IN THE TENNESSEE PUBLIC UTILITY COMMISSION
AT NASHVILLE, TENNESSEE

IN RE:	)	
	)	
JOINT PETITION OF SUPERIOR	)	
WASTEWATER SYSTEMS, LLC, AND	)	
TPUC STAFF (AS A PARTY) TO	)	**DOCKET NO. 22-00087**
INCREASE RATES AND CHARGES	)	
	)	

DIRECT TESTIMONY

OF

DAVID N. DITTEMORE

January 4, 2023

I. Background

Q1. PLEASE STATE YOUR NAME AND OCCUPATION FOR THE RECORD.

A1. My name is David N. Dittemore. I am a self-employed consultant working in the utility regulatory sector.

Q2. PLEASE PROVIDE A SUMMARY OF YOUR BACKGROUND AND PROFESSIONAL EXPERIENCE.

A2. I received a Bachelor of Science Degree in Business Administration from the University of Central Missouri in 1982. I am a Certified Public Accountant licensed in Oklahoma (#7562). I was previously employed by the Kansas Corporation Commission ("KCC") in various capacities, including Managing Auditor, Chief Auditor, and Director of the Utilities Division. I was self-employed as a Utility Regulatory Consultant for approximately four years, representing primarily the KCC Staff in regulatory issues. I also participated in proceedings in Georgia and Vermont, evaluating issues involving electricity and telecommunications regulatory matters.

Additionally, during this time frame, I performed a consulting engagement for Kansas Gas Service ("KGS"), my subsequent employer. For eleven years, I served as Manager and subsequently Director of Regulatory Affairs for KGS, the largest natural gas utility in Kansas, serving approximately 625,000 customers. KGS is a division of One Gas, a natural gas utility serving about two million customers in Kansas, Oklahoma, and Texas. I joined the Tennessee Attorney General's Office in September 2017 as a Financial Analyst. In July 2021, I began my consulting practice.

I have been a Board Member of the Financial Research Institute (University of Missouri). I have also been a member of the NARUC Subcommittee on Accounting, the Vice-Chair of the Accounting Committee of the National Association of State of Utility Consumer Advocates ("NASUCA"), and an active participant in NASUCA's Natural Gas and Water Committees.

Overall, I have over thirty years of experience in public utility regulation. I have presented testimony as an expert witness on many occasions. Attached as Exhibit DND-1 is a detailed overview of my background.

Q3. HAVE YOU PREVIOUSLY PROVIDED TESTIMONY BEFORE THE TENNESSEE PUBLIC UTILITY COMMISSION ("TPUC" OR THE "COMMISSION")?

A3. Yes. I have submitted testimony in many TPUC dockets.

Q4. ON WHOSE BEHALF ARE YOU APPEARING?

A4. I am appearing on behalf of the Consumer Advocate Division of the Tennessee Attorney General's Office ("Consumer Advocate").

II. Purpose of Testimony

Q5. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A5. The purpose of my testimony is to support the position of the Consumer Advocate. I am addressing three issues regarding the proposal of the TPUC staff. First, I recommend the pending rate increase be deferred until the resolution of TPUC Docket No. 21-00086 involving the Company's use of escrow funds in violation of Commission rules. Processing

this rate increase is premature and should be addressed in conjunction with resolving issues in TPUC Docket No. 21-00086. Secondly, I recommend an access fee of $84/year be implemented and charged to all lot owners within the Superior Wastewater System ("Superior"), consistent with prior Commission orders in proceedings involving other wastewater utilities. Third, I am supporting an adjustment to impute revenue to assign access fees to developed lots. Finally, I will summarize the customer comments submitted to the Commission in this docket.

Q6. DID YOU CONDUCT A FULL REVIEW OF THE APPLICANTS' BOOKS AND RECORDS?

A6. No. The scope of my review in this docket included reviewing the proposal supported by TPUC Staff and participating in discussions with them regarding their findings. I have also evaluated whether the Company's use of customer-provided escrow funds complies with the Commission's rules.

III. Implementation of a Rate Increase Is Premature

Q7. HAS SUPERIOR FOLLOWED THE COMMISSIONS RULES REGARDING THE USE OF ESCROW FUNDS?

A7. No.

Q8. WHAT RULES ARE IN PLACE APPLICABLE TO WASTEWATER UTILITIES, SUCH AS SUPERIOR REGARDING THE HANDLING OF ESCROW FUNDS?

A8. TPUC Rule 1220-04-13-.07(7) addresses requirements related to the disbursement of escrow assets:

> *Reserve/escrow accounts established by a public wastewater utility shall be limited to paying for or reimbursing the utility for extraordinary expenses of the utility or for necessary capital projects, unless otherwise permitted by the Commission. Extraordinary expenses are those resulting from events which are infrequent and unusual in nature, and unrelated to the utilities' routine service or business activities. The utility must first receive authorization from the Commission via approved petition or, in emergency situations, authorization in writing from the Chairman of the Commission upon written request by a representative of the utility to use such funds. The Commission may require public wastewater utility employees having signature authority over such account to obtain a fidelity bond. The public wastewater utility's tariff shall set forth the specific amount charged to customers to fund the reserve/escrow account.*

This rule became effective in December 2018.

Q9. WHICH ASPECT OF THE RULE DO YOU WISH TO EMPHASIZE?

A9. The applicable portion of the cited rule is that the utility must first receive authorization from the Commission via approved petition or, in emergency situations, authorization in writing from the Commission's Chairman upon written request by a utility representative to use such funds.

Q10. DO YOU HAVE EVIDENCE THAT THE COMPANY HAS WITHDRAWN FUNDS FROM ITS ESCROW ACCOUNTS?

A10. Yes. Exhibits DND-2 through DND-4 reflect the escrow activity of the Company for the annual periods of 2019–2021, respectively, taken from annual reports submitted by the Company to the Commission.[1]

[1] Note that two reports are identified as applicable to the twelve-month period ended December 31, 2019. However, based upon a comparison of the beginning/ending balances, it is clear that the information presented in Exhibit DND-3 reflects activity for the period ending December 31, 2020.

Q11. DID THE COMPANY REQUEST AUTHORIZATION FROM THE COMMISSION TO WITHDRAW FUNDS FROM ITS ESCROW ACCOUNT?

A11. No. The Company has used customer-provided funds without Commission authorization, which authorization was and is required by the Commission's rules.

Q12. DOES THE FACT THAT TPUC DOCKET NO. 21-00086 IS OPEN TO AUDIT THE USE OF THE COMPANY'S ESCROW FUNDS SUGGEST THAT COMPLIANCE WITH THE COMMISSIONS RULES SHOULD NOT BE CONSIDERED IN THIS DOCKET?

A12. No. The Commission should not, as a matter of policy, grant a significant rate increase to the Company knowing there is a material violation of the Commission rules involving the use of customer-provided escrow funds.

Q13. WILL THE COMPANY BE INCENTED TO COOPERATE WITH THE COMMISSION REGARDING THE ISSUE OF THE USE OF ESCROW FUNDS AFTER THE COMMISSION HAS GRANTED THE SIGNIFICANT RATE RELIEF?

A13. No. Once the Commission approves the rate increase, there is less incentive for the Company to reach an agreement on the resolution of its unauthorized use of customer-provided escrow funds. The pending rate increase and the resolution of escrow funding should be addressed simultaneously.

Q14. HAS THE STAFF MADE A PROPOSAL REGARDING THE COMPANY'S USE OF ESCROW FUNDING IN THEIR TESTIMONY?

A14. No. The Commission Staff has not addressed the Company's use of its escrow funds.

Q15. HAS THE STAFF AND THE COMPANY BEEN CONSISTENT IN ITS VIEW OF WHETHER THE ESCROW RATE PAID BY CUSTOMERS IS AN INTEGRAL PART OF THIS PROCEEDING?

A15. No. On one hand, the Staff and the Company's position is that it is inappropriate to consider the Company's use of escrow funds in this base rate docket. On the other hand, the Joint Petition of the Staff and the Company sums the Company's base rate request and the escrow charge to identify the rate increase of 55%. I agree that this represents the bill impact on customers from the Joint Proposal. However, since the Joint Petitioners' position is that it is not appropriate to consider the escrow compliance issue in this docket, the escrow charge of $10.13 should be excluded when calculating the impact of the rate proposal producing a rate increase request of 77%. If escrow receipts and disbursements are to be ignored in this proceeding, they should also be ignored for purposes of computing the increase in base rates.

Q16. DO YOU HAVE AN ANALOGY THAT YOU BELIEVE FITS THE CURRENT SITUATION WHERE THE JOINT PETITIONERS ARE REQUESTING THE COMMISSION GRANT A SIGNIFICANT RATE INCREASE BEFORE RESOLVING THE ESCROW DISBURSEMENTS?

A16. Yes. The current situation is similar to buying a used car with a known transmission problem. The Joint Petition would have ratepayers (the buyer) pay full sticker price as if the automobile were in excellent condition, under the assumption that the parties would resolve which party would be responsible for the costs of the faulty transmission at a future date.

Q17. HAS THE TPUC STAFF INCLUDED ESCROW REVENUE WITHIN THE REVENUE REQUIREMENT CALCULATION?

A17. No. Without a resolution of TPUC Docket No. 21-00086, it is impossible to adequately determine whether an increase in the Company's revenue stream is necessary. The annual report submitted to the Commission indicates the Company collected nearly $52,000 in 2021 from escrow charges.[2] According to the Company, the bank balance of escrow assets is less than $2,000 as of December 31, 2021.

Q18. WHAT IS YOUR RECOMMENDATION REGARDING THE DISPOSITION OF THE RATE INCREASE REQUEST?

A18. The Commission should not adopt a rate increase in this proceeding until fully evaluating the Company's unauthorized use of ratepayer-supplied escrow funding. The Commission should determine whether the Company should replenish such funds in TPUC Docket No. 21-00086 or whether the existing escrow revenue should be included as current revenue to determine the Company's revenue requirement. Addressing the revenue requirement in this proceeding without considering the implications of the Company's depleted escrow balance is premature.

IV. Access Fee Tariff Language

Q19. WHAT ARE YOU RECOMMENDING REGARDING THE SUBJECT OF ACCESS FEES IN THIS DOCKET?

[2] Exhibit DND-4.

A19. I am supporting two recommendations regarding the application of access fees. First, I recommend adopting tariff language that requires collecting access fees from all lot owners whose lots are either developed or for sale. Secondly, I am recommending an increase in Pro-forma revenue to reflect the imputation of access fee charges to be applied to developed lots within the Superior system.

Q20. WHAT ARE ACCESS FEES?

A20. Access fees are charges applied to lot owners within a system who are not receiving service from the utility but could acquire service upon request. The justification for the fees is that the lot owner is deriving value from the existence of the wastewater system, and it is appropriate that such owners bear some cost responsibility for the operation and maintenance of the system.

Q21. HAS MR. POWELL ADDRESSED THIS ISSUE IN HIS TESTIMONY?

A21. Yes. Mr. Powell seeks to eliminate the existing access fee tariff, arguing that such fees should only apply upon installation of a tap, which involves a capital expenditure.[3]

Q22. DO YOU AGREE WITH THIS POSITION?

A22. No. It is important to remember that Mr. Powell is both the utility owner and the developer and thus has a disincentive to charge access fees to developers, which would result in reduced rates charged to the Company's customers. Mr. Powell misunderstands the rationale for charging an access fee. The absence of an installed sewer tap for the lot does not preclude an access fee.

[3] *Direct Testimony of John Powell*, p. 2:11–19, TPUC Docket No. 22-00087 (Sept. 9, 2022).

Q23. HAS THE COMMISSION ADDRESSED THE APPLICABILITY OF ACCESS FEES IN PRIOR DOCKETS?

A23. Yes. In the DSH & Associates, LLC rate case, the Commission found as follows:

> *In its Petition, the Company proposed the implementation of a sewer system access fee in the amount of $120.00 per year for lot owners not connected to the system. This fee pays for the maintenance of the lines in the streets and the treatment plant components. The rationale for this charge is that even if a lot owner has not built his/her home, wastewater facilities have already been built to serve the customer. Although not currently used by the customer, the utility must provide continued maintenance and conduct certain tests and maintain records to meet state requirements. The sewer system access fee is intended to offset these costs and is identical to a similar charge approved by the Authority for TWS. Therefore, the Authority finds this fee reasonable and approves a sewer system access fee in the amount of $120.00.*[4]

In a separate rate case, Charles Pickney, Jr. with On-Site Wastewater Systems, Inc.[5] ("On-Site") testified to the need to implement an access fee charge:

> *The build out of a subdivision is often slow and it is necessary to charge a sewer access fee to the owner of each lot to cover the cost of monthly testing required by the State of Tennessee Department of the Environment. This alleviates the problem of having 3 to 4 paying customers and a $350 monthly testing fee for treatment at that development. A sewer access fee ($84/year) has been added to the proposed revised rules and regulations. The contract between On-Site Systems, Inc. and the developer requires that the sales contract for lots sold notify buyers of their responsibility to pay the access fee.*[6]

The Commission adopted the On-Site's access fee proposal to implement an $84 annual access fee in its August 4, 2000, order:

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[4] *Final Order Approving Rate Petition*, p. 21, TRA Docket No. 11-00162 (May 16, 2012) The *Final Order* is available at 1100162t.pdf (tn.gov). The Tennessee Regulatory Authority, or TRA, is the predecessor agency to the TPUC, just as the Tennessee Public Service Commission or TPSC predated the TRA. While the nomenclature has changed, the scope and function of these entities has remained essentially the same.

[5] In 2004, the Commission approved On-Site's Petition to change its name to Tennessee Wastewater Systems, Inc. *See Order Granting Approval of the Petition of On-Site Systems, Inc. for a Name Change*, TRA Docket No. 03-00518 (Feb. 19, 2004).

[6] *Testimony of Charles L. Pickney Jr.*, pp. 5–6, TRA Docket No. 99-00393 (June 3, 1999). See the *Petition of On-Site Systems, Inc. to Change Rate Structure, Increase Rates and Add Fees*, available at 9900393.pdf (tn.gov).

The Authority finds that it is necessary for On-Site to add the proposed costs to the list of cost categories on the basis of which it charges its customers. Although this addition represents a substantial increase in rates, this increase is necessary because On-Site's original tariff did not cover several types of common expenses. The Authority also finds that On-Site's proposed access fee is appropriate, as it will allow On-Site to cover monthly testing costs, and that the fees On-Site proposes to add for non-payment, disconnection, reconnection, and returned checks are reasonable and are comparable to fees charged by similar utility companies.[7]

Q24. CAN YOU SUMMARIZE THESE PRIOR COMMISSION ORDERS RELATED TO THE ADOPTION OF ACCESS FEES?

A24. Yes. In both the referenced cases, the collection of an access fee was not dependent on installing a service line. Instead, these fees were imposed upon lot owners without any further requirement concerning the existence of a service line.

Q25. WHAT IS THE RATIONALE FOR CHARGING AN ACCESS FEE TO A LOT OWNER THAT IS NOT RECEIVING SERVICE FROM THE WASTEWATER UTILITY?

A25. As mentioned above, the collection of access fees recognizes that lot owners (before being active customers) should bear some financial responsibility for the operating and maintenance costs of the system. Lot owners benefit from the system's existence and as a matter of equity, they should contribute towards the maintenance of the system. Further, active customers should not bear all of the risks from an underutilized wastewater system. In the absence of access fees charged by the utility to lot owners, existing customers bear the entire risk from the buildout of the subdivision.

[7] *Order Approving Change in Rate Structure, Rate Increase, and Addition of Fees*, p. 5, TRA Docket No. 99-00393 (Aug. 4, 2000).

Q26. WHAT IS YOUR RECOMMENDATION REGARDING THE APPLICATION OF AN ACCESS FEE FOR LOT OWNERS WITHIN THE COMPANY'S SERVICE TERRITORY?

A26. I recommend the Commission require the following language be added to the Company's tariff.

> *An annual access fee of $84 shall be assessed against each lot that is not connected to the wastewater system and is within an identified development phase or section which is or will be served by the wastewater system. Any lot connected to the wastewater system shall not be subject to an access fee from the connection date. The owners of lots connected to the system shall be charged the Commission-approved Base Rate Charge.*

This tariff language is necessary to conform to prior Commission decisions regarding the imposition of access fees for lots that are under development but yet to be connected to the system.

Q27. EARLIER, YOU MENTIONED THAT THE UTILITY'S AFFILIATE WAS INVOLVED IN DEVELOPING THE SUBDIVISION AND THUS HAD A FINANCIAL INCENTIVE NOT TO IMPOSE ACCESS FEES. CAN YOU CITE A WASTEWATER UTILITY THAT DOES NOT HAVE AN AFFILIATE DEVELOPING SUBDIVISIONS AND EXPLAIN HOW THEY ADDRESS THE ACCESS FEE ISSUE?

A27. Yes. Tennessee Wastewater Systems Inc. ("TWSI") is a stand-alone utility not involved in residential or commercial development and construction. TWSI charges a TPUC-approved Capacity Reservation Fee of $10/month (equating to $120/year). This fee is

described in the TWSI tariff as "an annual fee associated with platted empty lots which are capable of receiving service to reserve capacity at the treatment facility."[8]

V. Imputed Revenue – Access Fees

Q28. ARE YOU SPONSORING AN ADJUSTMENT TO THE STAFF REVENUE REQUIREMENT RECOMMENDATION TO ADDRESS THE ACCESS FEE ISSUE?

A28. Yes. A review of information supplied by the Company indicates that there are a total of 60 developed lots within Sections 12 and 13 of the Company's system.

Q29. WHAT ARE YOU RECOMMENDING REGARDING THE APPLICATION OF ACCESS FEES TO THESE 60 LOTS?

A29. I am recommending that the Company's study period Pro-forma revenue be increased by $5,040 to reflect the Company's ability to charge low owners for a contribution toward the operation and maintenance of the system. This revenue adjustment is the product of the 60 lots multiplied by the $84 annual assessment.

Q30. HOW DID YOU ARRIVE AT THE $84 ANNUAL CHARGE THAT SHOULD BE APPLIED TO LOT OWNERS?

A30. This amount was included as an access charge within the Company's tariff, limited to apply to those lot owners with a service line connected to the system. This is a conservatively

[8] TWSI, Wastewater Utility Service Tariff, Section 2, p. 4 (July 1, 2020). A copy of TWSI's tariff can be accessed on its website at www.tennesseewastewater.com/assets/docs/TWSI%20Tariff%20-%20Effective%20July%202021.pdf.

low charge as it is identical to the access charge adopted by the Commission twenty-two years ago in the On-Site decision referenced above.

Q31. WHAT REVENUE REQUIREMENT DEFICIENCY ARE YOU SPONSORING AS A RESULT OF YOUR ADJUSTMENT?

A31. The revenue deficiency I am sponsoring is $72,695 as reflected in Exhibit DND-5.

Q32. ARE YOU SUPPORTING AN EXHIBIT SETTING OUT YOUR CALCULATIONS?

A32. Yes. My calculations are outlined in Exhibits DND-5 through DND-7.

Q33. PLEASE DISCUSS HOW YOU ARRIVED AT YOUR RECOMMENDED REVENUE REQUIREMENT.

A33. The starting point for my calculations was Exhibits prepared by the Staff in support of their recommended revenue requirement. I then calculated the adjustment to the attrition period operating revenue by applying the $84 annual charge to the 60 lots to arrive at an increase in attrition period revenue of $5,040. This is reflected in Exhibit DND-6. This additional revenue is carried forward to the revenue deficiency calculations in Exhibit DND-5, resulting in a proposed revenue deficiency of $72,695. The calculated monthly service charge is calculated in Exhibit DND-7, producing a monthly base rate charge of $44.12, compared with the TPUC Party staff proposal of $44.21.[9]

Q34. PLEASE RECONCILE YOUR PROPOSED REVENUE REQUIREMENT WITH YOUR RECOMMENDATION EARLIER THAT THE PROPOSED RATE

[9] *Direct Testimony of Joe Shirley*, p. 7:9–11, TPUC Docket No. 22-00087 (Sept. 9, 2022).

INCREASE BE DEFERRED PENDING THE RESOLUTION OF ISSUES IN TPUC DOCKET NO. 21-00086.

A34. My recommendation is simply a slight modification to the revenue requirement calculation supported by TPUC Staff. This adjustment does not modify my recommendation that a rate increase should not be granted in this proceeding until the Commission addresses the issues in TPUC Docket No. 21-00086. Depending upon how the Commission addresses the Company's use of escrow funds, it is premature to assume, as Staff has done, that such funding should not be counted as revenue within the Company's revenue requirement. If the Company continues to have unrestrained access to escrow funds, this should be counted as a revenue stream of the Company and the pending rate increase reduced accordingly. Therefore, it is premature to make a determination of the amount of the rate increase until the Commission has addressed the Company's use of the escrow funds.

Q35. THE COMPUTED ADJUSTMENT TO THE REVENUE REQUIREMENT YOU ARE SPONSORING IS RELATIVELY SMALL. DO YOU BELIEVE THE IMPACT OF IMPLEMENTING THE ACCESS FEE MAY INCREASE GOING FORWARD AND THUS MAY BE A MORE SIGNIFICANT ISSUE THAN THE ADJUSTMENT QUANTIFIED ABOVE?

A35. Yes. Documents submitted to the Tennessee Department of Environment and Conservation indicate the Company seeks to serve 629 single-family residential homes as

these lots are developed.[10] Therefore, an access fee is appropriate and may become a material revenue stream to offset costs incurred by current customers.

VI. Customer Comments

Q36. HAS THE COMMISSION RECEIVED COMMENTS FROM CUSTOMERS EXPRESSING CONCERNS ABOUT THE PROPOSED RATE INCREASE?

A36. Yes. Twenty-three customers of the Company have taken the time to contact the Commission and express their concern with the 55% rate increase. The TPUC Staff is using an equivalent customer count of 338 to calculate the Company's revenue deficiency. Thus, the percentage of the Company's customers expressing concern about the rate increase equates to nearly 7% of the customer base, representing a significant portion.

Q37. DOES THIS COMPLETE YOUR TESTIMONY?

A37. Yes. However, I reserve the right to incorporate any new data that may subsequently become available.

[10] A copy of the most recent engineering plans for the Superior Wastewater system submitted to TDEC are attached as Exhibit DND-8.

IN THE TENNESSEE PUBLIC UTILITY COMMISSION
AT NASHVILLE, TENNESSEE

IN RE:	)	
	)	
JOINT PETITION OF SUPERIOR	)	
WASTEWATER SYSTEMS, LLC, AND	)	**Docket No. 22-00087**
TPUC STAFF (AS A PARTY) TO INCREASE	)	
RATES AND CHARGES	)	
	)	

AFFIDAVIT

I, David D. Ittemore on behalf of the Consumer Advocate Division of the Attorney General's Office, hereby certify that the attached Direct Testimony represents my opinion in the above-referenced case and the opinion of the Consumer Advocate Division.

David D. Ittemore

DAVID D. DITTEMORE

Sworn to and subscribed before me

This 4th day of January, 2023

Tiffany H Blackman

NOTARY PUBLIC

TIFFANY H. BLACKMAN
STATE OF TENNESSEE NOTARY PUBLIC
WILSON COUNTY
My Commission Expires MAR. 22, 2023

My Commission Expires: March 22, 2023

Exhibit DND-1

David Dittemore

Experience

Areas of Specialization
Approximately thirty-years experience in evaluating and preparing regulatory analysis, including revenue requirements, mergers and acquisitions, utility accounting and finance issues and public policy aspects of utility regulation. Presented testimony on behalf of my employers and clients in natural gas, electric, telecommunication and transportation matters covering a variety of issues.

Self-Employed; **Consultant July 1 - Current**; Responsible for providing evaluation of utility ratemaking issues on behalf of clients. Prepare analysis and expert witness testimony.

Tennessee Attorney General's Office; **Financial Analyst September, 2017 – June 2021;** Responsible for evaluation of utility proposals on behalf of the Attorney General's office including water, wastewater and natural gas utility filings. Prepare analysis and expert witness testimony documenting findings and recommendations.

Kansas Gas Service; **Director Regulatory Affairs 2014 - 2017; Manager Regulatory Affairs, 2007 - 2014**
Responsible for directing the regulatory activity of Kansas Gas Service (KOS), a division of ONE Gas, serving approximately 625,000 customers throughout central and eastern Kansas. In this capacity I have formulated strategic regulatory objectives for KOS, formulated strategic legislative options for KOS and led a Kansas inter-utility task force to discuss those options, participated in ONE Gas financial planning meetings, hired and trained new employees and provided recommendations on operational procedures designed to reduce regulatory risk. Responsible for the overall management and processing of base rate cases (2012 and 2016). I also played an active role, including leading negotiations on behalf of ONE Gas in its Separation application from its former parent, ONEOK, before the Kansas Corporation Commission. I have monitored regulatory earnings, and continually determine potential ratemaking outcomes in the event of a rate case filing. I ensure that all required regulatory filings, including surcharges are submitted on a timely and accurate basis, I also am responsible for monitoring all electric utility rate filings to evaluate competitive impacts from rate design proposals.

Strategic Regulatory Solutions; 2003 -2007
Principal; Serving clients regarding revenue requirement and regulatory policy issues in the natural gas, electric and telecommunication sectors

Williams Energy Marketing and Trading; 2000-2003
Manager Regulatory Affairs; Monitored and researched a variety of state and federal electric regulatory issues. Participated in due diligence efforts in targeting investor owned electric utilities for full requirement power contracts. Researched key state and federal rules to identify potential advantages/disadvantages of entering a given market.

MCI WorldCom; 1999 - 2000

Manager, Wholesale Billing Resolution; Manage a group of professionals responsible for resolving Wholesale Billing Disputes greater than $SOK. During my tenure, completed disputes increased by over 100%, rising to $1 50M per year.

Kansas Corporation Commission; 1984- 1999

Utilities Division Director - 1997 - 1999; Responsible for managing employees with the goal of providing timely, quality recommendations to the Commission covering all aspects of natural gas, telecommunications and electric utility regulation; respond to legislative inquiries as requested; sponsor expert witness testimony before the Commission on selected key regulatory issues; provide testimony before the Kansas legislature on behalf of the KCC regarding proposed utility legislation; manage a budget in excess of $2 Million; recruit professional staff; monitor trends, current issues and new legislation in all three major industries; address personnel issues as necessary to ensure that the goals of the agency are being met; negotiate and reach agreement where possible with utility personnel on major issues pending before the Commission including mergers and acquisitions; consult with attorneys on a daily basis to ensure that Utilities Division objectives are being met.

Asst. Division Director - 1996 - 1997; Perform duties as assigned by Division Director.

Chief of Accounting 1990 - 1995; Responsible for the direct supervision of9 employees within the accounting section; areas of responsibility included providing expert witness testimony on a variety of revenue requirement topics; hired and provided hands-on training for new employees; coordinated and managed consulting contracts on major staff projects such as merger requests and rate increase proposals;

Managing Regulatory Auditor, Senior Auditor, Regulatory Auditor 1984 - 1990; Performed audits and analysis as directed; provided expert witness testimony on numerous occasions before the KCC; trained and directed less experienced auditors on-site during regulatory reviews.

Amoco Production Company 1982 - 1984

Accountant Responsible for revenue reporting and royalty payments for natural gas liquids at several large processing plants.

Education

- B.S.B.A. (Accounting) Central Missouri State University
- Passed CPA exam; (Oklahoma certificate # 7562) - Not a license to practice

Superior Wastewater Systems
Activity Report for Escrow Account
For the Twelve Months Ended December 31, 2019

	Escrow Liability Required Per Books (Account 235.1)				Escrow Assets Provided Per Bank (Account 132.2)			
Month	Beginning Balance	Accrued Into Escrow	Removed From Escrow	Ending Balance	Beginning Balance	Deposited Into Escrow	Removed From Escrow	Ending Balance
January	$88,685.31	2,535.98	1,183.75	$90,037.54	$43.25	$3,700.00	$1,933.75	$1,809.50
February	90,037.54	1,585.63	314.96	91,308.22	1,809.50	0.00	0.00	1,809.50
March	91,308.22	1,946.80	1,899.10	91,355.91	1,809.50	1,700.00	1,899.10	1,610.40
April	91,355.91	1,890.98		93,246.89	1,610.40	0.00	0.00	1,610.40
May	93,246.89	955.68		94,202.58	1,610.40	0.00	0.00	1,610.40
June	94,202.58	3,135.97	8,602.15	88,736.40	1,610.40	7,000.00	6,911.15	1,699.25
July	88,736.40	2,330.85		91,067.24	1,699.25	7,500.00	0.00	9,199.25
August	91,067.24	1,870.79		92,938.03	9,199.25	2,500.00	7,171.17	4,528.08
September	92,938.03	2,164.22		95,102.25	4,528.08	2,500.00	0.00	7,028.08
October	95,102.25	1,645.19		96,747.44	7,028.08	0.00	0.00	7,028.08
November	96,747.44	1,718.35	402.27	98,063.52	7,028.08	2,500.00	402.27	9,125.81
December	98,063.52	1,937.59	165.00	99,836.10	9,125.81	0.00	0.00	9,125.81
Total		**$23,718.02**	**$12,567.23**			**$27,400.00**	**$18,317.44**	

Total Balance at End of Fiscal Year:

Escrow Assets	9,125.81
Escrow Liability	99,836.10
Net Escrow Assets (Shortfall)	**-90,710.29**

NOTE: This supplemental schedule to the Company's Annual Report is provided in conformance with the requirements of the TRA's Order in Docket 07-00062.

Superior Wastewater Systems
Activity Report for Escrow Account
For the Twelve Months Ended December 31, 2019

SU-2

	Escrow Liability Required Per Books (Account 235.1)				Escrow Assets Provided Per Bank (Account 132.2)			
Month	Beginning Balance	Accrued Into Escrow	Removed From Escrow	Ending Balance	Beginning Balance	Deposited Into Escrow	Removed From Escrow	Ending Balance
January	$99,836.10	1,713.04	1,535.62	$100,013.52	$9,125.81	$2,500.00	$1,235.62	$10,390.19
February	100,013.52	1,722.65		101,736.17	10,390.19			10,390.19
March	101,736.17	3,566.05	228.88	105,073.33	10,390.19			10,390.19
April	105,073.33	2,273.19	3,545.23	103,801.29	10,390.19	2,500.00	268.48	12,621.71
May	103,801.29	2,047.79	4,742.06	101,107.02	12,621.71	2,500.00	3,251.35	11,870.36
June	101,107.02	2,630.31	1,561.18	102,176.15	11,870.36			11,870.36
July	102,176.15	2,307.00	220.00	104,263.15	11,870.36		2,666.89	9,203.47
August	104,263.15	2,356.94	1,750.01	104,870.08	9,203.47			9,203.47
September	104,870.08	2,229.89	1,415.37	105,684.61	9,203.47	2,500.00	1,502.19	10,201.28
October	105,684.61	2,257.39	2,535.06	105,406.94	10,201.28		1,905.46	8,295.82
November	105,406.94	3,927.97		109,334.91	8,295.82			8,295.82
December	109,334.91	2,238.12	3,239.22	108,333.80	8,295.82	0.00	2,744.94	5,550.88
Total		$28,270.33	$20,772.63			$10,000.00	$13,574.93	

Total Balance at End of Fiscal Year:

Escrow Assets	5,550.88
Escrow Liability	108,333.80
Net Escrow Assets (Shortfall)	-102,782.92

NOTE: This supplemental schedule to the Company's Annual Report is provided in conformance with the requirements of the TRA's Order in Docket 07-00062.

Superior Wastewater Systems
Activity Report for Escrow Account
For the Twelve Months Ended December 31, 2021

	Escrow Liability Required Per Books (Account 235.1)				Escrow Assets Provided Per Bank (Account 132.2)			
Month	Beginning Balance	Accrued Into Escrow	Removed From Escrow	Ending Balance	Beginning Balance	Deposited Into Escrow	Removed From Escrow	Ending Balance
January	$108,333.80	4,065.70		$112,399.50	$5,550.88		$3,704.46	$1,846.42
February	112,399.50	4,142.33		116,541.83	1,846.42		1,500.00	346.42
March	116,541.83	5,863.32		122,405.14	346.42	2,500.00	1,025.00	1,821.42
April	122,405.14	3,944.72		126,349.86	1,821.42	2,500.00		4,321.42
May	126,349.86	3,653.75		130,003.62	4,321.42		2,471.24	1,850.18
June	130,003.62	3,736.95		133,740.56	1,850.18			1,850.18
July	133,740.56	4,609.40		138,349.96	1,850.18			1,850.18
August	138,349.96	4,272.63		142,622.59	1,850.18			1,850.18
September	142,622.59	4,017.68		146,640.27	1,850.18			1,850.18
October	146,640.27	5,101.79		151,742.06	1,850.18			1,850.18
November	151,742.06	4,367.27		156,109.33	1,850.18			1,850.18
December	156,109.33	4,210.48		160,319.81	1,850.18			1,850.18
Total		**$51,986.01**	**$0.00**			**$5,000.00**	**$8,700.70**	

Total Balance at End of Fiscal Year:

Escrow Assets	1,850.18
Escrow Liability	160,319.81
Net Escrow Assets (Shortfall)	**-158,469.63**

NOTE: This supplemental schedule to the Company's Annual Report is provided in conformance with the requirements of the TRA's Order in Docket 07-00062.

Superior Wastewater Systems, LLC
Results of Operations - Operating Margin Method
For the 12 Months Attrition Period Ending December 31, 2022

Schedule DND-5

Line			
1	**CA Adjusted Net Operating Income At Current Rates**		$ (52,110) A/
2	Total Operating Expenses per TPUC Party Staff	$ 158,597	
3	Fair Operating Margin	10.00% B/	
4	Required Net Operating Income		15,860
5	Operating Income Deficiency/(Surplus)		$67,970
6	Gross Revenue Conversion Factor		1.069519 C/
7	**Revenue Deficiency (Operating Margin Method)**		**$72,695**
8	**Monthly Service Rate Average Percentage Increase**		**71.66%**

A/ Schedule DND-6
B/ TPUC Party Staff proposed Margin
C/ Exhibit DND- 5

Superior Wastewater Systems, LLC
Income Statement at Current Rates
For the 12 Months Attrition Period Ending December 31, 2022

Exhibit DND-6

TPUC Party Staff Exhibit - Schedule 2

Line		Test Period	Adjustments	Adusted Test Period	Growth Adjustments	Attrition Period	CA Imputed Access Fee Revenue	CA Attrition Period Results
1	Residential Service Revenue - Flat Rate	$96,373 A/	$0 A/	$96,373 A/	$5,074 A/	$101,447 A/		$ 101,447
2	Access Fees - *Utility Does Not Charge*	0	0	0	0	0	5,040	5,040
	Total Operating Revenues	**$96,373**	**$0**	**$96,373**	**$5,074**	**$101,447**		**$106,487**
3	Office Expenses	620	3,600	4,220	1,247	$ 5,467		5,467
4	Electric Utility Expenses	11,723	0	11,723	884	$ 12,607		12,607
5	Bank Charges	1,615	(1,580)	35	3	$ 38		38
6	Materials and Supplies Expenses	4,144	(644)	3,500	264	$ 3,764		3,764
7	Postage Expenses	160	0	160	12	$ 172		172
8	Contract Services - Billing	0	0	0	0	$ -		0
9	Contract Services - Professional	40,661	(11,261)	29,400	1,897	$ 31,297		31,297
10	Contract Services - Testing	3,131	79	3,210	242	$ 3,452		3,452
11	Premier Property Management Charges	48,666	(1,093)	47,573	27,558	$ 75,131		75,131
12	Transportation Expenses	750	(100)	650	49	$ 699		699
13	Repair and Maintenance Expenses	10,958	(1,958)	9,000	9,039	$ 18,039		18,039
14	Insurance Expenses	2,990	0	2,990	280	$ 3,270		3,270
15	Business Meals Expenses	5,117	(4,117)	1,000	75	$ 1,075		1,075
16	Miscellaneous Expenses	711	0	711	54	$ 765		765
17	Taxes Other Than Income Taxes	6,499	295	6,794	0	$ 6,794		6,794
18	State Excise Tax	0	0	0	(3,973)	$ (3,973)		(3,973)
19	**Total Operating Expenses**	**$137,745**	**($16,779)**	**$120,966**	**$37,631**	**$158,597**		**158,597**
20	**Net Operating Income/(Loss)**	**($41,372)**	**$16,779**	**($24,593)**	**($32,557)**	**($57,150)**		**($52,110)**

A/ Revenue only includes those amounts related to providing wastewater services. It excludes receipts generated from escrow and bond cost surcharges.

Developed Lots	
Lot 12	28
Lot 13	32
	60
Annual Access Fee	$ 84.00
Annual Revenue	$ 5,040

Superior Wastewater Systems LLC
Calculation of Proposed Monthly Base Rate
Per Consumer Advocate Unit

Exhibit DND-7

Line No.	Category	Amount	
1	Operating Revenue at Current Rates	$106,487	A
2	Plus: Revenue Deficiency	$72,695	B
3	Target Revenue	$179,182	
4	Divided by: Total Customer Bills	4,061	C
5	CA Calculated Revenue Deficiency Subject to Resolution of Escrow Issue	$ 44.12	

A - Exhibit DND-6
B - Exhibit DND-5
C - TPUC Party Staff Exhibit 7

BROOKS
ENGINEERING ASSOCIATES

Planning & Project Management / Civil Engineering
Surveying / Environmental Engineering & Services
17 Arlington Street / Asheville NC 28801
www.brooksea.com / 828-232-4700

SUPERIOR WASTEWATER SYSTEMS
EXPANSION OF SOP-03032
WASTEWATER PROJECT NUMBER 22.0588

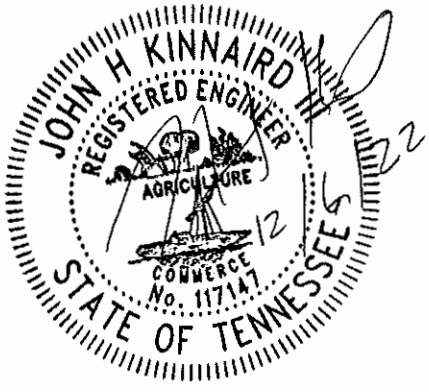
SERVING
KINGS CHAPEL, HIGH POINT HILL & FOX PROPERTY SUBDIVISIONS
WILLIAMSON COUNTY

WASTEWATER TREATMENT SYSTEM ENGINEER'S REPORT, SPECIFICATIONS & CALCULATIONS

PREPARED FOR:

SUPERIOR WASTEWATER SYSTEMS
P.O. BOX 190
ARRINGTON, TN 37014

FINAL DESIGN – NOT RELEASED FOR CONSTRUCTION



ORIGINAL: **NOVEMBER 18, 2022**

BROOKS ENGINEERING ASSOCIATES PROJECT NO.: 560222

TABLE OF CONTENTS

1.0 SYSTEM SUMMARY & PROJECT INFORMATION

1.1 Summary & Design Parameters

The Kings Chapel Subdivision has undergone several permit re-submittals and currently is permitted under Permit No. SOP-03032. The approved SOP is for 68,800 gpd and a Draft Permit revision was issued May 14, 2019 with a revised design flow of 190,800 gpd. It is our understanding this Draft SOP amendment was never finalized. This submittal is for an expansion of the existing permit to cover the expanded design flow expressed below encompassing residential flows from the Kings Chapel, High Point Hill, and Fox Property subdivisions. This *Engineer's Report, Specifications and Calculations* submittal is intended to cover the wastewater treatment system only. The wastewater irrigation system was recently approved as Wastewater Project Number 22.0588. Separate submittals shall be provided for the collection system expansion.

These documents are provided as part of the effort by Superior Wastewater Systems to amend the permit to serve 629 single family residential homes. This encompasses 449 homes in the Kings Chapel subdivision, 157 single family homes in the High Park Hill subdivision, and 23 homes in the Fox Property subdivision, (which will become part of the High Park Hill subdivision when completed). The resulting design flow is **188,700 gpd**.

Currently Kings Chapel is served by a sand filter system designed and permitted for 68,700 gpd. This system is to remain in use. This expansion is for an additional 120,000 gpd recirculating fixed media type system. The wastewater treatment facility consists of and initial equalization tank, anoxic treatment tank with effluent filtration, a Biomicrobics MyFAST recirculating fixed media aerobic treatment system. The treatment system effluent is pumped to the drip irrigation system for land disposal.

1.2 Contacts

Engineer of Record – John Kinnaird, PE Brooks Engineering Associates (828) 232-4700
Soil Scientist – Jay Andrews 615-443-1159
Owner Contact – John Powell Superior Wastewater Systems 615-496-8681
WWTP System Manufacturer: Joe Ribori Biomicrobics 913-422-0707

1.3 Scope & Qualifiers

This specifications manual is intended only for the use of permitting and construction of the intended wastewater treatment facility. Any changes to these plans and specifications shall be approved by the Project Engineer. Any changes in layout of equipment not approved shall release the Engineer of any potential liability associated with the system.

The maintenance and operation of the system are to be in accordance with the Operation & Maintenance Plan provided as a separate document. Monitoring requirements and discharge limitations are detailed in the TDEC State Operating Permit SOP-03032.

Notify Engineer in sufficient time to permit inspection of underground work before backfilling is initiated. A final inspection shall be required with the Owner, Engineer, TDEC representative, and Contractor. Only the set of engineering plans with revision labeled “RELEASED FOR CONSTRUCTION” shall be utilized for construction.

Specific component manufacturers are specified on the engineering plans and herein. The specific component manufacturers are identified only to set a standard for performance and quality. “Or Equal” substitutions are allowed but only as approved as such by the project engineer. In the event that the Owner or Contractor or another supplier proposes an alternate component to the specified manufacturer or component type, certain procedures must be followed. If proposing an alternate, the Contractor (supplier) must submit, no less than 15 business days in advance of the bid date (if during the bid review period) or 15 days prior to the need for installation. If needed, the contractor must provide a system hydraulic analysis based on the proposed component (including pipe sizes, flows, velocities, retention times, etc.), a list of exceptions to the governing specifications herein and/or demonstration of compliance to of these specifications. This information must be submitted to the Engineer for pre-approval of the alternate equipment being proposed and determination of compliance with these Contract Documents. If the equipment differs materially or differs from the dimensions given on the Drawings, the Contractor (supplier) shall submit complete drawings showing elevations, dimensions, or any necessary changes to the Contract Documents for the proposed equipment and its installation. Pre-approval, if granted, will be provided in writing by the Engineer to the Contractor (supplier) at least five business days in advance of the bid or installation date. If the Engineer’s approval is obtained for Alternate Equipment, the Contractor (supplier) must make any needed changes in the structures, system design, piping or electrical systems necessary to accommodate the proposed equipment at the expense of the Contractor (supplier).

2.0 PIPING

The collections system engineering is to be provided by others. WWTP plumbing and the piping for the lift station to the Drip System area are covered in these specifications.

2.1 Sizing & Material

Gravity flow pipe and fittings shall be SDR 35 Schedule 40 PVC with solvent-cemented or gasketed joints (ASTM D3034) for all gravity lines. Gravity lines shall maintain a minimum slope of 1/8-inch fall per lineal foot. No public gravity sewer main conveying wastewater shall be less than 8 inches in diameter. No private gravity sewer main conveying wastewater shall be less than 6 inches in diameter. Individual residential gravity sewer main lines shall not be less than 4 inches in diameter. Building sewers shall be in accordance with the state plumbing code and approved by the local building inspector.

Pressure sewer lines shall be Schedule 40 SDR 21 PVC with gasketed joints (ASTM D-2241) of a size as specified on the Engineering Plans. Line sizes will vary depending upon flow and shall be sized to ensure a fluid velocity of greater than 2 feet per second but no greater than 8 feet per second unless provisions are made for securing pipes (anchors and thrust blocks). Line materials shall be based upon calculated line pressures not exceeding the specified working pressure for a specified pipe material.

Piping from the lift station to the Irrigation Dose tank shall be welded joint HDPE (PE4710 - ASTM F714). Refer to the engineering drawings for sizing.

2.2 Burial

Bedding and installation shall be consistent with ASTM Standard F 667. These specifications do not cover interior or initial building connections. The following are general location and separation guidelines:

- Typically a 3-foot minimum cover shall be maintained on all sewer lines.
- Sewer lines may cross a water line if 18 inches clear separation is maintained, with the sewer line passing under the water line.
- Sewer lines may cross a storm drain if at least 12 inches of clear separation is maintained or the sewer pipe is of ductile iron or encased in ductile iron pipe for at least 5 feet on either side of the crossing.

- Sewer lines may cross a stream if at least three feet of stable cover can be maintained with a horizontal or directional boring with HDPE piping. No streams or jurisdictional wetlands shall be impacted without the applicable permitting.
- A minimum separation of 100 ft from any well is required.

2.3 Steep Slope Installation

Sewers on 20 percent slopes or greater shall be anchored securely with concrete, or equal, with the anchors spaced as follows:

a. Not greater than 50 feet center to center on grades 21% to 35%;
b. Not greater than 35 feet center to center on grades 35% to 50 %; and
c. Not greater than 25 feet center to center on grades 50% and over.

2.4 Trenching

Trench excavation shall conform to the line, depth and dimensions shown on the engineer plan details. The trench shall be properly braced and shored so that workmen may work safely and efficiently. If unstable conditions are encountered, the Engineer shall be notified in order that proper bedding materials may be selected. Trench excavation or excavation for pipelines shall consist of excavation necessary for the construction of sewers, conduits and other pipelines and all appurtenant facilities thereof, pipe embedment materials, and pipe protection, insulating and sleeving in ductile iron pipe, as called for on the plans. It shall include site preparation, backfilling and tamping of pipe trenches and around tanks and the disposal of waste materials, all of which shall conform to the applicable provisions of these specifications. When muck, quicksand, soft clay, swampy or other material unsuitable for foundations or subgrade are encountered which extend beyond the limits of the excavation, such material shall be removed and replaced with pipe foundation material as specified in the engineering drawings. Surface drainage shall not be allowed to enter excavated areas.

Rock encountered in trench excavation shall be removed for the overall width of trench which shall be as shown on the plans. It shall be removed to a minimum depth of three (3) inches below the bottom of the pipe. Clean compacted backfill shall replace the excavated rock.

The pipe material listed above shall be installed in accordance with the manufacturer's recommendations and the requirements of these specifications. All sewer lines shall be laid to the line and grade shown on the plans. No deviations from line and grade shall be made, unless they have been approved by the Engineer. The pipe interior shall be kept clean before and after laying by means approved by the Engineer. Pipe ends shall be plugged at the end of each work day or when

work is temporarily stopped. The plugs shall be watertight so that water and debris will not enter the pipe.

All backfilling shall be done in such manner as will not disturb or injure the pipe or structure over or against which it is being placed. Any pipe or structure injured, damaged or moved from its proper line or grade during backfilling operations shall be opened up and repaired and then re-backfilled as herein specified. Typically backfilling shall be conducted in lifts of no greater than 3 inches and compacted to a minimum 95% Standard Proctor. The Contractor shall be responsible for ensuring adequate testing is performed and demonstrate compliance with these specifications. Typically testing shall be performed approximately every 500 feet of piping. Any sections of piping demonstrating excessive trench settlement shall be excavated and re-compacted and backfilled. Excessive settlement is indicated by the grade above the piping trench being lower than the undisturbed adjacent natural grade.

No disturbance of any jurisdictional waters is allowed with proper permitting from the Army Corp of Engineering and TDEC. No permits are issued for this project therefore any creek crossings are to be directionally bored with no disturbance inside any creek buffers.

The Contractor shall replace all surface materials and shall restore paving, curbing, sidewalks, gutters, shrubbery, fences, sod, and other surfaces disturbed, to a condition equal to that before the work began, furnishing all labor and materials incidental thereto as provided elsewhere in these specifications.

2.5 Testing

All **gravity** sewer lines shall be tested by Low Pressure Air Exfiltration Testing with the following steps.

1. All branch fittings and ends of lateral stubs shall be securely plugged at each manhole. All stoppers shall be adequately braced when required.

2. Air shall be slowly supplied into the plugged pipe line until the internal air pressure reaches 4.0 pounds per square inch or 4.0 pounds per square inch greater than the average back pressure of any ground water that may submerge the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding further.

3. Calculate the pressure drop as the number of minutes for the air pressure within the pipeline to drop from a stabilized pressure of 3.5 to 2.5 psig.

4. The time allowed for mixed pipe sizes of varying lengths should be calculated as described in ASTM C828-76T.

5. The following times are for one pipe size only:

Pipe Size (inches)	Time, T (sec/100 ft)	Allowable Air Loss, Q (ft^3/min)
6	42	2.0
8	72	2.0
10	90	2.5
12	108	3.0
15	126	4.0
18	144	5.0
21	180	5.5
24	216	6.0
27	252	6.5
30	288	7.0

6. The pipe line shall be considered acceptable if the time interval for the 1.0 psi pressure drop is not less than the holding time listed in the following table.

7. If the test fails, the Contractor will be required to locate the cause of the failure, make necessary repairs, and repeat all testing of the line until the test is passed.

For **pressure sewer lines** the following Hydrostatic Testing Procedure shall be utilized.

1. As a minimum, all sewer force mains shall be tested in accordance with the Hydrostatic Testing Requirements of AWWA C600.
2. After pipe has been laid and backfilled, all newly laid pipe or any valve section thereof shall be subject to a hydrostatic pressure of not less than 150 psi or 1-1/2 times the working pressure, whichever is greater. The duration of the pressure test shall be two hours. Each valve section of the pipe shall be slowly filled with water. All air shall be expelled from the pipe while the pipe is being filled and before the application of the specified test pressure. Taps may be required at points of highest elevation. These taps are to be tightly plugged after completion of the test.
3. The test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Project Engineer. The pump, pump connections, gauges, and all necessary apparatus and labor shall be furnished by the Contractor. The Contractor shall calibrate the gauges in the presence of the Design Engineer.
4. A test shall be made only after a part or all of the backfilling has been completed and at least 36 hours after the last concrete thrust block has been cast with high-early strength cement or at least seven (7) days after the last thrust block has been cast using standard cement.
5. Any cracked or defective pipes, fittings, or valves discovered during hydrostatic pressure tests shall be removed and replaced with sound material and the test repeated until

satisfactory to the Design Engineer. No payment shall be made for the removal and replacement of defective pipes and appurtenances.

6. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure. Leakage shall not be measured by a drop in pressure in a test section over a period of time.
7. Allowable leakage shall not exceed the following U.S. gallons per hour reported in Table 1:

Table 1. Allowable leakage per 1000 ft of pipeline (gph)

Avg. Test Pressure (psi)	*NOMINAL PIPE DIAMETER (INCHES)*					
	3	*4*	*6*	*8*	*10*	*12*
250	0.36	0.47	0.71	0.95	1.19	1.42
225	0.34	0.45	0.68	0.90	1.13	1.35
200	0.32	0.43	0.64	0.85	1.06	1.28
175	0.30	0.40	0.59	0.80	0.99	1.19
150	0.28	0.37	0.55	0.74	0.92	1.10
125	0.25	0.34	0.50	0.67	0.84	1.01
100	0.23	0.30	0.45	0.60	0.75	0.90

If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

Alternatively, no pipe installation will be accepted if the leakage is greater than that determined by the following formula:

In inch-pound units,

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge)

The Contractor shall notify the Project Engineer when the work is ready for testing, and all testing shall be done in the presence of a representative of Brooks Engineering. All labor, equipment, water, and materials, including meters and gauges, shall be furnished by the Contractor at his own expense.

Low pressure pneumatic testing of pressure sewer lines in incremental stages of construction is recommended to ensure leaks are not occurring. Final testing shall be in accordance with the hydrostatic testing described above.

2.6 Lift Station

Precast wet wells shall meet requirements of ASTM C-478 and C-890. The interior shall be coated with an epoxy or polyurethane coating specifically designed for coating concrete pipes and wet wells. The pumping system shall either be a grinder type or sewage pump capable of passing a 3" spherical solid. An alternating duplex submersible pump system meeting the flow requirements for peak flow from treatment systems is to be utilized. The pump system shall be equipped with a slide piping connection and slide rail system for pump removal is to be utilized. Pumps are required to have minimum 20 HP motors providing a minimum of 475 gpm at 93 feet TDH. Refer to Section 6.4 for specified pumps.

2.7 Valving

Air release valves shall meet AWWA Standard C512-15. Valving shall be consistent with sizes of piping as shown on the Engineering Plans. All high points in pressure lines should have air release valves. Sufficient isolation should be incorporated to allow for line maintenance without having to shut down the entire distribution system. Air release valves must be mechanical lever air/vacuum relief valves (not flapper type). All valves in traffic areas shall be placed in traffic-rated vaults with steel lids. Non-traffic rate valve vaults may be utilized in irrigation and non-traffic areas.

3.0 TREATMENT SYSTEM

3.1 Influent Flow & Waste Characteristics

Flow

The project design flow is 188,700 gpd. The existing sand filter treatment system is currently permitted for 68,800 gpd and is to be integrated into the overall treatment system design. A new fixed media system (Biomicrobics MyFAST) sized for 120,000 gpd is to be constructed to meet the new design flow requirements. The calculated average instantaneous flow for the new 120,000 gpd system is 83.3 gpm with a peak flow 300 gpm based on a peaking factor of 3.6. The combined effluent has an average instantaneous flow of 131 gpm with a peak flow of 472.7 gpm.

Wastewater Characteristics

As the collection system is a STEP system pumping septic tank effluent, influent wastewater loading is anticipated to be slightly below typical organic and solids loading. Below are the anticipated influent/effluent wastewater loading characteristics.

Influent (mg/l)		**Effluent (mg/l)**	
cBOD	300	cBOD	30
Ammonia	35	Ammonia	10
TSS	300	TSS	30

3.2 Equalization System

Design

The equalization system is designed to store peak flow periods (two hours) and equalize the flow dose to the wastewater treatment system over a 16 hour time period. Minimum tanks size is 25% of the daily design flow.

Tankage

A 50,000 gallon cast-in-place concrete equalization tank is specified. Refer structural tank drawings for specifications by others for concrete and reinforcement structural specifications. The tank shall be equipped with a hatch for pumps and inlet/outlet cast in rubber boots for piping connections. Tank sizing based on providing the required float switch placement with dedicated floats providing functions as described below.

RED. OFF: Placed to allow for minimum pump submergence

TIMER ON: Placed to provide a minimum of 2 hours of storage at peak flow (28,332 gallons).

LAG ON:	Placed for sufficient separation from TIMER ON float. Starts both pumps simultaneously.
ALARM:	Placed for sufficient separation from LAG ON float and to allow for required emergency storage.

Pumps

The EQ Tank utilizes a duplex submersible pump system will pump in to the MyFAST initial settling chamber. Pumps are designed to dose the system over a 16 hour time period (960 minutes. The flow rate from the EQ pump is calculated to be 196.6 gpm. The pump design point is 200 gpm at 25' TDH. The pumps are duplex submersible centrifugal sewage pumps, Pentair 3 HP three phase 460 volt model S4B (refer to the *Calculations & Submittals* for pump specification sheets) or equal.

Control Panel

The duplex panel must alternate pumps each cycle. The timer settings are the same for each pump. The flow rate must be adjusted to the specified 30 gpm by throttling the gate valve on the pump discharge system. The timer settings are based on delivering the 7,010 gallon DDF to the pretreatment system over 24 cycles in a 24 hour period and a total of 12 hours/day.

The duplex NEMA 4X control panel shall be a stainless steel watertight enclosure with a 4 float time dosing system with run/rest times as specified on the Engineering Plans. The controller shall alternately actuate the duplex pumps and both pumps shall activate with a high level (LAG) condition. Audible visible alarm required.

The panel shall be equipped to send a signal on an alarm condition to a centralized cellular auto-dialer (RTU) located in the irrigation pump building that will call the operator in a high level condition. The auto-dialer must be proven to work with the local cellular service and shall be made for interior control panel mounting applications and shall be equipped with a backup battery. The unit shall be capable of data logging for pump events Refer to Section 6.6 for the recommended auto-dialer submittal sheets.

Float Switches

Floats are to be set at the levels specified in the engineering plans prior to the final inspection. Sealed mercury control floats or similar devices designed for detecting liquid levels in pump tank effluent shall be provided to control pump cycles. A separate circuit is provided to activate the high-water alarm. Float switch placement is to be set accurately consistent with the levels depicted in the engineering drawings.

Flow Control Weir

A stainless steel control weir is to be utilized to regulate the flow to the two treatment systems and to split the flow between the existing sand filter (68,800 gpd) and the MyFAST system (120,000 gpd). The EQ tank effluent is pumped up to the flow splitter initial stilling chamber and then over two 90-degree weir plates. The height over the weir plates (and consequentially flow rate) is set by two slide gates that set at prescribed elevations over the weir. Any excess discharge goes over the adjustable side plates and is circulated back in the EQ tank.

Height settings over the 90 degree weir are as follows:

- To Sand Filter (47.8 gpm) = 3.42”
- To Sand Filter (83.3 gpm) = 4.25”

3.4 Biomicrobics MyFAST 12.0

Process Descriptions

The MyFAST system uses submerged fixed-film treatment and clarification processes with the following stages:

1. Primary settling or aeration and screening
2. Attached-growth aerobic process for removal of BOD and TSS and nitrogen removal
3. Media-aided clarification of suspended solids
4. Transfer of settled biosolids to a sludge digester

The process is expected to function in each stage of treatment as follows:

1. Primary aeration and screening – Domestic septic tank effluent wastewater enters the treatment plant where a set of submerged aerators begin to break down organic material and suspended solids. A set of screening devices prevents large solids and debris from being transferred to downstream treatment stages. Fine suspended solids are kept in suspension via the mixing of the tank by aeration and are expected to be passed downstream. The zone can also be operated as a primary clarifier without the operation of blowers.
2. Attached-growth process – Screened wastewater enters the first attached-growth process stage with aerated media assemblies. A biofilm develops on the surface of the media. The biofilm is expected to consist of organisms which will metabolize organic material and thereby reduce the amounts of BOD and TSS in the wastewater stream. Nitrification also occurs in the media bed. The airlift mechanisms within each attached growth module distribute oxygenated water throughout the media bed. A portion of the aerated water is transferred to the anoxic volume of the tank outside of the media

module, achieving some denitrification. Residual biosolids collect on the bottom of the treatment tank and are intermittently removed by a biosolids collection grid piping system.

3. Media-aided clarification – The MyFAST system does not use a secondary clarifier after the aeration stage. A long Hydraulic retention time and upflow of treated water through the media bed to the baffled outlet of each MyFAST media module reduces the velocity of suspended solids and allows for their retention and removal. A return activated sludge stream is not used in the attached growth process.
4. Transfer of settled biosolids to sludge digester - Settled solids in the MyFAST treatment zone are moved by centrifugal pumps through a collection piping grid on the tank floor, and transferred to the BMS sludge digester zone. Aerators continually break down the waste sludge, while a submersible pump suspended on a jib crane allows for the decanting of the digester zone.

Treatment System Components

1. General. The treatment system is designed to treat a peak flow of approximately 160,000 gallons per day of domestic wastewater. The principal items of equipment shall include submerged, fixed-film interconnecting media assemblies with leg attachments, airlifts, hoses, solids collection manifold, transfer pumps, primary wastewater screens, blowers, submersible pumps, and a control panel. The treatment system must be arranged in a set of tanks as shown on the drawings provided by manufacturer. Tanks and attached structures (not provided by manufacturer) including handrails, walkways, ladders, etc. must conform to local, state, and all other applicable codes and are the responsibility of the design engineer and contractor.
2. Blowers. The blowers shall be of regenerative-type construction with gearless, direct-drive impellers. The blowers shall be provided with inlet filters, inlet and outlet fittings, and outdoor enclosures, and must be installed on a suitable platform. The blowers must be mounted above the water level in the tanks and above any flood level. Non-submerged blower piping to the tank shall use non-corrosive material (galvanized or stainless steel). Submerged blower piping must use noncorrosive stainless steel, PVC, or other suitable material.
3. Transfer Pumps. Transfer pumps shall be provided for the purpose of moving settled solids from the biological reactor and clarifier zones. Transfer pumps shall be self-priming centrifugal pumps with the ability to pass a 2-inch solid.

4. Submersible Pumps. Submersible pumps shall be of cast-iron construction and be suitable for handling sewage with the ability to pass a 2-inch solid.
5. Electrical/Control Panel. All wiring must conform to applicable state and local codes and provide the specified power to the blowers and pumps. Input power supply must be 60Hz 208-230 or 460 VAC, three phase. All conduit and wiring must be supplied by the contractor. The control panel shall utilize motor starters, overloads, and be housed in a NEMA 4 X enclosure. The control panel shall consist of a visual and audible alarm to indicate loss of power to the blowers or pumps. A manual silence switch shall be included for the alarm.
6. Media Assemblies. Media assemblies shall be provided which are designed to be interconnected by stainless-steel hardware. Media assemblies must be installed with a set of legs secured to the floor, supporting the weight of each assembly and setting the elevation of each assembly according to manufacturer-supplied drawings. The aeration media assembly shall contain air-lift diffuser devices positioned within the block of media. Air-lift diffusers distribute and recirculate of air and water within the volume of the media assembly. Open-channel fluid transfer devices are provided which must be installed to allow for fluid to move between the interconnected aeration media assemblies.
7. Media. The media shall be manufactured of polypropylene foils thermally welded together to form a rigid block. Media shall be held in place by a polyethylene liner. The media shall be fixed in position and contain no moving or wearing parts and will not corrode. The media is designed and installed so that residual solids processed in and generated by the treatment process settle to the bottom of the tank through the openings in the media.
8. Screens. Primary screening devices shall be supplied with each screen having an 8-inch outlet fitting. Each screen shall have a series of 1/8th-inch slotted openings arranged diagonally around a vertical cylinder. The screening device shall be made of polyethylene. Each screening device shall be capable of screening up to 10,000 gallons per day of domestic wastewater. Each screen shall have a clean-in-place mechanism consisting of a manually operated handle attached to a plunger-plate used for back-flushing the slotted openings of the screen.
9. Aeration Diffusers. The system shall include diffusers designed for coarse bubble aeration and mixing. The diffuser body shall be made of ABS. Each diffuser shall be permanently affixed to the floor of the tank and connected by an air delivery pipe manifold.
10. Biosolids Collections Assemblies. A biosolids collection manifold, which is designed

to accumulate settled solids, must be installed on the floor of the treatment tank. The collection assembly shall consist of a collection pipe manifold including the main trunk line and lateral lines with engineered orifices, and manually-actuated ball valves. The contractor must supply pipe needed to connect the biosolids collection grids to the transfer pumps. A field adjustable timer will control the operation of the transfer pumps. The biosolids collection manifold and valves must be installed so as to reverse the flow of fluid through the collection grid for backflushing.

The following components are supplied by BioMicrobics:

- (1) MyFAST control panel
- (16) MyFAST Submerged fixed-film aerobic treatment module (4 held for future expansion)
- (16) SaniTEE® 1618 Effluent screening devices (for primary settling/aeration tank)
- (4) 25-HP Regenerative blowers with inlet filters and above-ground housings (1 held for future)
- (3) 10-HP Regenerative blower (2 for the AMS Zone, 1 for the BMS zone)
- (3) 7.5-HP Sludge pump for sludge grid operation (1 held for future)
- (1) 0.5-HP Sludge pump for the BMS Zone
- (24) LIXOR® aeration diffuser (16 for the AMS Zone and 8 for the BMS Zone)
- (1) Jib crane
- Various 3-inch SCH 40 PVC pipes, connectors, caps, tees, etc.
- Various anchor screws, pipe straps, hardware kits, and angle braces.

The following are supplied by others:

- Concrete tank construction, material, handrails, walkways, coatings, etc.
- All wiring, conduit, and mounting hardware for proper installation of control panels and electromechanical components
- Fasteners, glue, additional pipe, and fittings for air and pump connections and leg assembly (leg assembly requires 4-inch PVC pipe)
- All other items needed for proper installation not mentioned here

3.4 Backup Generator

A backup generator to be run on available natural gas is to be utilized to run critical components of the treatment system. An automatic transfer switch shall be utilized to provide immediate backup power during a power failure. Based on equipment calculations, a 150 kW generator is the minimum recommended size.

3.6 Security

The entire treatment system area, including the wet weather pond, shall be secured by 6' privacy fencing with locking gate and signage indicating "Entry by Authorized Personnel Only".

4.0 SITE PREPARATION

4.1 Clearing & Grubbing

As the site is placed entirely on fill, no grubbing or clearing is necessary.

4.2 Final Cover

Final cover inside the fenced area is to be a clean stone gravel.

4.3 Erosion Control

These specifications and accompanying engineering plans shall not be construed as engineering plans for erosion control or for erosion control permitting. However, during the construction of the project, the Contractor shall be required to take the necessary steps to minimize soil erosion and siltation of rivers, streams, lakes and property. The Contractor shall comply with the applicable regulations of the appropriate governmental agencies in regard to soil erosion control and sedimentation prevention.

Temporary and permanent erosion control measures shall be accomplished at the earliest practicable time. Temporary erosion control measures shall be coordinated with permanent measures to insure economical effective and continuous erosion control during the life of the project. Temporary erosion control measures shall include, but are not be limited to, the use of temporary berms, dams, dikes, drainage ditches, silt ditches, silt fences, vegetation, mulches, mats, netting or any other methods or devices that are necessary. Erosion control measures installed by the Contractor shall be suitably maintained by the Contractor, until the site is fully stabilized.

Where excavation is adjacent to streams, lakes or other surface waters, the Contractor shall not place excavated materials between the excavation and the surface waters. Where live streams are crossed by the project, the Contractor shall exercise particular care to minimize siltation of the stream. Temporary erosion control measures shall be constructed. These may include but not be limited to use of coffer dam in the stream, dikes, diversion ditches and/or temporary sediment traps at the top of the banks, and silt fences on all creek banks. All temporary erosion control measures shall be acceptably maintained until permanent erosion control measures are established.

Where runoff on natural ground may cause erosion of the trench or erosion of the backfill in the trench, the Contractor shall construct temporary erosion control measures. These may include but not be limited to diversion ditches, check dams and silt basins or other suitable erosion control measures. Permanent seeding of disturbed areas shall be accomplished at the earliest practicable time.

5.0 INSPECTION AND MONITORING PROCEDINGS

5.1 Pre-Construction Meeting

A pre-construction meeting shall be scheduled which shall include the contractor, a TDEC representative, the engineer or his representative, the system(s) manufacturer representative and the certified operator. Scheduling this meeting shall be the responsibility of the installation contractor and all parties shall receive a minimum of one week's notice prior to the meeting date scheduled. Any changes to the plans requested by the contractor or TDEC representative will be discussed at this meeting and responded to within 3 working days by the engineer.

5.2 Intermediate Inspection of the System During Construction

The engineer or an employee of the engineer's firm under direct supervision by the engineer shall periodically inspect the system installation to verify if the installation is in accordance with the approved plans. The engineer will not be available to observe the entire installation of all components but shall inspect the installation with sufficient frequency to reasonably ensure that the quality and methodology of construction was of sufficient consistency to infer the quality and accuracy of construction of all components. The contractor shall be responsible for keeping the engineering informed as to the construction schedule for installation of all major system components.

The following are the minimum construction milestones that the Engineer shall be given sufficient notification to inspect.

- Setting of tanks.
- Leak testing of tanks.
- Pressure testing of gravity lines.
- Pressure testing for pressure lines.

If the engineer can not schedule an inspection, the contractor shall be asked to provide photographic documentation of these proceedings, along with testing data identified below.

It is the contractor's responsibility to submit to the engineer evidence of purchase and installation of all specified components. Submittal of critical components such as pumps and tanks are required.

5.3 Final Inspection & System Start-Up

The engineer must receive all Submittals at least one week prior to final start up and inspection. Submittals must include cut-sheets for all product specific components, tanks, and piping installed. The contractor shall be responsible for scheduling the final inspection and start-up with BEA, TDEC and an owner's representative. No wastewater shall be introduced in to the system prior to final start-up and inspection.

5.4 Operation & Maintenance – MyFAST 12.0

The MyFAST treatment system is designed to have minimal attention needed by a qualified operator. The regular maintenance tasks and suggested minimum frequencies are:

1. Maintaining blower intake filters – Every 3 months
2. Performing clean-in-place of SaniTEE® screening components – Every month
3. Decanting the sludge digester and/or hauling away of residual sludge – Every month

The description and purpose for each maintenance task are as follows:

1. Maintaining blower intake filters – Each blower has an intake filter with a metal mesh filter element housed under a removable cover. The filter element should be removed and cleaned with compressed air or water to remove dust and debris. This task can be completed within one hour.
2. SaniTEE clean-in-place procedure – The screening devices may build up material on the surface of the screen, restricting the flow of water. Cleaning a screening device involves pulling up and pushing down on a plunger handle one or more times to create a back-pulse flow of water through the surface of the screen to remove stuck-on material. This task can be completed within one hour.
3. Decanting the sludge digester and hauling away sludge – When the sludge digester is full of liquid and solids from the sludge transfer systems, the operator can shut down the aeration of the sludge digester and allow the solids to settle out. The top layer of liquid can be manually pumped to the primary aeration tank by lowering the submersible pump mounted on a jib crane into the top liquid layer.

This process can be done until no separation of solids and liquid layers occurs, at which point the sludge should be removed from the digester and hauled away or processed at a separate facility. This task might take two or more hours.

5.5 Residuals Management

As part of routine O&M procedures, sludge levels are to be checked in the septic tanks and Recirculation Tanks. As sludge levels approach 1/3 of the tank volume sludge is to be removed by a vacuum truck and hauled to a permitted POTW facility. The facility shall be an approved residual disposal/utilization site that provides sludge stabilization in accordance with EPA requirements 40 CRF 503 and 40 CFR Part 257 Appendix II. The facility shall have sufficient excess capacity and routinely accepts hauled waste from septage transporters.

6.0 CALCULATIONS

- WWTP Process Calculations
- EQTDH and Float Elevation Calculations
- Lift Station Calculations
- Backup Generator Calculations

WASTEWATER TREATMENT PLANT DESIGN

Sources:

1) Metcalf & Eddy: Wastewater Engineering, 1979
2) Grady & Lim: Biological Wastewater Treatment, 1980
3) Ten States Standard
4) Biomicrobics Data & Calculations

Daily Design Flow			Avg. Daily Flow		Peak Flow*	
Combined Systems	188800	gpd	131.11	gpm	472.69	gpm
Biomicorbics	120000	gpd	83.33	gpm	300.44	gpm

*Peak Flow based on 3 people/household and Ten States Standards Q_{peak}

P = Population in thousands

$Q_{peak} = (18+P^{.5}) / (4+P^{.5})$

$Q_{peak} = 3.605$

Flow Splitter Calculations

Ratio Between Sand Filter & Biomicrobics		0.57333	
(68,800 gpd and 120,000 gpd)			
Based on EQ pump rate of		236	gpm
Flow to Sand Filter		86.0	gpm
Flow to Biomicrobics		150.0	gpm
45º Weir Setting	SF	6.1	inches
	BioM	7.6	inches

Influent (mg/l)		**Effluent (mg/l)**	
cBOD	300	cBOD	30
Ammonia	35	Ammonia	10.0
TSS	300	TSS	30

BOD Loading	300.240	lb/day
Ammonia Loading	35.028	lb/day
Solids Loading	300.240	lb/day
BOD Removal	270.2	lb/day
Ammonia Removal	25.0	lb/day
Solids Removal	270.2	lb/day

Flow Equalization Requirements

Volume = 25% of DDF = 47200 gal.

Aeration Basin Requirements

For Extended Air - Volume = 24 hrs DDF	120000	gal
For MYFast = 19 lbs/1,000 cf	14,222	cu.ft.
Aerobic Volume Utilized (see Drawings)	16,040	cu.ft.
	119,978	gal.
Aeration Detention Time	24.0	hrs
BOD Oxygen requirement = 1.5lbs/lb BOD =	450.36	lb/day
NH_3 Oxygen Requirement = 4.5lb/lb NH3 =	157.63	lb/day
Total Oxygen Requirment =	607.99	lb/day
Aeration Required with 5% efficiency =	**562.95**	scfm
Mixing Rqmt = 25 cfm/1,000cf vol x aeration vol =	401.00	scfm

Sludge Holding Basin Requirements

Daily Sludge Production = .65lb/lb BOD Removed	175.64	lb/day solids
Volume of Thickened Sludge at 3.0%	702.0	gal/day
30 days Storage Rqmt.	21,060	gal
Volume Provided	40,000	gal
Aeration Requirement for Mixing (20 cfm/1000 ft^3)	107.0	cfm

Total Plant Air Requirements	Calculated		Air Provided	
1. For EQ Basin = 2 cfm/1000 gal.	NA	scfm	NA	cfm
2. For SHT = 20 cfm/1000 ft^3 (mixing minimum)	107	scfm	190	cfm
3. For Post-Aeration Basin = 20 cfm/1000 ft^3	NA	scfm	NA	cfm
4. For Aeration Basin = 2100 cfm/lb.BOD/min	563	scfm	1725	cfm
5.**OR** For Aeration Mixing = 25 cfm/1000 ft^3	401	scfm	NA	cfm
6. For air lift = 10 cfm/return	240	scfm	included above	
TOTAL	910	cfm	1915	cfm

TANK SIZING CALCULATIONS

EQUALIZATION SUMMARY

GPD	EQ GPM*	Pump Rate	Daily Run Time (min)	Daily Rest Time (min)	cycles/day	min/cycle	run time/cycle (min)	rest time/cycle (min)
188,700	262.1	265.0	712.1	727.9	24.0	60.0	29.7	30.3

*EQ GPM based on equalizing 40,000 gpd over 12 hours

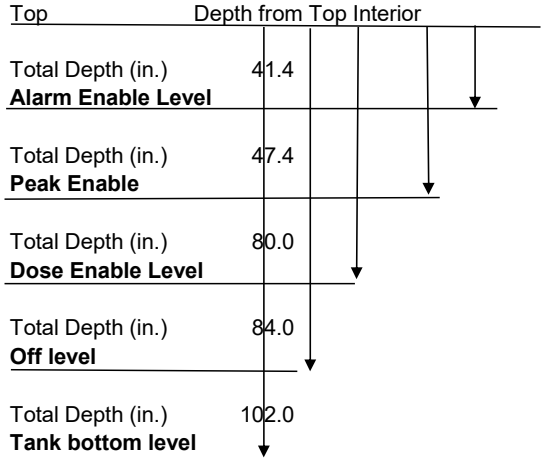
EQ Pump Tank

50,000 gallon Pump Tank Selected

Total Tank Height	102	inches
Storage (gal/ft)	9162.96	
Storage (gal/in)	763.58	
Pump Off Level	24	inches
Pump Drawdown on Cycle Dose	10.3	inches
Req'd. 4 Hour Emergency Storage (gal)	31450	gal
Req'd. Emergency Storage (in)	41.19	inches
Req'd EQ Storage (gal)	24893.19	gal.
Req'd EQ Storage	32.60	in.

**Req'd EQ Storage = 2 hours peak flow - 2 hours period of EQ flow

Actual Settings



41.4	31611.7	inches/gal.	
6.0	4581.5	inches/gal.	
32.6	24893.2	inches/gal.	
4.00	3054.3	inches/gal.	
18	13744	inches/gal.	

EQ Tank to WWTP
TDH CALCULATIONS

TDH = DH + h_m

where:

DH = elevation head

h_m = major pipe losses, utilize Hazen Williams equation with equivalent lengths for fittings

$h_m = (4.727\ L/\ d^{4.87})\ (Q/C)^{1.85}$ where: Q in cfs, L in feet, d in ft.

no user input
user input req'd

Piping: sch. 40 PVC
Diameter = 6 inches (nominal) equals 6.031 inches (ID)
0.5025833 ft.

NODE: EQ to WWTP

INPUTS			Elevation Head Loss		Major Losses		Equiv. Length	Sum
No. inputs	**Fittings**	**Details**	**Initial Elev.**	**Final Elev.**	**L**	**"C"**	**(FT)**	**Eq. Length**
1	Pipe		710.0	722.0	30	130		32.3
6	90 DEG ELL						20	120.00
6	45 DEG ELL						12	72.00
4	90 DEG TEE						30	120.00
4	COUPLING						6	24.00
3	GATE VALVE						4	12.00
0	GLOBE VALVE						165	0.00
0	ANGLE VALVE						80	0.00
1	CHECK VALVE						54	54.00
								434.31

Q (gpm)	DH	hm (feet)	TDH	PSI	Velocity
100	**12.00**	0.44	**12.44**	5.4	1.14
120	**12.00**	0.62	**12.62**	5.5	1.36
140	**12.00**	0.82	**12.82**	5.6	1.59
160	**12.00**	1.05	**13.05**	5.7	1.82
180	**12.00**	1.31	**13.31**	5.8	2.04
200	**12.00**	1.59	**13.59**	5.9	2.27
220	**12.00**	1.90	**13.90**	6.0	2.50
240	**12.00**	2.23	**14.23**	6.2	2.72
260	**12.00**	2.59	**14.59**	6.3	2.95
280	**12.00**	2.97	**14.97**	6.5	3.18
300	**12.00**	3.38	**15.38**	6.7	3.41

Project Name - Pump Station # 1

FLOW INFORMATION

Total Daily Flow	188700	GPD
Average Daily Flow	131.04	GPM
Peaking Factor	3.605	
Peak Flow	**472.41**	**GPM**

PUMP STATION INFORMATION

Estimated Pump Size	475.0	GPM
High Point on System	756.34	Feet
Invert in to Wet Well	705	Feet
Pump Base Height	6	Inches
Minimum Water Height	24	Inches
Top of Wet Well	708.50	Feet
Lag Pump On (H)	695.49	Feet
Pump On (I)	693.99	Feet
Pump Off (K)	690.50	Feet
Pump Elevation	689.00	Feet
Floor	688.50	Feet
Wet Well Depth	20.00	Feet
Wet Well Shape	Round	
Wet Well Size	8.0	Feet - Diameter
Volume / Foot of Well	50.24	Cubic Feet
Gallons / Foot of Well	375.82	Gallons
Detention Time	10	Minutes
Fill/Detention Volume	1310.42	Gallons
Drawdown Time at ADF	3.81	Minutes
Cycle Time at ADF	13.81	Minutes
Fill/Detention Volume Peak	4724.05	Gallons
Drawdown Time at Peak	9.89	Minutes
Cycle Time at ADF	19.89	Minutes

FRICTION CALCULATIONS - HAZEN WILLIAMS

Select Pipe Diameter	6	Inches	
Select Pipe Material	PVC		
Hazen Williams Coeff	130		
Inside Diameter	6.0310	Inches	
Length of Main	1054	Linear Feet	
Number of 90deg elbows	12	E.L. =	106.8
Number of 45deg elbows	8	E.L. =	44.8
Number of Gate Valves	2	E.L. =	6.4
Number of Check Valves	1	E.L. =	63
Connection Joints	(Pipe Length /18)	E.L. =	58.56
Equivalent Length	1333.56		
Velocity	5.46	FPS	
Elevation Head (Hf)	67.34	Feet	
Friction Head at 475 GPM	24.96	Feet	
Total Head Loss (TDH)	**92.30**	**Feet**	

SYSTEM CURVE CACLULATIONS

Single Pump		Flow Rate	TDH	PSI	
	1	285 (GPM)	77.04	33.35	
	2	333 (GPM)	80.24	34.74	
	3	380 (GPM)	83.86	36.30	
	4	428 (GPM)	87.88	38.04	
	5	**475 (GPM)**	**92.30**	**39.96**	**Design**
	6	523 (GPM)	97.12	42.04	
	7	570 (GPM)	102.32	44.29	
	8	665 (GPM)	113.86	49.29	
	9	855 (GPM)	141.39	61.21	

Duplex Pumps		Flow Rate	TDH	PSI	
	1	570 (GPM)	102.32	44.29	
	2	665 (GPM)	113.86	49.29	
	3	760 (GPM)	126.89	54.93	
	4	855 (GPM)	141.39	61.21	
	5	**950 (GPM)**	**157.33**	**68.11**	**Design**
	6	1045 (GPM)	174.68	75.62	
	7	1140 (GPM)	193.43	83.73	
	8	1330 (GPM)	235.04	101.75	
	9	1710 (GPM)	334.30	144.72	

Backup Generator Calculations

	HP	FLA		
Unit	**HP**	**FLA**	**Voltage**	**kW**
MyFAST Aeration Blower 1	25	31	460	18.7
MyFAST Aeration Blower 2	25	31	460	18.7
MyFAST Aeration Blower 3	25	31	460	18.7
MyFAST Aeration Blower 4	25	31	460	18.7
AMS Blower 1	10	12.5	460	7.5
AMS Blower 2	10	12.5	460	7.5
BMS Blower	10	12.5	460	7.5
BMS Decant Pump	0.5	1.7	460	0.4
Sludge Pump 1	7.5	11	460	5.6
Sludge Pump 2	7.5	11	460	5.6
Sludge Pump 3	7.5	11	460	5.6
EQ Pump 1	3.0	4.8	460	2.2
EQ Pump 2	3.0	4.8	460	2.2
Lift Station Pump 1	20	13	460	14.9
Lift Station Pump 2	20	13	460	14.9
				148.5
Safety Factor	1.25			**185.6**

Indicates future equipment

746 Watts = 1 HP

Watts = amps x Voltage

7.0 PRODUCT INFORMATION SHEETS

7.1 MyFAST Equipment Technical Sheets
7.2 Submittal Sheets for EQ Pumps
7.3 Submittal Sheets for Lift Station Pumps

7.1 MyFAST Equipment Technical Sheets

Exhibit DND-8

BIO MICROBICS

BETTER WATER. BETTER WORLD.®

MyFAST®

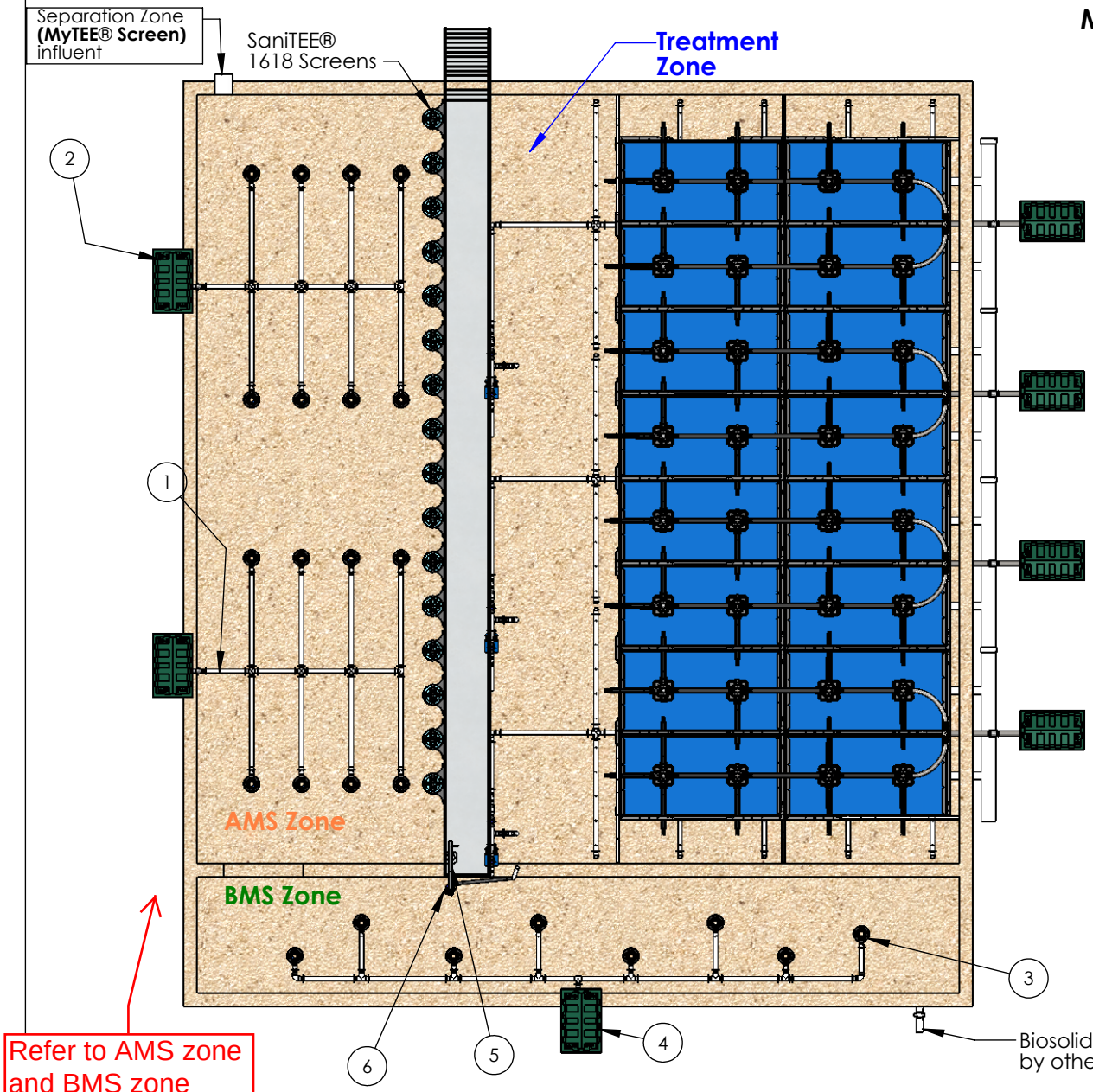
WASTEWATER TREATMENT SYSTEM

SUBMITTED TO

Brooks Engineering Associates

September 21 2022

MyFAST® 16.0 BASIC MyTEE® AMS & BMS OPTIONS



Product Description & Layout

MyFAST® 16.0 BASIC

Designed to treat up to 160,000GPD (600 m3/day) of residential waste water.

- (16) MyFAST® Liners
- (16)SaniTEE® 1618 Screens
- Blowers & Blower housings
- Control Panel
- (3)Biosolids Collection Grids
- (3)Biosolids Collection Pumps and Manifold

MyFAST® 16.0 OPTIONS

Aeration Management System (AMS)

LIXOR® aeration system provides oxygen and mixing, reducing primary sludge and BOD.

1. (2)LIXOR® 8.0 XD
2. Blowers & Blower Housings
-- Control Panel

Biosolids Management System (BMS)

LIXOR® aeration system to reduce Biosolids Quantity.

3. LIXOR® 8.0
4. Blower & Blower Housing
5. Jib Crane
6. Decant Pump
-- Control Panel

MyTEE®Screen

A prescreening device is required prior to AMS Zone. MyTEE® screen provides separation of non-biological solids and grit.

See sheet 5 of 8 MyTEE® Screen

DO NOT SCALE

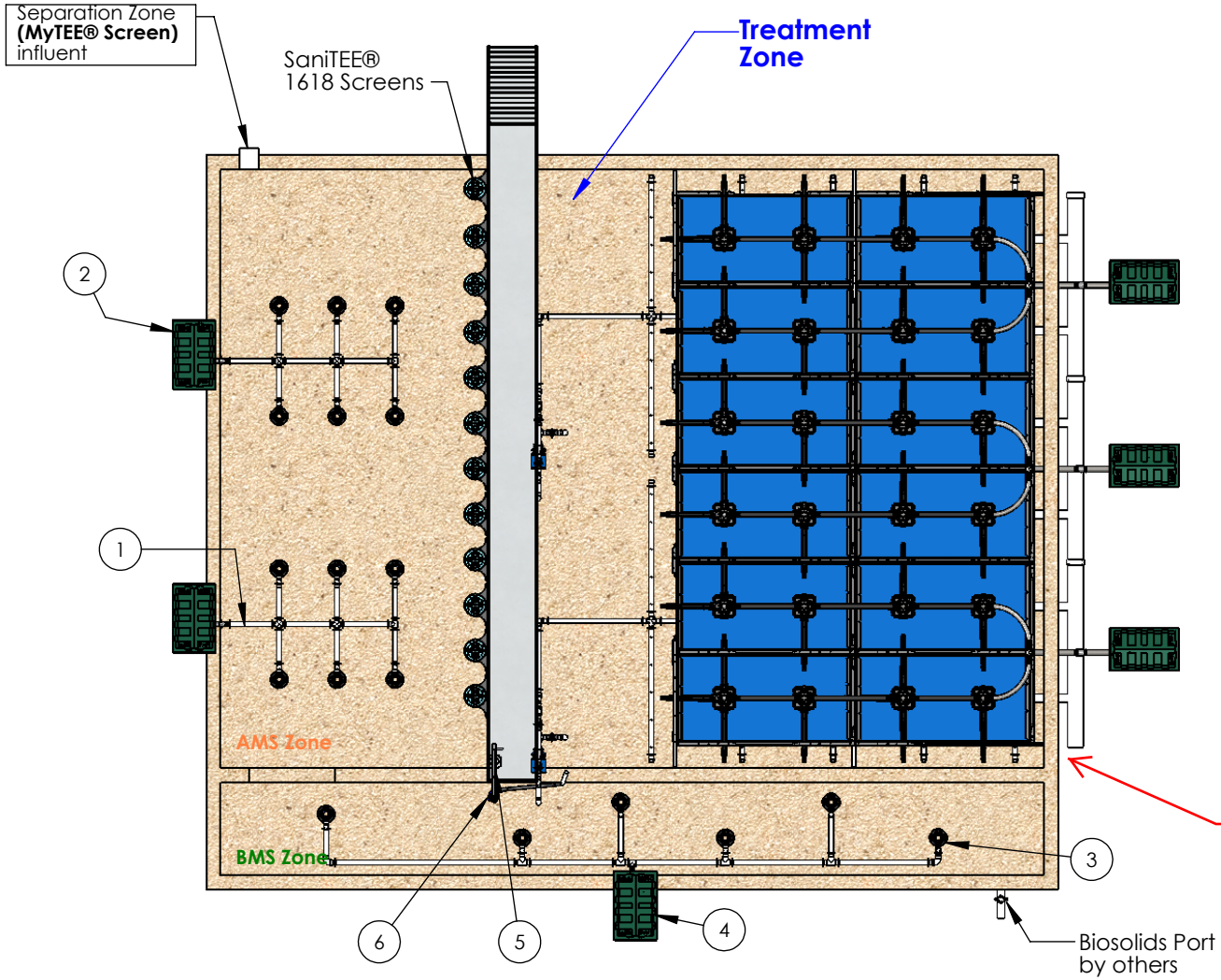
UNLESS NOTED DIMENSIONS ARE IN INCHES [CENTIMETERS]
TOLERANCES
± 0.02 IN/IN
[± 0.05 CM/CM]

BIO-MICROBICS® INCORPORATED

MyFAST 16.0

WEIGHT	lb	SIZE	DRAWING NUMBER		SHEET
NAME	DATE	A	Options Layout		2 OF 9
DRAWN CTC	3/27/2009				
CHECKED PF	8/31/2012		REVISED 8/31/2012	REV. INI-08-N	

MyFAST® 12.0 BASIC AMS & BMS OPTIONS



Refer to MyFAST 12.0 treatment zone

Product Description & Layout

MyFAST® 12.0 BASIC

Designed to treat up to 120,000 GPD (454 m3/day) of residential waste water.

- (12) MyFAST® Liners
- (12)SaniTEE® 1618 Screens
- Blowers & Blower housings
- Control Panel
- (2)Biosolids Collection Grids
- (2)Biosolids Collection Pumps and Manifolds

OPTIONS

Aeration Management System (AMS)

LIXOR® aeration system provides oxygen and mixing, reducing primary sludge and BOD.

1. (2)LIXOR® 6.0 XD
2. Blowers & Blower Housings

-- Control Panel

Biosolids Management System (BMS)

LIXOR® aeration system to reduce Biosolids Quantity.

3. LIXOR® 6.0
4. Blower & Blower Housing
5. Jib Crane
6. Decant Pump

-- Control Panel

MyTEE®Screen

A prescreening device is required prior to AMS Zone. MyTEE® screen provides separation of non-biological solids and grit.

See sheet 5 of 8 MyTEE® Screen

DO NOT SCALE

UNLESS NOTED DIMENSIONS ARE IN INCHES [CENTIMETERS] TOLERANCES ± 0.02 IN/IN [± 0.05 CM/CM]

BIO-MICROBICS INCORPORATED

MyFAST 12.0

WEIGHT	lb	SIZE	DRAWING NUMBER		SHEET
NAME	DATE	A	Options Layout		2 OF 9
DRAWN CTC	3/27/2009				
CHECKED PF	8/31/2012	REVISED 8/31/2012		REV. INI-08-M	

K07 model for sludge Digester
K12 model for FAST process

REGENERATIVE BLOWERS - PRESSURE

SCL K07 / K08 / K09 / K10 / K11 / K12

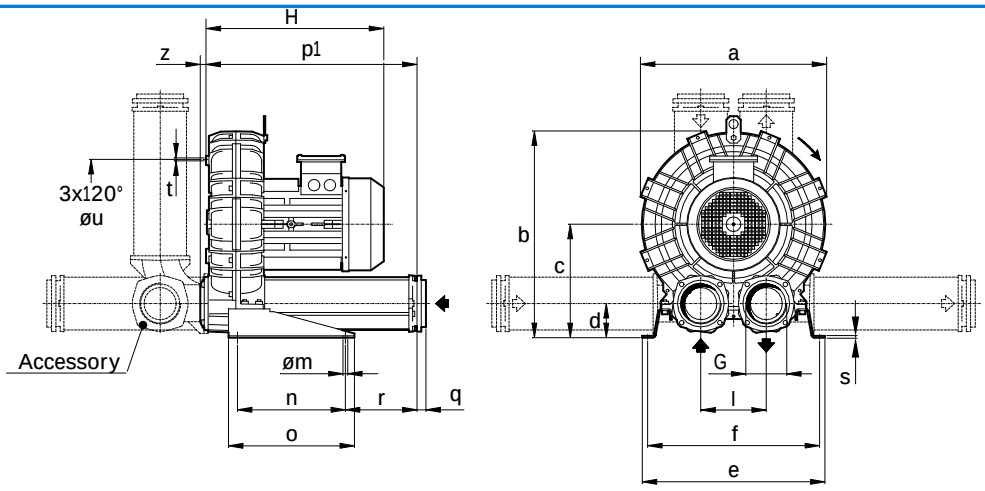
MS SERIES

SN1805-18B 1/2

TECHNICAL CHARACTERISTICS
- Aluminium alloy construction
- Smooth operation
- High efficiency impeller
- Maintenance free
- Mountable in any position
- Recognized TEFC - cURus motor

OPTIONS
- Special voltages (IEC 38)
- Surface treatments

ACCESSORIES
- Inlet and/or inline filters
- Additional inlet/outlet silencers
- Safety valves
- Flow convertingdevice
- Optional connectors



Dimensions in inches.
Dimension for reference only.

Model	a	b	c	d	e	f	G	l	m	n	o	p1	q	r	s	t	u	z
K07-MS	16.69	18.84	10.59	3.23	18.43	17.24	3" NPT	6.10	0.51	11.81	13.78	20.16	0.98	5.39	0.20	M8	11.61	0.63
K08-MS	17.99	19.61	10.59	3.23	18.82	17.64	3" NPT	6.10	0.51	11.81	13.78	20.16	0.98	5.39	0.20	M8	12.2	0.63
K09-MS	19.37	22.09	12.40	3.78	20.00	18.82	4" NPT	7.17	0.51	11.81	13.78	23.07	0.98	7.83	0.20	M8	14.17	0.63
K10-MS	20.31	22.56	12.40	3.78	20.00	18.82	4" NPT	7.17	0.51	11.81	13.78	23.07	0.98	7.83	0.20	M8	14.17	0.63
K11-MS	21.34	23.74	13.07	3.58	21.26	20.00	4" NPT	7.87	0.51	11.81	13.78	23.46	0.98	8.03	0.20	M8	15.35	0.63
K12-MS	21.57	23.82	13.07	3.58	21.26	20.00	4" NPT	7.87	0.51	11.81	13.78	23.58	0.98	8.03	0.20	M8	15.35	0.51

Model	Maximum flow Scfm		Installed power Hp		Maximum differential pressure △p (In WG)		Noise level Lp d B (A) (1)		Overall dimensions H	Weight
	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	Inches	Lbs
K07-MS	294	243	4	4	50	80	78.7	76.7	15.6	116.2
			5 ½	5 ½	80	110	79.0	77.0	16.3	119.0
			7 ½	7 ½	121	141	79.3	77.3	18.4	160.5
			10	10	171	-	79.6	77.6	19.1	172.6
K08-MS	381	316	5 ½	5 ½	40	70	79.7	77.7	16.3	124.8
			7 ½	7 ½	70	100	80.0	78.0	18.4	166.5
			10	10	111	141	80.3	78.3	19.1	179.0
			15	15	171	171	80.6	78.6	19.1	192.0
K09-MS	471	390	7 ½	7 ½	50	80	80.2	78.2	18.8	186.3
			10	10	80	120	80.5	78.5	19.5	199.0
			15	15	141	171	81.0	79.0	19.6	212.0
			20	20	171	-	81.3	79.3	22.0	245.0
K10 -MS	556	460	7 ½	7 ½	30	60	80.1	78.1	18.8	189.6
			10	10	50	90	80.5	78.5	19.5	202.0
			15	15	111	141	81.0	79.0	19.6	215.0
			20	20	161	171	81.4	79.4	22.0	248.0
			25	25	201	-	81.6	79.6	24.0	322.0
K11 - MS	650	539	15	15	70	110	82.4	80.4	19.8	226.0
			20	20	121	160	82.7	80.7	22.5	259.0
			25	25	151	181	85.6	83.6	24.0	333.0
K12 - MS	726	602	15	15	50	90	82.9	80.9	19.9	229.5
			20	20	90	130	83.2	81.2	22.5	263.0
			25	25	121	161	86.1	84.1	24.0	337.0

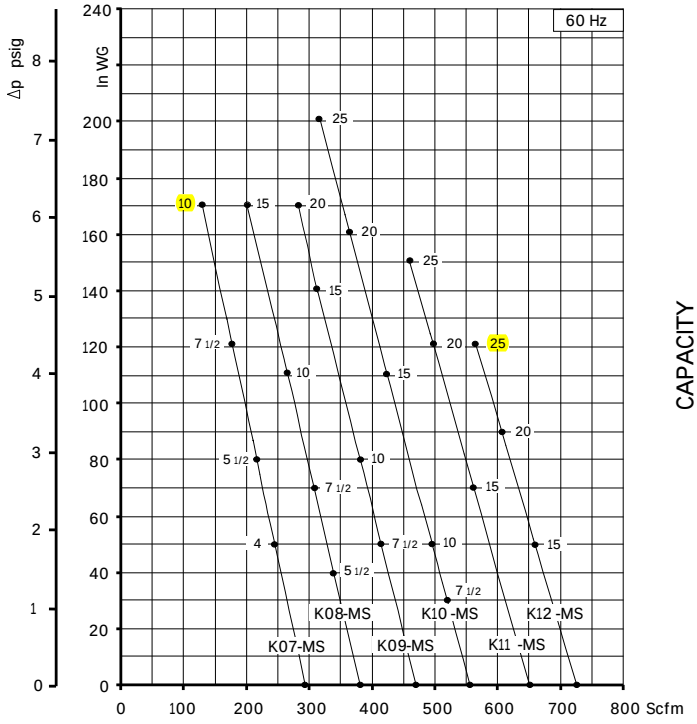
(1) Noise measured at 1 m distance with inlet and outlet ports piped, in accordance to ISO 3744.

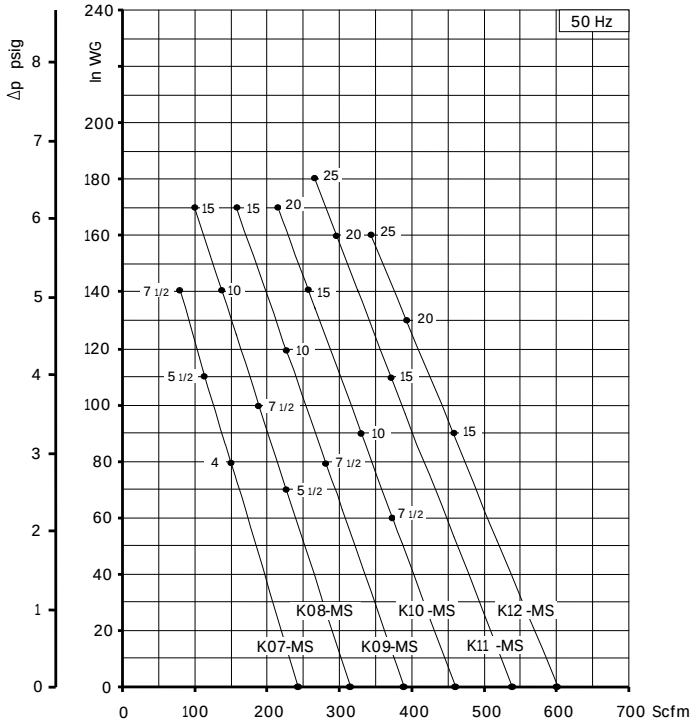
- For proper use, the blower should be equipped with inlet filter and safety valve; other accessories available on request.
- Ambient temperature from +5° to +104°F.
- Specifications subject to change without notice.

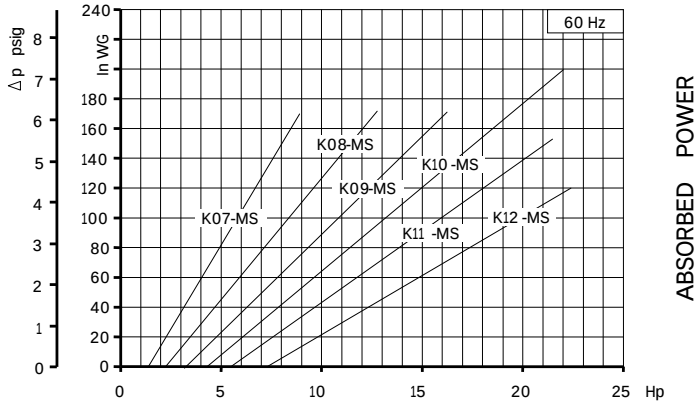
SCL K07 / K08 / K09 / K10 / K11 / K12

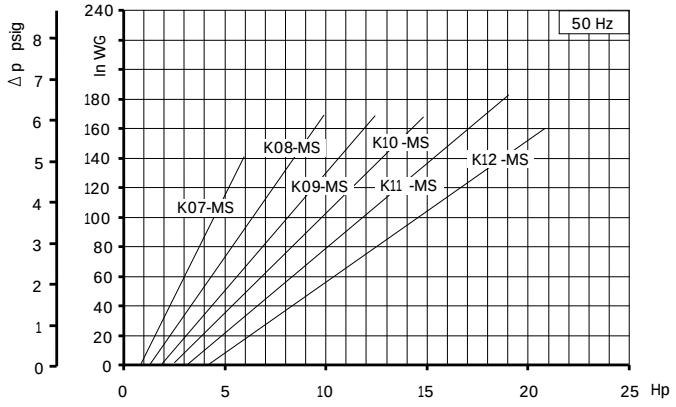
MS SERIES

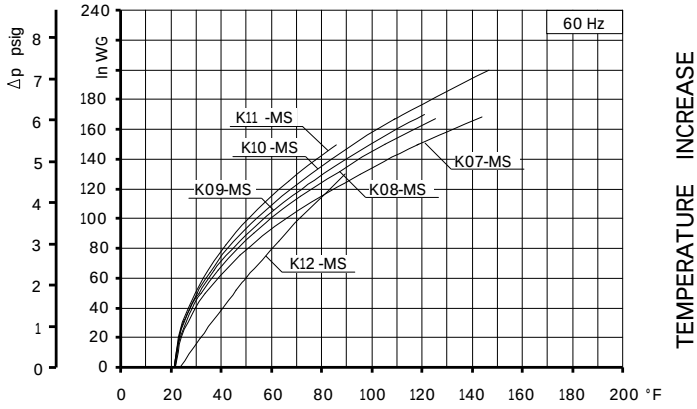
SN1805-18B 2/2

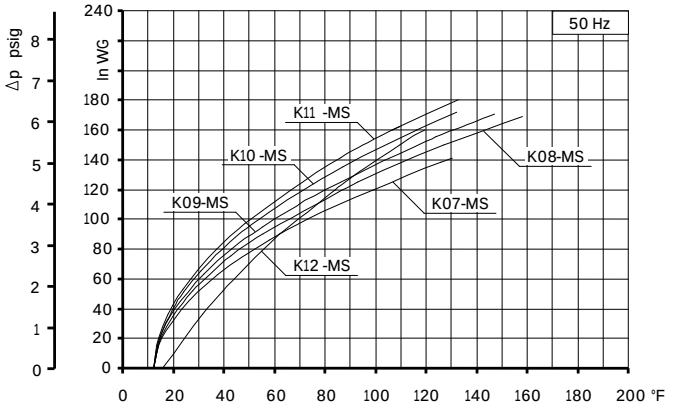












Curves refer to air at 68°F temperature and 29.92 In Hg atmospheric pressure (abs) measured at inlet port.
Values for flow, power consumption and temperature rise: +/- 10% tolerance.
Data subject to change without notice.

AMS Zone first stage aeration Blower

Exhibit DND-8

REGENERATIVE BLOWERS - PRESSURE

SCL K07R / K08R / K09 / K10 / K11 / K12

MD SERIES

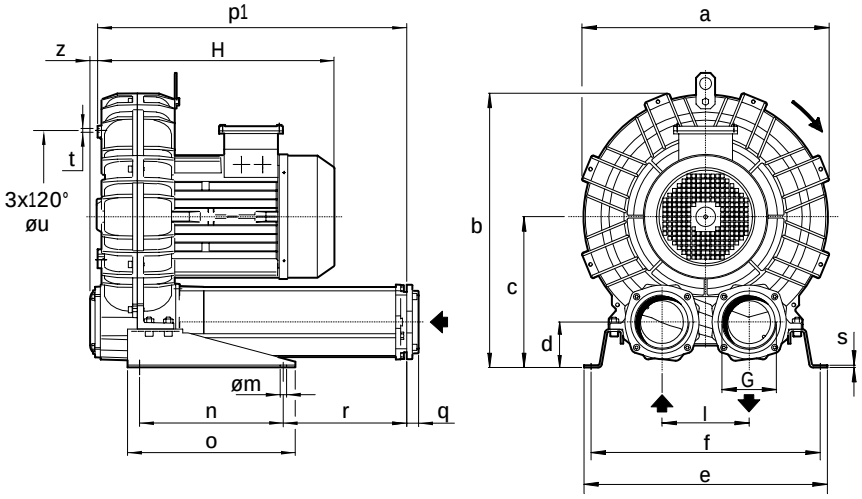
SN 1848-12B 1/2

TECHNICAL CHARACTERISTICS
- Aluminium alloy construction
- Smooth operation
- High efficiency impeller
- Maintenance free
- Mountable in any position
- Recognized TEFC - cURus motor

OPTIONS
- Special voltages (IEC 38)
- Surface treatments

ACCESSORIES
- Inlet and/or inline filters
- Additional inlet/outlet silencers
- Safety valves
- Flow converting device
- Optional connectors

Dimensions in inches.
Dimension for reference only.



Model	a	b	c	d	e	f	G	l	m	n	o	p1	q	r	s	t	u	z
K07R-MD	16.69	18.94	10.59	3.23	18.43	17.24	2" NPT	6.10	0.51	11.81	31.78	16.46	0.71	1.70	0.20	M8	11.61	0.63
K08R-MD	17.99	19.61	10.59	3.23	18.82	17.64	2" NPT	6.10	0.51	11.81	13.78	16.46	0.71	1.70	0.20	M8	12.20	0.63
K09-MD	19.37	22.09	12.40	3.78	20.00	18.82	4" NPT	7.17	0.51	11.81	13.78	25.35	0.98	10.12	0.20	M8	14.17	0.63
K10-MD	20.31	22.56	12.40	3.78	20.00	18.82	4" NPT	7.17	0.51	11.81	13.78	25.35	0.98	10.12	0.20	M8	14.17	0.63
K11-MD	21.35	23.74	13.07	3.58	21.18	20.00	4" NPT	7.87	0.51	11.81	13.78	25.75	0.98	10.31	0.20	M8	15.35	0.63
K12-MD	21.57	23.85	13.07	3.58	21.18	20.00	4" NPT	7.87	0.51	11.81	13.78	25.87	0.98	10.31	0.20	M8	15.35	0.62

Model	Maximum flow Scfm		Installed power Hp		Maximum diff erential pressure p (In WG)		Noise level Lp dB (A) (1)		Overall dimensions H Inches	Weight Lbs
	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm		
K07R-MD	129	107	5 ½	5 ½	150	220	74.5	72.5	16.30	117
			7 ½	7 ½	231	260	75.0	73.0	17.60	159
			10	10	280	-	75.0	73.0	19.10	171
K08R-MD	168	139	5 ½	5 ½	85	140	76.2	74.2	16.30	125
			7 ½	7 ½	151	200	76.6	74.6	17.60	167
			10	10	220	260	77.0	75.0	19.10	179
			15	-	260	-	77.3	-	19.10	192
K09-MD	221	183	10	10	190	250	79.5	77.5	19.50	210
			15	15	290	-	80.5	78.5	19.50	223
K10-MD	275	228	10	10	130	200	80.3	78.3	19.50	214
			15	15	240	260	81.4	79.4	19.50	228
			20	20	260	-	81.7	79.7	22.00	264
K11-MD	306	254	15	15	180	260	81.4	79.4	19.70	244
			20	20	280	-	81.7	79.7	22.50	280
K12-MD	336	278	15	15	100	180	82.3	80.3	19.90	242
			20	20	180	260	82.6	80.6	22.50	278
			25	-	240	-	82.9	-	25.00	362

(1) Noise measured at 1 m distance with inlet and outlet ports piped, in accordance to ISO 3744.

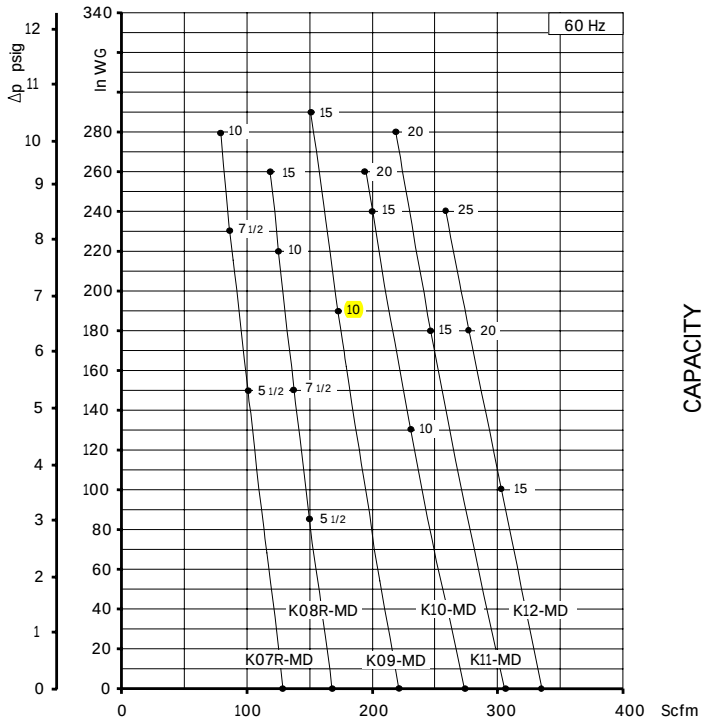
- For proper use, the blower should be equipped with inlet filter and safety valve; other accessories available on request.
- Ambient temperaturefrom +5° to +104°F.
- Specifications subject to change without notice.

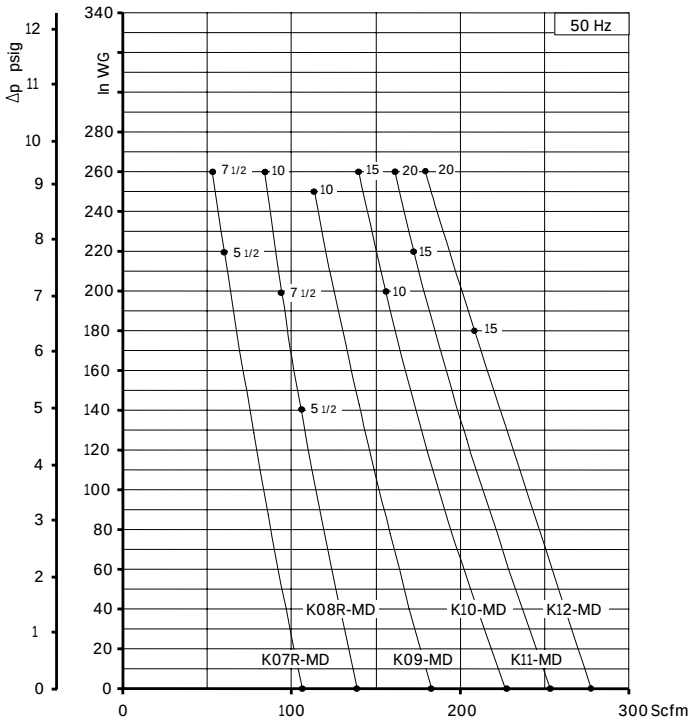
FPZ, Inc. 150 N. Progress Drive Saukville, WI 53080 USA Tel. (262) 268-0180 - usa@fpz.com www.fpzusa.com

SCL K07R / K08R / K09 / K10 / K11 / K12 MD SERIES

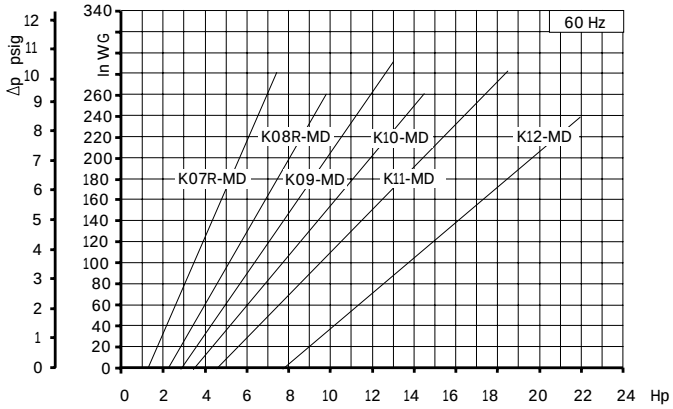
SN 1848-12B 2/2

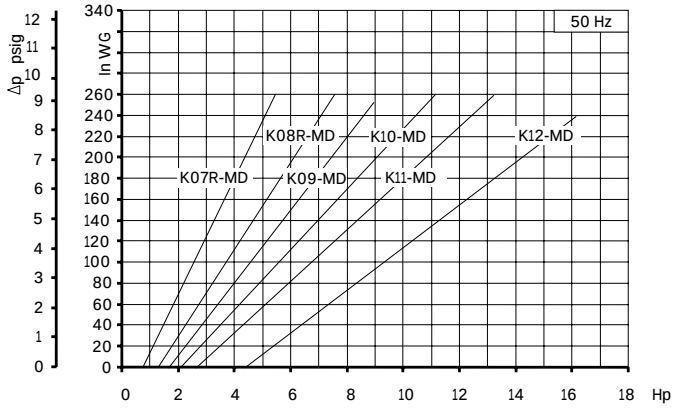
CAPACITY



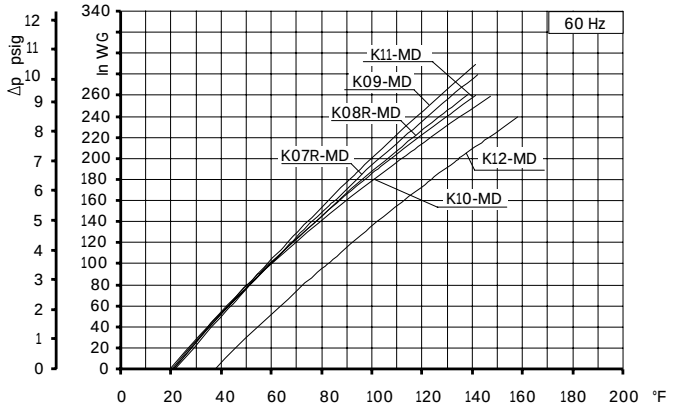


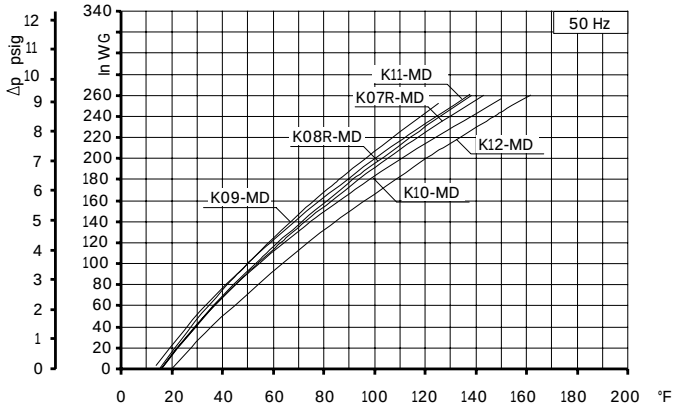
ABSORBED POWER





TEMPERATURE INCRESASE





Curves refer to air at 68°F temperature and 29.92 In Hgatmospheric pressure (abs) measured at inlet port.
Values for flow, power consumption and temperature rise: +/-10% tolerance.
Data subject to change without notice.

TECHNICAL

Three Phase Electric Motor

SS2002

THREE PHASE MOTOR

GENERAL SPECIFICATIONS:

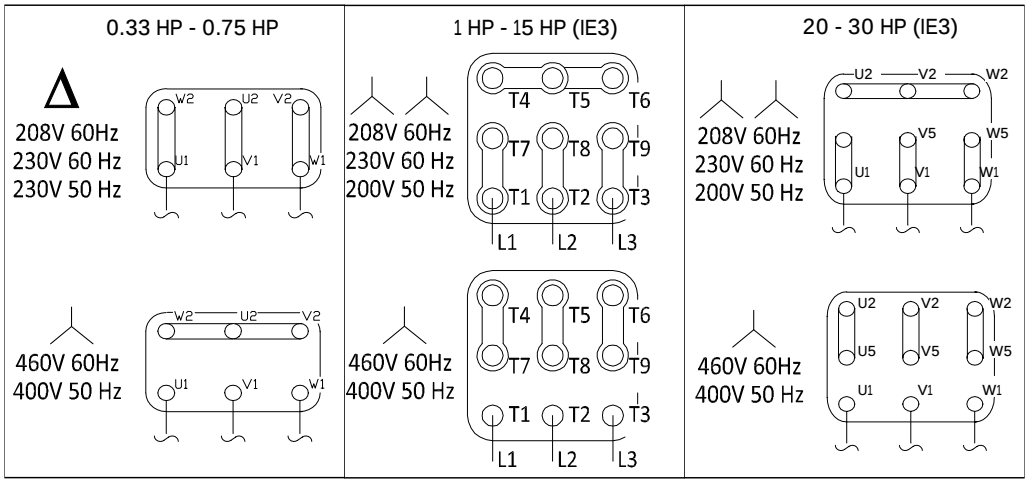
1. Type: 3-phase AC Motor IEC 60034
2. Marks: cURus, CE
3. Nema Premium Efficiency (IE3) - 1 HP AND LARGER (3 ph)
4. Poles: 2
5. Insulation class: F; F (B) for Premium efficient
6. Enclosure: TEFC
7. Protection IP55, Tropicalized
8. Thermal protector: Klixon 1400 C/150^{0} C
9. Service factor: 1.15 (60 hz)
10. Max. Ambient 40^{0} C
11. Duty: Continuous
12. Construction: aluminum frame

POWER		SIZE	60 HZ			50 HZ			60 hz Starting Current Ratio*	CABLE ENTRY 1 (cable gland incl.)	CABLE ENTRY 2
HP	KW		VOLTAGE	FLA 208-230 / 460 V	Efficiency	VOLTAGE	FLA 200/400 V	Efficiency			
0.33	0.25	63	208-230/460	1.5 / 0.7	59%	230/400	1.4 / 0.8	60.0%	3.9	M16	M20
0.5	0.37	63	208-230/460	2.3 / 1.0	59.2%	230/400	2.1 / 1.2	61.4%	3.6	M16	M20
0.75	0.55	71	208-230/460	2.7 / 1.2	68.8%	230/400	2.6 / 1.5	69.0%	3.8	M16	M20
0.75	0.55	71	208-230/460	2.3-2.2 / 1.3	74.5%	230/400	2.6 / 1.5	74.5%	6.8	M20	-
1	0.75	80	208-230/460	2.99-2.94 / 1.47	77.0%	200/400	3.28 / 1.64	80.7%	8.0	M25	M25
1.5	1.1	80	208-230/460	4.35-4.34 / 2.17	84.0%	200/400	4.92 / 2.46	82.8%	9.3	M25	M25
2	1.5	80**	208-230/460	5.91-5.96 / 2.98	85.5%	200/400	6.82 / 3.41	84.2%	8.7	M25	M25
		90	208-230/460	5.77-5.74 / 2.87	85.5%	200/400	6.58 / 3.29	84.2%	9.4	M25	M25
3	2.2	90	208-230/460	8.27-8.31 / 4.15	86.5%	200/400	9.6 / 4.8	85.9%	10.7	M25	M25
4	3	100	208-230/460	10.9-11.1 / 5.53	88.5%	200/400	12.86 / 6.38	87.1%	11.0	M25	M25
5.5	4	100	208-230/460	14.6-15.1 / 7.55	88.5%	200/400	17.7 / 8.86	88.1%	11.1	M25	M25
6.2	4.6	100	208-230/460	16.5-16.4 / 8.2	89.5%	200/400	19 / 9.5	88.6%	12.5	M25	M25
7.5	5.5	132	208-230/460	19.8-19.5 / 9.75	89.5%	200/400	22.2 / 11.1	89.2%	13.7	M25	M25
10	7.5	132	208-230/460	26.1-25 / 12.5	90.2%	200/400	28.6 / 14.3	90.1%	13.0	M25	M25
15	11	132	208-230/460	38.2-37.3 / 18.7	91.0%	200/400	43.4 / 21.7	91.0%	12.5	M25	M25
20	15	132	208-230/460	47.0 / 23.5	91.7%	200/400	52.4 / 26.2	91.9%	9.7	M32	M32
20***	15	160	208-230/460	48.8 / 24.4	91.0%	200/400	54.4 / 27.2	91.9%	10.7	M32	M32
25	18.5	160	208-230/460	62 / 31	91.7%	200/400	69 / 34.5	92.4%	12.5	M40	M40
30	22	160	208-230/460	71.6/35.8	91.7%	200/400	77.8 / 38.9	92.7%	10.6	M40	M40

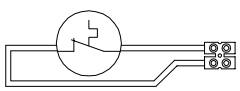
* FLA x starting current ratio = starting current ** 2 hp size 80 motors used on SCL R30-MD ONLY. *** TS / TD models ONLY.

Shaded models to be discontinued

WIRING DIAGRAMS



Thermal protection



V_N =250V , cosφ 0,6 , I_N = 1,6 A

V_N =250V , cosφ 1 , I_N = 2,5 A

Specifications subject to change without notice. Alternate motor suppliers may be used.

Exhibit DND-8

TECHNICAL BROCHURE
B3886 R2

WS_B Series

Model 3886

SUBMERSIBLE SEWAGE PUMP

BUILT IN THE USA
ENGINEERED, ASSEMBLED & TESTED

GOULDS WATER TECHNOLOGY
a xylem brand

FEATURES

Impeller: Cast iron, semi-open, dynamically balanced, non-clog with pump out vanes for mechanical seal protection. Optional Silicon bronze impeller available.

Casing: Cast iron volute type for maximum efficiency. Designed for easy installation on A10-20 guide rail or base elbow rail systems.

Mechanical Seal: SILICON CARBIDE VS. SILICON CARBIDE sealing faces for superior abrasive resistance, stainless steel metal parts, BUNA-N elastomers.

Shaft: Corrosion-resistant stainless steel. Threaded design. Locknut on all models to guard against component damage on accidental reverse rotation.

Fasteners: 300 series stainless steel.

Capable of running dry without damage to components.

Designed for continuous operation when fully submerged.

EXTENDED WARRANTY AVAILABLE FOR RESIDENTIAL APPLICATIONS.

AGENCY LISTINGS

Tested to UL 778 and CSA 22.2 108 Standards
By Canadian Standards Association
File #LR38549

APPLICATIONS

Specifically designed for the following uses:

- Homes
- Sewage systems
- Dewatering/Effluent
- Water transfer

SPECIFICATIONS

Pump

- Solids handling capabilities: 2" maximum
- Discharge size: 2" NPT
- Capacities: up to 185 GPM
- Total heads: up to 38 feet TDH
- Temperature: 104°F (40°C) continuous, 140°F (60°C) intermittent

MOTORS

- Fully submerged in high grade turbine oil for lubrication and efficient heat transfer. All ratings are within the working limits of the motor.
- Class B insulation

Single phase (60 Hz):

- All single phase models feature capacitor start motors for maximum starting torque.
- Built-in overload with automatic reset.
- SJTOW or STOW severe duty oil and water resistant power cords.
- ⅓ – 1 HP models have NEMA three prong grounding plugs.

Three phase (60 Hz):

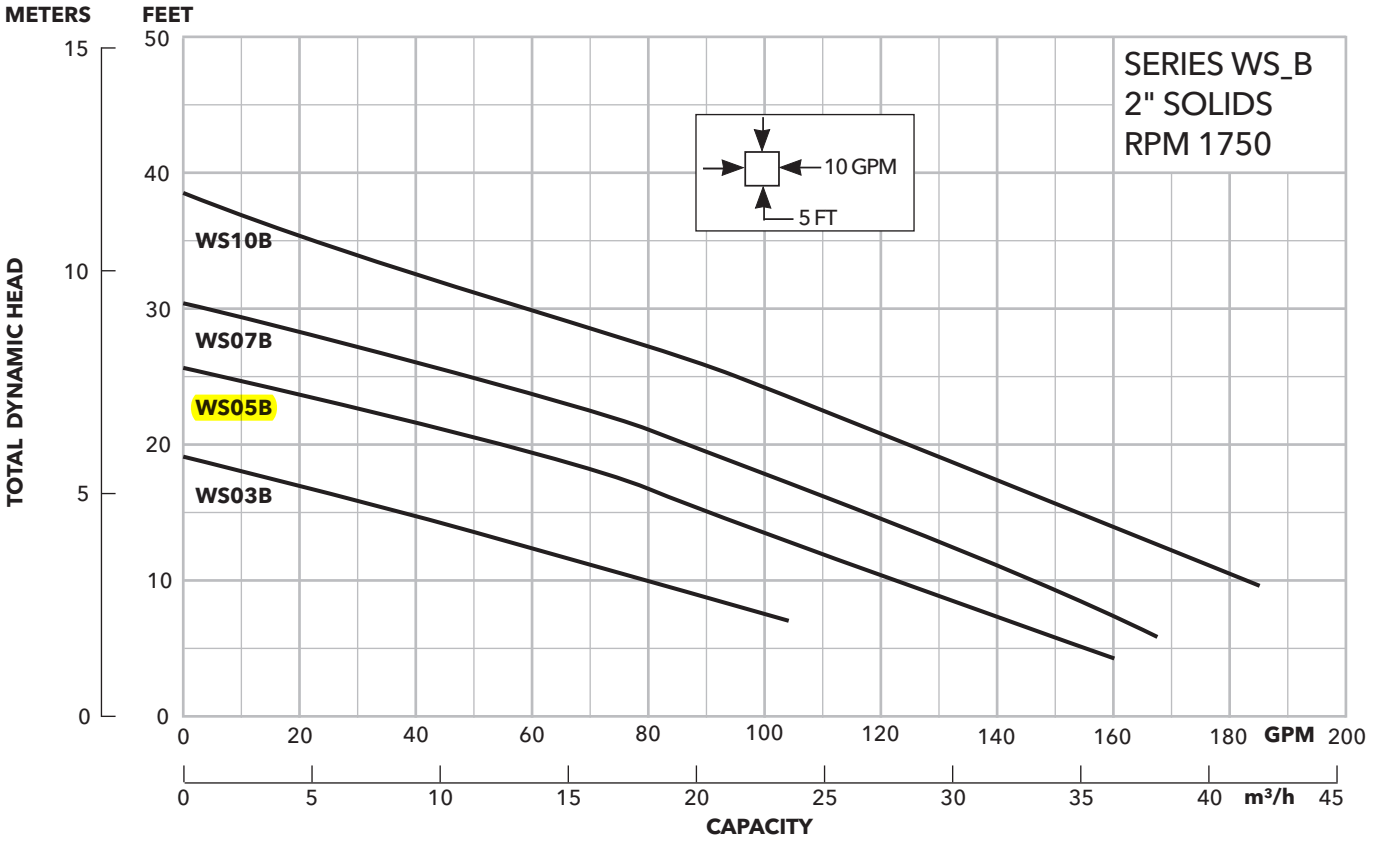
- Class 10 overload protection must be provided in separately ordered starter unit.
- STOW power cords all have bare lead cord ends.

- **Bearings:** Upper and lower heavy duty ball bearing construction.
- **Designed for Continuous Operation:** Pump ratings are within the motor manufacturer's recommended working limits, can be operated continuously without damage when fully submerged.
- **Power Cable:** Severe duty rated, oil and water resistant. Epoxy seal on motor end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking. Standard cord is 20'. Optional lengths are available.
- **Motor Cover O-ring:** Assures positive sealing against contaminants and oil leakage.

Used for Jib Crane Decant Pump

MODELS

Order Number	HP	Phase	Volts	RPM	Impeller Diameter (in.)	Maximum Amps	Locked Rotor Amps	KVA Code	Full Load Efficiency	Resistance		Weight (lbs.)
										Start	Line-Line	
WS0311B	0.33	1	115	1750	4.69	10.7	30.0	M	54	11.9	1.7	63
WS0318B			208			6.8	19.5	K	51	9.1	4.2	
WS0312B			230			4.9	14.1	L	53	14.5	8.0	
WS0511B	0.5		115		5.00	14.5	31.1	J	55	9.3	1.4	65
WS0518B			208			8.0	19.5	K	51	9.1	4.2	
WS0512B			230			7.3	16.5	J	54	11.7	5.6	
WS0538B		3	200			3.8	12.3	K	75	NA	6.7	
WS0532B			230			3.3	9.7	K	75	NA	9.9	
WS0534B			460			1.7	4.9	K	75	NA	39.4	
WS0537B			575			1.4	4.3	K	68	NA	47.8	
WS0718B	0.75	1	208		5.38	11.0	39.0	K	65	2.6	1.4	85
WS0712B			230			9.4	24.8	J	57	4.8	2.3	
WS0738B		3	200			4.1	21.2	H	74	NA	4.3	
WS0732B			230			3.6	17.3	J	76	NA	5.6	
WS0734B			460			1.8	8.9	J	76	NA	22.4	
WS0737B			575			1.5	7.3	J	71	NA	29.2	
WS1018B	1	1	208		5.75	14.0	39.0	K	65	2.6	1.4	
WS1012B			230			12.3	30.5	H	60	4.3	1.8	
WS1038B		3	200			6.0	21.2	H	74	NA	4.3	
WS1032B			230			5.8	17.3	J	76	NA	5.6	
WS1034B			460			2.9	8.9	J	76	NA	22.4	
WS1037B			575			2.4	7.3	J	71	NA	29.2	

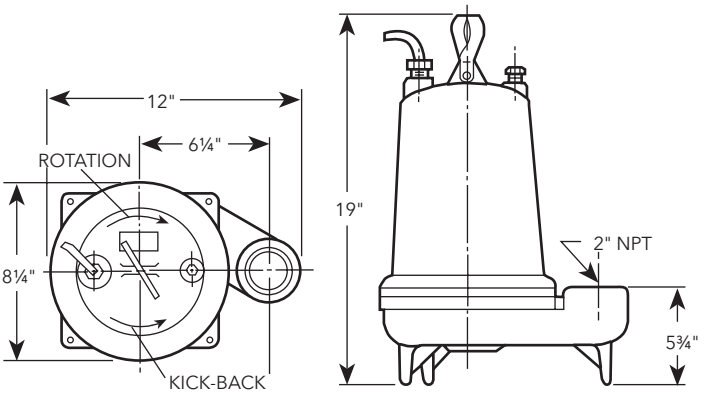


PERFORMANCE RATINGS (gallons per minute)

Order No.		WS03B	WS05B	WS07B	WS10B
HP ▶		⅓	½	¾	1
RPM ▶		1750	1750	1750	1750
Total Head Feet of Water	10 ▶	80	122	145	183
	15	36	90	116	152
	20	–	50	86	123
	25	–	–	48	95
	30	–	–	–	58
	35	–	–	–	20

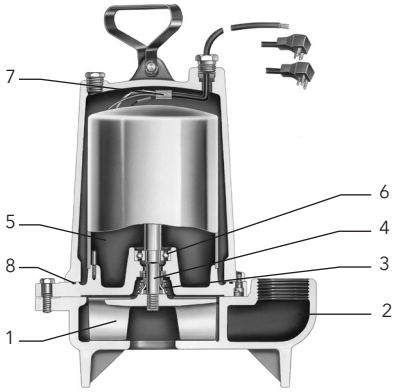
DIMENSIONS

(All dimensions are in inches. Do not use for construction purposes.)



COMPONENTS *(for reference only)*

Item No.	Description
1	Impeller
2	Casing
3	Mechanical Seal
4	Motor Shaft
5	Motor
6	Ball Bearings
7	Power Cable
8	Casing O-Ring



NOTE: *For specific parts breakdown, see repair parts.*

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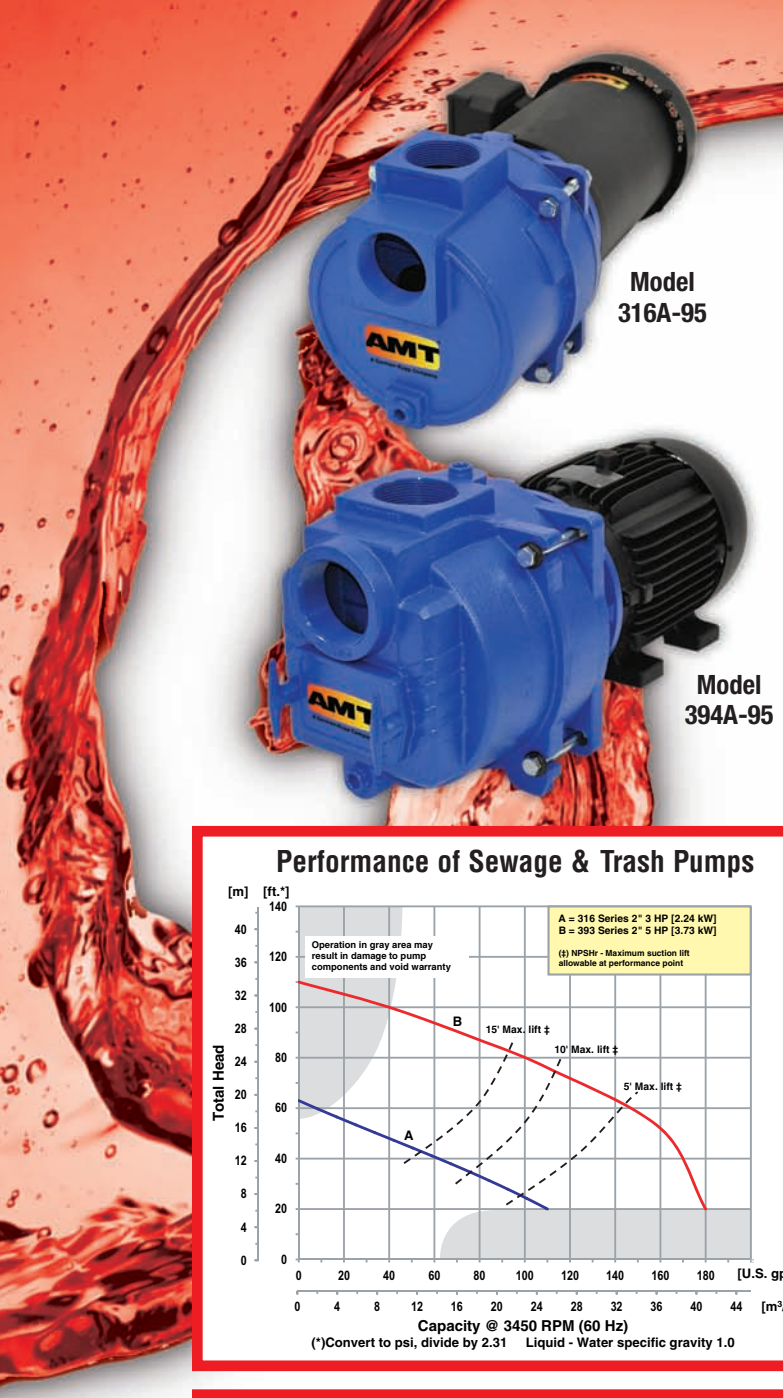


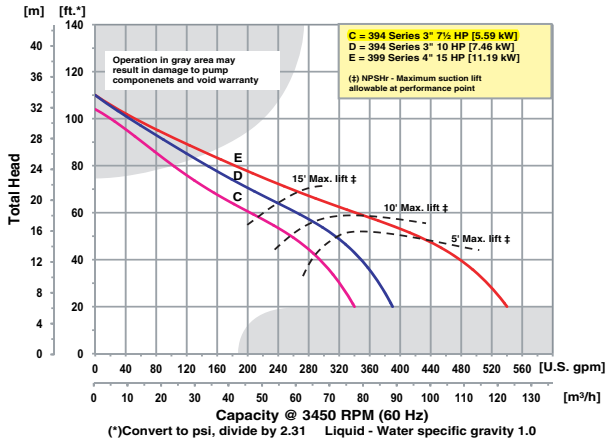
Cast Iron Sewage & Trash Pumps

- **Cast Iron Construction**
- **Silicon Carbide/Viton® Mechanical Seal**
- **2″, 3″ & 4″ NPT Ports Sizes**
- **Maximum Temperature 180° F**
- **Self-Priming to 20 Ft.**
- **Stainless Steel Semi-Open, Clog Resistant Impeller**
- **Buna-N Check Valve and O-Ring**
- **Removable Cast Iron Volute/Wearplate**
- **Easy Cleanout Design**
- **3″ & 4″ Models Feature Front Cleanout**
- **Pull-from-Rear Design**
- **Available with 3 to 15 HP Totally Enclosed Fan Cooled (TEFC) Electric Motors**

Performance of Sewage & Trash Pumps

(*)Convert to psi, divide by 2.31 Liquid - Water specific gravity 1.0

Performance of Sewage & Trash Pumps



(*)Convert to psi, divide by 2.31 Liquid - Water specific gravity 1.0

AMT Cast Iron Sewage/Trash pumps are designed for trouble free and economical handling of solids laden liquids and slurries. Pumps are available in three NPT port sizes: 2", 3" or 4". Cast iron construction with two vane stainless steel self-cleaning impellers, silicon carbide mechanical seals for abrasion resistance and Buna-N O-rings and check valves. Built-in check valve allows pump to reprime automatically in an open system without the foot valve. The solids handling capabilities of the pumps make them ideally suited for a variety of industrial applications including: sewage treatment, canneries, chemical processing, wineries, tanneries, meat packing, breweries, pulp, wood chips, process water, sludge and slime, waste water, white water and other applications. These sewage/trash pumps will easily handle liquids containing sewage, stones, sticks, mud and other solids. Minimum liquid requirement must be above 85% – maximum 15% solids. **Failure to do so may damage pump and void warranty.**

AMT
A Gorman-Rupp Company

400 Spring Street • Royersford, PA 19468 USA

www.amtpump.com • 888-amt-pump (268-7867)

Self-Priming Sewage/Trash Pumps

Pump Dimensional & Specification Data

Model	HP	SUC*	DIS*	A**	B	C**	D	E	F	G	J**	K	L**	W**	H	Ship Wt. (Lbs.)
316B-95	3	2	2	2.4 [6.1]	2.1 [5.3]	3.8 [9.6]	3.5 [8.8]	4.7 [11.9]	3.1 [7.8]	6.1 [15.4]	11.1 [28.2]	2.4 [6.1]	20.3 [51.5]	9.3 [23.6]	8.8 [22.3]	94
316A-95	3	2	2	2.4 [6.1]	2.1 [5.3]	3.8 [9.6]	3.5 [8.8]	4.7 [11.9]	3.1 [7.8]	6.1 [15.4]	11.1 [28.2]	2.4 [6.1]	19.9 [50.5]	9.3 [23.6]	8.8 [22.3]	87
393B-95	5	2	2	3.7 [9.4]	2.1 [5.3]	5.5 [13.9]	5.2 [13.2]	4.7 [11.9]	3.1 [7.8]	6.9 [17.5]	14.8 [27.6]	4.4 [11.1]	27.4 [69.6]	13.4 [34.0]	10.0 [25.4]	189
393A-95	5	2	2	3.7 [9.4]	2.1 [5.3]	5.5 [13.9]	5.2 [13.2]	4.7 [11.9]	3.1 [7.8]	6.9 [17.5]	14.8 [27.6]	4.4 [11.1]	24.9 [63.2]	12.3 [31.2]	10.0 [25.4]	173
394B-95	7½	3	3	4.2 [10.6]	3.5 [8.8]	5.5 [13.9]	6.0 [15.2]	6.5 [16.5]	5.0 [12.7]	9.3 [23.6]	16.4 [41.6]	3.7 [9.4]	31.1 [79.0]	15.5 [39.4]	12.5 [31.7]	248
394A-95	7½	3	3	3.7 [9.4]	3.5 [8.8]	5.5 [13.9]	6.0 [15.2]	6.5 [16.5]	5.0 [12.7]	9.3 [23.6]	15.7 [39.7]	3.7 [9.4]	26.6 [67.5]	13.5 [34.3]	12.5 [31.7]	226
394F-95	10	3	3	4.2 [10.6]	3.5 [8.8]	7.0 [17.7]	6.1 [15.4]	9.0 [22.8]	8.8 [22.3]	12.5 [31.7]	19.7 [50.0]	3.7 [9.4]	34.3 [87.1]	15.5 [39.4]	15.1 [38.3]	450
394E-95	10	3	3	4.2 [10.6]	3.5 [8.8]	7.0 [17.7]	6.1 [15.4]	9.0 [22.8]	8.8 [22.3]	12.5 [31.7]	19.7 [50.0]	3.7 [9.4]	33.4 [84.8]	14.3 [36.3]	15.1 [38.3]	330
399C-95	15	4	4	4.2 [10.6]	3.5 [8.8]	7.0 [17.7]	6.1 [15.4]	9.0 [22.8]	8.8 [22.3]	12.5 [31.7]	19.7 [50.0]	3.7 [9.4]	33.4 [84.8]	14.3 [36.3]	15.1 [38.3]	350

(*) Standard NPT (Female) pipe thread.

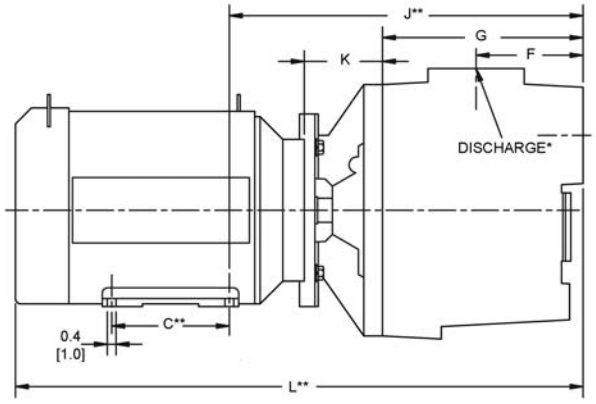
(**) This dimension may vary due to motor manufacturer's specifications.

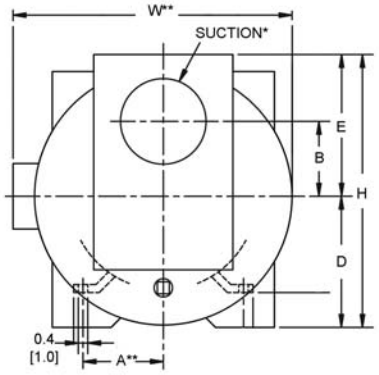
NOTE:Dimensions are in inches (centimeters) and have a tolerance of ±1/4".

Model	Curve	HP	PH	ENC	Frame	Voltage @ 60 Hz +	Full Load Amps	Max Solids
316B-95 316A-95	A	3	1 3	TEFC	56J	230 230/460	16 8/4	1"
393B-95 393A-95	B	5	1 3	TEFC	184JM	230 230/460	20 17/9	1"
394B-95 394A-95	C	7½	1 3	TEFC	215JM 184JM	230 230/460	31 22/11	1½"
394F-95 394E-95	D	10	1 3	TEFC	215JM	230 230/460	40 26/13	1½"
399C-95	E	15	3	TEFC	215JM	230/460	47/24	2"

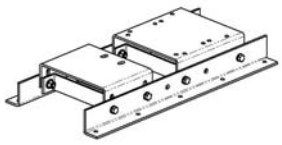
(+) 3-Phase models can also operate on 50 Hz (This will change full load amps and service factor, RPM and priming capabilities).

NOTE: Electric supply for **ALL** motors must be within ±10% of nameplate voltage rating (e.g. 230V ±10%= 207 to 253).





Optional Mounting Base Model A200-90



Standard Features

- Cast Iron Construction for Abrasive Resistance and Durability
- Silicon Carbide/Viton® Mechanical Seal
- Built-in Buna-N Check Valve
- Buna-N O-ring Casing Seal Reusable After Clean Out Maintenance
- Self-Cleaning Stainless Steel Impeller Resists Clogging and Wear
- Pull-from-Rear Design Permits Clean Out and Repair Without Removing Piping
- 3" & 4" Models Feature Front Cleanout
- Replaceable Cast Iron Volute/Wearplate Designed for Solids Handling
- Motor Includes Stainless Steel Shaft or Stainless Steel Shaft Sleeve
- Available with 3 to 15 HP Totally Enclosed Fan Cooled (TEFC) Electric Motors
- Single or Three Phase, 3450 RPM Motors
- Optional Mounting Base Available for 184/215 JM Frames
- Maximum Working Pressure 150 PSI
- Seal Flush Port Provided on 5 HP and Larger
- Optional Mounting Base Available
- QSP – Quick Ship Pump for Many Models

Hazardous Duty/Xplosion Proof motors available from stock ranging from 1 to 10 HP; *CALL FOR QUOTATION & LEAD TIME!*

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1212

7.2 Submittal Sheets for EQ Pumps

Item Number / Tags	: Default	Size	: Hydromatic - S4N/S4NX
Service	:	Stages	: 1
Quantity	: 1	Based on curve number	: SUB_S_E_AH_00005_B_6 Rev 2016-01-14
Quote number	:	Date last saved	: 21 Nov 2022 4:39 PM

Operating Conditions

Flow, rated	: 265.0 USgpm
Differential head / pressure, rated (requested)	: 15.00 ft
Differential head / pressure, rated (actual)	: 15.03 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed criteria	: Synchronous
Speed, rated	: 1165 rpm
Impeller diameter, rated	: 7.25 in
Impeller diameter, maximum	: 8.00 in
Impeller diameter, minimum	: 5.50 in
Efficiency	: 60.84 %
NPSH required / margin required	: - / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 45 / - Metric units
Minimum Continuous Stable Flow	: 49.00 USgpm
Head, maximum, rated diameter	: 23.72 ft
Head rise to shutoff	: 57.81 %
Flow, best eff. point	: 309.4 USgpm
Flow ratio, rated / BEP	: 85.65 %
Diameter ratio (rated / max)	: 90.63 %
Head ratio (rated dia / max dia)	: 74.41 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids diameter limit	: 3.00 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

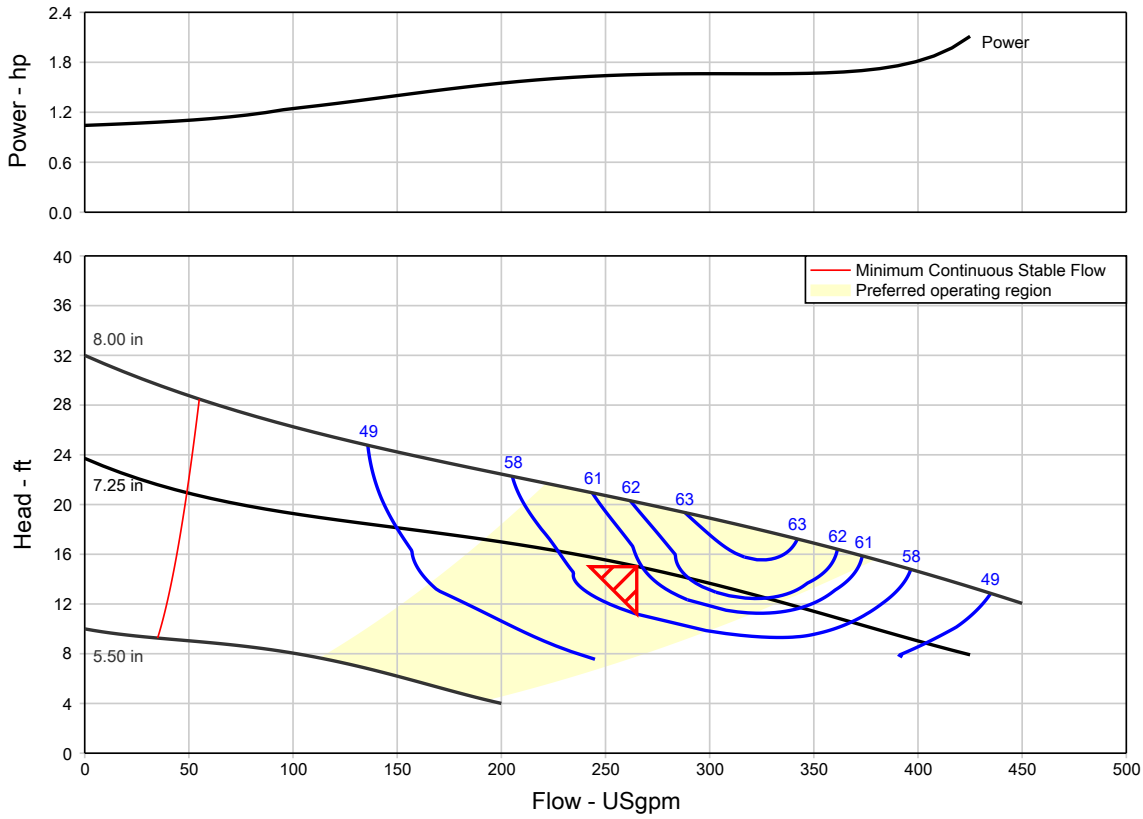
Material selected	: Standard

Pressure Data

Maximum working pressure	: 10.26 psi.g
Maximum allowable working pressure	: N/A
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: N/A

Driver & Power Data (@Max density)

Driver sizing specification	: Rated power
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 1.01 hp
Power, rated	: 1.65 hp
Power, maximum, rated diameter	: 2.11 hp
Minimum recommended motor rating	: 2.00 hp / 1.49 kW



7.3 Submittal Sheets for Lift Station Pumps

Item Number / Tags	: Default	Size	: Hydromatic - S4K
Service	:	Stages	: 1
Quantity	: 1	Based on curve number	: SUB_S_E_AH_00011_E_4 Rev 2012-03-23
Quote number	:	Date last saved	: 11 Nov 2022 10:32 AM

Operating Conditions

Flow, rated	: 475.0 USgpm
Differential head / pressure, rated (requested)	: 93.00 ft
Differential head / pressure, rated (actual)	: 94.66 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed criteria	: Synchronous
Speed, rated	: 1750 rpm
Impeller diameter, rated	: 10.13 in
Impeller diameter, maximum	: 12.00 in
Impeller diameter, minimum	: 8.50 in
Efficiency	: 67.77 %
NPSH required / margin required	: - / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 28 / - Metric units
Minimum Continuous Stable Flow	: 144.6 USgpm
Head, maximum, rated diameter	: 118.2 ft
Head rise to shutoff	: 27.07 %
Flow, best eff. point	: 669.0 USgpm
Flow ratio, rated / BEP	: 71.00 %
Diameter ratio (rated / max)	: 84.38 %
Head ratio (rated dia / max dia)	: 66.17 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids diameter limit	: 3.00 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

Material selected	: Standard

Pressure Data

Maximum working pressure	: 51.16 psi.g
Maximum allowable working pressure	: N/A
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: N/A

Driver & Power Data (@Max density)

Driver sizing specification	: Rated power
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 11.16 hp
Power, rated	: 16.46 hp
Power, maximum, rated diameter	: 24.63 hp
Minimum recommended motor rating	: 20.00 hp / 14.91 kW