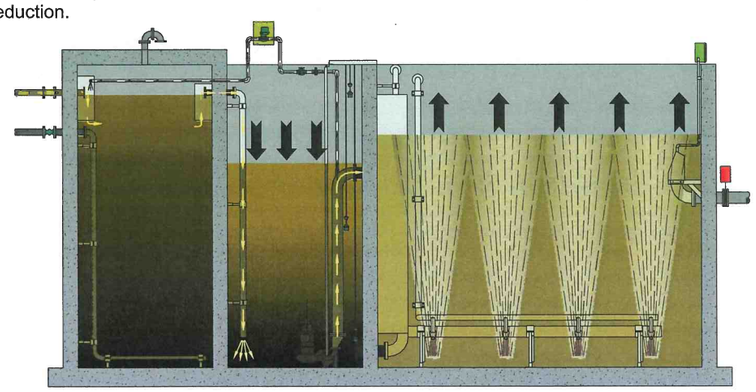
DRAWN NWS	DATE 2/1/19	JOB #	CAD FILE West Branch, IA – 2 – Section Views
CHECKED	DATE	SCALE	SHEET 2 OF 2

FLUIDYNE CORPORATION

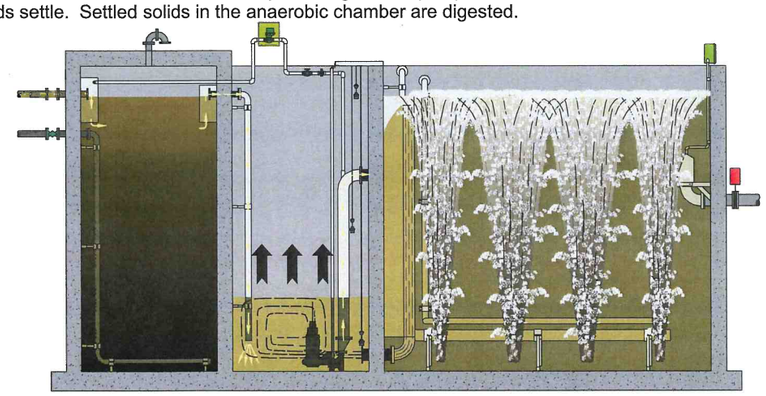
THE EXPERIENCED LEADER IN SEQUENCING BATCH REACTOR TECHNOLOGY



System Components: Influent continuously enters the anaerobic chamber where solids settle. Settleable BOD is converted to soluble BOD. BOD is reduced by 30%, and solids are reduced by 60%. The influent then flows to the SAM™ reactor. Mixed liquor is maintained in the SAM™ reactor to suppress odors, and initiate and accelerate carbon and nitrogen reduction.



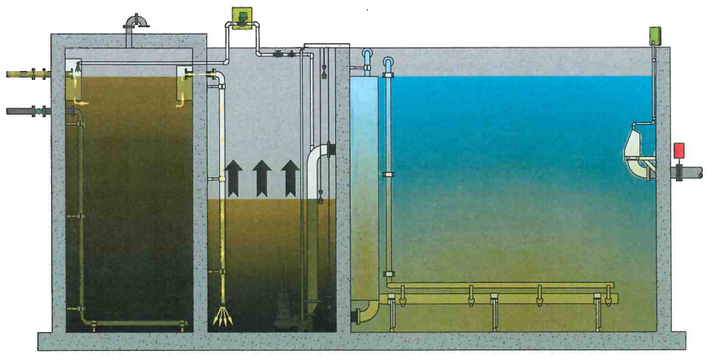
Fill Phase: When the level in the SAM™ reactor reaches a predetermined "control level" the motive liquid pump is started. The SBR basin is filled and mixed. A percentage of the pumped flow is returned to the anaerobic chamber where biological solids settle. Settled solids in the anaerobic chamber are digested.



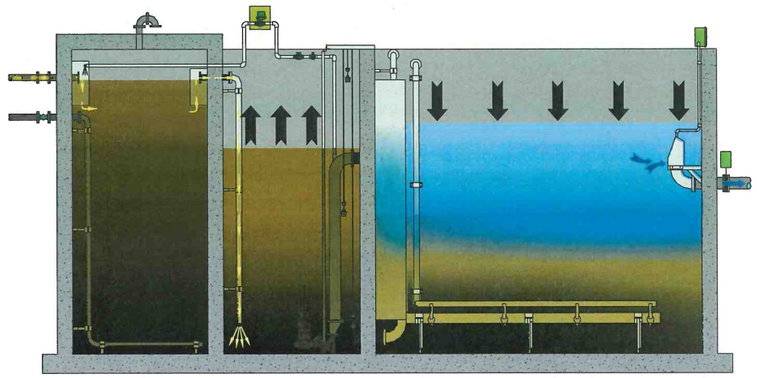
Interact Phase: When the level in the SBR reaches TWL, nitrified mixed liquor overflows the surge chamber weir and is returned to the SAM™ chamber to mix and react with the raw influent. Aeration is cycled on and off to provide the required oxygen. Denitrification is reliable and complete. Scum is also removed from the SBR basin.

FLUIDYNE CORPORATION

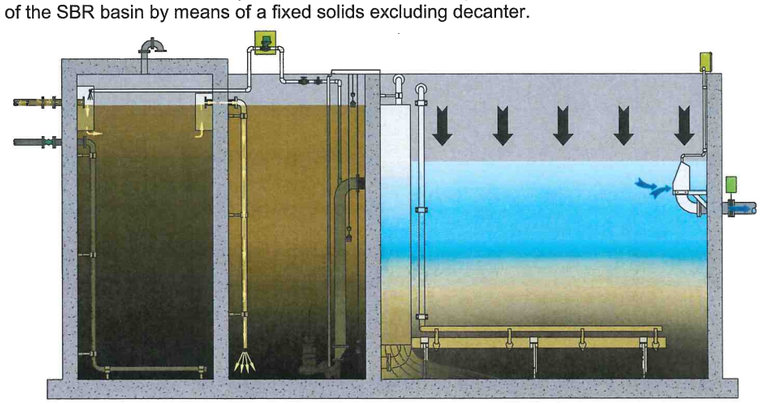
THE EXPERIENCED LEADER IN SEQUENCING BATCH REACTOR TECHNOLOGY



Settle Phase: When the level in the SAM™ reactor again reaches "control level," aeration is discontinued, and the SBR basin settles under perfect quiescent conditions.



Decant Phase: When the settle timer expires, the decant valve is opened, and treated effluent is withdrawn from the upper portion of the SBR basin by means of a fixed solids excluding decanter.



Filled Decant Phase: If, during peak flow events, the SAM™ reactor reaches TWL before the decant phase ends, influent flows in a reverse direction through the surge return line and overflows the surge chamber secondary weir, and is diffused into the settled sludge at very low velocity as the decant phase continues.

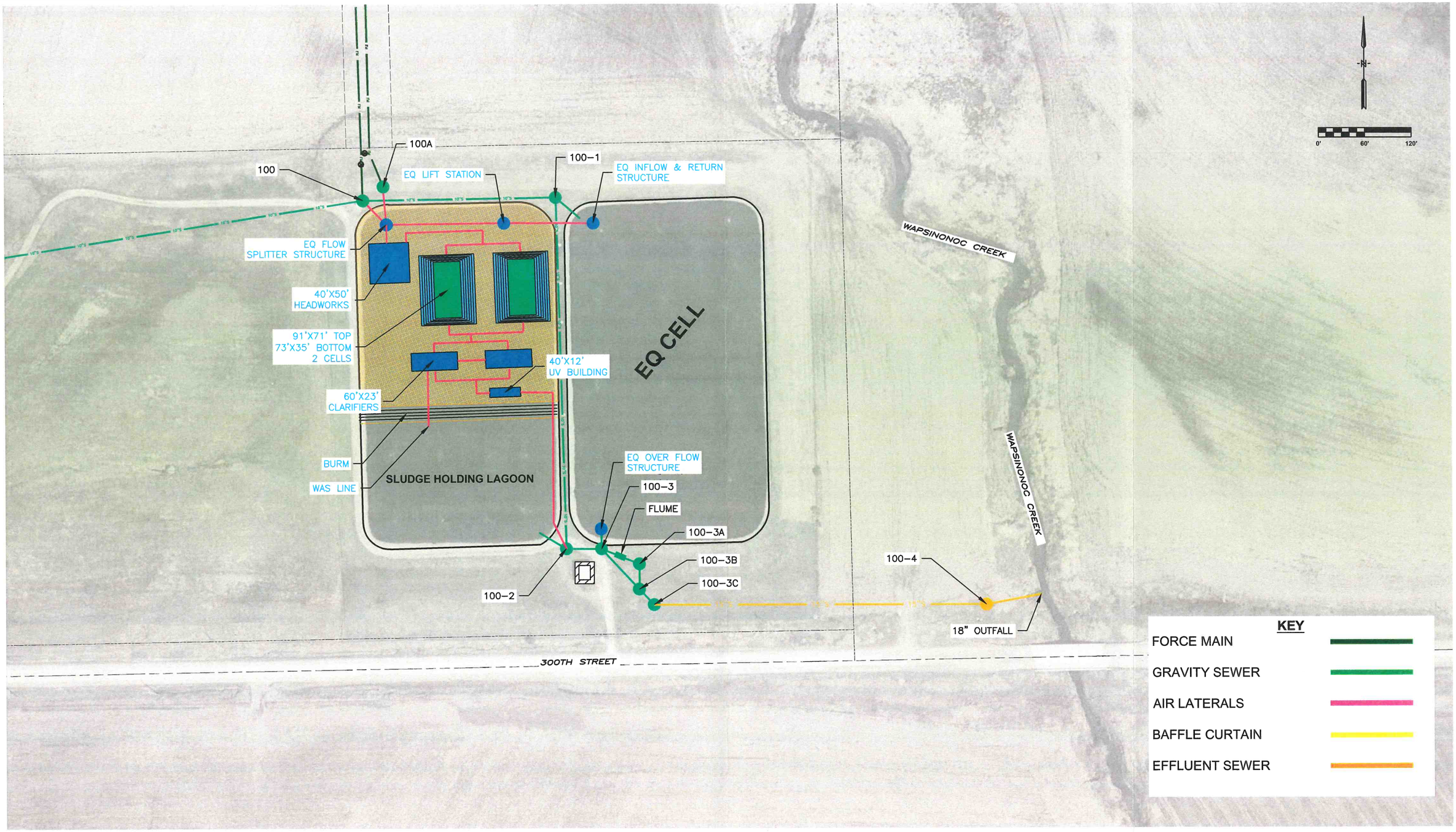
Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa

SBR
5/1/2019

No.	Description	Price
1	Headworks	$834,000
2	SBR/ISAM Treatment System	$1,922,000
3	UV System	$239,000
4	EQ Lift Station & Piping	$235,000
5	Site Work & Piping	$985,000
6	Generator (120 kW) & Transfer Switch	$130,000
7	Electrical & Controls	$530,000
	SUB-TOTAL	$4,875,000
	Contingency (15%)	$732,000
	CONSTRUCTION TOTAL	$5,607,000
	Land Acquisition	$0
	Eng., Leg., Adm. (18%)	$1,010,000
	PROJECT TOTAL	$6,617,000
	EXPECTED O&M (20 YR PRESENT WORTH)	$1,788,000
	20 YEAR PRESENT WORTH VALUE OF PROJECT	**$8,405,000**

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

OPTION 3
MECHANICAL PLANT: BIOLAC



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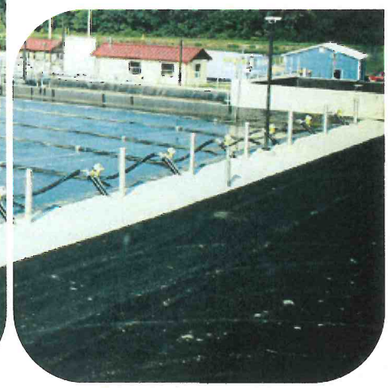
VEENSTRA & KIMM, INC.

BIO-LAC SITE PLAN
WEST BRANCH, IOWA
FIGURE 4-X



Biolac® EZClear™ Clarifier

Advanced Gravity Separation

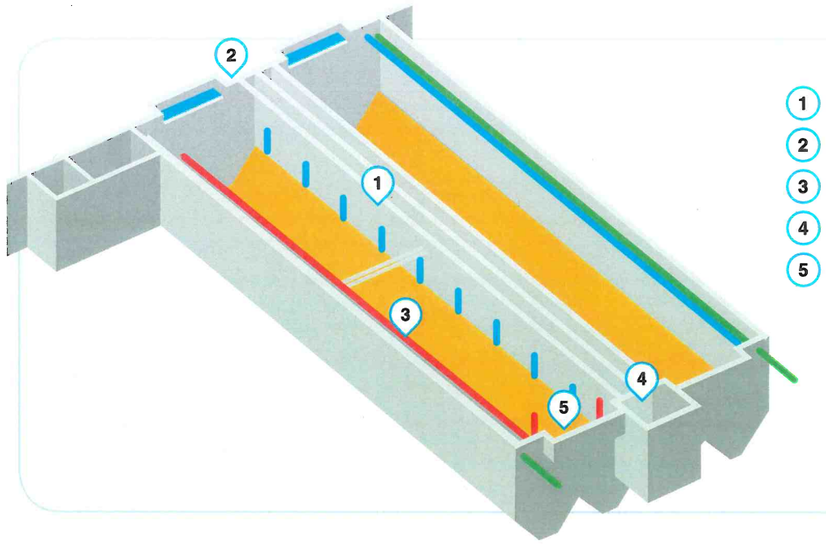
For years, a key part of the Biolac System has been the simple, common wall secondary clarifier that completes the system. Efficient liquid-solids separation is critical to maintaining high quality effluent and the Biolac® clarifier has proven to perform with excellent reliability. Many plants produce effluent TSS between 5 and 10 mg/l. Along with hundreds of successful installation over the past 25 years comes the experience and learning that leads to new innovation and development.

The EZClear™ design builds on the successful innovation of the existing Biolac® clarifier while maintaining all the features and benefits that owners want.

- Low effluent TSS
- Rapid sludge removal
- Simple maintenance of all equipment from the surface
- Gravity RAS flow option
- Low hydraulic profile

With lengths up to 100 feet, the EZClear™ almost doubles the available surface area per clarifier, expanding the range of application and further reducing operation and maintenance requirements while improving effluent quality.

Biolac® EZClear™ Clarifier



1. EZClear™ feed channel orifices control the flow into the clarifier
2. Feed channel slide gate
3. Rapid sludge removal from the entire V-bottom EZClear™
4. Surface wasting slide gate
5. Automated scum skimming and removal

Features	Benefits
Effluent TSS guaranteed – as low as 10 mg/l TSS	Provides the owner with the confidence and security of a successful EZClear™ installation
Turned 90° from the original Biolac™ clarifier, the EZClear™ Clarifier is available in lengths up to 100 feet.	The surface area available per clarifier is increased by over 80%, providing higher flow capacity for lower total cost
Vertical, common wall construction with the Biolac™ treatment basin and other structures	Reduces the amount of concrete and excavation required, lowering the cost of construction. Clarifier/RAS footprint is at least 30% less than with separate circular clarifiers
Low-velocity, equally distributed crossflow design	Inlet distribution pipes ensure superior hydraulic efficiency and eliminates the density currents that destroy clarifier performance
EZClear™ feed channel orifices control the flow into the clarifier	Controlled equalization can automatically be provided in the Biolac® treatment basin, dampening short term peak clarifier loading, improving performance
Feed channel slide gate	Provides easy isolation of each EZClear™ from the Biolac® treatment basin
Rapid sludge removal from the entire EZClear™ V-bottom	Keeps sludge healthy and in the process treating wastewater – no danger of denitrification or P re-release in the sludge collection zone
Automated sludge wasting	Improves process stability and performance while reducing operator time and attention
Surface wasting slide gate	Allows for removal of poor settling floc/scum from the clarifier feed. The operator decides when and how much to waste this way
Automated scum skimming and removal	Minimizes scum flow while reducing operator time and attention
Both airlift pumps with gravity RAS flow, and mechanical pumps with pumped RAS flow are available	Design flexibility depending on plant hydraulics and operator preference

Parkson™
Treating Water Right

50 YEARS 2010

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Kansas City
Dubai

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technology@parkson.com
www.parkson.com

BL-EZ

Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa

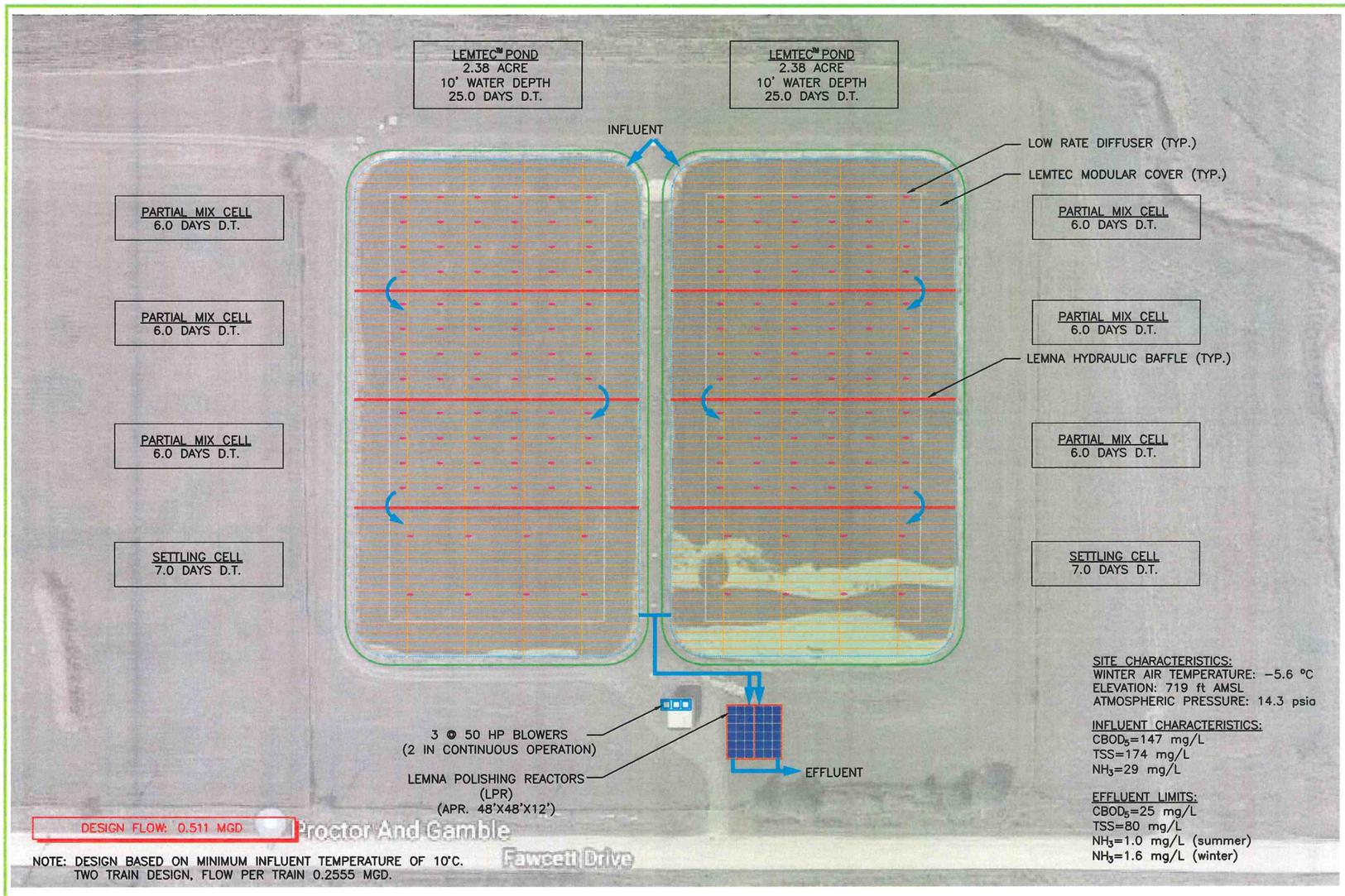
BioLac
5/1/2019

No.	Description	Price
1	Headworks	$834,000
2	BioLac Treatment System	$1,778,000
3	UV System	$239,000
4	EQ Lift Station & Piping	$220,000
5	Site Work & Piping	$1,558,000
6	Generator (80 kW) & Transfer Switch	$90,000
7	Electrical & Controls	$530,000
8	Demolition & Temporary Construction Costs	$325,000
9	Biosolids Removal from West Lagoon Cell	$150,000
	SUB-TOTAL	$5,724,000
	Contingency (15%)	$859,000
	CONSTRUCTION TOTAL	$6,583,000
	Land Acquisition	$0
	Eng., Leg., Adm. (18%)	$1,185,000
	PROJECT TOTAL	$7,768,000
	EXPECTED O&M (20 YR PRESENT WORTH)	$1,696,000
	20 YEAR PRESENT WORTH VALUE OF PROJECT	**$9,464,000**

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

Veenstra Kimm, Inc.

OPTION 4
ENHANCED LAGOON TREATMENT: LEMNA



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APPROVED BY: AMM
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DATE: JANUARY 2019
SHEET NO: 1 OF 1

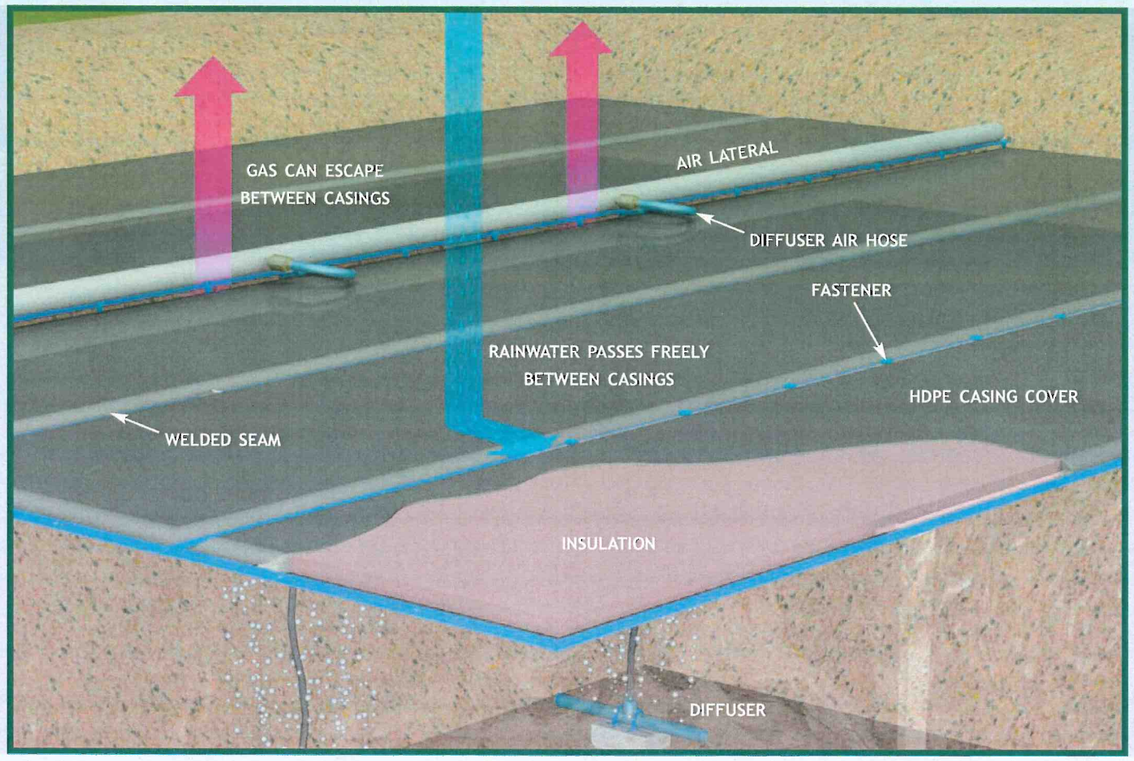
LEMTEC™ BIOLOGICAL TREATMENT PROCESS
WEST BRANCH, IA

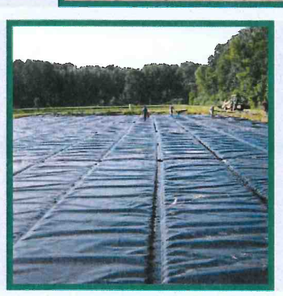
L•E•T
LEMNA ENVIRONMENTAL TECHNOLOGIES, INC.
4215 WHITE BEAR PARKWAY, SUITE 200 • VADNAIS HEIGHTS, MN 55110
PHONE: 612-253-2005 FAX: 612-253-2003 WWW.LEMNATECHNOLOGIES.COM

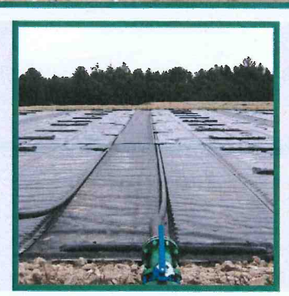
Insulated Modular Cover

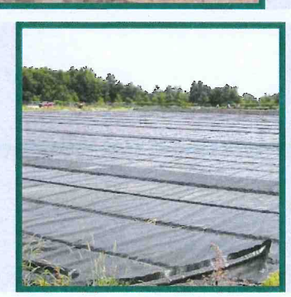
First and Still the Best . . .

Lemna Technologies was the 1st company to introduce a floating modular cover system in the wastewater industry. This innovative patented cover solution consists of individual casings that are fastened together to form a complete cover over the water surface. Each individual casing consists of closed cell insulation sealed between two sheets of durable geomembrane. The result is a cost-effective, easy to install, maintenance-free solution.









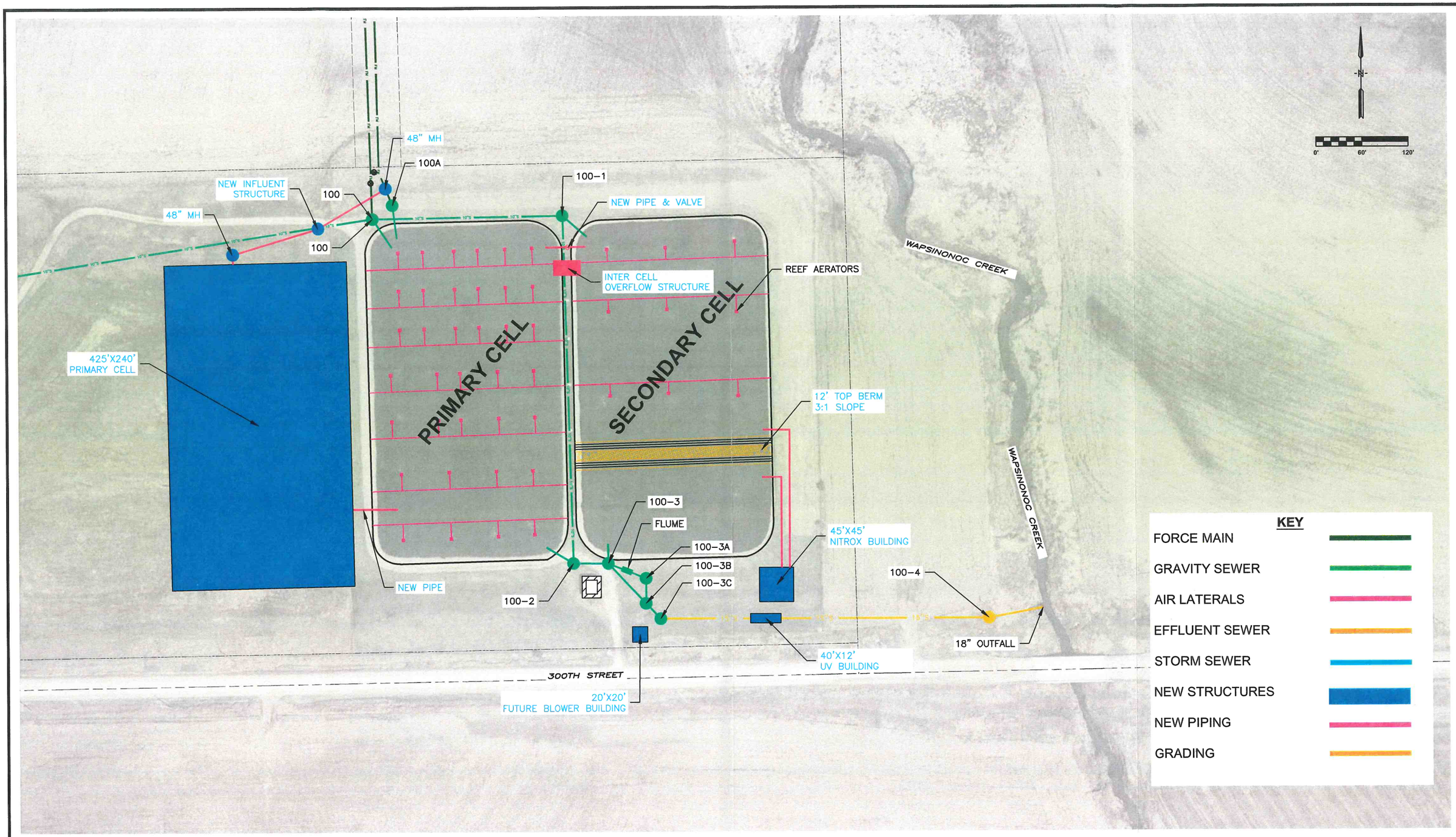
Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa

Lemna 3-Cell System
5/1/2019

No.	Description	Price
1	Lemna Treatment System	$3,047,000
2	3rd Aerated Lagoon	$751,000
3	UV System	$239,000
5	Site Work & Piping	$832,000
6	Generator (170 kW) & Transfer Switch	$180,000
7	Electrical & Controls	$325,000
	SUB-TOTAL	$5,374,000
	Contingency (15%)	$807,000
	CONSTRUCTION TOTAL	$6,181,000
	Land Acquisition	$0
	Eng., Leg., Adm. (18%)	$1,113,000
	PROJECT TOTAL	$7,294,000
	EXPECTED O&M (20 YR PRESENT WORTH)	$1,287,000
	20 YEAR PRESENT WORTH VALUE OF PROJECT	**$8,581,000**

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

OPTION 5
ENHANCED LAGOON TREATMENT: NITROX



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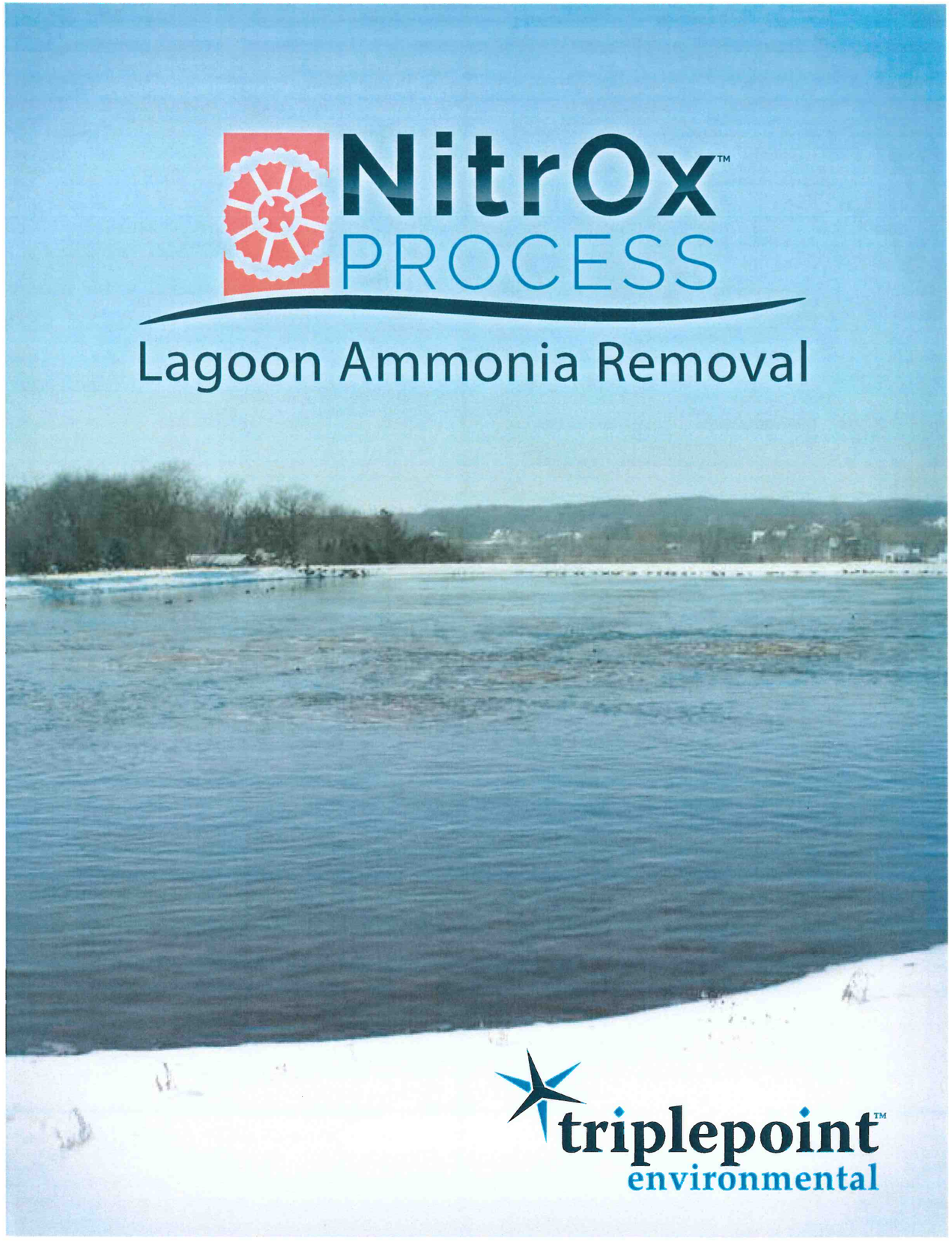
NITROX SITE PLAN
WEST BRANCH, IOWA
FIGURE 4-X

NitrOx™ PROCESS

Lagoon Ammonia Removal



triplepoint™ environmental

NitrOx™ Process

The patent-pending **NitrOx Process** features a thermally-regulated nitrification reactor specifically designed to remove ammonia from your lagoon effluent. When winter wastewater temperatures fall those few month a year, the NitrOx System cost-effectively heats up the water—just a few degrees—to ensure sufficient biomass to achieve rapid nitrification. The NitrOx System integrates with your existing infrastructure and can even be configured to address BOD and TN challenges while economically achieving near-complete ammonia removal at any lagoon temperature.

NitrOx™ PROCESS

Lagoon Ammonia Removal

FINANCIALLY FEASIBLE

1. **Low Capital Costs:** Any required facility upgrade should not be prohibitively expensive. Your lagoons are already accomplishing the majority of the required treatment, and we harness that resource by incorporating the NitrOx Reactor directly into your existing process for the sole purpose of ammonia removal. This helps to keep your capital costs low, minimizing the financial burden of plant upgrades.

2. **Simple Operation:** Lagoons are simple to operate—they are low maintenance, low hassle, and offer lots of flexibility—making them the perfect wastewater treatment solution for small communities. We designed the NitrOx Reactor with precisely this in mind: Self-cleaning media, robust medium bubble aeration, and automated temperature control are just some of the features that keep maintenance low and operation simple.

3. **Built to Last:** Wastewater systems must be designed to stand the test of time. Lagoons are among the most robust treatment plants available, and the NitrOx Reactor is built to last just as long without replacement. Concrete and stainless steel materials ensure that your infrastructure remains viable for twenty plus years.

PROVEN & PREDICTABLE

1. **Decades of Performance:** We believe in evolution, not revolution, and that's why the NitrOx Reactor integrates technology that was not just proven but perfected over decades, with thousands of installations in operation around the world. By adapting this technology to the specific needs of lagoon systems, we leverage proven nitrification performance to ensure your system reliably keeps you in compliance.

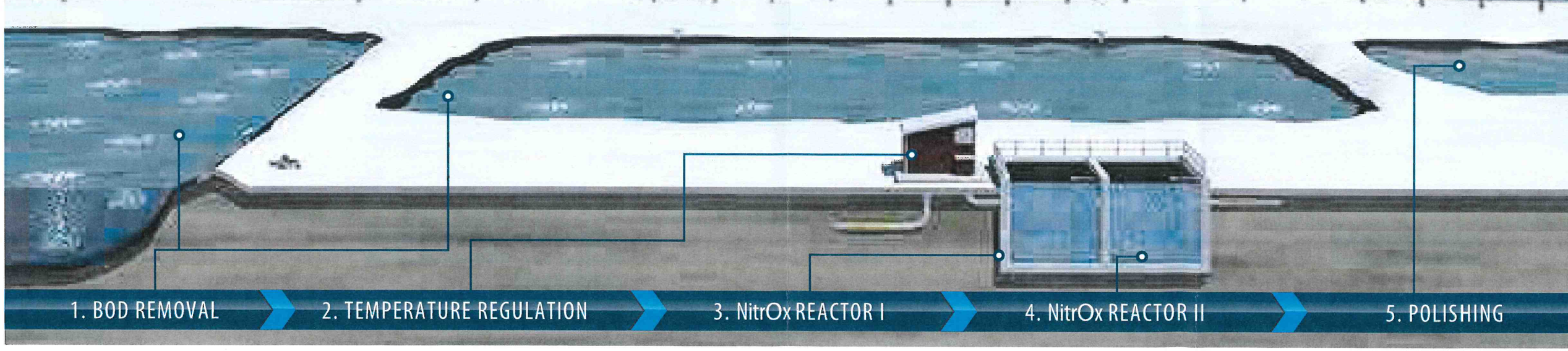
2. **Independently Verified:** We believe good data leads to good decisions. Backed by over 50 independent research papers spanning decades of study, as well as by firmly established kinetics, the NitrOx Reactor is the most proven and predictable lagoon ammonia solution available.

CONTROLLED NITRIFICATION

1. **Controlled Temperature:** Controlled processes yield controlled results. By thermally regulating the influent and insulating to prevent heat loss, the NitrOx Reactor consistently meets strict ammonia limits no matter how cold or unpredictable your winters are.

2. **Controlled Biomass:** The NitrOx Reactor cultivates a dense collection of nitrifying bacteria by utilizing millions of individual attached-growth media. This population of nitrifiers is thousands of times larger than what occurs naturally in your lagoon, providing for rapid ammonia removal—even in cold weather.

3. **Controlled Mixing & Aeration:** The NitrOx Reactor incorporates a robust complete-mix aeration system that ensures that the ammonia, bacteria, and oxygen are in continuous contact. With the entire basin thoroughly mixed, there are no underutilized "dead zones"—ultimately ensuring that every single gallon of your wastewater is treated to precise requirements.



NitrOx REACTOR

Lagoon Ammonia Removal

THE NitrOx™ PRINCIPLE

Ammonia removal through nitrification will reliably occur with the proper conditions. The purpose of the NitrOx Process is to control and optimize each of these conditions, fostering an ideal habitat for a specific set of bacteria called nitrifiers and super-concentrating them into a small, cost-effective, and highly efficient reactor. In doing so, NitrOx guarantees results.

MAXIMIZING BACTERIA CONCENTRATION

An increase in nitrifiers yields an increase in ammonia reduction. Nitrifiers grow on substrate or "media," meaning that in order to increase the quantity of these bacteria, you need to increase the surface area they grow on. The NitrOx Reactor contains millions of small media, producing over 150 square feet of surface area per every cubic foot of volume. This provides for a dense concentration of nitrifiers, and allows the NitrOx Process to be the most effective ammonia treatment solution in the smallest footprint, even at low temperatures.

CONTROLLING TEMPERATURE

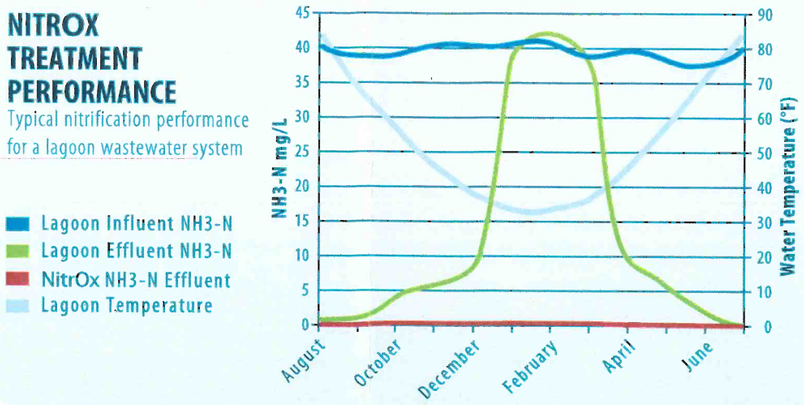
As the water cools, nitrifiers consume ammonia more slowly. In the coldest winter months, wastewater can be too cold for the nitrifiers to effectively consume ammonia, so the NitrOx Reactor automatically regulates its influent by gently heating the water to 39-42˚F with heat exchangers and/or an optional geothermal heat source, then maintains this temperature with an insulated cover. Because this temperature increase is minor and only required a few months per year, the NitrOx Reactor operates cost effectively while promoting rapid ammonia reduction.

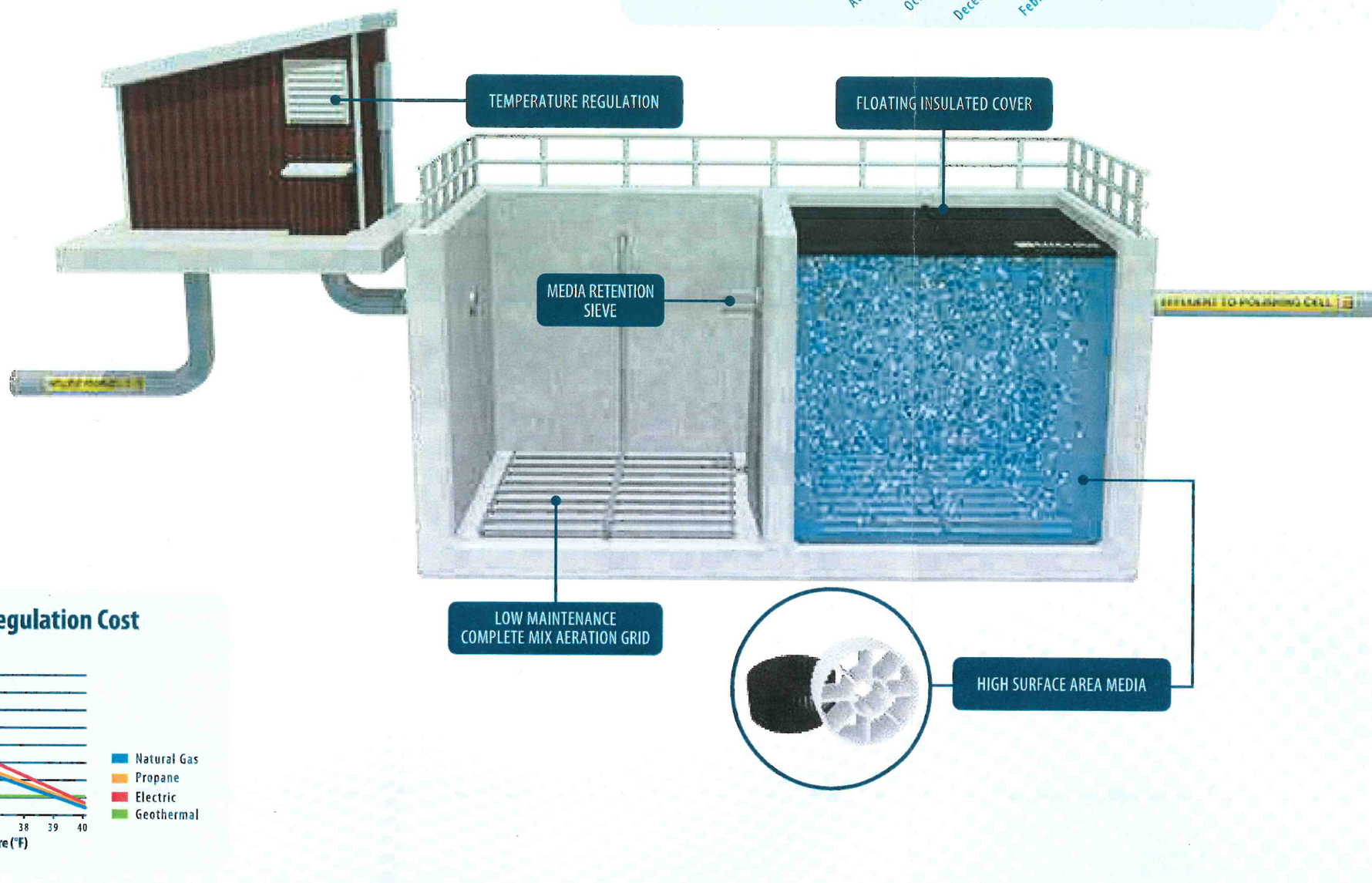
OPTIMIZING MIXING & AERATING

Low maintenance coarse bubble diffusers release large bubbles from a full-floor grid, transferring the oxygen nitrifiers need to complete their ammonia digestion. These coarse bubbles also distribute their high-energy mixing throughout the Reactor, agitating the millions of media so the bacteria, the oxygen, and the waste are continuously in contact, creating an ideal environment for rapid ammonia reduction. This same mixing also causes the media to collide with each other, the walls, and the piping sieves, constantly self-cleaning so you don't have to.

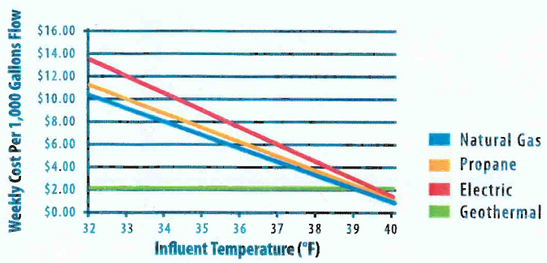
NITROX TREATMENT PERFORMANCE

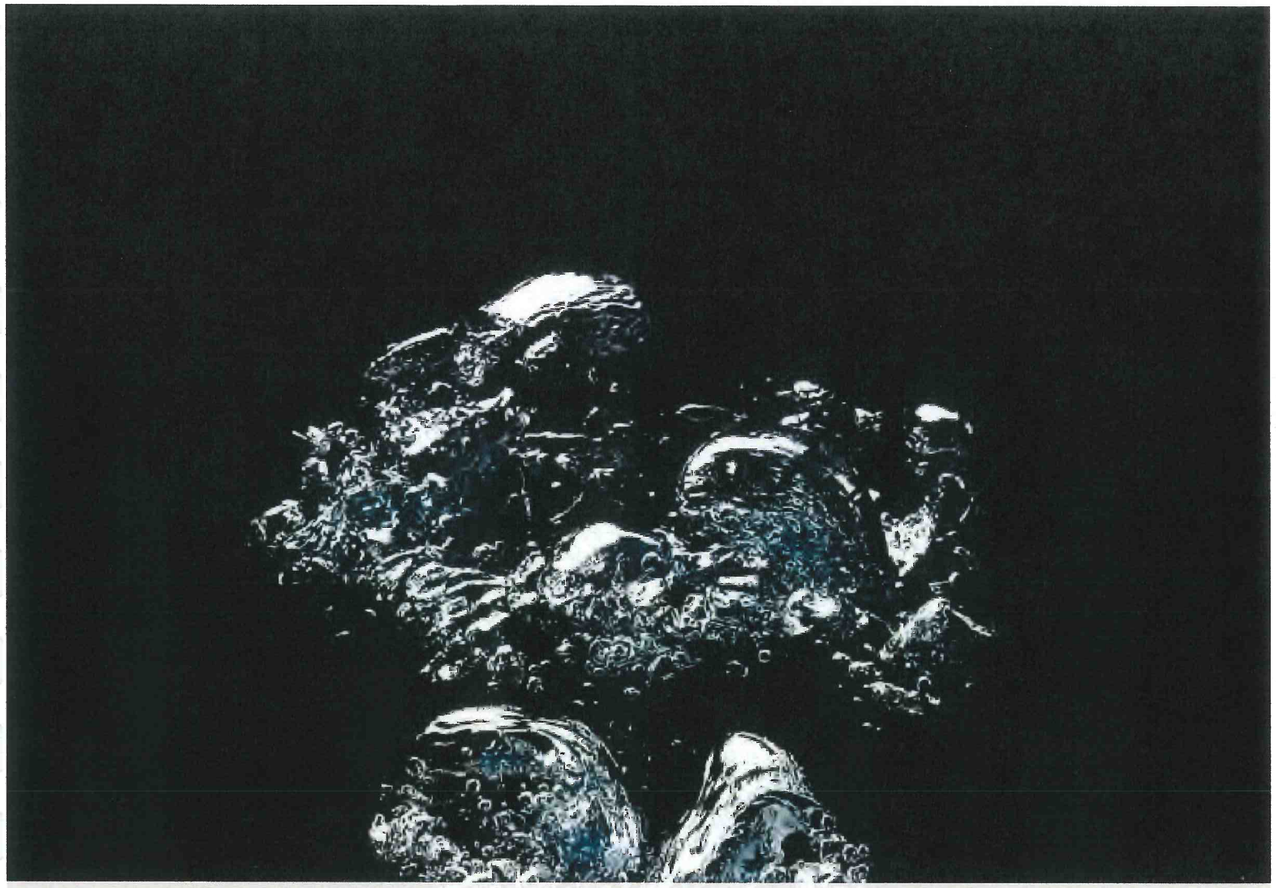
Typical nitrification performance for a lagoon wastewater system





Temperature Regulation Cost





MARS AERATION SYSTEM

Mixing. Aerating. Lagoons.

triplepoint™
water technologies

THE MARS AERATION SYSTEM

The MARS Aeration System utilizes industry-leading submerged aeration diffuser technology, providing effective mixing and efficient aeration in a portable unit. MARS Aerators are simple to install: each self-weighted unit is connected to an on-shore air supply via flexible weighted tubing and lowered into the water. Maintenance is just as easy and can be completed from the surface without incurring system downtime. This modular design allows for the MARS to be implemented in any size wastewater facility, from single user systems to full-scale facilities.

EFFICIENT MIXING & AERATING
ONE PORTABLE UNIT

DOUBLE BUBBLE TECHNOLOGY™

Coarse Bubble Mixing: Large bubbles are released at the bottom of the static tube creating a draft that pulls water and liquefied organic matter up from the basin floor and through the unit. This produces a highly agitated water column that thoroughly mixes and circulates the entire wastewater tank or lagoon.

Fine Bubble Efficiency: Fine bubble diffusers surround the static tube, maximizing oxygen transfer efficiency (OTE) while minimizing energy consumption. Enhanced by coarse bubble mixing, the fine bubble oxygenation provides the ideal environment for biological treatment.

Optimized Energy Distribution: The MARS Technology's modular design allows for treatment to be evenly distributed throughout the entire lagoon, mixing and aerating from the basin floor to the surface.

COST EFFICIENT INSTALLATION

Ease of Installation: The self-weighted, portable, and modular design allows an entire MARS Aeration System to be quickly installed from the surface without ever taking the lagoon offline. This keeps effluent levels within permit, even during a system-wide upgrade.

High Airflow and Mixing Capacity: Due to the MARS' industry leading high airflow and mixing capabilities, the total number of units necessary to treat a facility is minimized. As a result, costs from installation materials, labor, and long-term maintenance are all greatly decreased.

LOWER MAINTENANCE COSTS

Ease of Maintenance: Each MARS Aerator is self-weighted, portable and equipped with a stainless steel tether and locator float. When necessary, individual units can be easily lifted to the surface for servicing without the expense of dewatering or the inconvenience of system downtime.

Centralized Air Supply: Air can be supplied to the entire MARS Aeration System by a single, centralized on-shore blower. If needed, additional blowers can be provided to meet sizing, layout, or redundancy requirements. For further energy savings and control, Variable Frequency Drives (VFD) and dissolved oxygen (DO) meters can be incorporated.

Anti-Fouling Design: The MARS Aerator resists fouling in several ways:

a. Utilizing self-checked fine & coarse bubble diffusers
b. Using self-cleaning EPDM membranes
c. Elevating the diffusers above accumulated solids
d. Eliminating all submerged moving parts

Installation of MARS Aerators with optional service barge

MARS PRODUCT LINE

The versatility and portability of the MARS Aerator make it ideal for wastewater facility retrofits. MARS Aeration is frequently used to upgrade treatment plants with clogged fine bubble diffusers, inefficient coarse bubble aerators, or broken down surface aerators. Durable construction, fast and simple installation, and low operation and maintenance costs, coupled with its superior oxygenation and mixing performance, make the MARS Aerator the preferred choice for efficiency, reliability, and longevity.

MODELS OPTIMIZED FOR YOUR APPLICATION

The MARS Aeration System includes a broad range of product models and options. Triplepoint's engineering team designs systems that are customized to meet your facility's unique requirements while targeting the fastest possible project payback period—often 12-36 months.

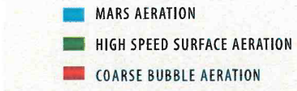
DESIGNED FOR RELIABILITY

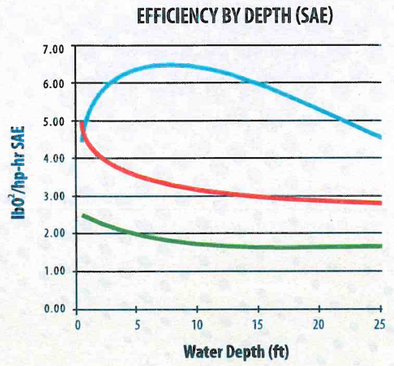
All products are manufactured in the USA from the finest industrial-grade materials and have proven resilient in the harshest municipal and industrial wastewater environments. The MARS even excels at cold-weather operation, as all equipment is installed below the surface of the water. Whether it's the compact, rugged frame, stainless steel fittings, lack of moving parts, or the Anti-Fouling diffusers, every component has been selected and tested to provide many years of worry-free operation.

ENERGY EFFICIENCY

Extensive independent testing has proven that the MARS Aerator has a best-in-industry Standard Aeration Efficiency (SAE). The MARS is 50-60% more energy efficient than high-speed surface aerators and 40-50% more efficient than coarse bubble diffusers. Energy efficiency is further enhanced by the patented Double-Bubble Technology, which allows custom optimization of each system's fine bubble (oxygenation) and coarse bubble (mixing) demands.

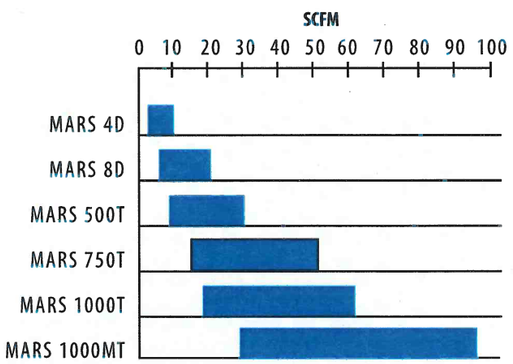
AERATION EFFICIENCY COMPARISON

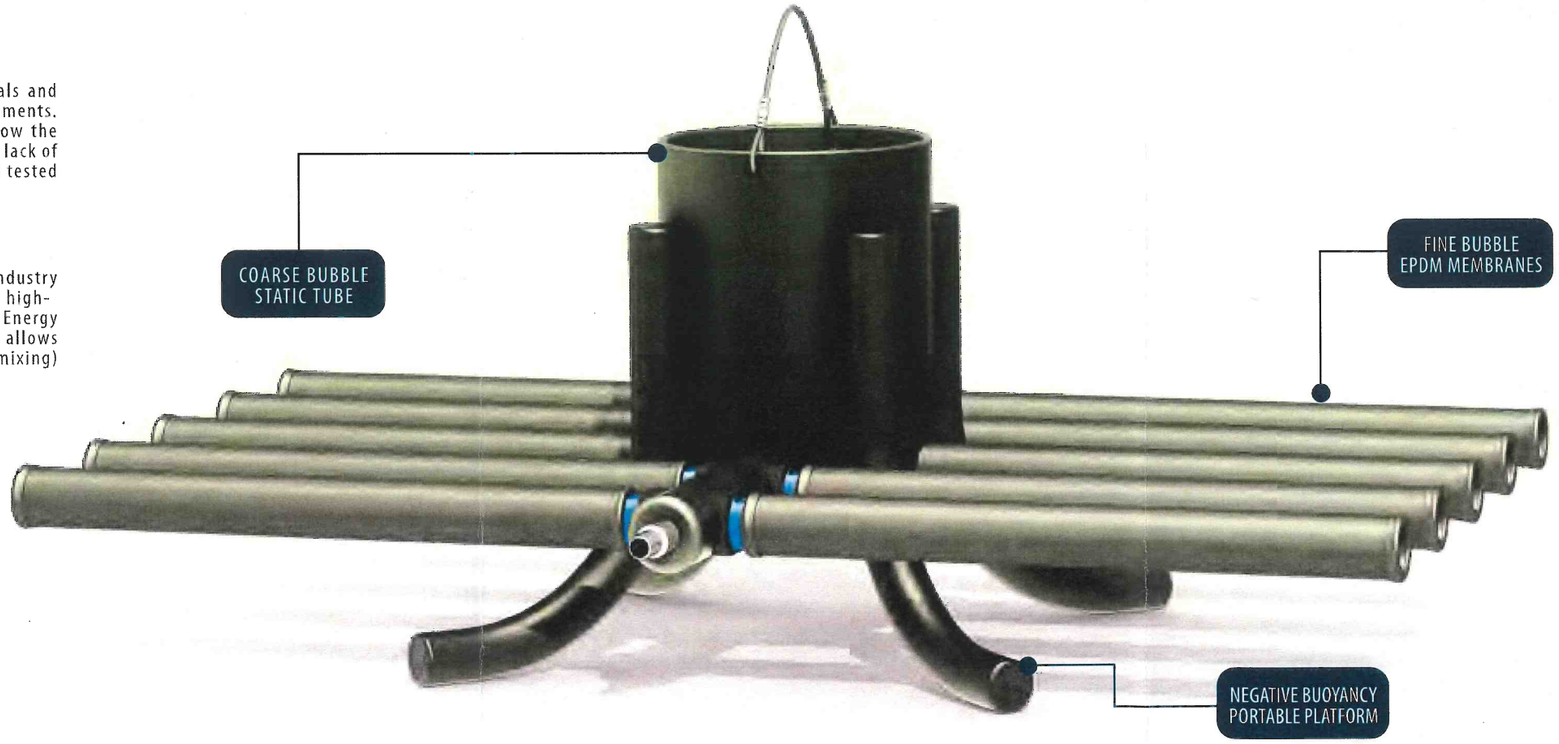


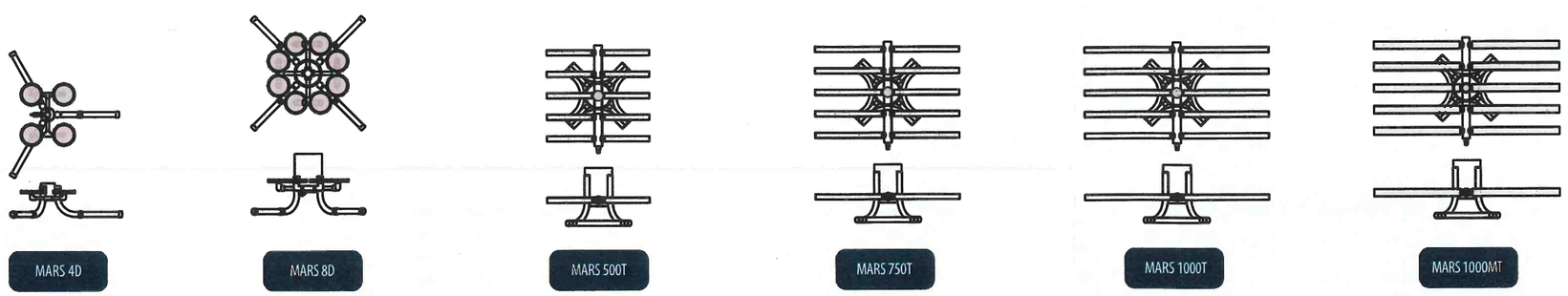


*Based on lab testing in clean water. Not for design purposes.

MARS RECOMMENDED AIRFLOW







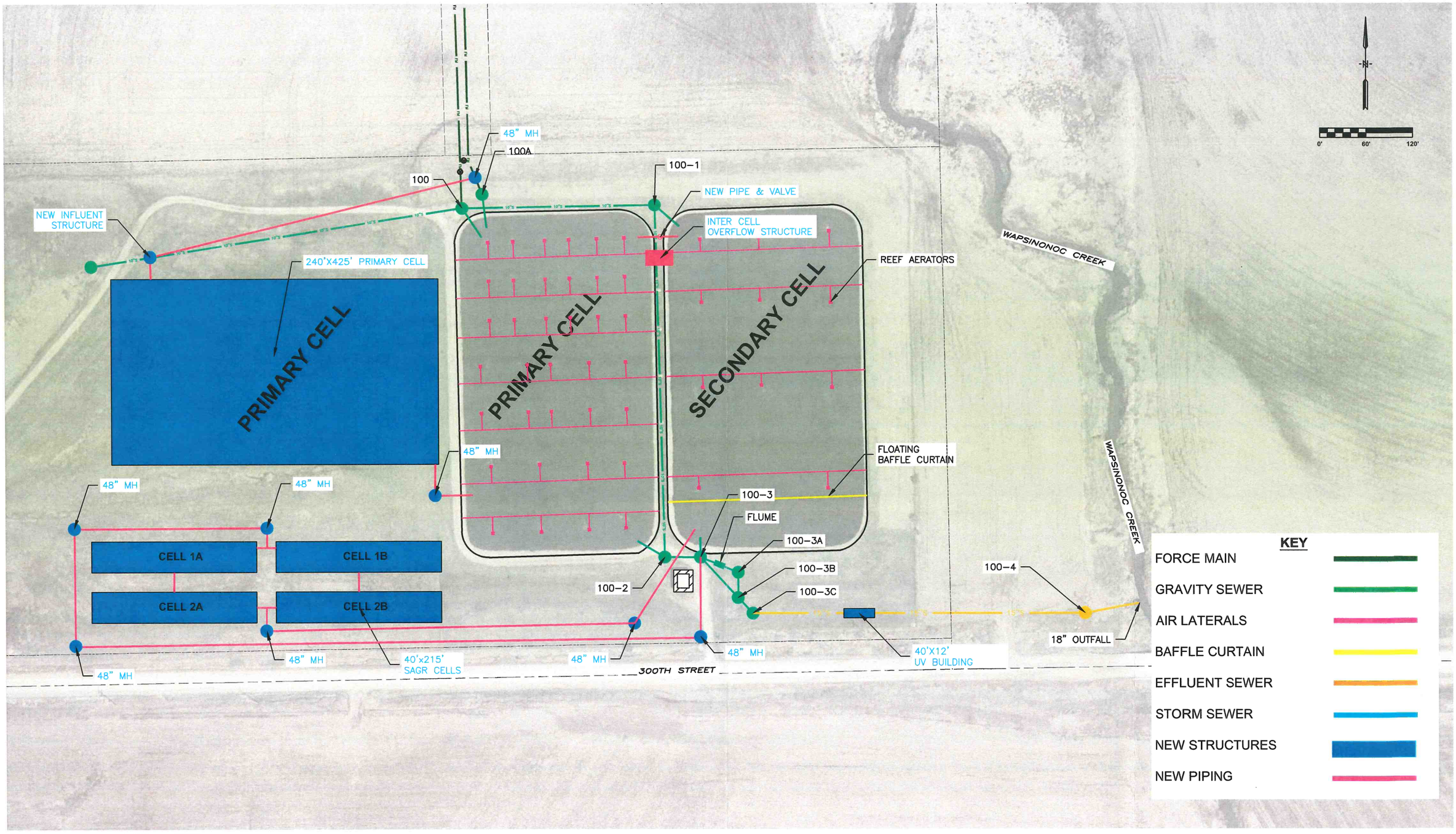
Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa

Nitrox w/ 3 Aerated Lagoon Cells
5/1/2019

No.	Description	Price
1	Nitrox Treatment System	$1,734,000
2	MARS Aeration System	$222,000
3	3rd Aerated Lagoon Earthwork	$610,000
4	UV System	$239,000
5	Site Work & Piping	$771,000
6	Generator (190 kW) & Transfer Switch	$200,000
7	Electrical & Controls	$325,000
	SUB-TOTAL	$4,101,000
	Contingency (15%)	$616,000
	CONSTRUCTION TOTAL	$4,717,000
	Land Acquisition	$0
	Eng., Leg., Adm. (18%)	$850,000
	PROJECT TOTAL	$5,567,000
	EXPECTED O&M (20 YR PRESENT WORTH)	$3,791,000
	20 YEAR PRESENT WORTH VALUE OF PROJECT	**$9,358,000**

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

OPTION 6
ENHANCED LAGOON TREATMENT: SAGR



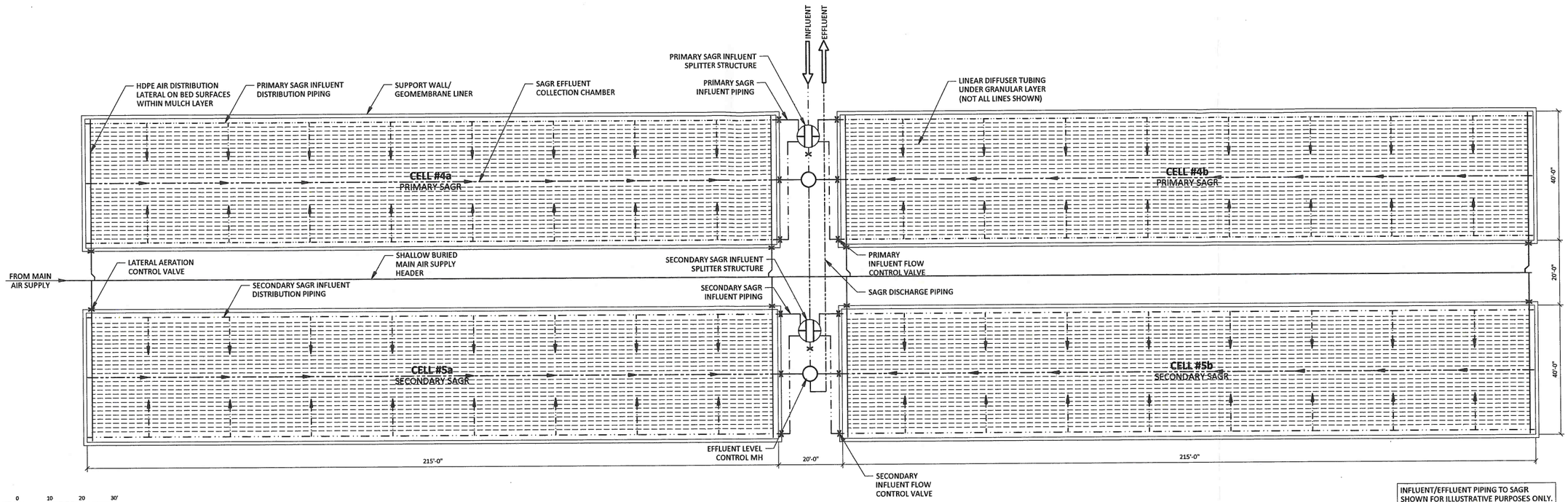
V&K

VEENSTRA & KIMM, INC.

SAGR SITE PLAN
WEST BRANCH, IOWA
FIGURE 4-X

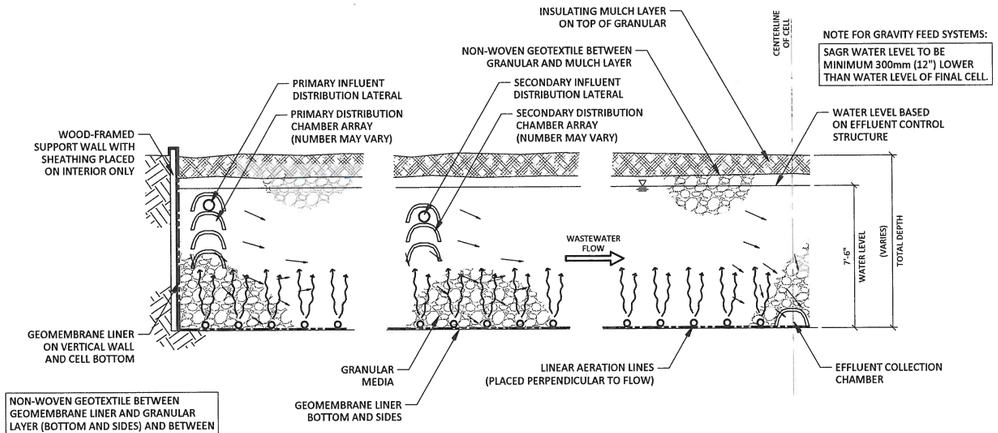
PLOT SIZE: 610mm x 914mm (24" x 36")

REDUCED SIZE PLOT - DO NOT SCALE

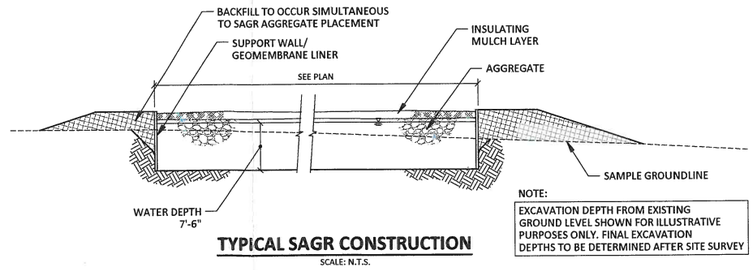


PROPOSED SAGR LAYOUT
SCALE: 1:200

INFLUENT/EFFLUENT PIPING TO SAGR SHOWN FOR ILLUSTRATIVE PURPOSES ONLY. EXACT PIPING ROUTING TO BE DETERMINED BASED ON FINAL LOCATION OF SAGR.



HORIZONTAL FLOW SAGR - SECTION
SCALE: N.T.S.



TYPICAL SAGR CONSTRUCTION
SCALE: N.T.S.

Nexom technologies for cleaner water
5 Burks Way
Winnipeg, Manitoba
Canada R2J 3R8
888-426-8180
www.nexom.com

PROJECT:	WEST BRANCH, IA PROPOSED WASTEWATER TREATMENT SYSTEM
TITLE:	OPTAER SYSTEM SAGR LAYOUT, TYPICAL SECTION
DRAWN BY: MR	APPROVED BY: MK
SCALE: AS NOTED	DRAWING NO. NE02
DATE: 2019/01/14	FILE # CD1815.03
SHT. 2 of 2	

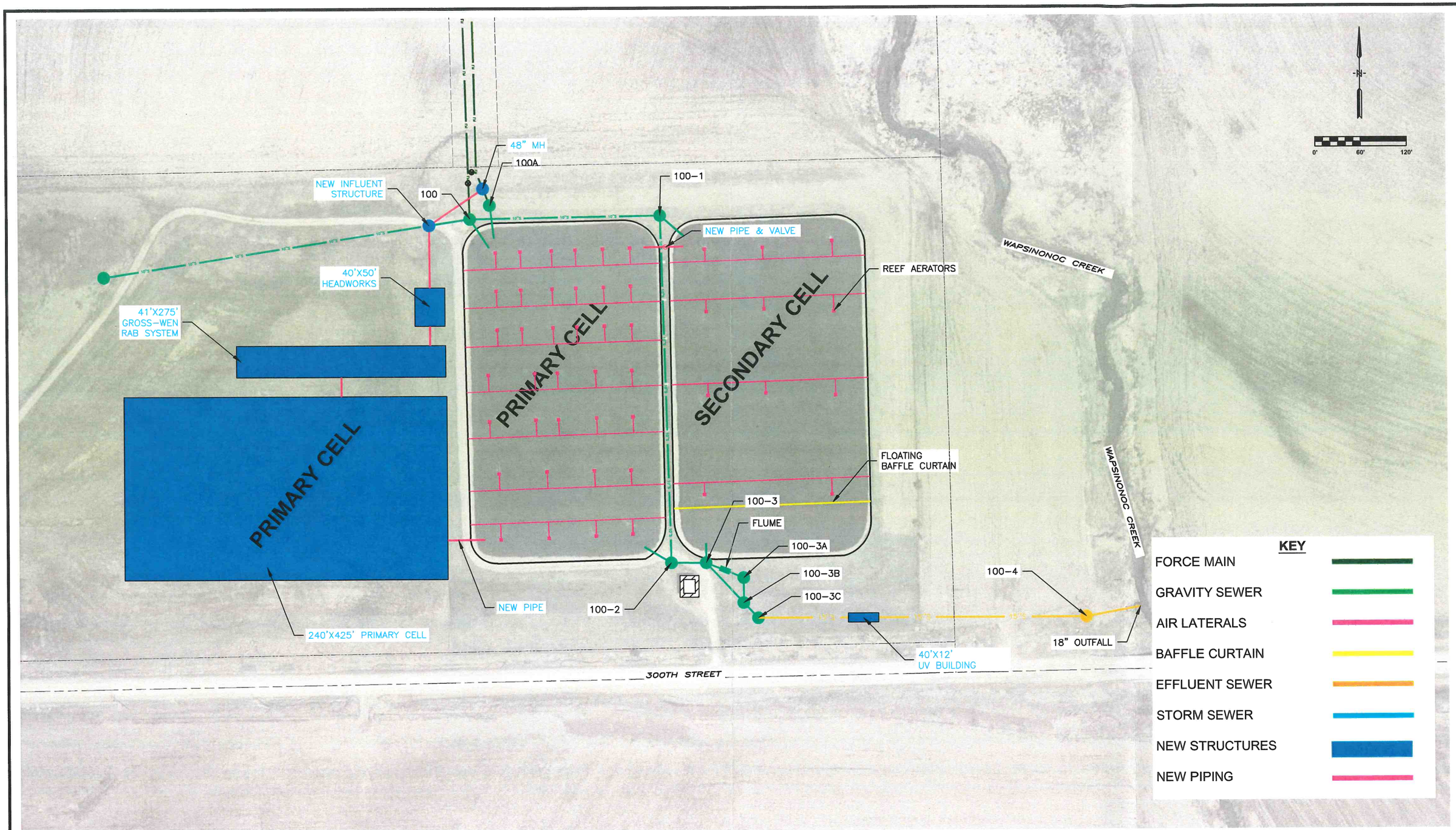
Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa

SAGR w/ 3 Aerated Lagoon Cells
5/1/2019

No.	Description	Price
1	SAGR Treatment System	$2,292,000
2	3rd Aerated Lagoon Earthwork	$610,000
3	UV System	$239,000
4	Site Work & Piping	$1,037,000
5	Generator (90 kW) & Transfer Switch	$100,000
6	Electrical & Controls	$350,000
	SUB-TOTAL	$4,628,000
	Contingency (15%)	$695,000
	CONSTRUCTION TOTAL	$5,323,000
	Land Acquisition (2 ac)	$30,000
	Eng., Leg., Adm. (18%)	$959,000
	PROJECT TOTAL	$6,312,000
	EXPECTED O&M (20 YR PRESENT WORTH)	$954,000
	20 YEAR PRESENT WORTH VALUE OF PROJECT	**$7,266,000**

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

OPTION 7
GROSS-WEN: REVOLVING ALGAL BIOFILM



V&K

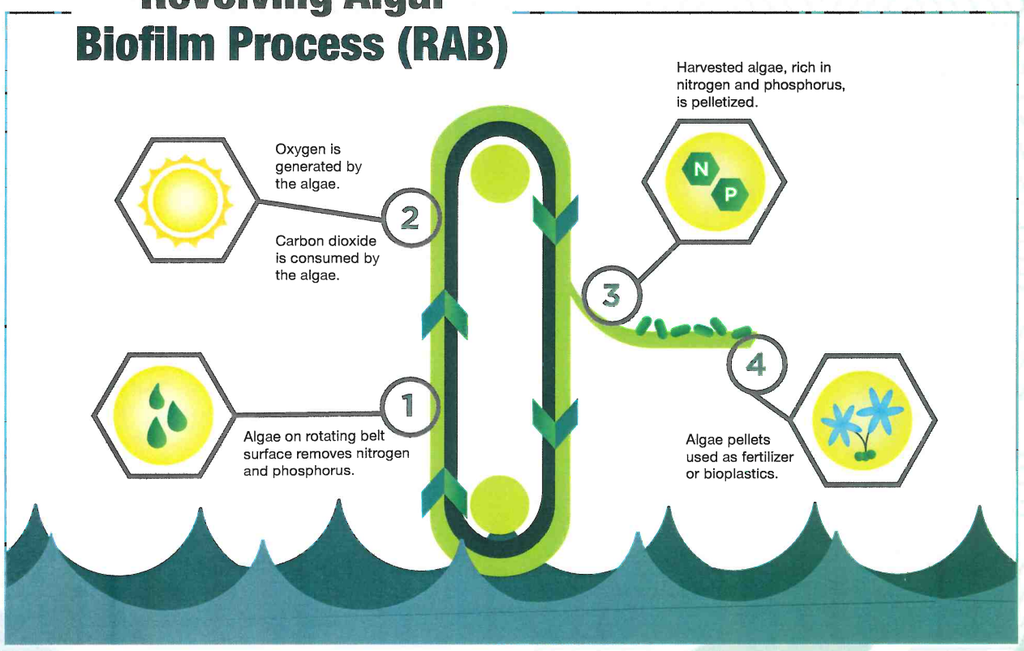
VEENSTRA & KIMM, INC.

GROSS - WEN SITE PLAN
WEST BRANCH, IOWA
FIGURE 4-X

Our Approach to Clean Water

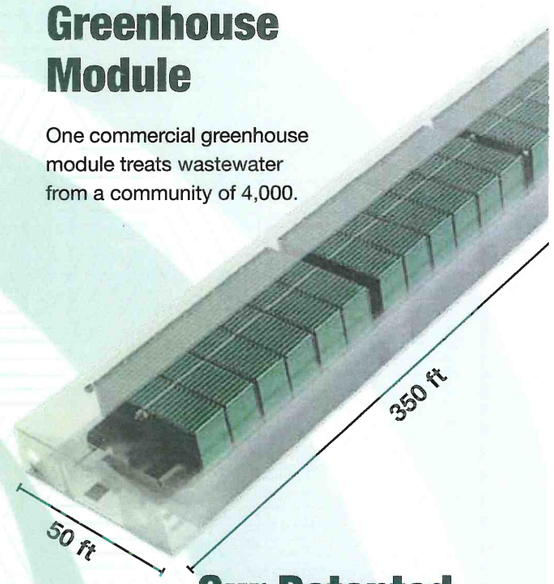
Gross-Wen Technologies uses its **patented** wastewater treatment technology, known as the revolving algal biofilm system (RAB), to cost-effectively address new wastewater permits that are being enforced at municipalities. Our system uses algae to **recover nutrients such as nitrogen and phosphorus from wastewater**. Compared to other treatment options, our system is **significantly more affordable** and produces algae biomass which can be sold as a slow-release algal fertilizer or bioplastic. Overall the process is carbon negative, making it the **most sustainable** approach to treat nitrogen and phosphorus from wastewater. Additionally, our RAB system can be used by industries to treat nutrients, CBOD and toxic metals.

Revolving Algal Biofilm Process (RAB)



Commercial Greenhouse Module

One commercial greenhouse module treats wastewater from a community of 4,000.



Our Patented Technology

Our core technology known as the revolving algal biofilm treatment system (RAB) has **10x higher treatment capacity and biomass productivity** in comparison to conventional algal systems such as raceway ponds. The technology was invented at Iowa State University and utilizes a rotating biofilm which allows for simple and low-cost algal harvesting.

Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa

Gross-Wen w/ 3 Aerated Lagoon Cells
5/1/2019

No.	Description	Price
1	Headworks	$834,000
2	Gross-Wen RAB Treatment System	$3,367,000
3	3rd Aerated Lagoon Earthwork	$610,000
4	New Aeration System	$222,000
5	UV System	$239,000
6	Site Work & Piping	$980,000
7	Generator (60 kW) & Transfer Switch	$70,000
8	Electrical & Controls	$475,000
	SUB-TOTAL	$6,797,000
	Contingency (15%)	$1,020,000
	CONSTRUCTION TOTAL	$7,817,000
	Land Acquisition	$0
	Eng., Leg., Adm. (18%)	$1,408,000
	PROJECT TOTAL	$9,225,000
	EXPECTED O&M (20 YR PRESENT WORTH)	$1,143,000
	20 YEAR PRESENT WORTH VALUE OF PROJECT	**$10,368,000**

* Does not include biosolids removal from existing lagoons; biosolids assumed to be significantly reduced with current pilot study that uses microbial additions and super saturated oxygen to reduce sludge blanket

* If Nano2 aeration system is desired, add $855,000 to capital cost and $600,000 to 20-Year O&M cost

Veenstra Kimm, Inc.

OPTION 8
STORMWATER WETLAND

KEY

- TRUNK SEWER
- FORCE MAIN
- AIR LATERALS
- BAFFLE CURTAIN
- EFFLUENT SEWER
- STORM SEWER
- NEW STRUCTURES
- NEW PIPING
- GRADING

Proposed Stormwater Wetland (approx. 8 acres)

N

0' 80' 160'

100A
100-1
100
REEF AERATORS
PRIMARY CELL
SECONDARY CELL
FLOATING BAFFLE CURTAIN
100-3
FLUME
100-3A
100-3B
100-3C
100-4
100-2
18" OUTFALL

V&K

VEENSTRA & KIMM, INC.

EXISTING FACILITY
WEST BRANCH, IOWA
FIGURE 4-x

Opinion of Cost for 2019 West Branch Facility Plan
West Branch, Iowa

Stormwater Wetland
5/1/2019

No.	Description	Price
1	Wetland Construction	$500,000
	SUB-TOTAL	$500,000
	Contingency (15%)	$75,000
	CONSTRUCTION TOTAL	$575,000
	Land Acquisition (10 Acres)	$250,000
	Eng., Leg., Adm. (18%)	$104,000
	PROJECT TOTAL	$929,000
	EXPECTED O&M (20 YR PRESENT WORTH)	$954,000
	20 YEAR PRESENT WORTH VALUE OF PROJECT	**$1,883,000**

Summary of Wastewater Facility Improvement Options
West Branch, Iowa

Options	Project Costs	20 Year Present Worth O&M	Total	Annual O&M
SAGR (3 aerated lagoon cells)	$6,312,000	$954,000	**$ 7,266,000**	$48,000
SBR	$6,617,000	$1,788,000	**$ 8,405,000**	$90,000
Lemna 3-Cell System	$7,294,000	$1,287,000	**$ 8,581,000**	$65,000
Nitrox (3 aerated lagoon cells)	$5,567,000	$3,791,000	**$ 9,358,000**	$190,000
BioLac	$7,768,000	$1,696,000	**$ 9,464,000**	$85,000
Aero-Mod	$8,153,000	$2,331,000	**$ 10,484,000**	$117,000
Gross-Wen (RAB) (3 aerated lagoon cells)	$9,225,000	$1,143,000	**$ 10,368,000**	$58,000
Stormwater Wetland	$929,000	$90,000	**$ 1,019,000**	$5,000
Gross-Wen (RAB) (2 cell, assuming BOD credit)	$7,840,000	$1,143,000	**$ 8,983,000**	$58,000
Lemna 2-Cell System	$4,964,000	$711,000	**$ 5,675,000**	$36,000
Nitrox (2 aerated lagoon cells)	$5,060,000	$3,791,000	**$ 8,851,000**	$190,000
SAGR (2 aerated lagoon cells)	$5,335,000	$954,000	**$ 6,289,000**	$48,000

West Branch Facility Plan Project Schedule
Ammonia & *E. coli* Compliance

Created: 10/1/2018
Revised: 5/1/2019

Task	Projected Date	Completed	Compliance Deadline
Contract Signed			
Project Initiation Meeting			
Flow & Load Analysis Complete/Submit to IDNR		September 28, 2018	
Flow & Load Analysis Approved by IDNR		October 8, 2018	
Submit WLA Request to IDNR		October 8, 2018	
Receive WLA from State		December 20, 2018	
Treatment Options Presented to Council	May 2019		
City Selects Treatment Process	May 2019		
Draft Anti-Deg Complete	May 2019		
Public Comment Period for AntiDeg	June 2019		
P&D Loan Application	July 1, 2019		
Submit AntiDeg to IDNR	July 2019		
Facility Plan Complete & Submitted	August 2019		December 1, 2018
Apply for IUP	**September 3, 2019**		
Design Conference	September 2019		
Facility Plan Approved	October 2019		
Survey	October 2019		
Plans/Specs - 30%	December 2019		
Apply for CDBG Funding	**January 2, 2020**		
Environmental Review Complete	March 2020		
Begin Construction Permit Application (Plans/Specs - 60%)	May 2020		
Plans/Specs - 90%	November 2020		
Construction Plans & Permit Application Submitted to IDNR	December 2020		March 1, 2020
Construction Permit Issued	January 2021		
Project Bids	February 2021		
Award Contract	February 2021		August 1, 2020
Begin Construction	March 2021		
Construction Complete	October 2022		December 1, 2021
Ammonia & *E. coli* Compliance Achieved	November 2022		January 1, 2022

SRF
STATE
REVOLVING FUND

About the State Revolving Fund

The State Revolving Fund (SRF) is the best choice to finance the design and construction of Iowa water and wastewater infrastructure.

The Clean Water SRF funds wastewater treatment, sewer rehabilitation, and storm water quality improvements, as well as nonpoint source projects. Publicly owned wastewater treatment works, including those owned by cities, counties, sanitary districts, and utility management organizations, are eligible. For nonpoint source projects, both public and private entities are eligible, including farmers, landowners, watershed organizations, landfills and rural homeowners.

The Drinking Water SRF funds water treatment plants or improvements to existing facilities, water line extensions to existing unserved properties, water storage facilities, wells, and source water protection efforts. Public and private community water systems, whether they are for profit or not for profit, nontransient noncommunity public water supplies if they are either publicly owned or are not for profit, and transient noncommunity systems if they are owned by government entities are eligible.





Types of Loans

- **Construction Loans**: SRF has the lowest cost funds compared to other financing options, with interest rate of 1.75% for loans up to 20 years. Origination fee is 0.5% and servicing fee is 0.25%. Extended financing of up to 30 years is available for some loans.

- **Planning & Design (P&D) Loans**: P&D Loans are offered at 0% interest for up to three years to cover engineering and project development costs. P&D loans can be rolled into an SRF construction loan, or paid off with other permanent financing.

- **Source Water Protection Loans**: These loans are offered at a 0% interest rate and can help public water supplies acquire land and conservation easements from willing sellers, or fund source water protection practices in their wellhead or source water protection areas.

- **Nonpoint Source Loans**: Low-interest loans are available to public and private borrowers to address storm water management, inadequate septic systems, landfill closure, lake restoration, soil erosion control, brownfield cleanup, manure management and much more.

INVESTING IN IOWA'S WATER

www.IowaSRF.com

Planning & Design Loans

For Wastewater, Storm Water & Drinking Water Infrastructure

Planning & Design Loans offer unique, 0% financial assistance for communities and municipalities that are in the planning and design phase of a proposed water pollution control or drinking water project.

Benefits:

- **0% interest for up to 3 years**
- **NO** initiation fee
- **NO** servicing fee
- **NO** minimum loan amount
- **NO** maximum loan amount
- Eligible costs include the following: Engineering fees, archaeological surveys, environmental studies, and fees related to project plan preparation and submission.
- Loans will be rolled into a SRF construction loan OR may be repaid upon permanent financing.
- The project planning and design costs must be directly related to the proposed wastewater, storm water or drinking water project.

Water pollution control projects:

- Construction of treatment plants or improvements to existing facilities
- Sewer line extensions to existing unsewered properties
- Combined sewer overflow corrections
- Infiltration/inflow projects
- Storm water projects that have an environmental benefit

Drinking water projects:

- Construction of treatment plants or improvements to existing facilities
- Water line extensions to existing unserved properties
- Water storage facilities
- Wells

Eligible Entities:

- Cities, towns, counties, regional sewer/water districts, conservancy districts and water authorities eligible for water pollution control and drinking water SRF loans.
- Private and not-for-profit facilities eligible for drinking water SRF loans.

Contact:

Tracy Scebold
800-432-7230
tracy.scebold@iowa.gov
2015 Grand Avenue
Des Moines, IA 50312

STATE REVOLVING FUND INTENDED USE PLAN UPDATE SCHEDULE

Please note that applications must be postmarked by the due date.

FY 2019

Quarter	Applications Due	P&D Apps Due	Public Hearing	Comments Closed	Commission Mtg and Approval
SFY 2019 Q1	March 1, 2018				
Annual		April 2, 2018			
			May 10, 2018	May 17, 2018	
					June 19, 2018
SFY 2019 Q2	June 1, 2018				
(Update)		July 2, 2018			
			August 9, 2018	August 16, 2018	
					September 18, 2018
SFY 2019 Q3	September 4, 2018				
(Update)		October 1, 2018			
			November 8, 2018	November 15, 2018	
					December 18, 2018
SFY 2019 Q4	December 3, 2018				
(Update)		January 2, 2019			
			February 14, 2019	February 21, 2019	
					March 18, 2019

FY 2020

Quarter	Applications Due	P&D Apps Due	Public Hearing	Comments Closed	Commission Mtg and Approval
SFY 2020 Q1	March 1, 2019				
Annual		April 1, 2019			
			May 9, 2019	May 16, 2019	
					June 18, 2019
SFY 2020 Q2	June 3, 2019				
(Update)		July 3, 2019			
			August 8, 2019	August 15, 2019	
					September 17, 2019
SFY 2020 Q3	September 2, 2019				
(Update)		October 1, 2019			
			November 14, 2019	November 21, 2019	
					December 17, 2019
SFY 2020 Q4	December 2, 2019				
(Update)		January 2, 2020			
			February 13, 2020	February 20, 2020	
					March 17, 2020

IOWA economic development

WATER AND SEWER FUND

IMPROVING WATER AND WASTEWATER SERVICES

Funds awarded through this annual competitive program assist cities and counties with projects such as sanitary sewer system improvements, water system improvements, water and wastewater treatment facility projects, storm sewer projects related to sanitary sewer system improvements and rural water connections.

The program is funded through the federal Community Development Block Grant (CDBG). The goal of this program is to provide economic opportunities for people, especially those of low- and moderate income.

Maximum funding requests are based on community population:

- Less than 300 and unincorporated areas request up to $1,000 per capita
- Less than 1,000 request up to $300,000
- Between 1,000 and 2,500 request up to $500,000
- Between 2,500 and 15,000 request up to $600,000
- Greater than 15,000 request up to $800,000

Eligibility

- Projects must primarily benefit low- and moderate income persons as defined by the U.S. Department of Housing and Urban Development

How to Apply

- Applications are accepted and reviewed quarterly
- Application deadlines are January 1, April 1, July 1 and October 1 with award announcements in March, June, September and December
- Visit **iowagrants.gov** for application instructions and to apply for funds

Related Programs

- **CDBG Housing Rehabilitation Fund**
- **CDBG Management Guide and Other Resources**
- **Community Facilities and Services Fund**
- **Workforce Housing Tax Credits**

City	Percentage of Low & Moderate Income Persons	FIPS City	Low Income Persons Count
Wapello city, Iowa	50.81%	82200	355
Washburn CDP, Iowa	39.24%	82290	210
Washington city, Iowa	40.14%	82335	1,910
Washta city, Iowa	57.14%	82380	110
Waterloo city, Iowa	50.53%	82425	19,255
Waterville city, Iowa	52.63%	82470	50
Watkins CDP, Iowa	0.00%	82515	-
Waucoma city, Iowa	40.74%	82650	60
Waukee city, Iowa	21.17%	82695	1,070
Waukon city, Iowa	50.21%	82740	1,095
Waverly city, Iowa	38.43%	82875	2,430
Wayland city, Iowa	45.86%	82965	255
Webb city, Iowa	43.90%	83010	55
Webster city, Iowa	18.75%	83055	15
Webster City city, Iowa	44.23%	83145	1,910
Weldon city, Iowa	68.00%	83190	50
Wellman city, Iowa	46.15%	83280	350
Wellsburg city, Iowa	35.88%	83325	110
Welton city, Iowa	22.86%	83370	15
Wesley city, Iowa	42.86%	83415	35
West Amana CDP, Iowa	43.33%	83505	10
West Bend city, Iowa	32.84%	83550	150
West Branch city, Iowa	35.37%	83595	455
West Burlington city, Iowa	47.06%	83685	540
West Chester city, Iowa	47.62%	83775	25
West Des Moines city, Iowa	29.74%	83910	7,525
Westfield city, Iowa	40.48%	84090	55
Westgate city, Iowa	45.90%	84180	40
West Liberty city, Iowa	57.92%	84315	1,015
West Okoboji city, Iowa	35.96%	84450	95
Weston CDP, Iowa	2.67%	84495	-
Westphalia city, Iowa	16.67%	84540	4
West Point city, Iowa	31.35%	84585	115
Westside city, Iowa	36.76%	84630	55
West Union city, Iowa	41.19%	84765	525
Westwood city, Iowa	16.67%	84835	4
What Cheer city, Iowa	55.91%	84900	215
Wheatland city, Iowa	52.98%	84945	255
Whiting city, Iowa	46.67%	85215	140
Whittemore city, Iowa	43.20%	85260	55
Whitten city, Iowa	62.50%	85305	10
Willey city, Iowa	23.53%	85710	4
Williams city, Iowa	47.78%	85800	130