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October 22, 2009

VIA HAND DELIVERY

Ann Cole, Commission Clerk
Office of Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, FL 32399

Re: Docket No. 090349-WS; Cypress Lake Utilities, Inc.'s Application for a Limited Proceeding Water and Wastewater Rate Increase in Polk County, Florida
Our File No. 30057.182

Dear Ms. Cole:

Enclosed for filing in the above-referenced docket are the Utility's Notice of Filing and Cypress Lakes WWTP Improvements Preliminary Engineering Report.

Should you or the Staff have any questions regarding this filing, please do not hesitate to give me a call.

Very truly yours,

CHRISTIAN W. MARCELLI
For the Firm

CWM/mp
Enclosures

cc: Jennifer Brubaker, Esquire, Office of General Counsel (w/o enclosure) (via e-mail)
Bart Fletcher, Division of Economic Regulation (w/o enclosure) (via e-mail)
Curt Mouring, Division of Economic Regulation (w/o enclosure) (via e-mail)
John P. Hoy, Chief Regulatory Officer (w/o enclosure) (via e-mail)
Ms. Kirsten Weeks (w/o enclosure) (via e-mail)
Patrick C. Flynn, Regional Director (w/o enclosure) (via e-mail)

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Application of
CYPRESS LAKES UTILITIES, INC.
for a limited proceeding in
Polk County, Florida
_______________________________/

DOCKET NO. 080249-WS

NOTICE OF FILING

Applicant, CYPRESS LAKES UTILITIES, INC., by and through its undersigned attorneys, hereby gives notice of filing in the above-referenced docket CYPRESS LAKES WWTP IMPROVEMENTS PRELIMINARY ENGINEERING REPORT.

Respectfully submitted this 22nd day of October, 2009, by:

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For the Firm

DOCUMENT NO. DATE
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CYPRESS LAKES WWTP IMPROVEMENTS PRELIMINARY ENGINEERING REPORT

Prepared by:

HDR Engineering, Inc.
315 E. Robinson Street, Suite 400
Orlando, Florida 32801

July, 2007

CYPRESS LAKES WWTP IMPROVEMENTS
PRELIMINARY ENGINEERING REPORT

Prepared by:

HDR Engineering, Inc.
315 E. Robinson Street, Suite 400
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J. Richard Voorhees
(SIGNATURE)
JOHN RICHARD VOORHEES, PE., BCEE
FL. P.E. LICENSE NO.: 25385

6/29/07
(DATE)

The signature and seal cover the entire document and the engineering drawings included herein

July, 2007

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CYPRESS LAKES WWTP PROPOSED MODIFICATIONS PRELIMINAR ENGINEERING REPORT

1. INTRODUCTION

1.1 PURPOSE

The purpose of this preliminary engineering report is to provide the Florida Department of Environmental Protection (FDEP) with a description of the design methodologies used for the proposed modifications to the Cypress Lakes Wastewater Treatment Plant (WWTP) in accordance with Chapters 62-600 and 62-610 of the Florida Administrative Code (F.A.C).

The modifications presented in this report are for the up-rating of the Cypress Lakes WWTP from 0.175 MGD 3-month average daily flow (3MDAF) to 0.190 MGD Three Month Rolling Average Daily Flow (3MADF). The modifications include replacement of the existing manual bar screen with a new static screen and screenings washing and dewatering system, adaptation of the existing surge tank to a grit compartment, upgrading of the existing Equalization Basin, replacement of the Equalization Basin Transfer Pumps with new submersible pumps of higher capacity and with variable frequency drives, construction of a new flow splitting structure, addition of centrifugal blowers to increase the aeration capacity of the existing Aeration Trains, and the addition of positive displacement blowers to provide aeration to the Equalization Basin and to the newer Sludge Holding Tank.

Information provided in this report is based on documentation provided by Blair Communities Cypress Lakes Utilities, Inc., the Capacity Analysis Report by Gierok Engineering, Inc (January 2006), the Process Evaluation Technical Memorandum by HDR Engineering, Inc (June, 2006), official monthly discharge monitoring reports (DMRs) and plans provided by FDEP (Tampa); and actual flow records provided by the Cypress Lakes WWTP.

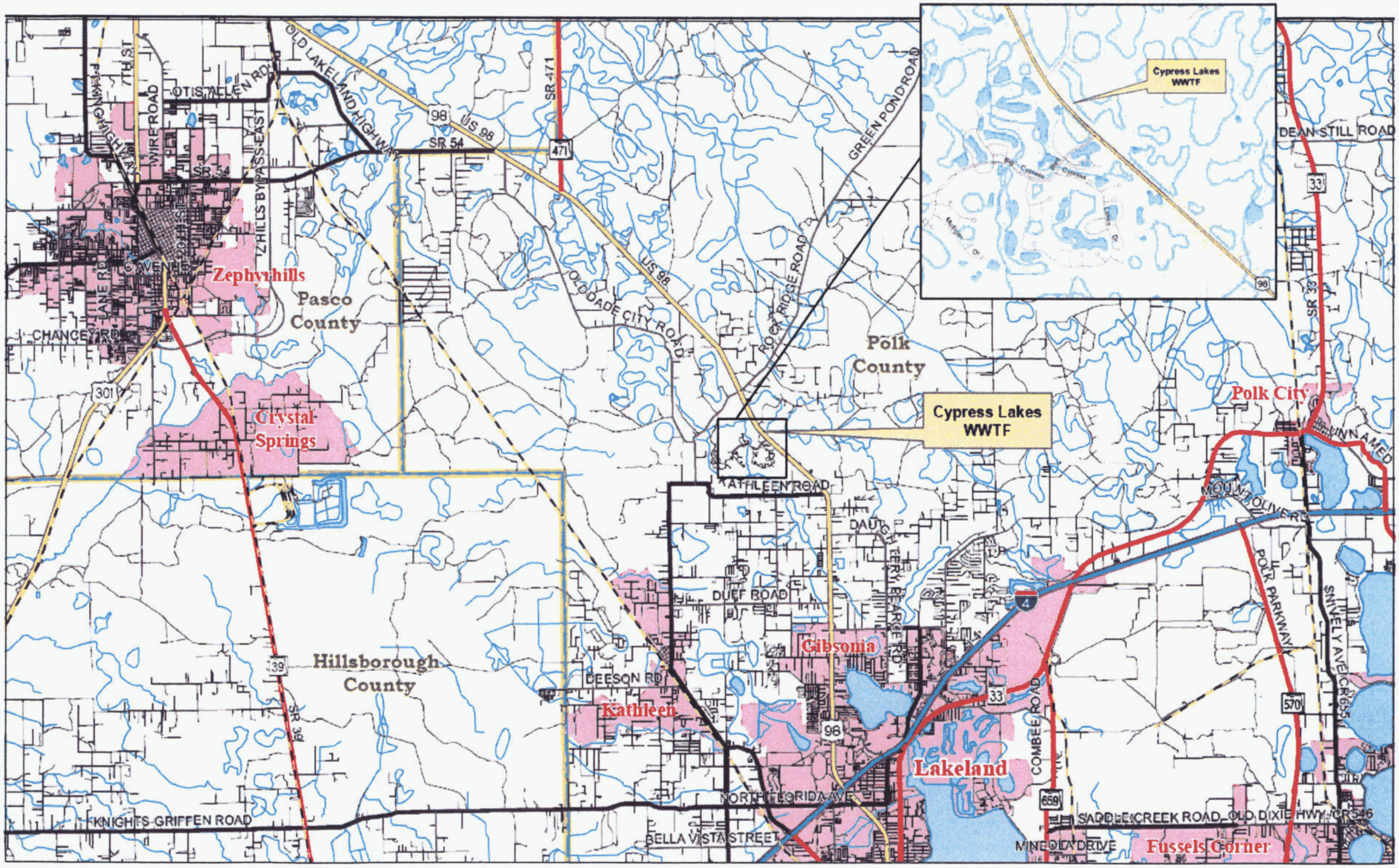
1.2 BACKGROUND

The Cypress Lakes WWTP is located in Polk County, north of the City of Lakeland, FL serving the Blair Communities - Cypress Lakes Retirement Community which has a projected buildout of 1,608 units. This WWTP provides advanced secondary treatment of wastewater by extended aeration, effluent filtration, and high level disinfection. The treated wastewater effluent from the facility is discharged to three (3), off-site storage ponds with capacity of 2.0 MGD each for a total storage capacity of 6 MGD. The reuse water is pumped from the off-site ponds into a public access reuse irrigation system that serves the community golf course and residential lots of the Cypress Lakes Communities. The WWTP is currently permitted for a capacity of 0.175 MGD on a three-month average flow (3MADF) basis and is classified as a Type II, Category III Facility in accordance with Chapters 62-600 and 62-699 FAC. Currently, the Cypress Lakes WWTP operates under the jurisdiction of the FDEP under operating permit FLA013123 issued on January 13, 2004 and with expiration date of January 12, 2009. Figure 1.1 illustrates the location of the Cypress Lakes residential area and the WWTP and Figure 1.2 depicts the Site Plan of the WWTP.

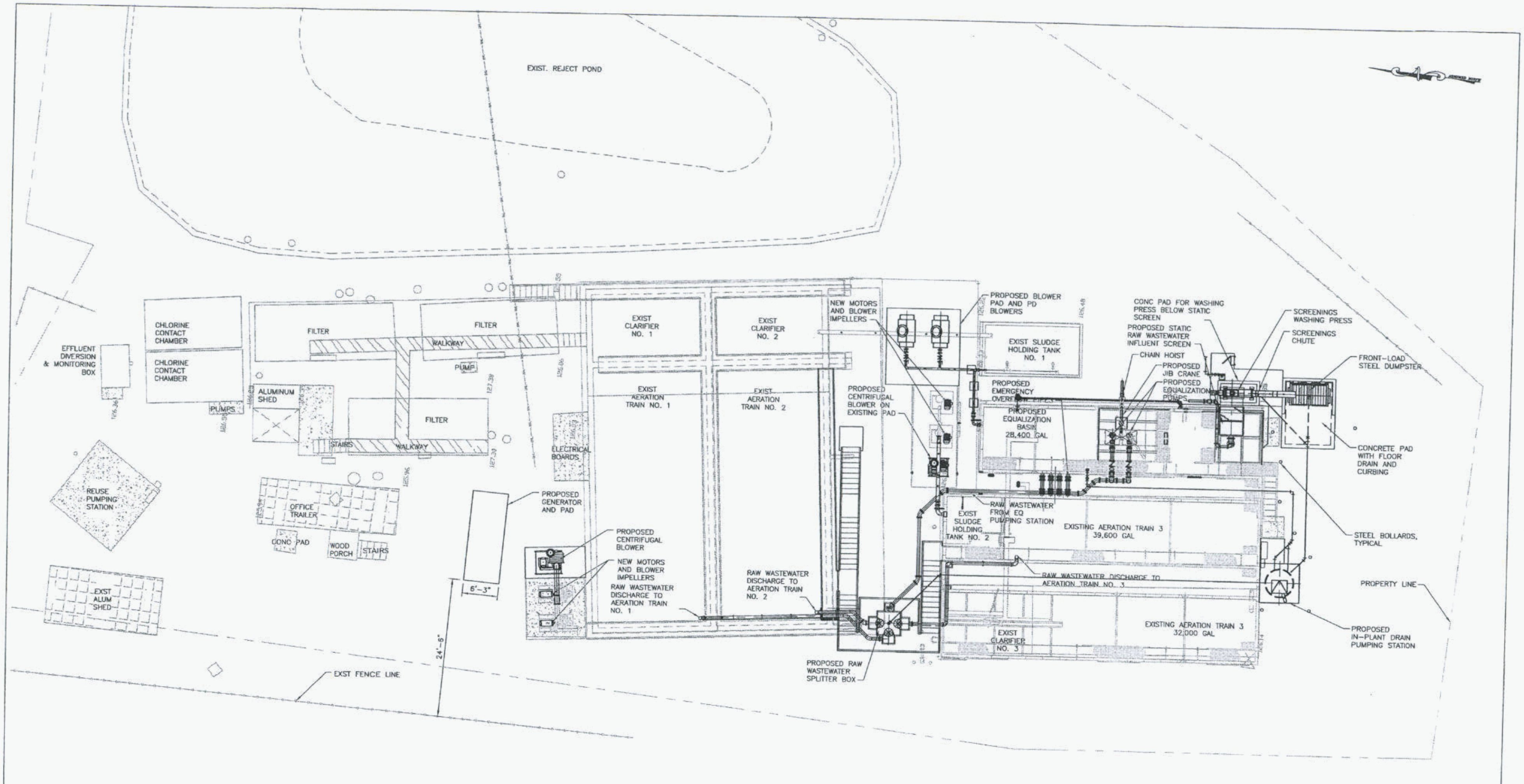
1.3 Scope of Services

The Preliminary Engineering Report for the Cypress Lakes WWTP Improvements was prepared to meet the regulatory requirements for up-rating the WWTP to meet the flows required for buildout of the community wastewater service area. The WWTP Preliminary Engineering Report includes the following:

- Includes projections of influent wastewater flow at buildout and establish design parameters for the proposed improvements.
- Provides the basis of design of the modifications and improvements of the selected treatment units. It also includes design criteria, design standards, and equipment selection necessary to support permitting for construction of the wastewater treatment facility improvements as required by Rule 62-600.700 and Rule 62-620 FAC.
- Summarize WWTP operation and control strategies for process upsets, and reliability.



HDR	CYPRESS LAKES UTILITIES, INC. WASTEWATER TREATMENT PLANT EXPANSION **CYPRESS LAKES WWTF LOCATION** PRELIMINARY ENGINEERING REPORT	DATE May, 2007 FIGURE 1.1



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HDR

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CYPRESS LAKES UTILITIES, INC.
WASTEWATER TREATMENT PLANT EXPANSION

SITE PLAN

PRELIMINARY ENGINEERING REPORT

DATE: July, 2007

FIGURE: 1.2

2. HISTORICAL AND FUTURE WASTEWATER FLOWS

2.1 GENERAL

The Cypress Lakes WWTP is a permanent facility providing advanced secondary treatment with effluent filtration and high-level disinfection for the raw domestic wastewater received from the Blair Communities - Cypress Lakes Retirement Community. The WWTP is owned and operated by Cypress Lakes Utilities, Inc. There are no plans for commercial or industrial development within this community and currently the Cypress Lakes WWTP does not receive commercial or industrial discharges. The population of the retirement community is seasonal with November through April as the period with higher occupancy; however, it is expected that in the future the population will become more permanent year round. The current operating permit for the Cypress Lakes WWTP issued by the FDEP on January 13, 2004 allows for an operating capacity of 0.175 MGD on a 3MADF basis. The projected 3MADF for the buildout capacity with 1,608 units in service has been estimated to be 0.190 MGD to provide sufficient treatment capacity at buildout flows. Maximum daily flows of 0.285 MGD and peak hour events of 0.665 MGD were estimated based on the peaking factors determined for this facility as discussed later in this report.

This section presents the current and projected flows at buildout and the criteria used to determine the peaking factors; the wastewater characteristics, and the effluent concentration limits.

2.2 AVERAGE FLOW REQUIREMENTS

2.2.1 CURRENT AND HISTORICAL AVERAGE FLOWS

Historical monthly average daily flows (MADF) from a period of five years (January 2002 through December 2006), daily average flows (ADF) from a 3-year period between October 2003 and December 2006, and hourly flows for the year 2006 were obtained from the Cypress Lakes WWTP DMRs and from the plant's influent flow meter charts, to estimate the future flows at buildout. A summary of the monthly average, maximum, and annual average flows during the analyzed 5-year period is presented in Table 2.1.

Variation of 3MADFs during the last three years (2004-2006) was minimal ranging from 0.118 to 0.124 MGD 3MADF. Similarly, maximum monthly average flows (MMADFs) did not show significant variation during the same period of time ranging from 0.145 to 0.152 MGD.

TABLE 2.1 HISTORICAL MONTHLY AVERAGE DAILY FLOWS FROM 2002 TO 2006

Month	Year				
	2002	2003	2004	2005	2006
January	0.118	0.124	0.131	0.131	0.136
February	0.124	0.132	0.147	0.146	0.145
March	0.126	0.138	0.135	0.150	0.143
April	0.109	0.117	0.126	0.152	0.136
May	0.088	0.097	0.099	0.108	0.109
June	0.105	0.098	0.099	0.118	0.103
July	0.112	0.092	0.101	0.113	0.107
August	0.104	0.094	0.104	0.099	0.100
September	0.104	0.094	0.117	0.103	0.106
October	0.104	0.100	0.114	0.117	0.110
November	0.104	0.119	0.122	0.126	0.134
December	0.102	0.116	0.121	0.121	0.131
Three Month Rolling Average Daily Flow	0.108	0.110	0.118	0.124	0.122
Max. Monthly Average Flow	0.126	0.138	0.147	0.150	0.145
Max. Month	Mar.	Mar.	Feb.	Mar.	Feb

These patterns suggest that flow increments are affected by new service connections to the sewer system rather than by changes in water consumption habits from residents. Additionally, the average number of residents per unit is not expected to increase significantly since it is mostly a retirement community. Consequently, the individual wastewater production rate per connected unit was assumed to be constant for the historical and projected flows. To calculate this rate for the connected units, the 3MADF of 0.124 MGD recorded for year 2005 was selected and divided by the number of units connected to the sewer system during this year (1,265). The resulting wastewater production rate per unit was 98 gallons per day (gpd) on a 3MADF basis. Thus, the rate used to project the buildout flows for design was set at 100 gpd per connected unit.

2.2.2 PROJECTED AVERAGE FLOWS

The projected average flow was calculated based on the wastewater unit production rate of 100 gpd/unit. It has been projected by the developer of the community that at buildout 1,608 residential units, including the common areas, will be connected to the sewer system serviced by the Cypress Lakes WWTP. At a rate of 100 gallons per day per unit, it was estimated that a three month average daily flow of 0.161 MGD will be entering the plant at buildout. However, because the community serviced is seasonal and maximum month average flows occur for a period of approximately six months November to April) and to provide sufficient treatment capacity at buildout, it is recommended that the modifications to the Cypress Lakes WWTP are designed based on a 3MADF of 0.190 MGD.

2.3 PEAK WASTEWATER FLOWS

The maximum day flow (MDF) peaking factor was calculated from the three month average daily flows between October 2003 and December 2006. Table 2.2 presents a summary of the maximum day flow that occurred each month during the analyzed period.

TABLE 2.2 HISTORICAL MDFS BETWEEN OCTOBER 2003 AND DECEMBER 2006

Year	2003		2004		2005		2006	
	3MADF = 0.110 MGD		3MADF = 0.118 MGD		3MADF = 0.124 MGD		3MADF = 0.122 MGD	
Month	MDF (MGD)	MDF to 3MADF Ratio (PF)	MDF (MGD)	MDF to 3MADF Ratio (PF)	MDF (MGD)	MDF to 3MADF Ratio (PF)	MDF (MGD)	MDF to 3MADF Ratio (PF)
January	-	-	0.166	1.4	0.170	1.4	0.165	1.4
February	-	-	0.177	1.5	0.161	1.3	0.181	1.5
March	-	-	0.172	1.4	0.223	1.8	0.156	1.3
April	-	-	-	-	0.156	1.3	0.165	1.3
May	-	-	0.132	1.1	0.159	1.3	0.140	1.1
June	-	-	0.118	1.0	0.140	1.2	0.142	1.2
July	-	-	0.127	1.1	0.144	1.2	0.147	1.2
August	-	-	-	-	0.131	1.1	0.116	1.0
September	-	-	0.146	1.2	0.119	1.0	0.147	1.2
October	0.113	1.0	0.135	1.1	0.167	1.4	0.132	1.1
November	0.156	1.4	0.140	1.2	0.141	1.2	0.149	1.2
December	0.148	1.4	0.137	1.2	0.150	1.2	0.166	1.4

The MDF peaking factors (PF) occurring between the months of October and April during the analyzed years range between 1.3 and 1.5. The PF of 1.8 calculated for the maximum day flow of March 2004 is atypical. The maximum day flow of 0.223 MGD occurring that month is an isolated event and is well above the maximum flows entering the plant during the past 4 years.

Despite the increment in the 3MADF during the last years, the ratio between the recorded maximum day flows and the 3MADF has presented the same trends ranging between 1.2 and 1.5. Therefore, a peaking factor of 1.5 was selected to calculate the current and buildout MDFs.

The peak hour flow (PHF) peaking factor was determined from hourly flow records from the year 2006. Hourly flows data for previous years was not available. Table 2.3 presents a summary of the highest peak hour flow recorded each month during 2006 and the associated peaking factor.

TABLE 2.3 HISTORICAL PHFS DURING THE YEAR 2006

Year	2006	
	3MADF = 0.122	
Month	PHF (MGD)	PHF's PF
January	0.362	3.0
February	0.449	3.7
March	0.321	2.6
April	0.295	2.4
May	0.267	2.2
June	0.427	3.5
July	0.319	2.6
August	0.276	2.3
September	0.255	2.1
October	0.239	2.0
November	0.330	2.7
December	0.341	2.8

Most of the PHF peaking factors shown in Table 2.3 are below 3.0. However, to offer a conservative design and to provide enough capacity for peak hour events occurring during filter backwashing periods and other maintenance activities that require re-circulating flow, a PF of 3.5 will be used to estimate the current and buildout PHFs. The analyzed data including daily and hourly flows from the period studied are shown on Figure 2.1 and Figure 2.2.

2.4 PROJECTED BUILDOUT WASTEWATER FLOWS

Table 2.4 presents a summary of the projected buildout flows used as a basis of design for the proposed modifications for the Cypress Lakes WWTP improvements. The peaking factor that will be handled by the process units will be discussed later in the report in the section including the equalization basis analysis. The values shown in Table 2.4 have been estimated as discussed previously in this section.

TABLE 2.4 PROJECTED BUILDOUT WASTEWATER FLOWS

Description	Value	Units
Wastewater connected unit production rate	100	gallons per connected unit
Three Month Rolling Average Daily Flow (3MADF)	0.190	MGD
Maximum Daily Flow (MDF)	0.285	MGD
Peak Hour Flow (PHF)	0.665	MGD

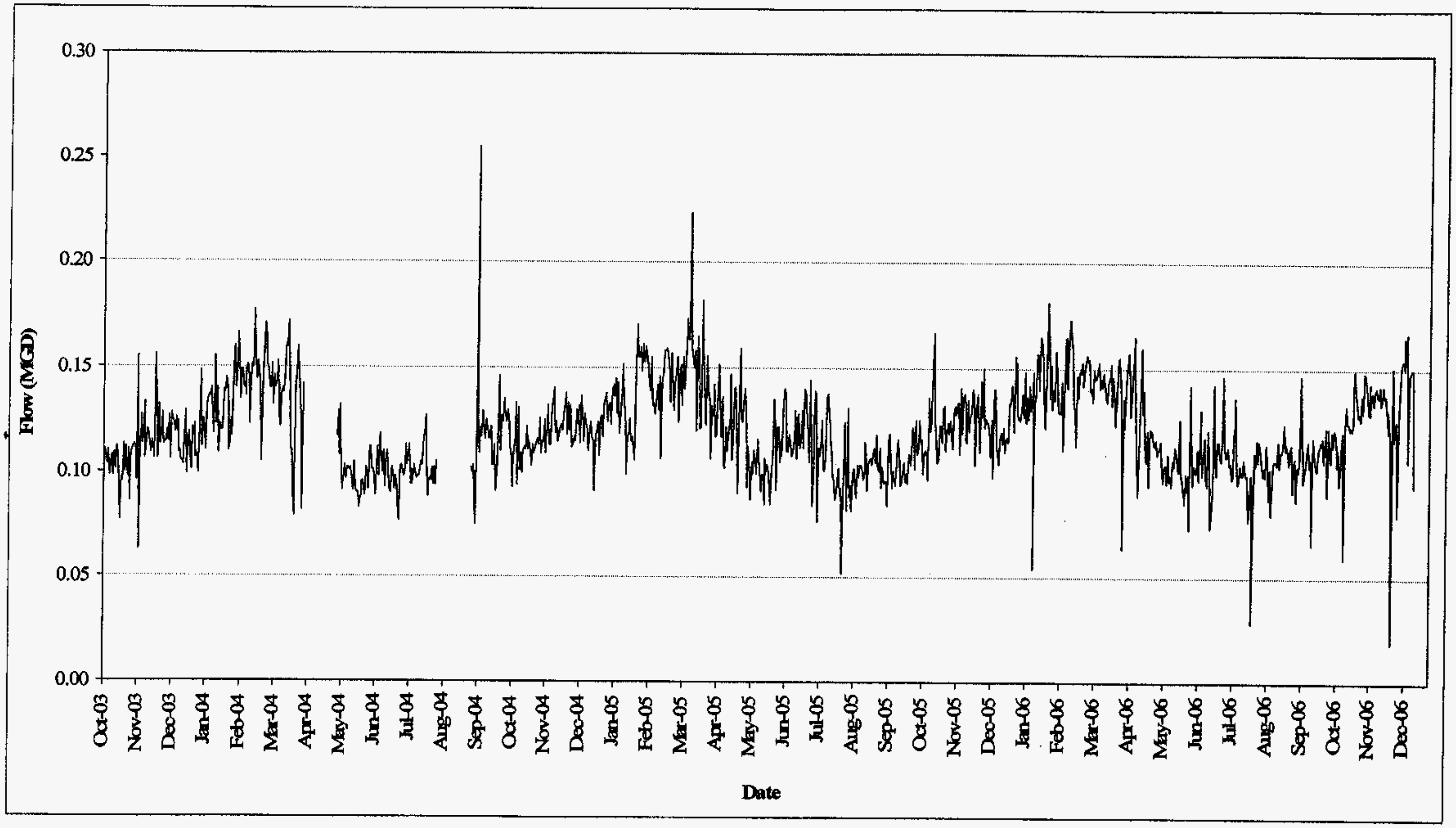


FIGURE 2.1 CYPRESS LAKES WWTP AVERAGE DAILY FLOWS BETWEEN OCTOBER 2003 AND DECEMBER 2006

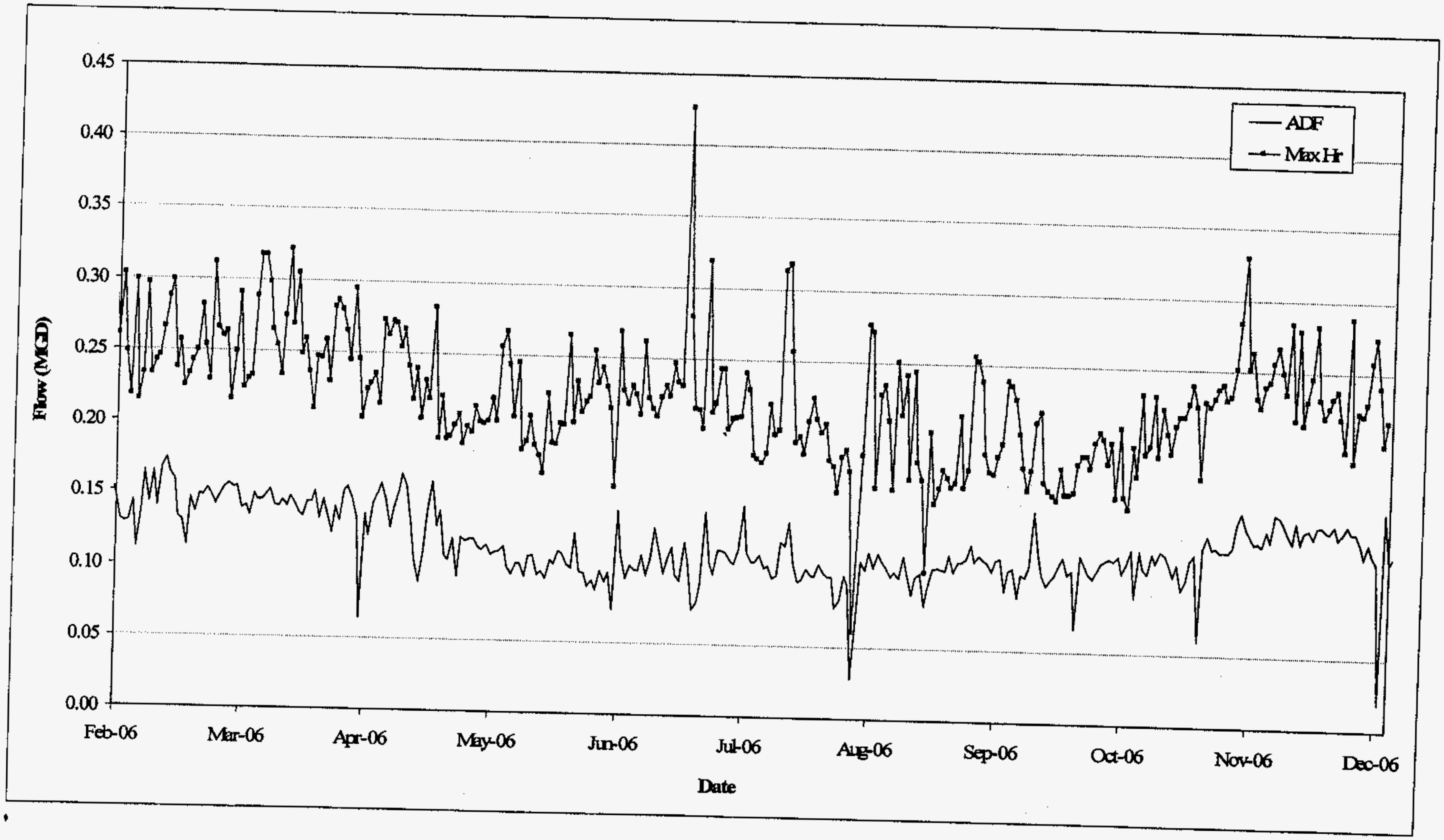


FIGURE 2.2 CYPRESS LAKES WWTP AVERAGE DAILY FLOWS AND PEAK HOUR FLOWS DURING YEAR 2006

2.5 Wastewater Characteristics

Table 2.5 summarizes historical influent and effluent wastewater characteristics from data reported in the 2005 treatment plant's Discharge Monitoring Report (DMR). Monthly average, minimum, and maximum influent five-day carbonaceous biological oxygen demand ($CBOD_5$) and total suspended solids (TSS) are shown as well as effluent $CBOD_5$, TSS, Turbidity, Total Residual Chlorine (TRC), and Fecal Coliforms.

Table 2.5 Wastewater Characteristics

Location	Influent		Effluent									
Parameter	$CBOD_5$	TSS	$CBOD_5$			TSS	pH		Fecal Coliform		Turbidity	TRC
Basis	-	-	An Avg	Mo Avg	Max	Max	Min	Max	Min	Max	Max	Min
Units	-	-	mg/L	mg/L	mg/L	mg/L	SU	SU	#/100 mL	#/100 mL	NTU	mg/L
Limit	-	-	**20.0**	**30.0**	**60.0**	**5.0**	**6.0**	**8.5**	**N.D.**	**25**	**3.0**	**1.0**
January	470	480	2.0	2.0	2.0	2.6	7.1	7.5	100%	<1.0	0.79	1.6
February	270	110	2.0	2.0	2.0	2.4	7.0	7.5	100%	<1.0	1.24	4.8
March			2.0	2.1	2.1	4.4	7.0	7.4	100%	<1.0	3.20	0.8
April			2.0	2.0	2.0	4.8	7.2	7.5	100%	4.0	4.90	1.5
May	530	110	2.0	2.2	2.2	8.0	7.1	7.4	100%	<1.0	2.90	1.1
June	140	520	2.0	2.0	2.0	2.0	7.1	7.4	100%	1.0	2.10	0.8
July	240	84	2.0	2.0	2.0	3.4	7.1	7.4	100%	<1.0	2.40	0.5
August	860	230	2.0	2.0	2.0	10.0	6.9	7.3	100%	<1.0	1.90	0.7
September	235	135	<2.0	<2.0	<2.0	4.0	7.1	7.4	100%	<1.0	1.40	0.2
October	530	140	2.0	3.4	4.8	<2.0	7.1	7.6	100%	<1.0	1.50	0.2
November	100	140	<2.0	<2.0	<2.0	<2.0	7.0	7.4	100%	<1.0	1.30	0.2
Average	375	217	2.0	2.0	2.3	4.6	7.1	7.4	100%	1	2.15	1.1
Minimum	100	84	2.0	2.0	2.0	2.0	6.9		100%		0.79	0.2
Maximum	860	520	2.1	2.1	3.4	10.0		7.6	100%	4	4.90	

* Percentage of the fecal coliform values below detection limits over a 30-day period.

According to the wastewater effluent concentrations presented in Table 2.5, the Cypress Lakes WWTP is performing within the permitted limits with exception of TSS during the month of August. Turbidity exceeded the set point limits during the months of March and April. The turbidity values exceeding the operating set point could be related to limited capacity of the filters which will be later discussed in this report. The maximum TSS sample for May occurred because of a sample error.

Diversion of effluent to the reject storage pond for low chlorine occurred only for the dates of 08/10/05 and 08/23/05. All other low residual data occurred due to either a faulty battery back-up system or the residual returned to within acceptable levels prior to the five (5) minute alarm period, according to the DMRs for year 2005.

According to the historical data obtained from the plant's DMRs, the characteristics of the raw wastewater discharges to the Cypress Lakes WWTP correspond to a medium to high strength domestic wastewater based on the classification by Metcalf and Eddy, Inc. in "Wastewater Engineering: Treatment and Reuse", Fourth Edition (M&E, 2004). The average influent concentration of $CBOD_5$ and TSS (245 mg/L and 229 mg/L respectively) were calculated from the monthly average for each parameter reported in the DMRs during a three-year period (November 2003 to November 2006)..Parameters such as the influent Total Kjeldahl Nitrogen (TKN) and Total Phosphorus (TP) were assumed to be 40 mg/L as N and 12 mg/L as P respectively, based on the typical values for medium strength domestic wastewater included in the reference above. These concentrations were used to verify the capacity of the existing process units and as a base for design.

3. EXISTING TREATMENT PLANT

3.1 PURPOSE

The purpose of this section is to provide a detailed summary of the existing processes and equipment at the Cypress Lakes WWTP.

3.2 PERMITTED CAPACITIES AND EFFLUENT CONCENTRATION LIMITS

The current operating permit for the Cypress Lakes WWTP issued by the FDEP on January 13, 2004 allows for an operating capacity of 0.175 MGD on a 3MADF basis. This permit will expire on January 12, 2009. This permit includes land application of the treated effluent for a 0.175 MGD twelve-month average daily flow (12MADF) slow-rate public access reuse system (R-001). This system consists of 3 off-site unlined effluent storage ponds located on the Cypress Lakes Golf Course. It should be noted that unlined ponds may allow rapid infiltration to the ground water, which may be a concern in the future due to the high concentrations of nitrate in the effluent.

The reuse/land application of the effluent requires that it meets the concentration limits established by the FDEP and the United States Environmental Protection Agency (EPA). Such concentration limits vary according to the level of treatment of the wastewater facility. The Cypress Lakes WWTP is classified as a Type II, Category III facility for the secondary treatment of domestic wastewater including secondary organic wastewater treatment, advanced effluent filtration, and high level disinfection. Table 3.1 summarizes the effluent concentration limits for this type of facility.

TABLE 3.1 LAND APPLICATION/REUSE SYSTEM EFFLUENT CONCENTRATION LIMITS

Parameter	Limit		Basis
	Minimum	Maximum	
Flow (MGD)	-	0.175	12 MADF
$CBOD_5$ (mg/L)	-	20.0	Annual Average
	-	30.0	Monthly Average
	-	60.0	Single Sample
TSS (mg/L)	-	5	Single Sample
Turbidity (NTU)	-	3.0	Continuous
pH	6.5	8.5	Single Sample
Chlorine Residual (mg/L)	1.0	-	Single Sample
Fecal Coliforms (Non detectable)	75%*	-	30-day period

* 75% of the fecal coliform values below detection limits over a 30-day period.

3.3 PROCESS DESCRIPTION

The Cypress Lakes WWTP is permitted as a 0.175 MGD 3MADF Type II, Category III, extended air domestic wastewater treatment facility. The plant receives the domestic wastewater flows from the Blair Communities Development – Cypress Lakes Retirement Community. The projected buildout flows discussed in Subsection 2.4 estimate that the plant will receive a 0.190 MGD Three Month Rolling Average Daily Flow (3MADF), a maximum daily flow (MDF) of 0.285 MGD, and a peak hour flow (PHF) of 0.665 MGD with an ultimate buildout of 1,608 residences connected to the sewer system. As indicated previously, the Cypress Lakes WWTP does not receive any commercial or industrial flow and there are no plans for commercial or industrial development. The existing facility consists of the processes listed below and illustrated in the Flow Diagram in:

- One (1) manually cleaned bar rack with 1-inch openings.
- One (1) 15,000 gallon aerated surge tank with two (2), 2-inch 1-HP submersible grinder pumps, each with a capacity of 100 gpm at 12 ft. TDH.
- Three (3) activated sludge aeration basins with a total combined capacity of 256,000 gallons, with diffused aeration. Two (2) aeration basins (Trains 1 and 2) each consists of a single tank with a volume of 79,100 gallons and one (1) aeration basin (Train 3) consists of three tanks in series, with individual volumes of 28,400 gallons (Tank No. 1), 39,600 gallons (Tank 2) and 32,000 gallons (Tank 3).
- Two (2) 20-HP centrifugal blowers each with an estimated capacity of 300 cfm at a discharge pressure of 4 psig, based on manufacturer's information and equipment curves. These blowers provide air to Aeration Train 3, the sludge digesters, and the surge tank through coarse bubble diffusers.
- Two (2) 30-HP centrifugal blowers each with an estimated capacity of 450 scfm at a discharge pressure of 6 psig, based on manufacturer's information and equipment curves. These blowers provide air to the Aeration Trains 1 and 2 through coarse bubble diffusers.
- Three (3) rectangular clarifiers with a total surface area of 708 square feet. Clarifiers 1 and 2 each with a side water depth of 11 ft. and clarifier 3 with a side water depth of 10.5 ft.
- Three (3) gravity sand filters. Two (2) of the filters have a surface area of 50 square feet each, and one (1) filter has a surface area of 40 square feet, for a total combined surface area of 140 square feet.
- Two (2) chlorine contact chambers, each with a volume capacity of 2,500 gallons.
- Two (2) 50-HP effluent reuse pumps, each with a capacity of 900 (gpm) at 175 psi.
- Two (2) aerobic sludge holding tanks with a total combined capacity of 17,200 gallons.
- One (1) substandard effluent reject pond with a total volume of 0.231 MGD.

The effluent reject pond receives the effluent of the filtration units and the chlorine contact chambers not meeting the turbidity and chlorine residual concentrations stipulated in the plant operating protocol. The reject water is pumped from the effluent reject pond back to the head of the plant during low flow periods.

High-level disinfection is achieved by adding sodium hypochlorite solution to the filtered effluent and providing sufficient contact time and chlorine to meet the minimum residual requirements for public access reuse.

The sludge in the holding tanks is disposed of by hauling the liquid sludge to an off-site sludge processing facility, operated by a third party.

The following sections of this report will provide descriptions of the existing facilities along with the proposed modifications at the Cypress Lakes WWTP.

3.4 RAW WASTEWATER SCREENING

The raw wastewater screening facility is a manual bar screen with openings of maximum size 1-inch housed in a 2-ft x 2-1/2-ft fabricated, galvanized steel box, located on top of the existing surge tank.

3.5 FLOW EQUALIZATION BASIN

The Cypress Lakes WWTP currently operates with a steel surge tank with a volume of 15,000 gallons. This unit does not operate as an equalization basin as proper dampening of the peak flows is not achieved by the unit due to its small volume available. According to the operations staff of the Cypress Lakes WWTP the capacity of the surge tank is limited during the winter months when high flows are received at the plant due to a seasonal increase on the population served. During these high-flow periods, the flow may have to be directed to the effluent reject pond in order to avoid overflow of the surge tank.

3.5.1 EQUALIZATION BASIN TRANSFER PUMPS AND AERATION

The surge tank is equipped with two (2) submersible sewage grinder pumps, each sized for 100 gpm at 12 ft TDH. Each pump is furnished with a 1 horsepower (HP) single-phase, 230 VAC motor. The size of the discharge piping is 2-inch. These pumps will not provide sufficient pumping capacity at the projected buildout flows.

Aeration of the surge tank is currently provided by centrifugal blowers. These blowers are primarily used to provide air to the Aeration Train 3 and to the two (2) existing sludge holding tanks. At the projected buildout flows the air requirements of the process units will increase and additional blowers for the equalization basin will be required. In addition, centrifugal blowers are not recommended for equalization tank applications due to their inability to properly operate at a wide range of liquid levels. In this case, positive displacement blowers are more suitable to provide air without compromising performance.

3.6 AERATION BASINS

The secondary treatment at the Cypress Lakes WWTP consists of three (3) extended Aeration Trains operated in parallel. Aeration Trains 1 and 2, constructed as part of the latest WWTP modification, have a capacity of 79,100 gallons each. Each train has its own clarification unit from which return activated sludge (RAS) is returned to the head of each aeration tank. Aeration Train 3 consists of three tanks in series with a combined capacity of 100,000 gallons distributed as follows: the first tank with capacity of 28,400 gallons, the second tank with capacity of 39,600 gallons, and the third tank with a capacity of 32,000 gallon. The clarifier receiving the effluent of the Aeration Train 3 has a surface area of 228 ft^2. A RAS pump is located in the clarifier to return the RAS to the first tank (Tank No. 1) of Aeration Train 3. The total aeration volume of the three Aeration Trains is 258,200 gallons.

The existing capacity of each Aeration Train is sufficient to handle the current and projected buildout flows, based on the predictions of the biological model for the Single Stage Activated Sludge process developed by The ECES Group, LLC. Table 3.2 presents a summary of the model results.

TABLE 3.2 CAPACITIES OF THE EXTENDED AERATION TRAINS AT 0.121 MGD 3MADF

Description	Units	Train 1	Train 2	Train 3
Flow: 0.121 MGD (Average 3MADF 2004-2006)				
Percentage of 3MADF	%	31%	31%	39%
Volume	gallons	79,100	79,100	100,000
3MADF	MGD	0.037	0.037	0.047
HRT[1]	Hours	51.2	51.2	51.2
SRT[2]	Days	54.8	54.8	54.8
Effluent sol. $CBOD_5$	mg/L	1.6	1.6	1.6

1. Hydraulic retention time (HRT).

2. Solids retention time (SRT)

The high HRT's and SRT's at the current flows will provide flexibility to the operation during peak flow events at the projected buildout flows without compromising the organic matter removal efficiencies.

3.7 Blowers for Aeration Trains

Aeration to the existing Aeration Trains 1 and 2 is provided by two (2), 30-HP centrifugal blowers, each with a capacity of 450 scfm at an estimated discharge pressure of 6.0 psig according to the manufacturer's catalog curve. Aeration Train 3 is aerated with two (2), 20 HP centrifugal blowers, each with a capacity of 300 scfm at an estimated discharge pressure of 4.0 psig according to the manufacturer's catalog curve. The two (2), 20 HP blowers are also used to supply air to the existing surge tank and the two (2) existing sludge holding tanks.

The capacity of the existing blowers is sufficient to handle average and peak flows/loads at the current ADF of 0.121 MGD and at ADF's of up to 0.160 MGD. However, Class I Reliability operation is not achieved at any of these flows. Class I reliability is required by FDEP Chapter 62-610 for non-restricted public access to areas where treated effluent is applied. The current aeration system capacity will meet the air demands at the projected buildout flows only if redundant units are added and the discharge pressure of the existing blowers is increased.

3.8 Clarifiers

The existing plant has three (3) rectangular clarifiers with a total surface area of 708 square feet. One (1) clarifier with a surface area of 228 square feet treats the effluent from the Aeration Train 3. One (1) clarifier with a surface area of 240 square feet treats the effluent from Aeration Train 1 and one (1) clarifier also with a surface area of 240 square feet treats the effluent from Aeration Train 2.

Each of the three clarifiers has sufficient capacity to treat the current flows without flow equalization of peak flows. Table 3.3 presents a summary of the loading rate of the clarifiers at the current flows. The PHF was used as the design flow due to the existing limitations of the surge tank and to verify the capacity of the clarifiers at the worst case scenario.

TABLE 3.3 CLARIFIERS CAPACITY AT 0.121 MGD 3MADF

Parameter	Design Criteria	Units
No. of Existing Clarifiers:	3	
Surface Area of Existing Clarifiers 1 and 2 (each):	240	sqft.
Surface Area of Existing Clarifier 3:	228	sqft.
Weir Length of Existing Clarifiers 1 and 2 (2x19-ft each -per survey):	38	ft.
Weir Length of Existing Clarifier 3: (2x13.6-ft -per survey)	27.2	ft.
MLSS	3,500	mg/L
Return Activated Sludge Flow	0.182	MGD
Design Peak Flow (PHF)	0.424	MGD
Clarifier Loadings at Design Flow		
Maximum Allowable Surface Overflow Rate (SOR)	1,000	gpd/sqft.
Design Flow SOR Clarifiers 1 and 2 (each):	541	gpd/sqft.
Design Flow SOR Clarifier 3:	719	gpd/sqft.
Class 1 Reliability Design Flow SOR	905	gpd/sqft.
Maximum Allowable Solids Loading Rate (SLR)	35	ppd/sqft
MDF SLR Clarifiers 1 and 2 (each):	14	ppd/sqft
MDF SLR Clarifier 3:	19	ppd/sqft
Class 1 Reliability MDF Solids Loading Rate	23	ppd/sqft
Maximum Allowable Weir Loading Rate at Design Flow	20,000	gpd/ft.
Design Flow Weir Loading Rate for Clarifiers 1 and 2 (ea)	3,414	gpd/ft.
Design Flow Weir Loading Rate for Existing Clarifier 3:	4,805	gpd/ft.
Class 1 Reliability Design Weir Loading Rate	6,515	gpd/ft.

3.9 GRAVITY SAND FILTERS

Effluent filtration at the Cypress Lakes WWTP comprises three (3) gravity sand filters with a total surface area of 140 ft^2. One (1) filter has a surface area of 40 square feet and the other two (2) filters, each have a surface area of 50 square feet.

Each filter has granular filter media composed of an upper layer of anthracite with effective size of 1.4 mm to 1.8 mm and uniformity coefficient of less than 1.7, and a bottom layer of sand with effective size of 0.8 mm to 1.0 mm and uniformity coefficient of less than 1.7. The depth of each layer is 24 inches, for a total media depth of 48 inches. A gravel bed with depth of 6 inches supports the sand layer, with stone sizes ranging from 1/12-inch to ¾-inch. The backwash system includes two (2) backwash pumps with capacity 305 gpm each and two (2) backwash-return pumps with a capacity of 90 gpm each. According to the operations staff, filter backwash is required twice a day during the winter months and 3 times a week during the summer months. Each backwash period is approximately 15 minutes per filter.

The filter units have capacity to handle the current flows based on a maximum loading rate of 4.0 gpm/sqft. However, if one filter is out of service and at the same time a second filter is being backwashed, the loading rate of the filter in operation is almost two times the maximum loading rate. Therefore, no backwashing operations should be performed during peak hourly flows when one unit is out of service. At the projected flows, the filters will no require any expansion provided that proper flow equalization is taking place. The filtration capacity will be verified for the projected buildout flows later in this report. Table 3.4 presents a summary of the current filtration capacity.

TABLE 3.4 GRAVITY SAND FILTERS CAPACITIES AT 0.121 MGD 3MADF

	Description	Value	Unit
A. Design Criteria			
	3MADF	0.121	MGD
	Design Peak Flow (PHF without EQ):	0.424	MGD
	Maximum Allowable Loading Rate	4.0	gpm/sqft
B. Existing Gravity Sand Filters –One Unit out of Service			
	No. of Filters:	3	Units.
	Total Surface Area:	140	sqft.
	Design Surface Area (Largest unit out of service)	90	sqft.
	Design Peak Flow Loading Rate for Existing Filters	3.3	gpm.
C. Existing Gravity Sand Filters –One Single Unit Operating			
	Design Surface Area (Largest unit out of service and second largest unit on backwash)	7.4	gpm/sqft

3.10 CHLORINE CONTACT CHAMBERS

The current disinfection system consists of two (2) chlorine contact basins with a capacity of 2,500 gallons each, for a total capacity of 5,000 gallons. The Cypress Lakes WWTP provides high level disinfection for the effluent which requires at least a total chlorine residual (TCR) of 1.0 mg/L at all times, a minimum acceptable contact time of 15 minutes at peak hourly flow, and fecal coliform values below detectable limits, following disinfection.

The capacity of the CCCs was determined based on the current peak hour flow given that proper flow equalization is not currently provided. For a PHF equal to 3.5 times the 3MADF (0.424 MGD), and with both contact basins in operation, the estimated detention time is 17 minutes and the resulting TCR is 7.1 mg/L at a CT of 120. However, if one unit is out of service the contact time will drop to 9 minutes and the TCR will be 14 mg/L. Hence, the existing chlorine contact chambers do not have the capacity to handle the current flows providing class I reliability if proper flow equalization is not provided and will not be able to provide the minimum detention times at the buildout flows.

Table 3.5 presents a summary of the current capacity of the disinfection system.

TABLE 3.5 CHLORINE CONTACT CHAMBERS CAPACITY AT 0.121 MGD 3MADF

Description	Value	Units
A. Design Criteria		
Monthly Average Day Demand (MADD):	0.121	MGD
Design Peak Flow (PHF without EQ and MDF with EQ):	0.424	MGD
Max. MADF	0.182	MGD
Class I Reliability (100% Design Peak Flow):	0.424	MGD
Minimum Detention Time:	15	minutes
B. Existing CCC 1 & 2		
No. of Trains:	2	
Volume Per Train:	2,500	gallons
Total Volume:	5,000	gallons
C. Capacities with 1.5 3MADF as Design Flow		
Maximum Detention Time at Design Peak Flow with all Units in Service:	17	minutes
Chlorine Residual at CT=120	7.1	mg/L
Detention Time at Class 1 Reliability with Largest Unit Out of Service:	9	minutes
Chlorine Residual at CT=120	14.1	mg/L

The calculated high residual concentrations may adversely affect golf course turf grass growth. If sufficient flow equalization is provided, the contact time of the basins will increase dropping the chlorine residual concentration to values less than 6.0 mg/L. Therefore, there is not need to increase the capacity of the chlorine contact basin if proper flow equalization is provided at the head of the plant and both basins are functional. It is not recommended that one basin is taken out of service during peak flow conditions at the current and buildout flows.

3.11 REJECT POND

The existing reject pond was surveyed to calculate its actual storage capacity. Based on the survey and the profile created with AutoCad/LandDesktop applications, and based on the location of the existing overflow pipes, the current storage capacity of the existing reject pond is 0.231 MG. This capacity exceeds the projected 3MADF of 0.190 MGD; therefore; no expansion of the reject pond will be required at the proposed buildout flows.

3.12 SUMMARY

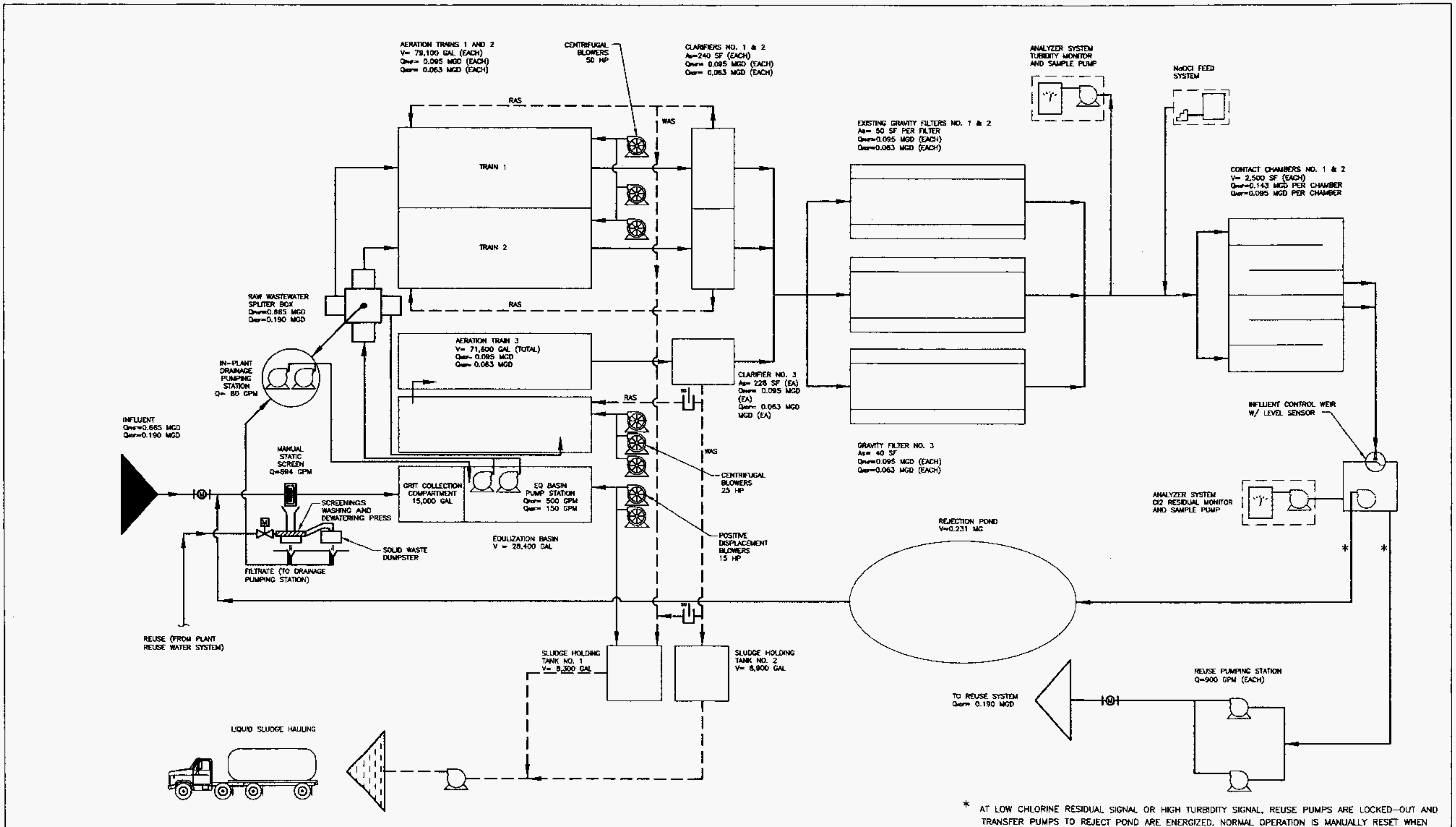
The Cypress Lakes WWTP does not have capacity to handle the buildout flows with Class I Reliability if flow equalization is not provided. At the current 3MADF of 0.121 MGD the surge tank does not have the capacity to handle peak events. The secondary treatment and filtration units have sufficient capacity at the current peak flows but this capacity may be limited at the projected buildout flows without proper flow equalization. The chlorine contact chambers capacity is affected by the limited capacity of the existing surge tank. Moreover, the filtration and disinfection units will not have enough capacity at buildout if the peak flows are not equalized. It should be noted that equal distribution of the flow is just as important as providing flow equalization.

4. PROPOSED IMPROVEMENTS

4.1 PURPOSE

The purpose of this section is to provide a detailed summary of the proposed improvements to the Cypress Lakes WWTP. Figure 4.1 depict the process flow diagram and Figure 4.2 and Figure 4.3 present the demolition plan and overall site improvements respectively. The improvements to the Cypress Lakes WWTP are discussed in further detail below:

1. Modification of the existing surge tank for service as a grit compartment.
2. Removal of the existing manual bar screen and splitter box and installation of new static screen and screenings washing and dewatering system in the proposed grit compartment (existing surge tank).
3. Modification of Tank No. 1 (part of aeration Train 3) for conversion to an equalization basin.
4. Installation of new flow equalization pumps with variable frequency drives designed with capacity for the estimated buildout flows, as well as worst case peak hour flow conditions without equalization.
5. Construction of a new splitter box for equal distribution of the flows to the three Aeration Trains. The splitter box will have walkways and stairs to connect Aeration Trains 1 and 2 to Aeration Train 3 to optimize operation efficiency.
6. Modifications to the existing aeration system which include:
    a. Installation of two (2) new positive displacement blowers to provide aeration to the proposed equalization basin and the sludge holding tank No. 1.
    b. Modifications to the existing air piping configuration to isolate Aeration Train 3 from the proposed equalization basin and grit compartment.
    c. Refitting of the existing centrifugal blowers providing air to the Aeration Trains 1 and 2, and to the centrifugal blowers providing air to the Aeration Train 3. The refurbishment includes replacement of the motors to higher horsepower units and addition of blower impellers to increase the discharge pressure of the existing blowers.
    d. Installation of one (1) centrifugal blower to provide air to Aeration Train 3 and to provide redundancy.
    e. Installation of one (1) centrifugal blower to provide air to the Aeration Trains 1 and 2 and one to provide redundancy to the system.
7. Installation of a new in-plant drainage pumping station with fiberglass wetwell basin and two (2) submersible wastewater grinder pumps each with capacity of 80 gpm at 43.7 ft. TDH.



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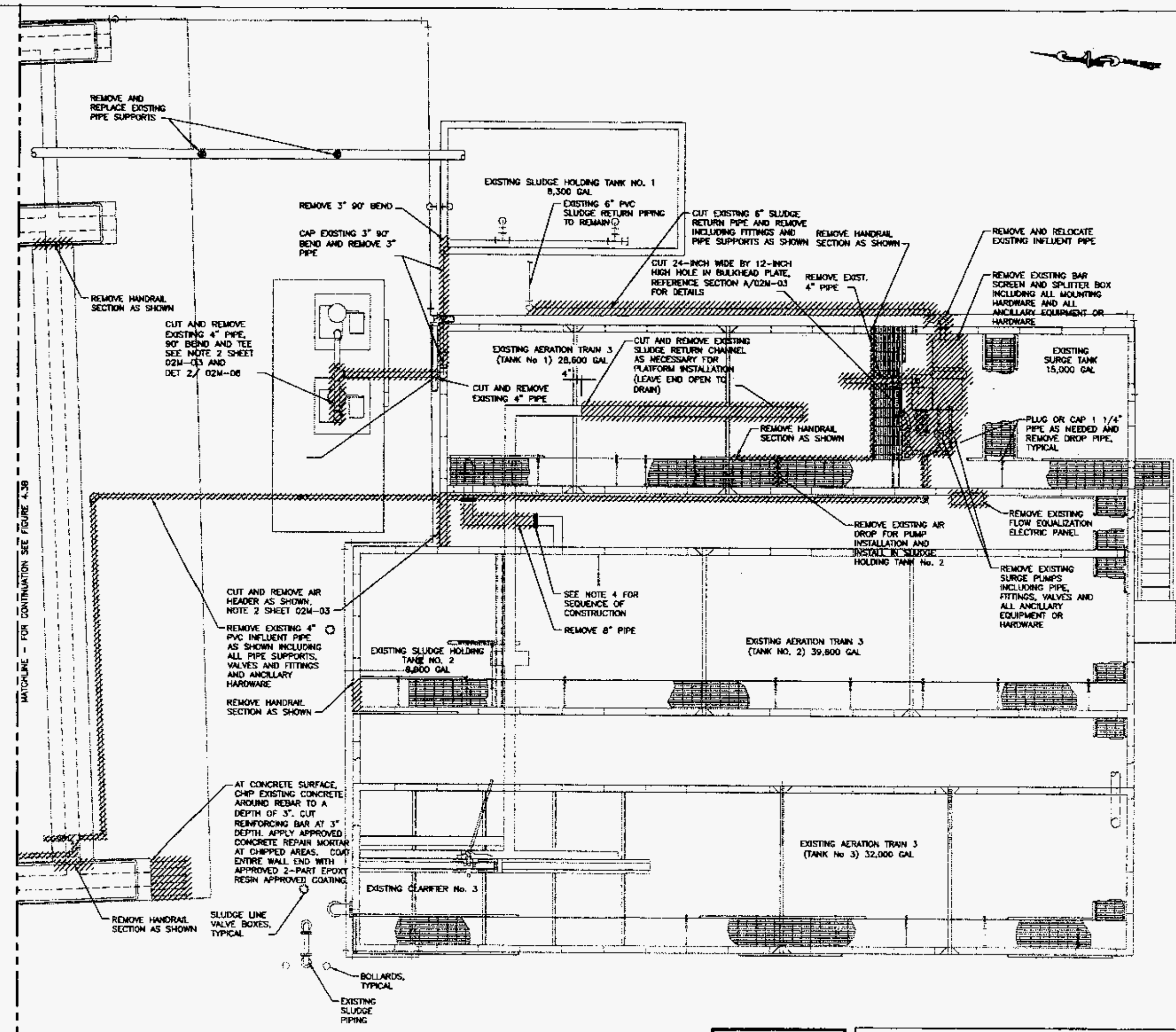
WASTEWATER TREATMENT PLANT EXPANSION

PROCESS FLOW DIAGRAM

PRELIMINARY ENGINEERING REPORT

DATE July, 2007

FIGURE 4.1



NOTES:

1. EXISTING PIPE OR EQUIPMENT DESIGNATED THUS ////// TO BE REMOVED AND PROPERLY DISPOSED AT THE EXPENSE OF THE CONTRACTOR.

2. IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN UNINTERRUPTED FLOW THROUGH THE PLANT AT ALL TIMES PROVIDING NECESSARY PIPE AND PUMPS AT THE CONTRACTOR'S EXPENSE.

3. REFERENCE SHEET 02M-05 FOR FURTHER INFORMATION RELEVANT TO EQUIPMENT REMOVAL AS SHOWN ON THIS SHEET.

4. SEQUENCE OF CONSTRUCTION SHALL BE IN THE FOLLOWING ORDER:
   1) CONSTRUCT BALLAST WALL
   2) INSTALL LINE STOP
   3) EMPTY EQ BASIN
   4) CUT BOTH ENDS OF 8" PIPE INSTALL CUP AND REMOVE LINE STOP EQUIPMENT.

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DEMOLITION PLAN

PRELIMINARY ENGINEERING REPORT

DATE: July, 2007

FIGURE: 4.2A

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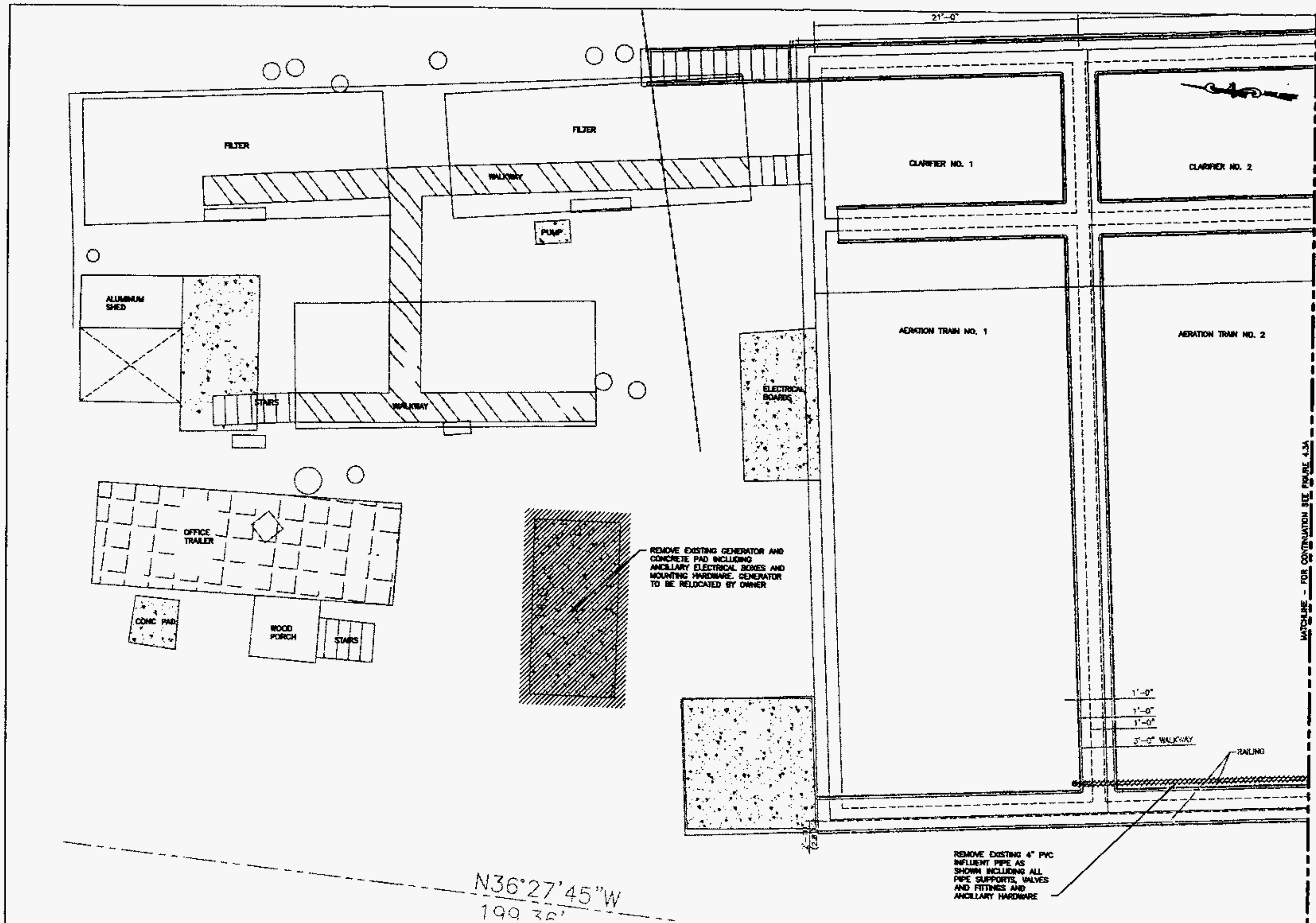

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   1) CONSTRUCT BALLAST WALL
   2) INSTALL LINE STOP
   3) EMPTY EQ BASIN
   4) CUT BOTH ENDS OF 8" PIPE INSTALL CUP AND REMOVE LINE STOP EQUIPMENT.

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DEMOLITION PLAN

PRELIMINARY ENGINEERING REPORT

DATE: July, 2007

FIGURE: 4.2B

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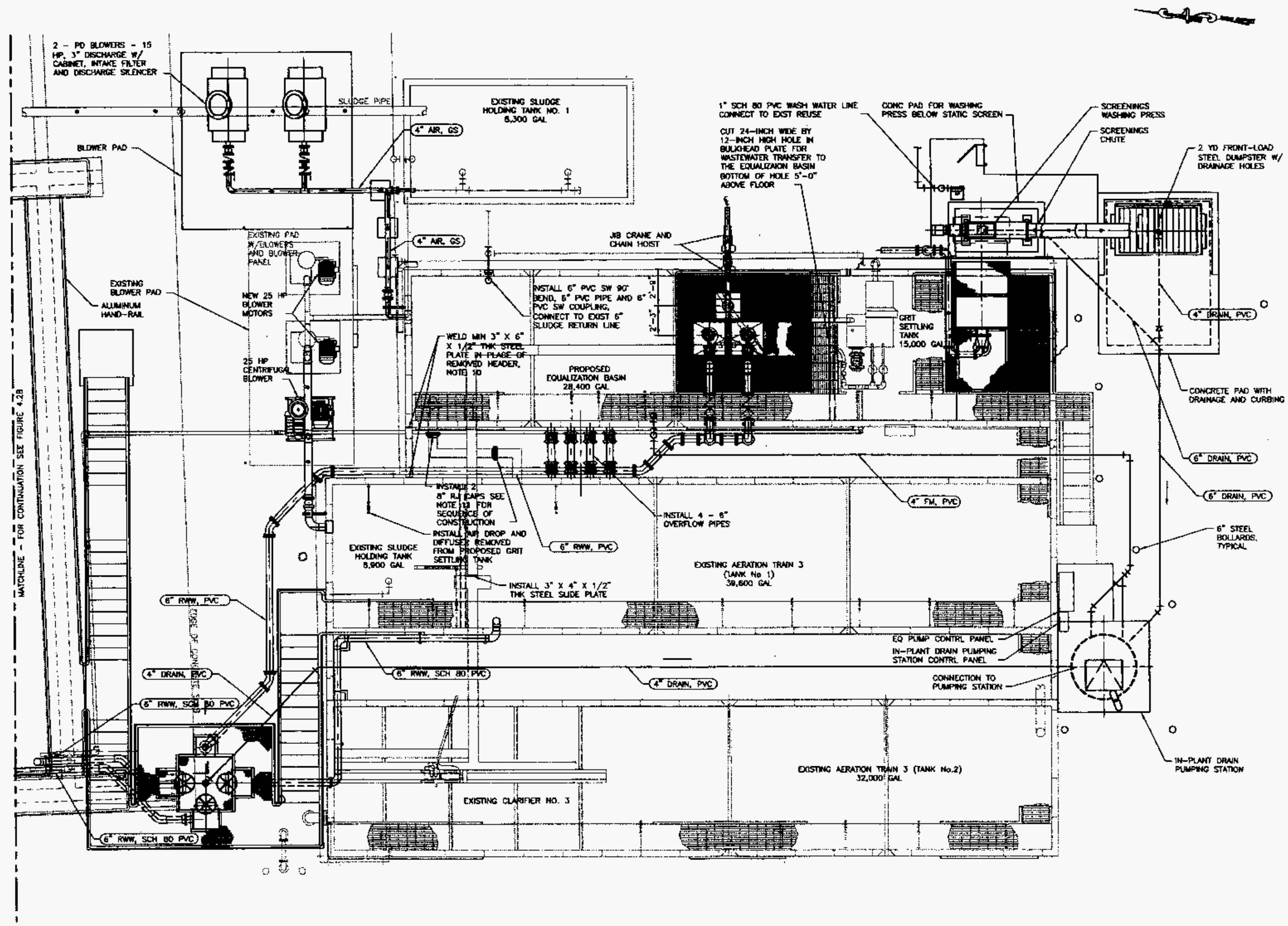

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WASTEWATER TREATMENT PLANT EXPANSION

OVERALL SITE IMPROVEMENTS

PRELIMINARY ENGINEERING REPORT

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FIGURE
4.3A

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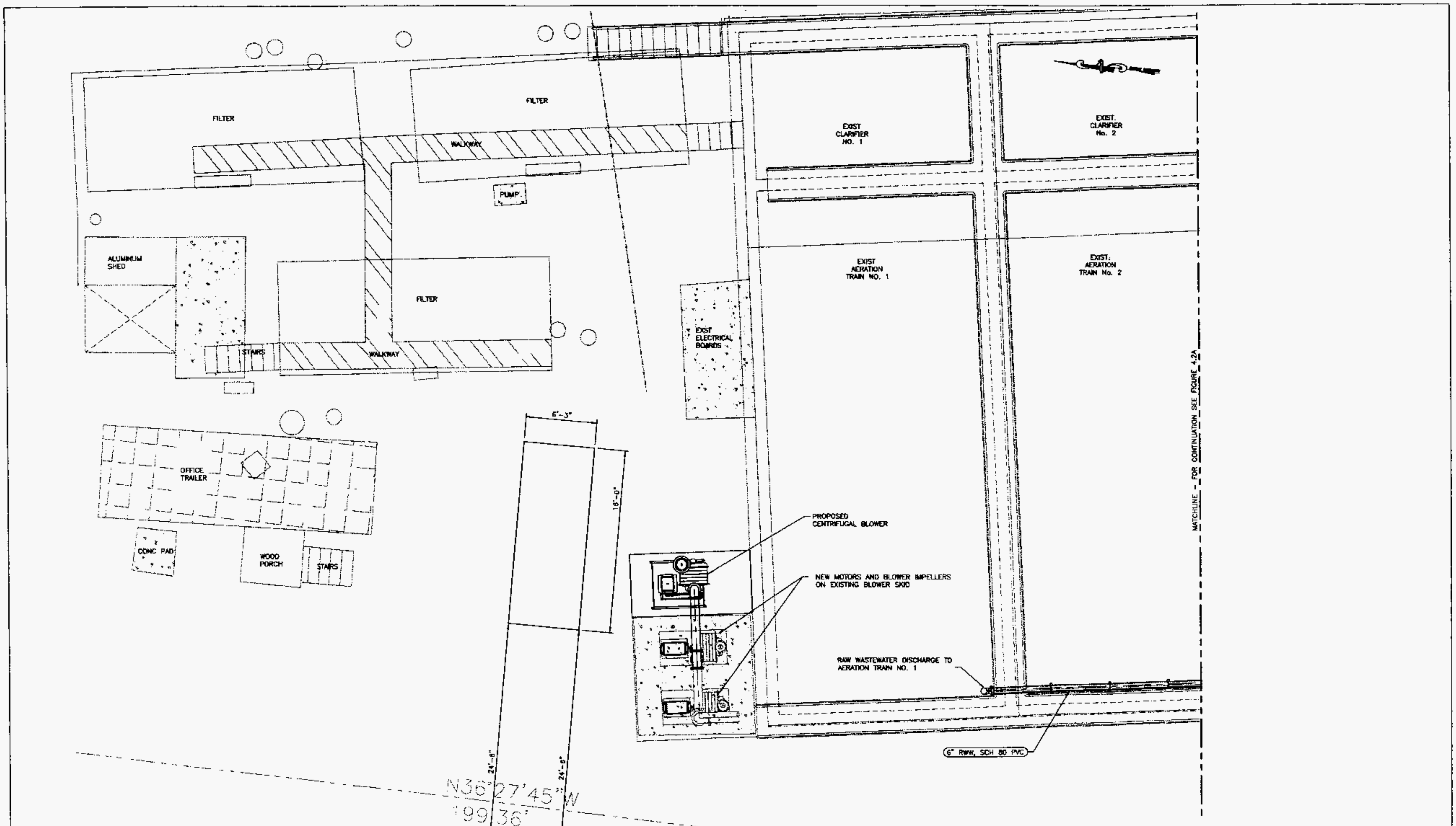

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WASTEWATER TREATMENT PLANT EXPANSION

OVERALL SITE IMPROVEMENTS

PRELIMINARY ENGINEERING REPORT

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FIGURE
4.3B

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4.2 RAW WASTEWATER SCREEN

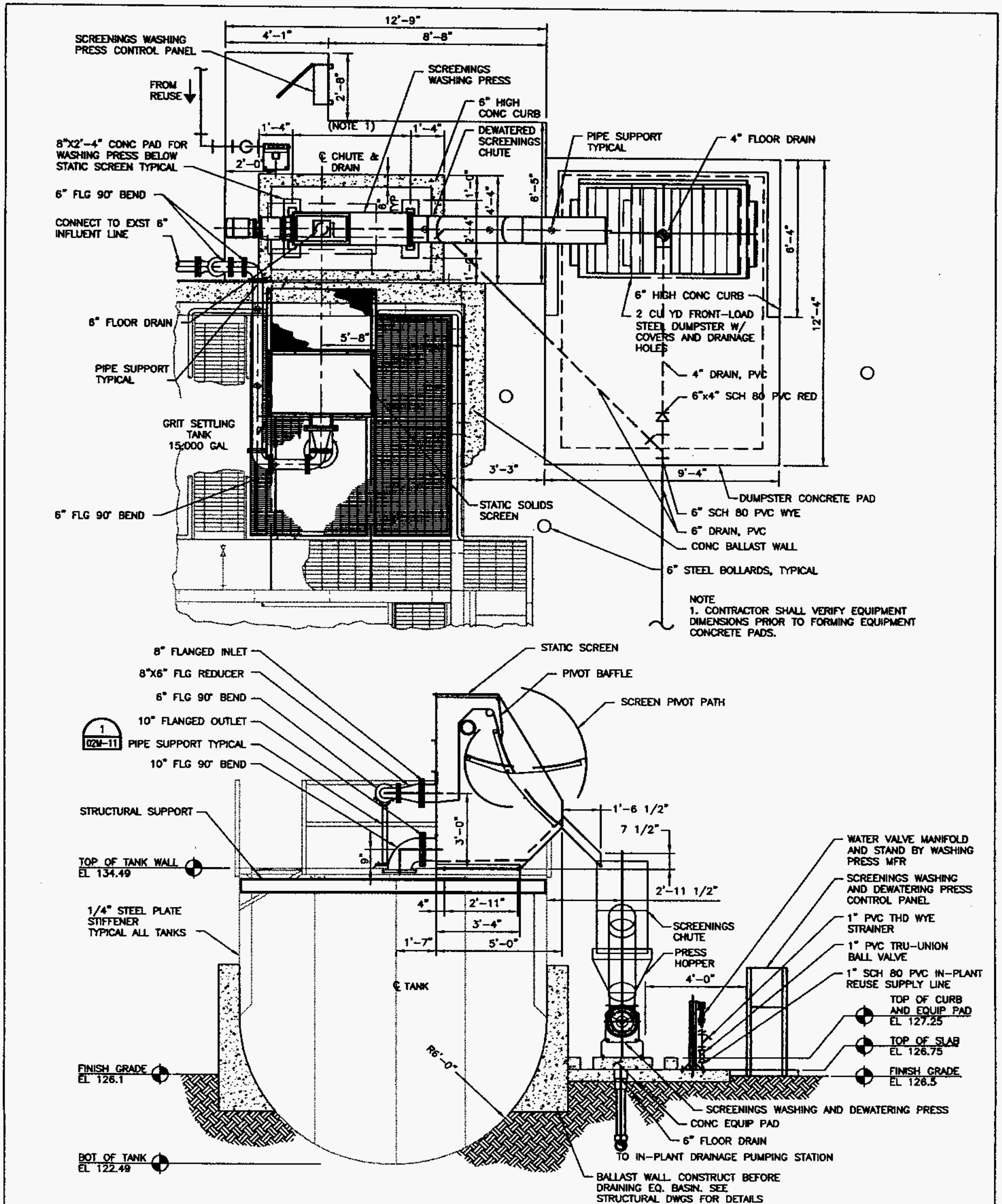
The existing manual bar screen will be removed and replaced with a new static screen with 2 mm openings (0.08 inch) and a capacity of 694 gpm. The static screen will be constructed of Type 316 stainless steel materials and will be installed on the southeast corner of the proposed grit chamber (existing surge tank). The existing raw wastewater influent pipe will be relocated and will be connected to the flanged 8-inch screen inlet.

A screenings washing and dewatering system will be installed at the screening discharge. The screenings material from the static screen will be discharged into a Type 316 stainless steel hopper and transported to a washing and a dewatering zone by means of a rotating screw. The dewatered material will be discharged to a 2-cubic yard dumpster with easy access for hauling. The wash water and excess water from the dewatering process will be discharged to a drain to the proposed in-plant drainage pumping station and sent to the equalization basin.

The type of screen selected will greatly increase removal of screenings from the raw wastewater and reduce problems in subsequent processes with floatable debris and screenings accumulation in process tankage and the waste sludge. The proposed screenings washing, dewatering and compaction system will benefit the process by reducing the organic material in the screenings, producing dryer screenings and consequently reducing the odors in the screenings collection dumpster. As a consequence vector attraction will be reduced, cleaner production will be achieved, and the hauling cost will be reduced if compared to the volume generated without the system. Figure 4.4 depicts the proposed screen and screenings washing and dewatering system, and Appendix C presents the manufacturer's information on the proposed screen.

4.3 PROPOSED EQUALIZATION BASIN

It is recommended that the existing surge tank be modified to accommodate the projected buildout flows in order to provide the subsequent process units with an equalized flow. This requires a tank with a greater volume, larger pumps, and greater aeration capacity. The proposed modifications are discussed in the following paragraphs.



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HDR Engineering, Inc.

CYPRESS LAKES UTILITIES, INC.
WASTEWATER TREATMENT PLANT EXPANSION
PROPOSED SCREEN & SCREENINGS WASHING WASHING AND DEWATERING SYSTEM
PRELIMINARY ENGINEERING REPORT

DATE: May, 2007

FIGURE: 4.4

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4.3.1 <u>EQUALIZATION BASIN CAPACITY ANALYSIS AND BASIS OF DESIGN</u>

Due to footprint limitations in the current location of the Cypress Lakes WWTP, it is recommended that the first of a series of three tanks (Tank No.1) conforming Aeration Train 3 be converted to an Equalization Basin. Tank No. 1 is located adjacent to the existing surge tank as shown in Figure 4.3Figure 4.2 and has a capacity of 28,400 gallons.

During the worst case flow conditions the equalization basin should have sufficient capacity to equalize the peak flows entering to the plant to the 3MADF of 0.190 MGD (equivalent to a peaking factor of 1.0); otherwise, flow rates higher than 0.190 MGD will be pumped to the subsequent treatment units. The ratio of such flow rate to the 3MADF of 0.190 MGD corresponds to the actual peaking factor that the treatment units would receive during the worst case conditions. An inflow cumulative volume analysis was developed to determine the actual Equalization Basin volume required to attenuate the buildout peaking flows entering the plant and the peaking factors that the treatment units will see based on the actual equalization basin capacity.

The analysis was developed using the average daily flow data a three-year period from October 2003 and December 2006 and the hourly flows from the year 2006. The average daily flows from the three-year period were tabulated and compared. Several values were selected for individual analysis in order to evaluate the different flow scenarios under which the Cypress Lakes WWTP operates. These flow scenarios included:

- <u>Scenario No. 1:</u> Maximum daily flows occurring between November and April when the operation of the plant is considered critical due to the high flows received.
- <u>Scenario No. 2:</u> Three month average daily flows occurring between the months of May and October which are similar in value to the historical 3MADFs.
- <u>Scenario No. 3:</u> Days in which significant peak hour events occurred.

Hourly-flow data was only available for the year 2006; therefore, the hourly flows occurring before this year were obtained by extrapolating from comparable days occurring in 2006.

To analyze Scenarios No. 1 and 3 (MDFs and PHFs), hourly flows from March 25, 2006 were used. The ADF during March 25, 2006 (0.148 MGD) is very close to the maximum monthly average daily flow for 2006 (0.145 MGD) (see Table 2.1). The flows occurring hourly between 12:00 am and 11:00 pm on March 25, 2006, were divided by that day's ADF, which yielded hourly percentages of the ADF that occurred that day. The obtained flow percentages were used to extrapolate the hourly flows of the selected days (before year 2006) by multiplying the percentage hourly flows by the selected day's ADF. Calculations and flow data for the selected days are presented in Appendix A. The hourly flows of the selected days occurring in 2006 were taken directly from the plant's flow charts.

Table 4.1 presents a summary of the calendar days selected including the peak flow condition evaluated, average daily flows, peak hour flows, and peaking factors for each day. Appendix A presents the hourly flows and calculations for each of the selected days.

TABLE 4.1 DAYS SELECTED FOR THE PEAK FLOWS ANALYSIS

Date	Peak Condition	Year's 3MADF (MGD)	ADF (MGD)	MDF PF[1]	PHF (MGD)	PHF PF
15-Feb-04	MDF	0.118	0.177	1.5	0.385	3.3
17-Mar-04	MDF	0.118	0.172	1.5	0.374	3.2
28-Mar-05	MDF	0.121	0.180	1.5	0.305	2.5
4-Feb-06	MDF	0.122	0.169	1.4	0.314	2.6
3-Feb-06	MDF	0.122	0.189	1.5	0.310	2.5
25-Mar-06	PHF	0.122	0.148	1.2	0.321	2.6
28-Jun-06	PHF	0.120	0.113	N/A	0.427	3.5
29-Jun-06	PHF	0.120	0.120	N/A	0.280	2.3
5-Sep-06	PHF	0.120	0.123	N/A	0.251	2.1
6-Nov-06	PHF	0.120	0.151	1.3	0.281	2.3

1. PF = Peaking Factor. MDF peaking factor calculated by dividing the analyzed day's ADF by the 3MADF.

The PHF peaking factors ranged between 2.1 and 3.7. Flow equalization at the head of the plant would drop these peaking factors if adequate storage capacity was available. Inflow cumulative flow analyses are commonly used to determine the required storage volume to drop the peaking factors to 1.0. However, in the case of the Cypress Lakes WWTP, the volume of the proposed equalization basin is limited by the volume of the existing structure. Therefore, the inflow cumulative flow analysis was used instead to determine the new peaking factors occurring after flow equalization.

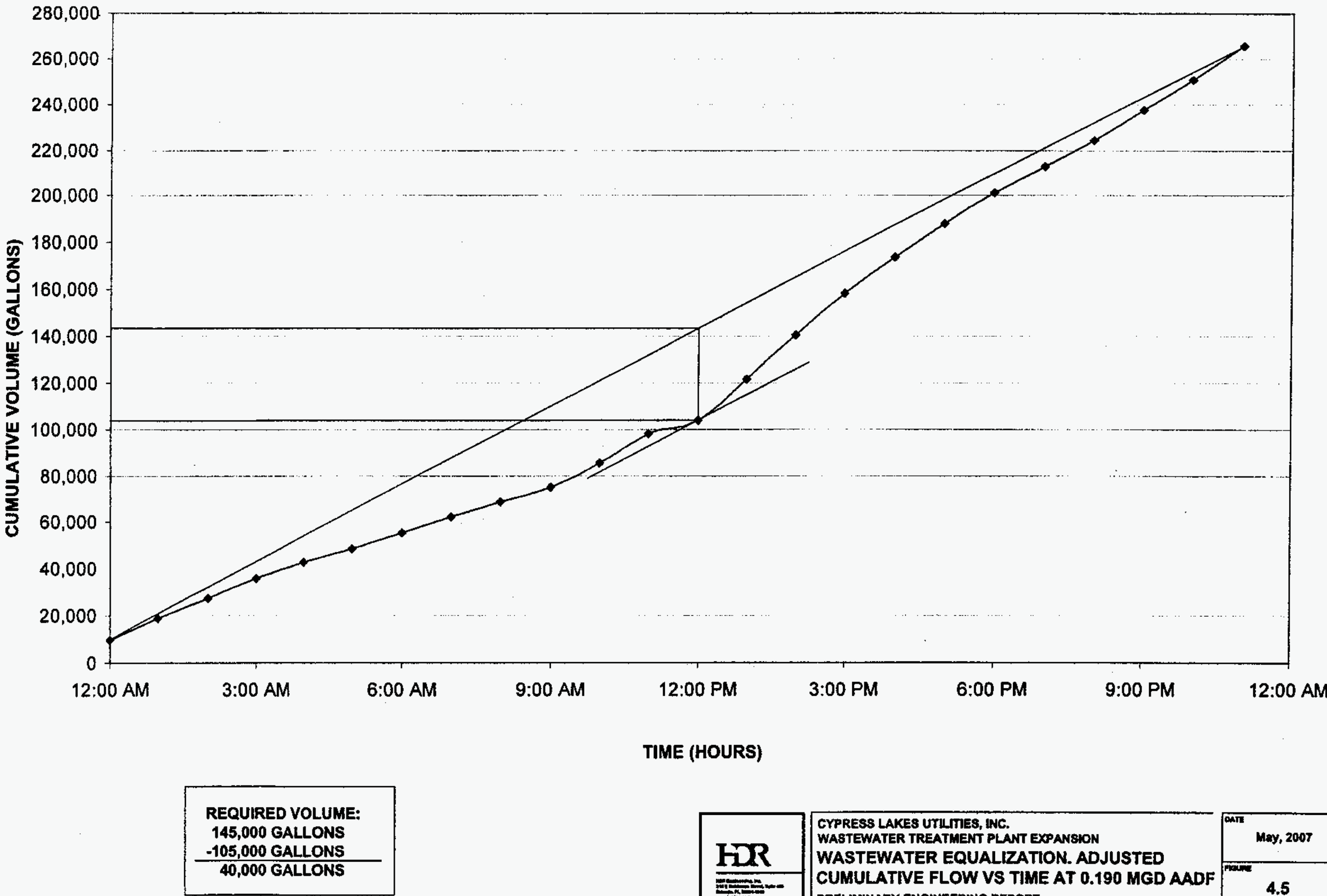
The analysis was developed for the 24-hour diurnal flows occurred on the selected days shown in Table 4.1. The criteria outlined in M&E, 2004 was used to perform the cumulative flow analysis. The obtained capacity requirements for equalization of the buildout flows in some cases exceeded the existing capacity of the proposed tank (28,400 gallons). This occurred at MDF or high PHF events. These events were selected as the worst case scenario and as basis of design even though they only occur a few times during the year. Table 4.2 presents a summary of the estimated equalization basin required, the estimated pumping rates to the treatment units after flow equalization and the corresponding peaking factors. Appendix A presents the calculations for the cumulative flow analysis for each analyzed day.

TABLE 4.2 EQUALIZATION BASIN CAPACITY ANALYSIS

Date	Peak Condition	ADF (MGD)	Calculated data for buildout flows				Old PHF PF w/o Flow Equalization
			Required Capacity (gallons)	Pumping rate		New PF w/ Flow Equalization	
				gpm	MGD		
15-Feb-04	MDF	0.177	50,616	214	0.308	1.6	3.3
17-Mar-04	MDF	0.172	47,797	200	0.288	1.5	3.2
28-Mar-05	MDF	0.180	39,648	201	0.289	1.5	2.5
4-Feb-06	MDF	0.169	29,916	164	0.236	1.2	2.6
3-Feb-07	MDF	0.189	29,743	205	0.295	1.6	2.5
					Average	1.5	3.0
25-Mar-06	PHF	0.148	36,325	143	0.206	1.1	2.6
28-Jun-06	PHF	0.113	56,942	200	0.288	1.5	3.5
29-Jun-06	PHF	0.120	17,382	120	0.173	0.9	2.3
5-Sep-06	PHF	0.123	25,851	128	0.184	1.0	2.1
6-Nov-06	PHF	0.151	35,209	140	0.202	1.1	2.3
					Average	1.0	2.6

Based on this analysis, the maximum capacity required for the Equalization Basin is approximately 57,000 gallons (Based on June 28, 2006 flows) for a peak hour event corresponding to a peaking factor of 3.5 during a day with flow similar or equal to the 3MADF (0.190 MGD). However, the higher pumping rate that will be entering the process units during a 24-hour period (peaking factor of 1.5) occurs during a maximum day flow (Based on March 28, 2005 flows).

Therefore, data from March 28, 2005 was selected as basis of design. Thus, with the proposed modifications to the Equalization Basin, the treatment units will receive flows with a peaking factor of 1.5 under the worst case scenario and of 1.0 or less under normal flow conditions. All the treatment units were verified to have capacity to handle a 1.5 peaking factor. Performance of each unit at this peaking factor at the buildout flows is presented in Appendix B of this report. Figure 4.5 illustrates the diurnal cumulative volume curve for this day.



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WASTEWATER TREATMENT PLANT EXPANSION

WASTEWATER EQUALIZATION. ADJUSTED CUMULATIVE FLOW VS TIME AT 0.190 MGD AADF

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FIGURE 4.5

4.3.2 MODIFICATIONS FOR AERATION TRAIN 3

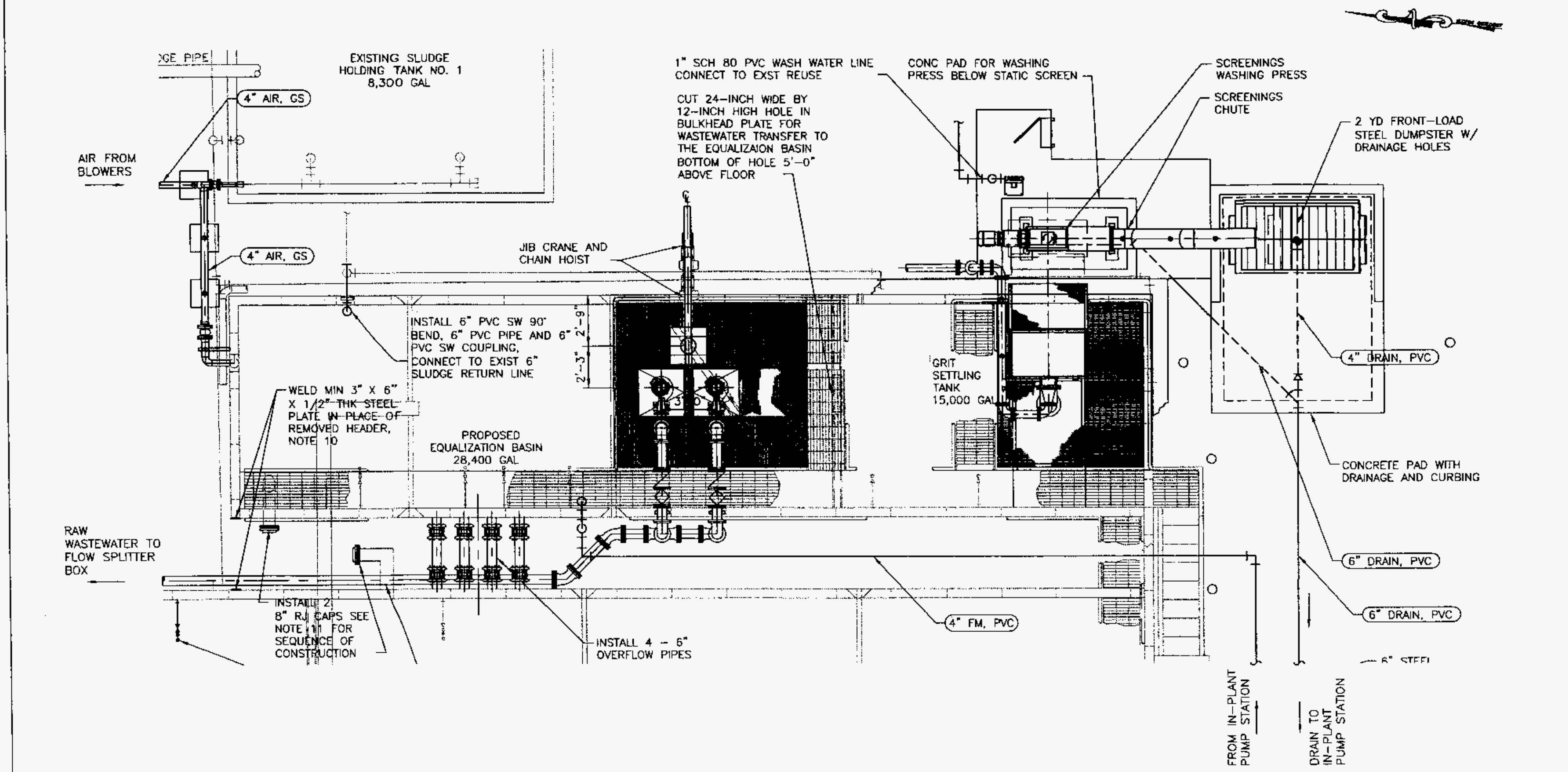
It is the Design Team recommendation that the existing surge tank be used as a grit compartment and as the location for the new plant headworks, and that modifications be made to Tank No. 1 to convert it to an Equalization Basin. Tank No.1 is the first of a series of three tanks that comprise the Aeration Train 3.

Conversion of Tank No. 1 of Aeration Train 3 to an Equalization Basin will provide the plant with a new equalization basin capacity of 28,400 gallons. This new basin capacity will reduce the PHF to 3MADF ratio from 3.5 to 1.5 during maximum day flows, and to 1.0 or less at all other times. The existing surge tank will be converted to provide grit settling and grit containment. The grit will be removed periodically by outside contractors using portable grit pumps. Proposed modifications to the existing Tank No. 1 are illustrated in Figure 4.6 and Figure 4.7 and listed below:

1. Isolation, partial removal and welding and/or capping of existing piping in Aeration Train 3 connecting Tanks No. 1 and No. 2. This includes raw wastewater piping, air piping, and return activated sludge (RAS) channel.
2. Isolation partial removal and welding and/or capping of existing air piping in Aeration Train 3 connecting Tank No. 1 and the existing surge tank.
3. Removal of existing manual bar screen and splitter box and removal and/or isolation of piping connecting the existing splitter box to the three Aeration Trains.
4. Removal of existing submersible pumps and installation of two (2), 5-HP submersible pumps with variable frequency drives. Each pump will be capable of flows ranging from 0 to 500 gpm for a TDH ranging from 9-ft to 26-ft.
5. Installation of a new static screen with 2mm (0.080 inch) openings and with a capacity of 780 gpm, and installation of a screenings washing and dewatering system. This equipment is to be located in the proposed grit compartment (existing surge tank).
6. Installation of 5-ft x 4-ft by 1/2-in steel plate, welded to the bottom of the tank. This plate will provide a flat surface to support the new pump discharge elbow and pumps.
7. Construction of four (4) 6-inch PVC emergency overflow pipes from the equalization basin to Aeration Train 3 - Tank No.2. The invert elevation of the overflow pipes will be located eleven (11) inches below the top of the tank and the centerline of the pipes will be installed 18 inches apart.
8. Modifications to the existing bulkhead to allow flow from the proposed grit compartment to the proposed equalization basin. The modification consists of cutting a 24-inch wide by 12-

inch opening. The bottom of the opening will be located five (5) feet from the bottom of the tank.

9. Installation of structural support for pump guide rails and access platform, and modifications to the existing walkway. Lighting for the proposed support platform will be provided.
10. Modifications to existing walkway to provide support for pump discharge piping and valves. To avoid a tripping hazard, discharge piping that will be supported on a portion of the existing walkway will be covered by a new walkway installed 1-ft above the existing walkway.
11. Connection of two (2) new positive displacement blowers to the existing air piping in Tank No. 1, to provide air exclusively to the new Equalization Basin and the sludge holding tank.
12. Construction of a ballast wall around the proposed equalization basin and grit compartment to avoid buoyancy issues during construction.



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PROPOSED EQUALIZATION BASIN - PLAN VIEW

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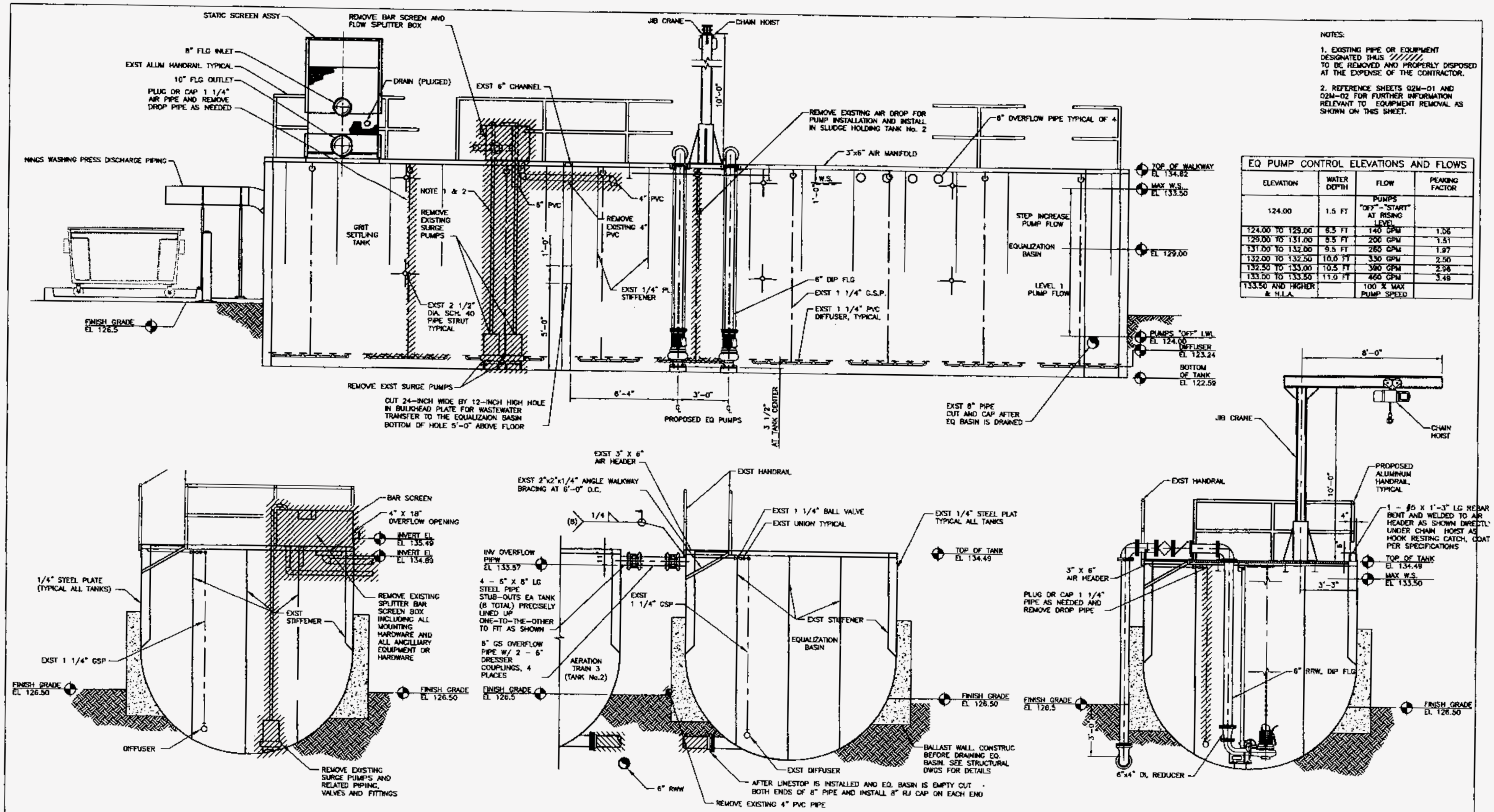
FIGURE: 4.6



NOTES:

1. EXISTING PIPE OR EQUIPMENT DESIGNATED THUS ////// TO BE REMOVED AND PROPERLY DISPOSED AT THE EXPENSE OF THE CONTRACTOR.

2. REFERENCE SHEETS 02M-01 AND 02M-02 FOR FURTHER INFORMATION RELEVANT TO EQUIPMENT REMOVAL AS SHOWN ON THIS SHEET.

EQ PUMP CONTROL ELEVATIONS AND FLOWS			
ELEVATION	WATER DEPTH	FLOW	PEAKING FACTOR
124.00	1.5 FT	PUMPS "OFF"-"START" AT RISING LEVEL	
124.00 TO 129.00	6.5 FT	140 GPM	1.06
129.00 TO 131.00	8.5 FT	200 GPM	1.51
131.00 TO 132.00	9.5 FT	260 GPM	1.97
132.00 TO 132.50	10.0 FT	330 GPM	2.50
132.50 TO 133.00	10.5 FT	390 GPM	2.96
133.00 TO 133.50	11.0 FT	460 GPM	3.48
133.50 AND HIGHER & H.L.A.		100 % MAX PUMP SPEED	

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WASTEWATER TREATMENT PLANT EXPANSION

PROPOSED EQUALIZATION BASIN - SECTIONS

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FIGURE: 4.7

4.3.3 PROPOSED EQUALIZATION BASIN TRANSFER PUMPS (EQ. PUMPS)

The existing equalization basin transfer pumps will not have sufficient capacity to handle the projected buildout flows; therefore, it is recommended that two (2) larger pumps each with capacity to handle the estimated buildout PHF (0.665 MGD or approximately 462 gpm) are used in lieu of the existing pumps.

The equalization basin transfer pumps should be capable of a design flow equal to the design PHF. The reason for this requirement is that if the equalization basin is full or out of service at the beginning of a peak hour event, there would be no available storage to attenuate the flow; therefore the proposed flow equalization basin transfer pumps should be capable of pumping the design PHF. Additionally, in order to maintain Class 1 Reliability, the flow equalization basin transfer pumps should also be capable of pumping the PHF with the largest unit out of service. The Design Team recommends the use of two (2) new 5-HP submersible non-clog wastewater pumps, each capable of 500 gpm and each provided with a variable frequency drive. The design criteria for these pumps are presented in Table 4.3 and additional pump information is included in Appendix D.

TABLE 4.3 FLOW EQUALIZATION TRANSFER PUMPING STATION

Item	Description
Pump Station Name	Equalization Basin Pumping Station
No. of Pumps Required	Two (2)
Flygt Model and Impeller (Basis of Design)	Flygt Model NP 3102, Impeller 463 MT
Pump Discharge Elbow Size, Inches	4-inch
Primary Condition	500 GPM @ 26 FT.
Primary Min. Hydraulic Efficiency	74 %
Secondary Condition	150 GPM @ 41.5 FT.
Secondary Min. Hydraulic Efficiency	47 %
Min. Motor, HP	5
Maximum Speed, RPM	1800
Motor Drive Type	Variable Frequency Drive
Voltage, Volts	230/460
Phase	3
Frequency, Hertz	60
Service	Raw, Screened Wastewater
Control Panel Construction Material	NEMA 4X, 316 SST
Alarm Level Sensor System	Float
Approved Manufacturers	1) Flygt (Basis of Design) 2) EMU 3) KSB

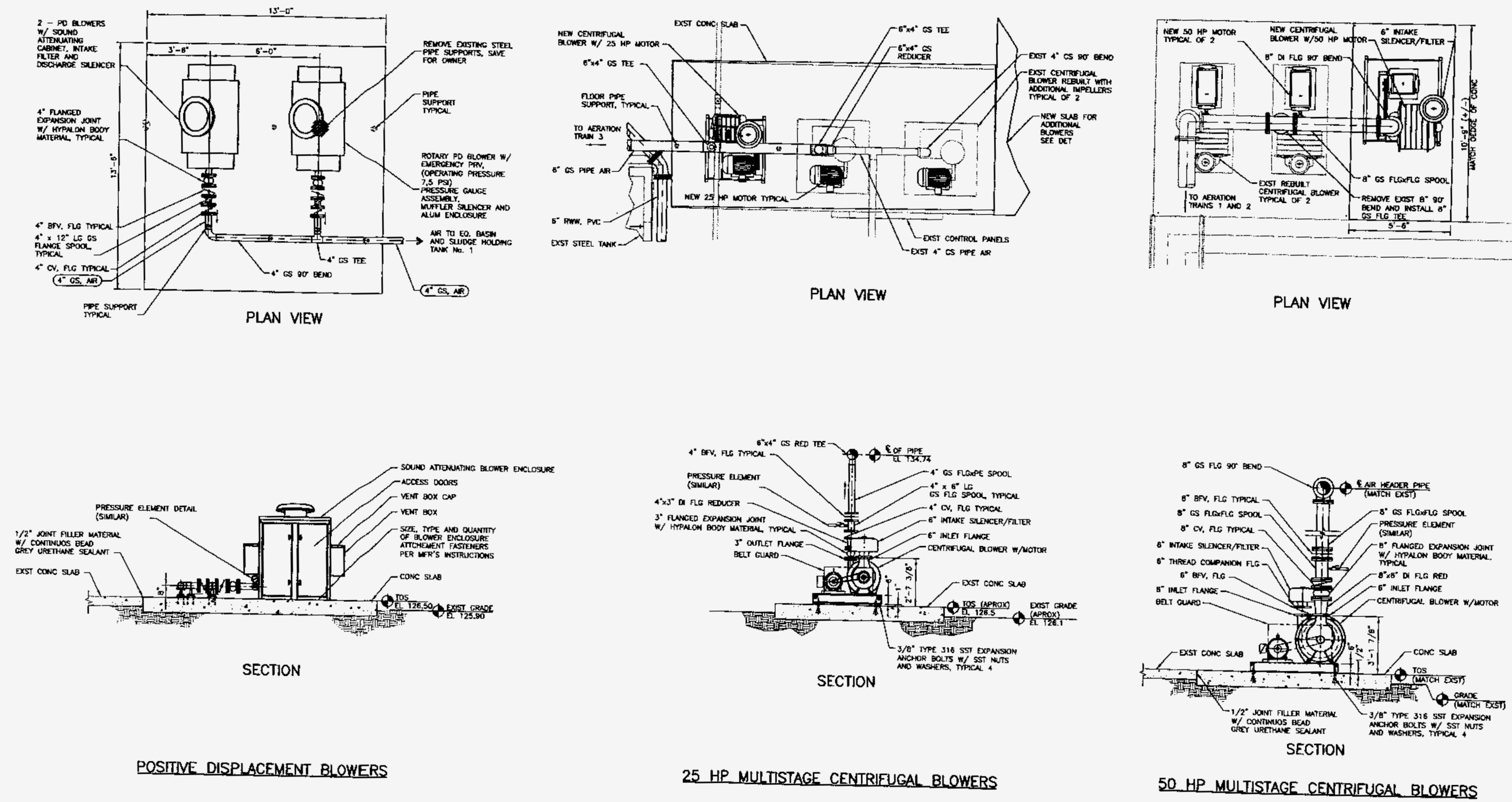
4.3.4 PROPOSED BLOWERS FOR THE EQUALIZATION BASIN

Due to the limited capacity of the existing blowers to supply air to a larger Equalization Basin at the projected buildout flows, it is recommended that the aeration system for the proposed Equalization Basin be independent from Aeration Train 3 and that positive-displacement blowers (PD-Blowers) be used instead of centrifugal blowers since PD blowers are better suited for use with fluctuating water levels.

Therefore, it is the Design Team's recommendation that a new set of two (2), 200 scfm positive displacement blowers at a discharge pressure of 7.0 psig be installed to supply air to the proposed Equalization Basin and the sludge holding tank No. 1. The following mechanical modifications will be required for the installation of these blowers:

1. Construction of 13.5-ft x 12-ft concrete pad. This pad will be located adjacent to the existing concrete pad and blowers currently providing air to Aeration Train 3.
2. Modifications to existing air piping connecting the existing centrifugal blowers to the proposed equalization basin.
   a. The centrifugal blowers discharge piping connection to the air in Tank No. 1 (proposed equalization basin) will be removed. The proposed PD-blowers discharge piping will be connected instead.
   b. The connection from the Tank No.1 air piping to the sludge holding tank No. 1 air piping will be removed. Instead, the sludge holding tank No.1 air piping will be connected directly to the proposed PD-blowers discharge piping.
   c. The existing rectangular air pipe distributing air around Tank No. 1 will be cut and welded to isolate the equalization basin aeration system from the Aeration Train No. 3, the sludge digester tank No. 2 and the proposed grit compartment (existing surge tank).
3. The existing air piping connecting the sludge holding tank No. 1 to the air discharge box on existing Tank No. 1 will be removed. A new connection to the sludge holding tank No. 1 air piping will be installed directly from the pd-blowers discharge piping.

Figure 4.8 illustrates the proposed equalization blowers' connections to the proposed equalization basin tank and the sludge holding tank No. 1.



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WASTEWATER TREATMENT PLANT EXPANSION

PROPOSED BLOWERS

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FIGURE: 4.8

4.4 PROPOSED SPLITTER BOX

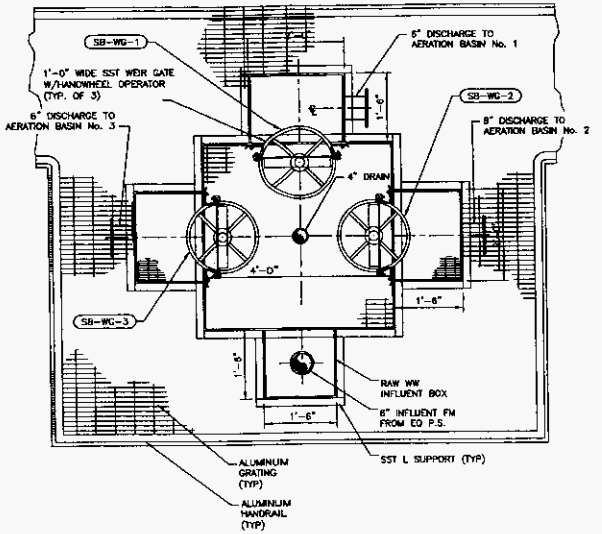
Construction of a new splitter box is proposed to provide equal flow distribution to the three existing aeration trains. The proposed splitter box will be constructed of Type 316 stainless steel materials and located between Aeration Trains 2 and 3 as shown in *Figure 4.3Figure 4.2*. The following features have been included in the design of the proposed structure:

1. The proposed splitter box will have a main chamber of dimensions 4-ft x 4-ft by 4-ft deep located as the center of the structure, three (3) identical effluent boxes of dimensions 2.0-ft wide x 1.5 ft by approximately 3.8-ft deep and one (1) influent box of dimensions of 1.5-ft x 1.5-ft x 4.0-ft deep. The influent box will receive the flow from the 6-in Equalization Basin Transfer Pump discharge pipe and will pass it onto the main chamber from where it will be distributed to each of the three effluent boxes. The main chamber will have a 4-inch drain for cleaning purposes that will be connected to the proposed in-plant drainage pumping station. The flow pumped from the in-plant drainage pumping station will be pumped back to the equalization basin.
2. The effluent boxes to Aeration Trains 1, 2, and 3 will each have 12-in weir gate with a handwheel operator for flow control. Each of the three effluent boxes will have a 6-inch discharge pipe located at the bottom of the box, each discharging to a different Aeration Train.
3. An aluminum grating walkway with aluminum handrails will be provided on top of the splitter box. Lighting will be provided for this new structure.
4. The proposed splitter box will be constructed at an elevation high enough so that equal flow distribution and complete drainage of the effluent boxes is achieved. The top of walkway of the splitter box will 5-ft higher than the top of walkway of Aeration Train 2 and at least 9-ft higher than the top of walkway of Aeration Train 3.
5. Stairways will be installed to provide access for operation of the weir gates and to connect Aeration Trains 2 and 3.

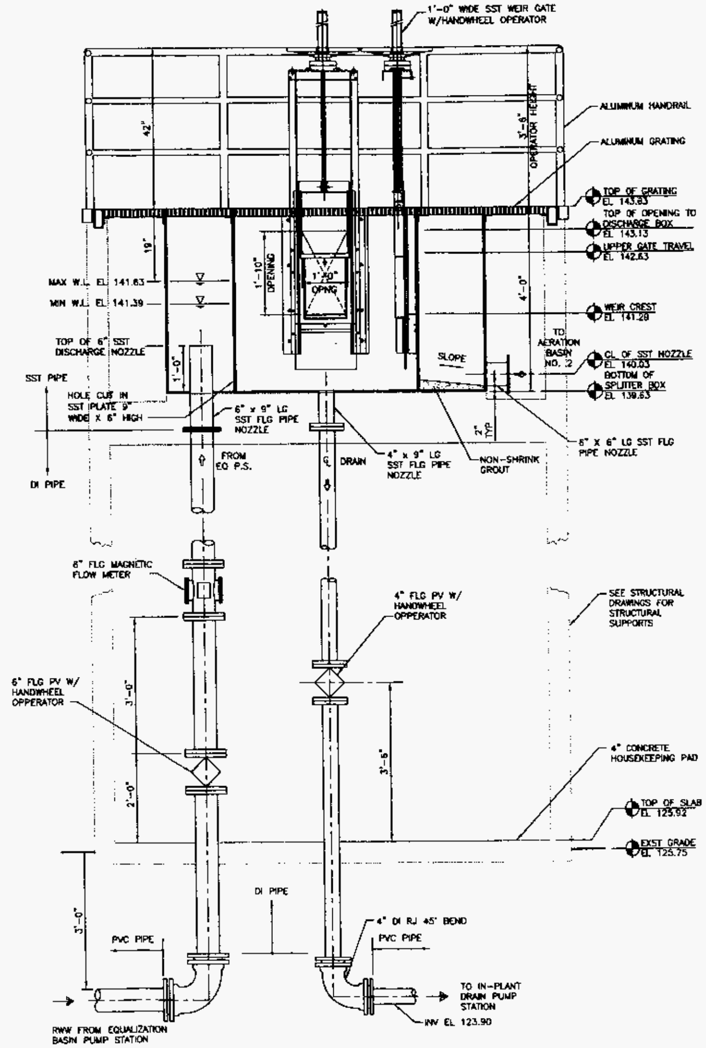
Figure 4.9 presents the plan view and section of the proposed splitter box.

4.5 PROPOSED BLOWERS FOR AERATION TRAINS

It is the Design Team's recommendation that in order to meet the air requirements at the buildout wastewater flows and to operate as a Class I Reliability facility as required by the FDEP the following modifications to the aeration supply systems to the Aeration Trains should be made:



PLAN DETAIL



RAW WASTEWATER SPLITTER BOX

HDR	CYPRESS LAKES UTILITIES, INC. WASTEWATER TREATMENT PLANT EXPANSION	DATE July, 2007
	RAW WASTEWATER SPLITTER BOX	FIGURE 4.9
	PRELIMINARY ENGINEERING REPORT	

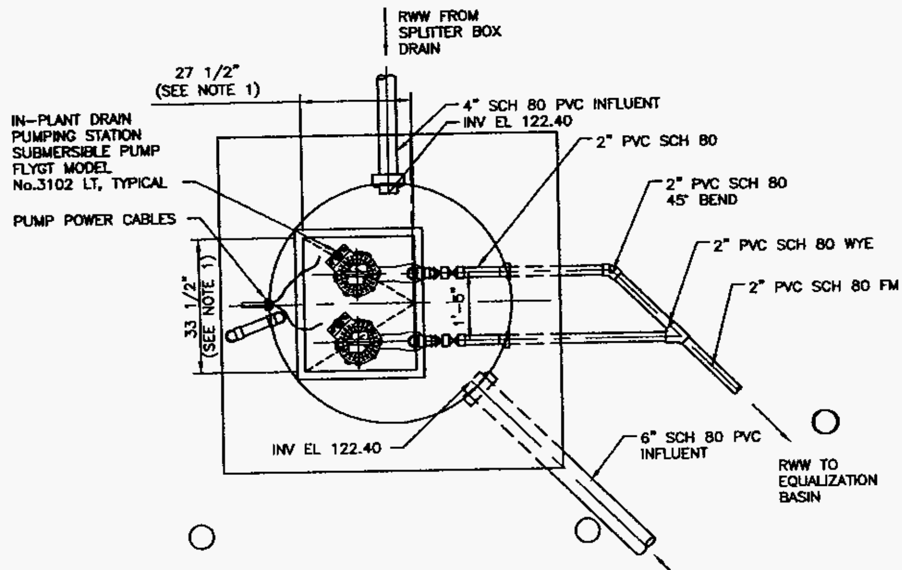
1. The aeration supply system for Aeration Trains 1 and 2 requires:
   a. One (1) additional 50 HP blower with a capacity of 450 scfm at discharge pressure of 8.0 psig to provide backup to the existing blowers.
   b. Replacement of existing 30 HP motors for each of the two (2) existing blowers with 50 HP motors and refurbishment of the blowers to increase the discharge pressure to 8.0 psi.
2. The aeration supply system for Aeration Train 3 and the sludge holding tank No. 2 requires:
   a. One (1) additional 25 HP blower with a capacity of 300 scfm at a discharge pressure of 7.0 psig. This new blower will provide backup to the existing blowers to meet Class I reliability requirements.
   b. Replacement of existing 20 HP motors for each of the two (2) existing blowers with 25 HP motors and refurbishment of the blowers to increase the discharge pressure to 7.0 psi.

4.6 Proposed In-Plant Drainage Pumping Station

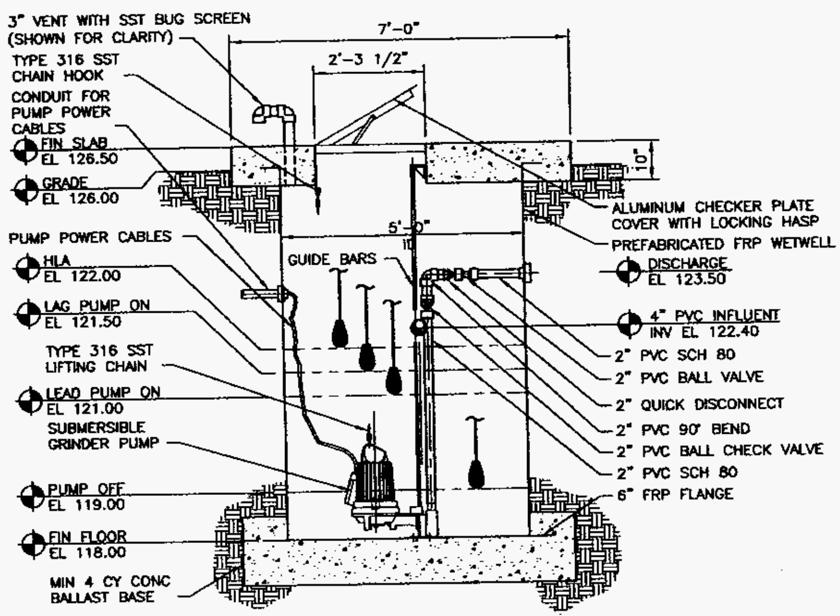
The proposed in-plant drainage pumping station will pump raw domestic wastewater drainage from the screenings washing and dewatering equipment and the splitter box drain to the equalization basin. The drainage pumping station will be located at the south end of the plant, next to the Aeration Train 3. It will be comprised of a 5-ft. diameter fiberglass wetwell basin with aluminum hatch cover and two (2) submersible wastewater grinder pumps. The pumps will have a 6.0 HP motor and a capacity of 80 gpm at 43.7 ft. TDH53 ft. Table 4.4 presents the design criteria of these pumps and Figure 4.10 presents the plant and section of the in-plant drainage pumping station.

Table 4.4 In-Plant Drainage Pumping Station Grinder Pumps

Item	Description
Number of Pumps Required	Two (2) Grinder-type
Basis of Design	Flygt Pump Model MP 3102, Impeller 216 LT
Pump Discharge Size, Inches	2-inch
Shut-off Head, Feet	52.9 Ft.
Primary Condition	80 GPM @ 43.7 Ft.
Secondary Condition	100 GPM @ 38.1 Ft.
Minimum Motor Size	6.0 HP
Maximum Speed	3,455 RPM
Motor Drive Type	Constant Speed
Voltage	230/460 Volts
Phase	3
Frequency	60 Hertz
Service	Raw Wastewater
Control Panel Construction Material	NEMA 4X, 316 SST
Level Control Sensor System	Float



NOTES:
1. OPENING HATCH SIZE AND LOCATION SHALL BE COORDINATED BY CONTRACTOR WITH PUMP MANUFACTURER PRIOR TO PURCHASING MATERIALS.
2. CONTRACTOR SHALL COORDINATE ORIENTATION OF INLET AND OUTLET PIPING.



NOTES:
1. CONC BALLAST BASE SHALL BE DESIGNED BASED ON A SEASONAL HIGH WATER TABLE ELEVATION OF 125.0 FT.

SECTION B

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HDR

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CYPRESS LAKES UTILITIES, INC.
WASTEWATER TREATMENT PLANT EXPANSION

IN-PLANT DRAINAGE PUMPING STATION

PRELIMINARY ENGINEERING REPORT

DATE
July, 2007

FIGURE
4.10

4.7 POWER SYSTEM

4.7.1 EXISTING POWER SYSTEM

The electrical power system at the Cypress Lakes WWTP consists of one electrical service rated at 400 ampere, 277/480-volt, 3-phase service from one set of pole mounted transformers located near US-98. The service transformer is owned and maintained by the local power utility. The existing service conductors originated from the service transformers then to a meter and a single 400 ampere main breaker. From the main breaker the power is distributed to one 400 ampere automatic transfer switch. From the automatic transfer switch, both normal and emergency power is distributed to plant loads. The transfer switch will automatically detect a utility power failure and transfer to an existing 150kW/187kVA/225A emergency generator after appropriate time delays.

4.7.2 DESIGN OPTIONS FOR THE PROPOSED POWER SYSTEM

There are two options for sizing the incoming power service which are approved by the National Electrical Code. Option No. 1 is simply to add all of the existing and proposed loads to size the incoming power service plus 25% of the largest motor. Option No. 2 allows for the sizing of the service to an existing power system by summing the existing demand loads plus 25 percent and all of the proposed electrical loads.

Table 4.5 and Table 4.6 summarize the existing and proposed demand loads and the total capacity required from the service.

TABLE 4.5 OPTION NO.1 SERVICE CALCULATIONS FOR PROPOSED AND EXISTING EQUIPMENT

Proposed & Existing Equipment	Status	HP	Amperes
Blower #1 Trains 1 & 2	Existing/Rebuilt	50	65
Blower #2 Trains 1 & 2	Existing/Rebuilt	50	65
Blower #3 Train 3	Existing/Rebuilt	25	34
Blower #4 Train 3	Existing/Rebuilt	25	34
Blower #5 Trains #1 & 2	Proposed	50	65
Blower #6 Train #3	Proposed	25	34
Equalization Pump #1	Proposed	5	7.6
Equalization Pump #2	Proposed	5	7.6
Equalization Blower #1	Proposed	15	21
Equalization Blower #2	Proposed	15	21
In-plant Drainage Pump #1	Proposed	6	11
In-plant Drainage Pump #2	Proposed	6	11
Screenings Washing Press	Proposed	5	7.6
Reuse Pump #1	Existing	50	65
Reuse Pump #2	Existing	50	65
Backwash Pumps	Existing	10	14
Pond Pump	Existing	2	3.4
Backwash Blowers	Existing	3	4.8
Air-Conditioning/Lighting/Instruments			6
25% of largest motor load			16
Total		397	558

The total load of 558 ampere for Option No.1 exceeds the existing 400 ampere service. This option will require a new 600 ampere electrical service be constructed.

TABLE 4.6 OPTION NO.2 SERVICE CALCULATIONS FOR PROPOSED AND EXISTING EQUIPMENT

Proposed & Existing Equipment	Status	HP	Amperes
Blower #1	Existing/Rebuilt	50	65
Blower #3	Existing/Rebuilt	25	34
Reuse Pump #1	Existing	50	65
Backwash Pumps	Existing	10	14
Pond Pump	Existing	2	3.4
Backwash Blowers	Existing	3	4.8
Air-Conditioning/Lighting/Instruments			6
Sub-Total Existing Equipment		140	192.2
Blower #5 Trains #1 & 2	Proposed	50	65
Blower #6 Train #3	Proposed	25	34
Equalization Pump #1	Proposed	5	7.6
Equalization Pump #2	Proposed	5	7.6
Equalization Blower #1	Proposed	15	21
Equalization Blower #2	Proposed	15	21
In-plant Drainage Pump #1	Proposed	6	11
In-plant Drainage Pump #2	Proposed	6	11
Screenings Washing Press	Proposed	5	7.6
Sub-Total Proposed Equipment		132	186

192.2 x 1.25 = 240.25 Amperes
+ 186.00 Amperes
Total 426.25 Amperes

The total load for Option No. 2 exceeds the existing 400 ampere service. Therefore, this option will also require a new 600 ampere electrical service be constructed.

4.7.3 EMERGENCY GENERATOR

The bases for sizing the generator for the existing and proposed loads are tabulated in Table 4.7 below.

TABLE 4.7 ELECTRICAL CONNECTED LOADS FOR EMERGENCY GENERATOR

Equipment	Status	HP	Amperes
Blower #1	Existing	50	65
Blower #3	Existing	25	34
Blower #5 Trains #1 & 2	Proposed	50	65
Blower #6 Train #3	Proposed	25	34
Equalization Pump #1	Proposed	5	7.6
Equalization Blower #1	Proposed	15	21
In-plant Drainage Pump #1	Proposed	6	11
Screenings Washing Press	Proposed	5	7.6
Reuse Pump #1	Existing	50	65
Backwash Pump #1	Existing	10	14
Pond Pump	Existing	2	3.4
Backwash Blower #1	Existing	3	4.8
Air-Conditioning/Lighting/Instruments			6
Total		246	338.4

The existing 150 kW emergency generator is too small. The required emergency generator will be rated at 300 kW with a base mounted fuel tank sized for 24 hours operating at full load.

5. SUMMARY

5.1 Report Summary

The purpose of this preliminary engineering report was to provide the preliminary engineering basis of design documentation for the proposed improvements and up-rating of the Cypress Lakes Wastewater Treatment Plant (WWTP). This report, upon the Owner's approval, will be attached to the construction permit application that will be submitted to the Florida Department of Environmental Protection (FDEP) in accordance with Chapters 62-600 and 62-610 of the Florida Administrative Code (F.A.C).

5.2 Design Summary

The performance of the WWTP was evaluated to ensure that the facility will have the ability to meet current FDEP and USEPA regulations, following the proposed modifications described in Section 4. It is HDR's belief that the proposed modifications to the facility will provide the level of treatment necessary to consistently meet or exceed the current permit conditions at the uprated flow of 0.190 MGD on an 3MADF basis.

However, based on the estimated performance of the filtration and disinfection process, it is recommended that during MDF events, the following conditions are met to operate within the required limits:

1. During MDF events, backwashing should not be performed to any of the filters remaining in service if at least one (1) filter is out of service. With the largest unit out of service and other being backwashed, the remaining operating unit will have a loading rate of 4.9 gpm/sqft which is lower than the maximum allowable loading rate recommended by the Ten State Standards, but higher than the rate of 4.0 gpm/sqft. recommended by the Design Team.
2. During MDF events, two (2) chlorine contact chambers must be in service in order to provide more than 15 minutes of contact time as required by the FDEP Chapter 62-600.440(5)(c). By taking one (1) unit out of service during MDF events, the contact time will be reduced to 13 minutes which is lower than the minimum permitted contact time.

Table 5.1 provides a design summary of the treatment process for the Cypress Lakes WWTP.

TABLE 5.1 PROCESS DESIGN SUMMARY

Process/Parameter	Design Criteria	Units
A. Flow Data		
Average Annual daily Flow (3MADF)	0.190	MGD
Maximum Average Daily Flow (MDF)	0.285	MGD
Peak Hour Flow (PHF)	0.665	MGD
Design Peaking Factor (PF to design for MADF or PHF events)	1.5	
CBOD5 - Raw Wastewater[1]	375	mg/L
TSS - Raw Wastewater[1]	217	mg/L
B. Pretreatment		
Proposed Static Screen (Max. opening)	2	mm
C. Equalization Basin		
Minimum Tank Capacity	28,400	gallons
EQ. Pump Capacity	500	gpm
EQ. Blowers Capacity	200	cfm
EQ Blowers Discharge Pressure	7.5	psig
D. Aeration Basins		
Aeration Trains 1 and 2 (Each)		
Tank Volume	79,100	gallons
Side Water Depth	12	ft
Hydraulic Detention Time @ 3MADF	30	hr
Hydraulic Detention Time @ 3MADF (for Class I Reliability)	20	hr
Hydraulic Detention Time @ MDF	20	hr
Hydraulic Detention Time @ MDF (for Class I Reliability)	13.3	hr
MLSS	3,500	mg/L
Volatile Fraction of MLSS	70%	
Maximum Return Activated Sludge Flow to each Aeration Train (RAS=1.5*3MADF)	0.095	MGD
Minimum Operating Dissolved Oxygen at 3MADF	2.0	mg/L
Minimum Operating Dissolved Oxygen at MDF	1.0	mg/L
Aeration Train 3 (2 Tanks in series)		
Tank Volume	71,600	gallons
Tank Water Depth	10.5	ft
Hydraulic Detention Time @ 3MADF	27.1	hr
Hydraulic Detention Time @ 3MADF (for Class I Reliability)	18.1	hr
Hydraulic Detention Time @ MDF	18.1	hr
Hydraulic Detention Time @ MDF (for Class I Reliability)	12.1	hr
MLSS	3,500	mg/L
Volatile Fraction of MLSS	70%	
Maximum Return Activated Sludge Flow to Aeration Train 3 (RAS=1.5*3MADF)	0.095	MGD
Minimum Operating Dissolved Oxygen at 3MADF	2.0	mg/L
Minimum Operating Dissolved Oxygen at MDF	1.0	mg/L

Notes: 1. Based on high-strength domestic wastewater (M&E, 2004)
2. Class I reliability considers 100% of the design flow w/ the largest unit out of service

TABLE 5.1 PROCESS DESIGN SUMMARY (CONTINUATION)

Process/Parameter	Design Criteria	Units
E. Secondary Clarifiers		
No. of Existing Clarifiers:	3	
Surface Area of Existing Clarifiers 1 and 2 (each):	240	sqft.
Surface Area of Existing Clarifier 3:	228	sqft.
Weir Length of Existing Clarifiers 1 and 2 (2x19-ft each -per survey):	38	ft.
Weir Length of Existing Clarifier 3: (2x13.6-ft -per survey)	27.2	ft.
MLSS	3,500	mg/L
Return Activated Sludge Flow	0.285	MGD
Design Flow (if PF = 1.0)	0.190	MGD
Design Flow (if PF = 1.5)	0.285	MGD
Clarifier Loadings at Design Flow 0.190 MGD (PF = 1.0)		
Class I Reliability[1] Flow (PF = 1.0)	0.190	MGD
Maximum Allowable Surface Overflow Rate (SOR)	1,000	gpd/sqft.
Design Flow SOR Clarifiers 1 and 2 (each):	264	gpd/sqft.
Design Flow SOR Clarifier 3:	278	gpd/sqft.
Class 1 Reliability[1] Design Flow SOR	406	gpd/sqft.
Maximum Allowable Solids Loading Rate (SLR)	35	ppd/sqft
MDF SLR Clarifiers 1 and 2 (each):	19	ppd/sqft
MDF SLR Clarifier 3:	20	ppd/sqft
Class 1 Reliability MDF Solids Loading Rate	30	ppd/sqft
Maximum Allowable Weir Loading Rate at Design Flow	20,000	gpd/ft.
Design Flow Weir Loading Rate for Clarifiers 1 and 2 (ea)	1,667	gpd/ft.
Design Flow Weir Loading Rate for Existing Clarifier 3:	2,346	gpd/ft.
Class 1 Reliability Design Weir Loading Rate	2,923	gpd/ft.
Clarifier Loadings at Design Flow 0.285 MGD (PF = 1.5)		
Class I Reliability Flow (PF = 1.5)	0.285	MGD
Maximum Allowable Surface Overflow Rate (SOR)	1,000	gpd/sqft.
Design Flow SOR Clarifiers 1 and 2 (each):	396	gpd/sqft.
Design Flow SOR Clarifier 3:	417	gpd/sqft.
Class 1 Reliability[1] Design Flow SOR	609	gpd/sqft.
Maximum Allowable Solids Loading Rate (SLR)	35	ppd/sqft
MDF SLR Clarifiers 1 and 2 (each):	23	ppd/sqft
MDF SLR Clarifier 3:	24	ppd/sqft
Class 1 Reliability MDF Solids Loading Rate	35	ppd/sqft
Maximum Allowable Weir Loading Rate at Design Flow	20,000	gpd/ft.
Design Flow Weir Loading Rate for Clarifiers 1 and 2 (ea)	2,500	gpd/ft.
Design Flow Weir Loading Rate for Existing Clarifier 3:	3,519	gpd/ft.
Class 1 Reliability Design Weir Loading Rate	4,385	gpd/ft.

Class I reliability for clarifiers considers 100% of the design flow w/ the largest unit out of service

TABLE 5.1 PROCESS DESIGN SUMMARY (CONTINUATION)

Process/Parameter	Design Criteria	Units
F. Aerobic Sludge Holding Tanks (2 Units)		
Sludge Production per Day @ 3MADF	5,217	gpd
Sludge Production per Day @ MDF	8,821	gpd
Tank Volume (Combined Capacity)	17,200	Gal.
Sludge Holding Capacity @ 3MADF	3	days
Sludge Holding Capacity @ MDF	2	day
G. Filtration		
No. of Filters:	3	
Total Surface Area:	140	sqft.
Total Design Area: (Largest filter out of service)	90	sqft.
Maximum Allowable Loading Rate	4	gpm/sqft.
Design Flow (if PF = 1.0)	0.190	MGD
Design Flow (if PF = 1.5)	0.285	MGD
Filter Loadings at Design Flow 0.190 MGD (PF = 1.0)		
Design Loading Rate (Class I Reliability)	1.5	gpm/sqft.
Design Peak Flow Loading Rate with a Single Unit Operating (Largest unit out of service and second unit on backwash)	3.3	gpm/sqft.
Filter Loadings at Design Flow 0.285 MGD (PF = 1.5)		
Design Loading Rate (Class I Reliability)	2.2	gpm/sqft.
Design Peak Flow Loading Rate with a Single Unit Operating (Largest unit out of service and second unit on backwash)	4.9	gpm/sqft.
H. Chlorine Contact Chambers (2 Units)		
No. of Trains:	2	
Volume Per Train:	2,500	gallons
Minimum Detention Time:	15	minutes
Design Flow (if PF = 1.0)	0.190	MGD
Design Flow (if PF = 1.5)	0.285	MGD
CCC Capacity at Design Flow 0.190 MGD (PF = 1.0)		
Detention Time at Design Flow with all Units in Service:	38	minutes.
Chlorine Residual at CT=120	3.2	mg/L
Detention Time at Class 1 Reliability	19	minutes.
Chlorine Residual at CT=120	6.3	mg/L
CCC Capacity at Design Flow 0.285 MGD (PF = 1.5)		
Detention Time at Design Flow with all Units in Service:	25	minutes.
Chlorine Residual at CT=120	4.8	mg/L
Detention Time at Class 1 Reliability w/ Largest Unit Out of Service:	13	minutes.
Chlorine Residual at CT=120	9.5	mg/L

Class I reliability for chlorine contact chamber considers 100% of the design flow w/ the largest unit out of service

APPENDIX A
HISTORICAL FLOWS

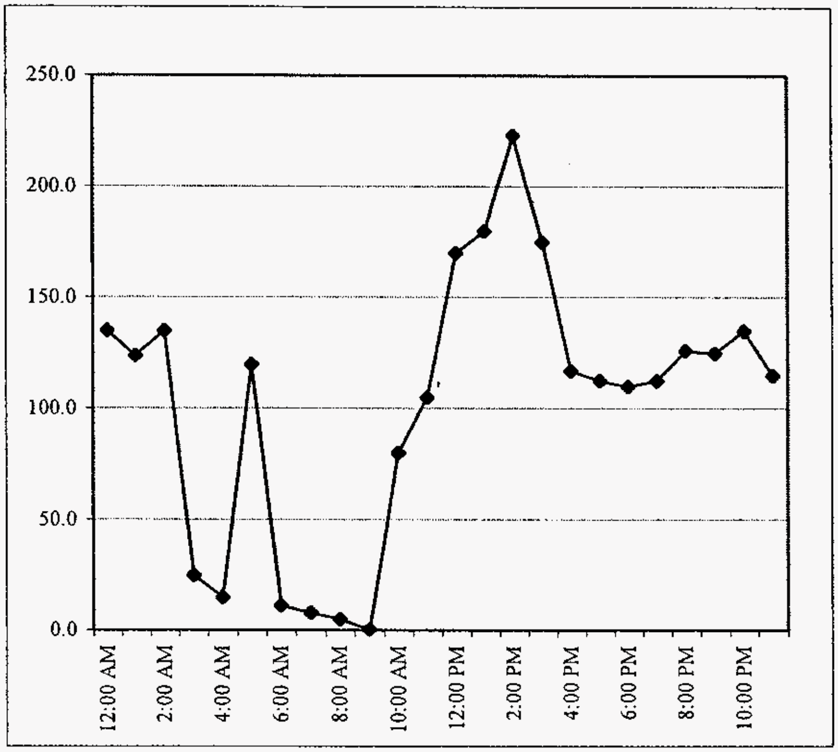
SUMMARY

March 25, 2006

Average daily flows from a 3-year period were analyzed and compared. The highest ADF found during this period were selected and analyzed individually. Due to the lack of hourly flow records from the Cypress Lakes WWTF for the year 2004, available hourly flows from 2006 were used to extrapolate the hourly behavior of the wastewater flow on the selected days. March 25 was selected to extrapolate the hourly % of ADF entering the plant, since the ADF for this particular day is similar to the ADF of the selected days, occurs in the same period of the year, and the corresponding AADF for the year 2006 is similar to the AADF of the other years evaluated.

Hourly flows are from 12:00 am to 11:00 pm which represents the worst condition, therefore ADFs may differ slightly from ADFs reported in the plant's DMRs which report daily flows from 8:00 am to 8:00 am of the next day. Data for March 25,

TIME	GPM	MGD	% of ADF
12:00 AM	135.0	0.194	131%
1:00 AM	123.8	0.178	121%
2:00 AM	135.0	0.194	131%
3:00 AM	25.0	0.036	24%
4:00 AM	15.0	0.022	15%
5:00 AM	120.0	0.173	117%
6:00 AM	11.3	0.016	11%
7:00 AM	8.0	0.012	8%
8:00 AM	5.0	0.007	5%
9:00 AM	0.3	0.000	0%
10:00 AM	80.0	0.115	78%
11:00 AM	105.0	0.151	102%
12:00 PM	170.0	0.245	166%
1:00 PM	180.0	0.259	175%
2:00 PM	223.1	0.321	217%
3:00 PM	175.0	0.252	170%
4:00 PM	117.0	0.168	114%
5:00 PM	112.5	0.162	110%
6:00 PM	110.0	0.158	107%
7:00 PM	112.5	0.162	110%
8:00 PM	126.0	0.181	123%
9:00 PM	125.0	0.180	122%
10:00 PM	135.0	0.194	131%
11:00 PM	114.8	0.165	112%
ADF	**102.7**	**0.148**	



A summary of the days selected for analysis and their corresponding input and output values are shown in the following table:

	Historical Flow Data							Calculated data for buildout flows		
Date	Peak Condition	Rain/ Dry	ADF (MGD)	MDF PF	PHF (MGD)	PHF PF	year's AADF (MGD)	Req'd Capac. at buildout (gallons)	Pumping rate rate req'd (gpm)	New PF to units at existing capacity
15-Feb-04	MADF	?	0.177	1.5	0.385	3.3	0.118	50,616	214	1.6
17-Mar-04	MADF	?	0.172	1.5	0.374	3.2	0.118	47,797	200	1.5
28-Mar-05	MADF	?	0.180	1.5	0.305	2.5	0.121	39,648	201	1.5
4-Feb-06	MADF	?	0.169	1.4	0.314	2.6	0.122	29,916	164	1.2
3-Feb-07	MADF	?	0.189	1.5	0.310	2.5	0.122	29,743	205	1.6
Average						*2.9*				*1.5*
25-Mar-06	PHF	Dry	0.148	1.2	0.321	2.6	0.122	36,325	143	1.1
28-Jun-06	PHF	Rain	0.113	N/A	0.427	3.5	0.122	56,942	200	1.5
29-Jun-06	PHF	Dry	0.120	N/A	0.280	2.3	0.122	17,382	120	0.9
5-Sep-06	PHF	?	0.123	N/A	0.251	2.1	0.122	25,851	128	1.0
6-Nov-06	PHF	?	0.151	1.2	0.281	2.3	0.122	35,209	140	1.1
Average						*2.6*				*1.0*

CUMULATIVE FLOW ANALYSIS

Hourly Flow for:	**15-Feb-04 - Maximum Average Day Flow -**
2004 AADF:	0.118 MGD
ADF:	0.177 MGD
PHF:	0.385 MGD
MADF Peaking Factor	**1.5**
PHF Peaking Factor:	3.3 (PHF/2004 AADF=0.118)

TIME	% of ADF	GPM	*MG/Hr*	Estimated Volume *gallons*	Cumulative Volume *gallons*	Equalized Cumulative *Volume (gallons)*	Volume in Storage *(gallons)*
12:00 AM	131%	161.6	0.0097	9,697	9,697	7,375	2,322
1:00 AM	121%	148.1	0.0089	8,889	18,586	14,750	3,836
2:00 AM	131%	161.6	0.0097	9,697	28,283	22,125	6,158
3:00 AM	24%	29.9	0.0018	1,796	30,079	29,500	579
4:00 AM	15%	18.0	0.0011	1,077	31,156	36,875	0
5:00 AM	117%	143.7	0.0086	8,620	39,776	44,250	1,245
6:00 AM	11%	13.5	0.0008	808	40,584	51,625	0
7:00 AM	8%	9.6	0.0006	575	41,159	59,000	0
8:00 AM	5%	6.0	0.0004	359	41,518	66,375	0
9:00 AM	0%	0.4	0.0000	22	41,539	73,750	0
10:00 AM	78%	95.8	0.0057	5,746	47,286	81,125	0
11:00 AM	102%	125.7	0.0075	7,542	54,828	88,500	167
12:00 PM	166%	203.5	0.0122	12,211	67,039	95,875	5,003
1:00 PM	175%	215.5	0.0129	12,929	79,968	103,250	10,558
2:00 PM	217%	267.1	0.0160	16,025	95,994	110,625	19,208
3:00 PM	170%	209.5	0.0126	12,570	108,564	118,000	24,403
4:00 PM	114%	140.1	0.0084	8,404	116,968	125,375	25,432
5:00 PM	110%	134.7	0.0081	8,081	125,049	132,750	26,138
6:00 PM	107%	131.7	0.0079	7,901	132,950	140,125	26,665
7:00 PM	110%	134.7	0.0081	8,081	141,031	147,500	27,370
8:00 PM	123%	150.8	0.0091	9,051	150,082	154,875	29,046
9:00 PM	122%	149.6	0.0090	8,979	159,060	162,250	30,650
10:00 PM	131%	161.6	0.0097	9,697	168,758	169,625	32,972
11:00 PM	112%	137.4	0.0082	8,242	177,000	177,000	33,839

Equalized Average Flowrate	7,375	gal/hr
Eq.ADF	177,000	gpd
	0.177	MGD

*% of MADF extrapolated from actual hourly flows from March 25,2006. Hourly flows for the MDF selected not available

Projected hourly flow at buildout for a Peak Hour Event

Buildout 3MADF:	0.190 MGD
Buildout MADF:	0.284 MGD

Time Period	Time	Adjusted Est. Q *(MG/hr)*	Adjusted Volume *(gallons)*	Cumulative Volume *(gallons)*	Equalized Cumulative Volume *(gallons)*	Volume In Storage *(gallons)*	Volume In Storage for actual avail. Vol *(gallons)*	
MIDNIGHT-1:00 A.M.	12:00 AM	0.0145	14,505	14,505	11,031	3,473	1,643	
1:00 AM - 2:00 A.M.	1:00 AM	0.0133	13,296	27,801	22,063	5,738	2,077	
2:00 AM - 3:00 A.M.	2:00 AM	0.0145	14,505	42,305	33,094	9,211	3,720	
3:00 AM - 4:00 A.M.	3:00 AM	0.0027	2,686	44,991	44,125	866	0	
4:00 AM - 5:00 A.M.	4:00 AM	0.0016	1,612	46,603	55,157	0	0	
5:00 AM - 6:00 A.M.	5:00 AM	0.0129	12,893	59,496	66,188	1,862	31	
6:00 AM - 7:00 A.M.	6:00 AM	0.0012	1,209	60,704	77,219	0	0	
7:00 AM - 8:00 A.M.	7:00 AM	0.0009	860	61,564	88,251	0	0	
8:00 AM - 9:00 A.M.	8:00 AM	0.0005	537	62,101	99,282	0	0	
9:00 AM - 10:00 A.M.	9:00 AM	0.0000	32	62,133	110,313	0	0	
10:00 AM - 11:00 A.M.	10:00 AM	0.0086	8,595	70,729	121,345	0	0	
11:00 AM - 12:00 P.M.	11:00 AM	0.0113	11,281	82,010	132,376	250	0	
12:00 P.M. - 1:00 P.M.	12:00 PM	0.0183	18,265	100,275	143,407	7,484	5,403	
1:00 PM - 2:00 P.M.	1:00 PM	0.0193	19,339	119,615	154,439	15,792	11,881	
2:00 PM - 3:00 P.M.	2:00 PM	0.0240	23,970	143,585	165,470	28,731	22,989	
3:00 PM - 4:00 P.M.	3:00 PM	0.0188	18,802	162,387	176,501	36,502	28,930	
4:00 PM - 5:00 P.M.	4:00 PM	0.0126	12,571	174,958	187,533	38,041	28,639	
5:00 PM - 6:00 P.M.	5:00 PM	0.0121	12,087	187,045	198,564	39,097	27,864	
6:00 PM - 7:00 P.M.	6:00 PM	0.0118	11,819	198,864	209,595	39,884	26,821	
7:00 PM - 8:00 P.M.	7:00 PM	0.0121	12,087	210,951	220,627	40,940	26,046	
8:00 PM - 9:00 P.M.	8:00 PM	0.0135	13,538	224,488	231,658	43,446	26,722	
9:00 PM - 10:00 P.M.	9:00 PM	0.0134	13,430	237,919	242,689	45,845	27,290	
10:00PM - 11:00 P.M.	10:00 PM	0.0145	14,505	252,423	253,721	49,318	28,933	
11:00 PM - 12:00 A.M.	11:00 PM	0.0123	12,329	264,752	264,752	50,616	28,400	Actual Capacity

Equalized Average Flowrate:	11,031	gal/hr
	264,752	gpd
	0.265	MGD

Actual flow rate pumped during the day if using the actual tank capacity of 43,600 gallons*:	12,862	gal/hour*
	214.4	gpm
	0.309	MGD
Actual peaking factor the process units will handle:	1.6	

*Value found by iteration to obtain max volume in storage equal to actual tank capacity

CUMULATIVE FLOW ANALYSIS

Hourly Flow for:	**17-Mar-04**	**- Maximum Average Day Flow -**
2004 AADF:	0.118	MGD
ADF:	0.172	MGD
PHF:	0.374	MGD
MADF Peaking Factor	**1.5**	
PHF Peaking Factor:	3.2	(PHF/2004 AADF=0.118)

TIME	% of ADF	GPM	*MG/Hr*	Estimated Volume *gallons*	Cumulative Volume *gallons*	Equalized Cumulative *Volume (gallons)*	Volume in Storage *(gallons)*
12:00 AM	131%	157.1	0.0094	9,423	9,423	7,167	2,256
1:00 AM	121%	144.0	0.0086	8,638	18,061	14,333	3,728
2:00 AM	131%	157.1	0.0094	9,423	27,484	21,500	5,984
3:00 AM	24%	29.1	0.0017	1,745	29,229	28,667	562
4:00 AM	15%	17.5	0.0010	1,047	30,276	35,833	0
5:00 AM	117%	139.6	0.0084	8,376	38,652	43,000	1,209
6:00 AM	11%	13.1	0.0008	785	39,438	50,167	0
7:00 AM	8%	9.3	0.0006	558	39,996	57,333	0
8:00 AM	5%	5.8	0.0003	349	40,345	64,500	0
9:00 AM	0%	0.3	0.0000	21	40,366	71,667	0
10:00 AM	78%	93.1	0.0056	5,584	45,950	78,833	0
11:00 AM	102%	122.2	0.0073	7,329	53,279	86,000	162
12:00 PM	166%	197.8	0.0119	11,866	65,145	93,167	4,862
1:00 PM	175%	209.4	0.0126	12,564	77,709	100,333	10,259
2:00 PM	217%	259.5	0.0156	15,573	93,282	107,500	18,665
3:00 PM	170%	203.6	0.0122	12,215	105,497	114,667	23,714
4:00 PM	114%	136.1	0.0082	8,167	113,664	121,833	24,714
5:00 PM	110%	130.9	0.0079	7,853	121,516	129,000	25,400
6:00 PM	107%	128.0	0.0077	7,678	129,195	136,167	25,911
7:00 PM	110%	130.9	0.0079	7,853	137,047	143,333	26,597
8:00 PM	123%	146.6	0.0088	8,795	145,842	150,500	28,225
9:00 PM	122%	145.4	0.0087	8,725	154,567	157,667	29,784
10:00 PM	131%	157.1	0.0094	9,423	163,990	164,833	32,040
11:00 PM	112%	133.5	0.0080	8,010	172,000	172,000	32,883

Equalized Average Flowrate	7,167	gal/hr
Eq.ADF	172,000	gpd
	0.172	MGD

*% of MADF extrapolated from actual hourly flows from March 25,2006. Hourly flows for the MDF selected not available

Projected hourly flow at buildout for a Peak Hour Event

Buildout 3MADF:	0.190	MGD
Buildout MADF:	0.276	MGD

Time Period	Time	Adjusted Est. Q *(MG/hr)*	Adjusted Volume *(gallons)*	Cumulative Volume *(gallons)*	Equalized Cumulative Volume *(gallons)*	Volume In Storage *(gallons)*	Volume In Storage for actual avail. Vol *(gallons)*
MIDNIGHT-1:00 A.M.	12:00 AM	0.0137	13,697	13,697	10,417	3,280	1,683
1:00 AM - 2:00 A.M.	1:00 AM	0.0126	12,555	26,252	20,834	5,418	2,225
2:00 AM - 3:00 A.M.	2:00 AM	0.0137	13,697	39,949	31,251	8,698	3,908
3:00 AM - 4:00 A.M.	3:00 AM	0.0025	2,536	42,485	41,668	818	0
4:00 AM - 5:00 A.M.	4:00 AM	0.0015	1,522	44,007	52,085	0	0
5:00 AM - 6:00 A.M.	5:00 AM	0.0122	12,175	56,182	62,501	1,758	161
6:00 AM - 7:00 A.M.	6:00 AM	0.0011	1,141	57,323	72,918	0	0
7:00 AM - 8:00 A.M.	7:00 AM	0.0008	812	58,135	83,335	0	0
8:00 AM - 9:00 A.M.	8:00 AM	0.0005	507	58,642	93,752	0	0
9:00 AM - 10:00 A.M.	9:00 AM	0.0000	30	58,673	104,169	0	0
10:00 AM - 11:00 A.M.	10:00 AM	0.0081	8,117	66,789	114,586	0	0
11:00 AM - 12:00 P.M.	11:00 AM	0.0107	10,653	77,442	125,003	236	0
12:00 P.M. - 1:00 P.M.	12:00 PM	0.0172	17,248	94,690	135,420	7,067	5,234
1:00 PM - 2:00 P.M.	1:00 PM	0.0183	18,262	112,952	145,837	14,912	11,483
2:00 PM - 3:00 P.M.	2:00 PM	0.0226	22,635	135,587	156,254	27,130	22,104
3:00 PM - 4:00 P.M.	3:00 PM	0.0178	17,755	153,342	166,670	34,469	27,846
4:00 PM - 5:00 P.M.	4:00 PM	0.0119	11,870	165,213	177,087	35,922	27,703
5:00 PM - 6:00 P.M.	5:00 PM	0.0114	11,414	176,627	187,504	36,919	27,103
6:00 PM - 7:00 P.M.	6:00 PM	0.0112	11,160	187,787	197,921	37,663	26,250
7:00 PM - 8:00 P.M.	7:00 PM	0.0114	11,414	199,201	208,338	38,660	25,650
8:00 PM - 9:00 P.M.	8:00 PM	0.0128	12,784	211,985	218,755	41,026	26,420
9:00 PM - 10:00 P.M.	9:00 PM	0.0127	12,682	224,667	229,172	43,292	27,088
10:00PM - 11:00 P.M.	10:00 PM	0.0137	13,697	238,363	239,589	46,571	28,772
11:00 PM - 12:00 A.M.	11:00 PM	0.0116	11,642	250,006	250,006	47,797	28,400 Actual Capacity

Equalized Average Flowrate:	10,417	gal/hr
	250,006	gpd
	0.250	MGD

Actual flow rate pumped during the day if using the actual tank capacity of 43,600 gallons*:	12,014	gal/hour*
	200.2	gpm
	0.288	MGD
Actual peaking factor the process units will handle:	1.5	

*Value found by iteration to obtain max volume in storage equal to actual tank capacity

CUMULATIVE FLOW ANALYSIS

Hourly Flow for: **28-Mar-05 - Maximum Average Day Flow -**
2005 AADF: 0.121 MGD
ADF: 0.180 MGD
PHF: 0.305 MGD
MADF Peaking Factor **1.5**
PHF Peaking Factor: 2.5 (PHF/2005 AADF=0.121)

TIME	% of ADF	GPM	*MG/Hr*	Estimated Volume *gallons*	Cumulative Volume *gallons*	Equalized Cumulative *Volume (gallons)*	Volume in Storage *(gallons)*
12:00 AM	87%	108.2	0.0065	6,492	6,492	7,480	0
1:00 AM	83%	103.5	0.0062	6,210	12,702	14,960	0
2:00 AM	79%	98.8	0.0059	5,928	18,630	22,440	0
3:00 AM	77%	96.4	0.0058	5,786	24,416	29,920	0
4:00 AM	64%	80.0	0.0048	4,799	29,215	37,400	0
5:00 AM	53%	65.9	0.0040	3,952	33,166	44,880	0
6:00 AM	60%	75.3	0.0045	4,516	37,683	52,360	0
7:00 AM	60%	75.3	0.0045	4,516	42,199	59,841	0
8:00 AM	57%	70.6	0.0042	4,234	46,433	67,321	0
9:00 AM	60%	75.3	0.0045	4,516	50,949	74,801	0
10:00 AM	94%	117.6	0.0071	7,057	58,006	82,281	0
11:00 AM	109%	136.4	0.0082	8,186	66,192	89,761	706
12:00 PM	57%	70.6	0.0042	4,234	70,426	97,241	0
1:00 PM	158%	197.6	0.0119	11,855	82,281	104,721	4,375
2:00 PM	170%	211.7	0.0127	12,702	94,983	112,201	9,597
3:00 PM	164%	204.6	0.0123	12,279	107,261	119,681	14,396
4:00 PM	140%	174.1	0.0104	10,444	117,705	127,161	17,359
5:00 PM	110%	160.0	0.0096	9,597	127,302	134,641	19,476
6:00 PM	107%	150.5	0.0090	9,033	136,335	142,121	21,029
7:00 PM	110%	127.0	0.0076	7,621	143,956	149,601	21,170
8:00 PM	123%	131.7	0.0079	7,903	151,859	157,081	21,593
9:00 PM	122%	145.8	0.0088	8,750	160,610	164,561	22,864
10:00 PM	131%	150.5	0.0090	9,033	169,642	172,042	24,416
11:00 PM	112%	164.7	0.0099	9,879	179,522	179,522	26,815

Equalized Average Flowrate 7,480 gal/hr
Eq.ADF 179,522 gpd
0.180 MGD

*% of MADF extrapolated from actual hourly flows from March 25,2006. Hourly flows for the MDF selected not available

Projected hourly flow at buildout for a Peak Hour Event
Buildout 3MADF: 0.190 MGD
Buildout MADF: 0.281 MGD
Normalization Factor (new AADF/Eq.ADF) 1.1

Time Period	Time	Adjusted Est. Q *(MG/hr)*	Adjusted Volume *(gallons)*	Cumulative Volume *(gallons)*	Equalized Cumulative Volume *(gallons)*	Volume In Storage *(gallons)*	Volume In Storage for actual avail. Vol *(gallons)*	
MIDNIGHT-1:00 A.M.	12:00 AM	0.0096	9,599	9,599	11,060	0	0	
1:00 AM - 2:00 A.M.	1:00 AM	0.0092	9,182	18,781	22,119	0	0	
2:00 AM - 3:00 A.M.	2:00 AM	0.0088	8,764	27,545	33,179	0	0	
3:00 AM - 4:00 A.M.	3:00 AM	0.0086	8,556	36,101	44,239	0	0	
4:00 AM - 5:00 A.M.	4:00 AM	0.0071	7,095	43,195	55,299	0	0	
5:00 AM - 6:00 A.M.	5:00 AM	0.0058	5,843	49,038	66,358	0	0	
6:00 AM - 7:00 A.M.	6:00 AM	0.0067	6,678	55,716	77,418	0	0	
7:00 AM - 8:00 A.M.	7:00 AM	0.0067	6,678	62,393	88,478	0	0	
8:00 AM - 9:00 A.M.	8:00 AM	0.0063	6,260	68,654	99,537	0	0	
9:00 AM - 10:00 A.M.	9:00 AM	0.0067	6,678	75,331	110,597	0	0	
10:00 AM - 11:00 A.M.	10:00 AM	0.0104	10,434	85,765	121,657	0	0	
11:00 AM - 12:00 P.M.	11:00 AM	0.0121	12,103	97,868	132,717	1,043	21	
12:00 P.M. - 1:00 P.M.	12:00 PM	0.0063	6,260	104,128	143,776	0	0	
1:00 PM - 2:00 P.M.	1:00 PM	0.0175	17,529	121,657	154,836	6,469	5,446	
2:00 PM - 3:00 P.M.	2:00 PM	0.0188	18,781	140,437	165,896	14,190	12,145	
3:00 PM - 4:00 P.M.	3:00 PM	0.0182	18,155	158,592	176,955	21,285	18,217	
4:00 PM - 5:00 P.M.	4:00 PM	0.0154	15,442	174,034	188,015	25,667	21,577	
5:00 PM - 6:00 P.M.	5:00 PM	0.0142	14,190	188,224	199,075	28,797	23,684	
6:00 PM - 7:00 P.M.	6:00 PM	0.0134	13,355	201,579	210,135	31,092	24,957	
7:00 PM - 8:00 P.M.	7:00 PM	0.0113	11,268	212,847	221,194	31,301	24,143	
8:00 PM - 9:00 P.M.	8:00 PM	0.0117	11,686	224,533	232,254	31,927	23,746	
9:00 PM - 10:00 P.M.	9:00 PM	0.0129	12,938	237,471	243,314	33,805	24,602	
10:00PM - 11:00 P.M.	10:00 PM	0.0134	13,355	250,826	254,373	36,101	25,875	
11:00 PM - 12:00 A.M.	11:00 PM	0.0146	14,607	265,433	265,433	39,648	28,400	Actual Capacity

Equalized Average Flowrate: **11,060** gal/hr
265,433 gpd
0.265 MGD

Actual flow rate pumped during the day if using the actual tank capacity of 43,600 gallons*:	12,082	gal/hour*
	201.4	gpm
	0.290	MGD
Actual peaking factor the process units will handle:	1.5	

*Value found by iteration to obtain max volume in storage equal to actual tank capacity

CUMULATIVE FLOW ANALYSIS

Hourly Flow for:	**4-Feb-06**	**- Maximum Average Day Flow -**
2006 AADF:	0.122	MGD
ADF:	0.169	MGD
PHF:	0.314	MGD
MADF Peaking Factor	**1.4**	
PHF Peaking Factor:	2.6	(PHF/2004 AADF=0.122)

TIME	% of ADF	GPM	*MG/Hr*	Estimated Volume *gallons*	Cumulative Volume *gallons*	Equalized Cumulative *Volume (gallons)*	Volume in Storage *(gallons)*
12:00 AM	63%	73.4	0.0044	4,406	4,406	7,028	0
1:00 AM	118%	137.7	0.0083	8,261	12,668	14,056	1,233
2:00 AM	67%	78.0	0.0047	4,682	17,349	21,084	0
3:00 AM	61%	71.1	0.0043	4,268	21,618	28,112	0
4:00 AM	63%	73.4	0.0044	4,406	26,024	35,140	0
5:00 AM	59%	68.8	0.0041	4,131	30,154	42,168	0
6:00 AM	61%	71.1	0.0043	4,268	34,423	49,196	0
7:00 AM	71%	82.6	0.0050	4,957	39,380	56,224	0
8:00 AM	82%	96.4	0.0058	5,783	45,163	63,252	0
9:00 AM	69%	80.3	0.0048	4,819	49,982	70,280	0
10:00 AM	82%	96.4	0.0058	5,783	55,765	77,308	0
11:00 AM	98%	114.7	0.0069	6,885	62,649	84,336	0
12:00 PM	102%	119.3	0.0072	7,160	69,809	91,364	132
1:00 PM	165%	192.8	0.0116	11,566	81,375	98,392	4,670
2:00 PM	186%	218.0	0.0131	13,081	94,456	105,420	10,723
3:00 PM	82%	96.4	0.0058	5,783	100,239	112,448	9,478
4:00 PM	147%	172.1	0.0103	10,327	110,566	119,476	12,777
5:00 PM	131%	153.8	0.0092	9,225	119,791	126,504	14,974
6:00 PM	121%	142.3	0.0085	8,537	128,328	133,532	16,483
7:00 PM	114%	133.1	0.0080	7,986	136,314	140,560	17,441
8:00 PM	94%	110.2	0.0066	6,609	142,923	147,588	17,022
9:00 PM	129%	151.5	0.0091	9,088	152,011	154,616	19,082
10:00 PM	133%	156.1	0.0094	9,363	161,374	161,644	21,417
11:00 PM	104%	121.6	0.0073	7,298	168,672	168,672	21,686

Equalized Average Flowrate	7,028	gal/hr
Eq.ADF	168,672	gpd
	0.169	MGD

*% of MADF extrapolated from actual hourly flows from March 25,2006. Hourly flows for the MDF selected not available

Projected hourly flow at buildout for a Peak Hour Event

Buildout 3MADF:	0.190	MGD
Buildout MADF:	0.262	MGD
Normalization Factor (new AADF/Eq.ADF)	1.1	

Time Period	Time	Adjusted Est. Q *(MG/hr)*	Adjusted Volume *(gallons)*	Cumulative Volume *(gallons)*	Equalized Cumulative Volume *(gallons)*	Volume In Storage *(gallons)*	Volume In Storage for actual avail. Vol *(gallons)*	
MIDNIGHT-1:00 A.M.	12:00 AM	0.0061	6,078	6,078	9,695	0	0	
1:00 AM - 2:00 A.M.	1:00 AM	0.0114	11,397	17,475	19,390	1,702	1,575	
2:00 AM - 3:00 A.M.	2:00 AM	0.0065	6,458	23,933	29,085	0	0	
3:00 AM - 4:00 A.M.	3:00 AM	0.0059	5,888	29,821	38,780	0	0	
4:00 AM - 5:00 A.M.	4:00 AM	0.0061	6,078	35,899	48,475	0	0	
5:00 AM - 6:00 A.M.	5:00 AM	0.0057	5,698	41,598	58,170	0	0	
6:00 AM - 7:00 A.M.	6:00 AM	0.0059	5,888	47,486	67,865	0	0	
7:00 AM - 8:00 A.M.	7:00 AM	0.0068	6,838	54,324	77,560	0	0	
8:00 AM - 9:00 A.M.	8:00 AM	0.0080	7,978	62,302	87,256	0	0	
9:00 AM - 10:00 A.M.	9:00 AM	0.0066	6,648	68,950	96,951	0	0	
10:00 AM - 11:00 A.M.	10:00 AM	0.0080	7,978	76,927	106,646	0	0	
11:00 AM - 12:00 P.M.	11:00 AM	0.0095	9,497	86,425	116,341	0	0	
12:00 P.M. - 1:00 P.M.	12:00 PM	0.0099	9,877	96,302	126,036	182	56	
1:00 PM - 2:00 P.M.	1:00 PM	0.0160	15,955	112,257	135,731	6,442	6,190	
2:00 PM - 3:00 P.M.	2:00 PM	0.0180	18,045	130,302	145,426	14,792	14,413	
3:00 PM - 4:00 P.M.	3:00 PM	0.0080	7,978	138,279	155,121	13,074	12,569	
4:00 PM - 5:00 P.M.	4:00 PM	0.0142	14,246	152,525	164,816	17,625	16,994	
5:00 PM - 6:00 P.M.	5:00 PM	0.0127	12,726	165,251	174,511	20,656	19,898	
6:00 PM - 7:00 P.M.	6:00 PM	0.0118	11,777	177,028	184,206	22,738	21,854	
7:00 PM - 8:00 P.M.	7:00 PM	0.0110	11,017	188,045	193,901	24,060	23,049	
8:00 PM - 9:00 P.M.	8:00 PM	0.0091	9,117	197,162	203,596	23,482	22,345	
9:00 PM - 10:00 P.M.	9:00 PM	0.0125	12,536	209,698	213,291	26,323	25,060	
10:00PM - 11:00 P.M.	10:00 PM	0.0129	12,916	222,614	222,986	29,544	28,154	
11:00 PM - 12:00 A.M.	11:00 PM	0.0101	10,067	232,681	232,681	29,916	28,400	Actual Capacity

Equalized Average Flowrate:	9,695	gal/hr
	232,681	gpd
	0.233	MGD

Actual flow rate pumped during the day if using the actual tank capacity of 43,600 gallons*:	9,821	gal/hour*
	163.7	gpm
	0.236	MGD
Actual peaking factor the process units will handle:	1.2	

*Value found by iteration to obtain max volume in storage equal to actual tank capacity

CUMULATIVE FLOW ANALYSIS

Hourly Flow for March 25, 2006 - Maximum Day Event - No Rain

2006 AADF:	0.122	MGD	
MADF	0.148	MGD	
PHF:	0.321	MGD	(equiv to 223.1 gpm; occurred at 2:00pm)
MADF Peaking Factor	**1.2**		
PHF Peaking Factor:	2.6	(PHF/2006 AADF=0.122)	

TIME	GPM	*MG/Hr*	**Estimated Volume** *gallons*	**Cumulative Volume** *gallons*	**Equalized Cumulative** *Volume (gallons)*	**Volume in Storage** *(gallons)*
12:00 AM	135.0	0.0081	8,100	8,100	6,160	1,940
1:00 AM	123.8	0.0074	7,425	15,525	12,321	3,204
2:00 AM	135.0	0.0081	8,100	23,625	18,481	5,144
3:00 AM	25.0	0.0015	1,500	25,125	24,642	484
4:00 AM	15.0	0.0009	900	26,025	30,802	0
5:00 AM	120.0	0.0072	7,200	33,225	36,962	1,040
6:00 AM	11.3	0.0007	675	33,900	43,123	0
7:00 AM	8.0	0.0005	480	34,380	49,283	0
8:00 AM	5.0	0.0003	300	34,680	55,443	0
9:00 AM	0.3	0.0000	18	34,698	61,604	0
10:00 AM	80.0	0.0048	4,800	39,498	67,764	0
11:00 AM	105.0	0.0063	6,300	45,798	73,925	140
12:00 PM	170.0	0.0102	10,200	55,998	80,085	4,179
1:00 PM	180.0	0.0108	10,800	66,798	86,245	8,819
2:00 PM	223.1	0.0134	13,386	80,184	92,406	16,045
3:00 PM	175.0	0.0105	10,500	90,684	98,566	20,384
4:00 PM	117.0	0.0070	7,020	97,704	104,726	21,244
5:00 PM	112.5	0.0068	6,750	104,454	110,887	21,833
6:00 PM	110.0	0.0066	6,600	111,054	117,047	22,273
7:00 PM	112.5	0.0068	6,750	117,804	123,208	22,863
8:00 PM	126.0	0.0076	7,560	125,364	129,368	24,262
9:00 PM	125.0	0.0075	7,500	132,864	135,528	25,602
10:00 PM	135.0	0.0081	8,100	140,964	141,689	27,542
11:00 PM	114.8	0.0069	6,885	147,849	147,849	28,266

Equalized Average Flowrate	**6,160**	gal/hr
Eq.ADF	147,849	gpd
	0.148	MGD

Projected hourly flow at buildout for a Peak Hour Event

Buildout 3MADF:	0.190	MGD	
Buildout MADF:	0.230	MGD	
Normalization Factor (new AADF/Eq.ADF)			1.3

Time Period	Time	**Adjusted Est. Q** *(MG/hr)*	**Adjusted Volume** *(gallons)*	**Cumulative Volume** *(gallons)*	**Equalized Cumulative Volume** *(gallons)*	**Volume In Storage** *(gallons)*	**Volume In Storage for actual avail. Vol** *(gallons)*	
MIDNIGHT-1:00 A.M.	12:00 AM	0.0104	10,409	10,409	7,917	2,493	1,847	
1:00 AM - 2:00 A.M.	1:00 AM	0.0095	9,542	19,951	15,833	4,118	2,827	
2:00 AM - 3:00 A.M.	2:00 AM	0.0104	10,409	30,360	23,750	6,610	4,674	
3:00 AM - 4:00 A.M.	3:00 AM	0.0019	1,928	32,288	31,667	621	0	
4:00 AM - 5:00 A.M.	4:00 AM	0.0012	1,157	33,445	39,583	0	0	
5:00 AM - 6:00 A.M.	5:00 AM	0.0093	9,253	42,697	47,500	1,336	691	
6:00 AM - 7:00 A.M.	6:00 AM	0.0009	867	43,565	55,417	0	0	
7:00 AM - 8:00 A.M.	7:00 AM	0.0006	617	44,182	63,333	0	0	
8:00 AM - 9:00 A.M.	8:00 AM	0.0004	386	44,567	71,250	0	0	
9:00 AM - 10:00 A.M.	9:00 AM	0.0000	23	44,590	79,167	0	0	
10:00 AM - 11:00 A.M.	10:00 AM	0.0062	6,168	50,759	87,083	0	0	
11:00 AM - 12:00 P.M.	11:00 AM	0.0081	8,096	58,855	95,000	179	0	
12:00 P.M. - 1:00 P.M.	12:00 PM	0.0131	13,108	71,963	102,917	5,371	4,546	
1:00 PM - 2:00 P.M.	1:00 PM	0.0139	13,879	85,842	110,833	11,333	9,863	
2:00 PM - 3:00 P.M.	2:00 PM	0.0172	17,202	103,044	118,750	20,619	18,503	
3:00 PM - 4:00 P.M.	3:00 PM	0.0135	13,493	116,538	126,667	26,196	23,434	
4:00 PM - 5:00 P.M.	4:00 PM	0.0090	9,021	125,559	134,583	27,300	23,894	
5:00 PM - 6:00 P.M.	5:00 PM	0.0087	8,674	134,233	142,500	28,058	24,006	
6:00 PM - 7:00 P.M.	6:00 PM	0.0085	8,482	142,715	150,417	28,623	23,925	
7:00 PM - 8:00 P.M.	7:00 PM	0.0087	8,674	151,389	158,333	29,381	24,038	
8:00 PM - 9:00 P.M.	8:00 PM	0.0097	9,715	161,105	166,250	31,179	25,191	
9:00 PM - 10:00 P.M.	9:00 PM	0.0096	9,638	170,743	174,167	32,901	26,267	
10:00PM - 11:00 P.M.	10:00 PM	0.0104	10,409	181,152	182,083	35,393	28,114	
11:00 PM - 12:00 A.M.	11:00 PM	0.0088	8,848	190,000	190,000	36,325	28,400	Actual Capacity

Equalized Average Flowrate:	7,917	gal/hr
	190,000	gpd
	0.190	MGD

Actual flow rate pumped during the day if using the actual tank capacity of 43,600 gallons*:	8,562	gal/hour*
	143	gpm
	0.205	MGD
Actual peaking factor the process units will handle:	1.1	

*Value found by iteration to obtain max volume in storage equal to actual tank capacity

CUMULATIVE FLOW ANALYSIS

Hourly Flow for June 29, 2006 - Peak Hour Event - No Rain

2006 AADF:	0.122	MGD
ADF:	0.120	MGD
PHF:	0.280	MGD
PHF Peaking Factor:	2.3	(PHF/2006 AADF=0.122)

TIME	GPM	*MG/Hr*	Estimated Volume *gallons*	Cumulative Volume *gallons*	Equalized Cumulative *Volume (gallons)*	Volume in Storage *(gallons)*
12:00 AM	41.1	0.0025	2,463	2,463	4,990	0
1:00 AM	141.4	0.0085	8,484	10,948	9,981	3,494
2:00 AM	31.9	0.0019	1,916	12,864	14,971	420
3:00 AM	18.2	0.0011	1,095	13,958	19,961	0
4:00 AM	22.8	0.0014	1,368	15,327	24,952	0
5:00 AM	146.0	0.0088	8,758	24,085	29,942	3,768
6:00 AM	73.0	0.0044	4,379	28,464	34,932	3,157
7:00 AM	18.2	0.0011	1,095	29,559	39,923	0
8:00 AM	159.7	0.0096	9,579	39,138	44,913	4,589
9:00 AM	41.1	0.0025	2,463	41,601	49,903	2,062
10:00 AM	50.2	0.0030	3,011	44,612	54,894	82
11:00 AM	95.8	0.0057	5,748	50,359	59,884	839
12:00 PM	59.3	0.0036	3,558	53,917	64,874	0
1:00 PM	118.6	0.0071	7,116	61,033	69,865	2,126
2:00 PM	114.0	0.0068	6,842	67,876	74,855	3,978
3:00 PM	31.9	0.0019	1,916	69,792	79,845	903
4:00 PM	194.3	0.0117	11,659	81,451	84,835	7,572
5:00 PM	114.0	0.0068	6,842	88,293	89,826	9,424
6:00 PM	54.7	0.0033	3,284	91,577	94,816	7,718
7:00 PM	95.8	0.0057	5,748	97,325	99,806	8,475
8:00 PM	132.3	0.0079	7,937	105,262	104,797	11,422
9:00 PM	54.7	0.0033	3,284	108,546	109,787	9,716
10:00 PM	164.2	0.0099	9,853	118,399	114,777	14,579
11:00 PM	22.8	0.0014	1,368	119,768	119,768	10,957

Equalized Average Flowrate	4,990	gal/hr
Eq.ADF	119,768	gpd
	0.120	MGD

Projected hourly flow at buildout for a Peak Hour Event

Buildout 3MADF:	0.190	MGD	
Buildout PHF:	0.435	MGD	(equiv to 296.5 gpm; occurred at 5:00pm)
Normalization Factor (new AADF/Eq.ADF)	1.6		

Time Period	Time	Adjusted Est. Q *(MG/hr)*	Adjusted Volume *(gallons)*	Cumulative Volume *(gallons)*	Equalized Cumulative Volume *(gallons)*	Volume In Storage *(gallons)*	Volume In Storage for actual avail. Vol *(gallons)*	
MIDNIGHT-1:00 A.M.	12:00 AM	0.0039	3,908	3,908	7,917	0	0	
1:00 AM - 2:00 A.M.	1:00 AM	0.0135	13,460	17,367	15,833	5,543	6,234	
2:00 AM - 3:00 A.M.	2:00 AM	0.0030	3,039	20,407	23,750	666	2,048	
3:00 AM - 4:00 A.M.	3:00 AM	0.0017	1,737	22,144	31,667	0	0	
4:00 AM - 5:00 A.M.	4:00 AM	0.0022	2,171	24,314	39,583	0	0	
5:00 AM - 6:00 A.M.	5:00 AM	0.0139	13,894	38,208	47,500	5,977	6,668	
6:00 AM - 7:00 A.M.	6:00 AM	0.0069	6,947	45,155	55,417	5,008	6,390	
7:00 AM - 8:00 A.M.	7:00 AM	0.0017	1,737	46,892	63,333	0	901	
8:00 AM - 9:00 A.M.	8:00 AM	0.0152	15,197	62,089	71,250	7,280	8,872	
9:00 AM - 10:00 A.M.	9:00 AM	0.0039	3,908	65,996	79,167	3,271	5,554	
10:00 AM - 11:00 A.M.	10:00 AM	0.0048	4,776	70,772	87,083	130	3,105	
11:00 AM - 12:00 P.M.	11:00 AM	0.0091	9,118	79,890	95,000	1,332	4,997	
12:00 P.M. - 1:00 P.M.	12:00 PM	0.0056	5,644	85,535	102,917	0	3,416	
1:00 PM - 2:00 P.M.	1:00 PM	0.0113	11,289	96,824	110,833	3,372	7,479	
2:00 PM - 3:00 P.M.	2:00 PM	0.0109	10,855	107,678	118,750	6,310	11,108	
3:00 PM - 4:00 P.M.	3:00 PM	0.0030	3,039	110,718	126,667	1,433	6,922	
4:00 PM - 5:00 P.M.	4:00 PM	0.0185	18,496	129,214	134,583	12,012	18,193	
5:00 PM - 6:00 P.M.	5:00 PM	0.0109	10,855	140,069	142,500	14,950	21,822	
6:00 PM - 7:00 P.M.	6:00 PM	0.0052	5,210	145,279	150,417	12,244	19,807	
7:00 PM - 8:00 P.M.	7:00 PM	0.0091	9,118	154,397	158,333	13,445	21,699	
8:00 PM - 9:00 P.M.	8:00 PM	0.0126	12,591	166,988	166,250	18,120	27,065	
9:00 PM - 10:00 P.M.	9:00 PM	0.0052	5,210	172,198	174,167	15,414	25,050	
10:00PM - 11:00 P.M.	10:00 PM	0.0156	15,631	187,829	182,083	23,128	33,455	
11:00 PM - 12:00 A.M.	11:00 PM	0.0022	2,171	190,000	190,000	17,382	28,400	Actual Capacity

Equalized Average Flowrate:	7,917	gal/hr
	190,000	gpd
	0.190	MGD

Actual flow rate pumped during the day if using the actual tank capacity of 43,600 gallons*:	7,225.6	gal/hour*
	120	gpm
	0.173	MGD
Actual peaking factor the process units will handle:	0.91	

*Value found by iteration to obtain max volume in storage equal to actual tank capacity

CUMULATIVE FLOW ANALYSIS

Hourly Flow for September 25, 2006

2006 AADF:	0.122	MGD
ADF:	0.123	MGD
PHF:	0.251	MGD
PHF Peaking Factor:	**2.1**	(PHF/2006 AADF=0.122)

TIME	GPM	*MG/Hr*	Estimated Volume *gallons*	Cumulative Volume *gallons*	Equalized Cumulative *Volume (gallons)*	Volume in Storage *(gallons)*
12:00 AM	114.7	0.0069	6,884	6,884	5,123	1,761
1:00 AM	105.6	0.0063	6,333	13,218	10,246	2,972
2:00 AM	59.7	0.0036	3,580	16,797	15,369	1,428
3:00 AM	22.9	0.0014	1,377	18,174	20,492	0
4:00 AM	11.5	0.0007	688	18,863	25,615	0
5:00 AM	64.3	0.0039	3,855	22,718	30,738	0
6:00 AM	18.4	0.0011	1,101	23,819	35,861	0
7:00 AM	64.3	0.0039	3,855	27,675	40,984	0
8:00 AM	174.4	0.0105	10,464	38,139	46,107	5,341
9:00 AM	18.4	0.0011	1,101	39,240	51,230	1,319
10:00 AM	64.3	0.0039	3,855	43,095	56,353	52
11:00 AM	27.5	0.0017	1,652	44,747	61,476	0
12:00 PM	119.3	0.0072	7,160	51,907	66,599	2,037
1:00 PM	160.6	0.0096	9,638	61,545	71,722	6,551
2:00 PM	114.7	0.0069	6,884	68,429	76,845	8,313
3:00 PM	110.1	0.0066	6,609	75,038	81,968	9,799
4:00 PM	96.4	0.0058	5,783	80,821	87,091	10,458
5:00 PM	96.4	0.0058	5,783	86,603	92,214	11,118
6:00 PM	96.4	0.0058	5,783	92,386	97,337	11,778
7:00 PM	101.0	0.0061	6,058	98,444	102,460	12,713
8:00 PM	101.0	0.0061	6,058	104,502	107,583	13,648
9:00 PM	105.6	0.0063	6,333	110,836	112,706	14,858
10:00 PM	101.0	0.0061	6,058	116,894	117,829	15,794
11:00 PM	101.0	0.0061	6,058	122,952	122,952	16,729
	Equalized Average Flowrate	5,123	gal/hr			
	Eq.ADF	122,952	gpd			
		0.123	MGD			

Projected hourly flow at buildout for a Peak Hour Event

Buildout 3MADF:	0.190	MGD	
Buildout PHF:	0.390	MGD	(equiv to 296.5 gpm; occurred at 5:00pm)
Normalization Factor (new AADF/Eq.ADF)	1.5		

Time Period	Time	Adjusted Est. Q *(MG/hr)*	Adjusted Volume *(gallons)*	Cumulative Volume *(gallons)*	Equalized Cumulative Volume *(gallons)*	Volume In Storage *(gallons)*	Volume In Storage for actual avail. Vol *(gallons)*	
MIDNIGHT-1:00 A.M.	12:00 AM	0.0106	10,638	10,638	7,917	2,722	2,934	
1:00 AM - 2:00 A.M.	1:00 AM	0.0098	9,787	20,426	15,833	4,592	5,017	
2:00 AM - 3:00 A.M.	2:00 AM	0.0055	5,532	25,957	23,750	2,207	2,845	
3:00 AM - 4:00 A.M.	3:00 AM	0.0021	2,128	28,085	31,667	0	0	
4:00 AM - 5:00 A.M.	4:00 AM	0.0011	1,064	29,149	39,583	0	0	
5:00 AM - 6:00 A.M.	5:00 AM	0.0060	5,957	35,106	47,500	0	0	
6:00 AM - 7:00 A.M.	6:00 AM	0.0017	1,702	36,809	55,417	0	0	
7:00 AM - 8:00 A.M.	7:00 AM	0.0060	5,957	42,766	63,333	0	0	
8:00 AM - 9:00 A.M.	8:00 AM	0.0162	16,170	58,936	71,250	8,254	8,466	
9:00 AM - 10:00 A.M.	9:00 AM	0.0017	1,702	60,638	79,167	2,039	2,464	
10:00 AM - 11:00 A.M.	10:00 AM	0.0060	5,957	66,596	87,083	80	717	
11:00 AM - 12:00 P.M.	11:00 AM	0.0026	2,553	69,149	95,000	0	0	
12:00 P.M. - 1:00 P.M.	12:00 PM	0.0111	11,064	80,213	102,917	3,147	3,360	
1:00 PM - 2:00 P.M.	1:00 PM	0.0149	14,894	95,106	110,833	10,124	10,549	
2:00 PM - 3:00 P.M.	2:00 PM	0.0106	10,638	105,745	118,750	12,846	13,483	
3:00 PM - 4:00 P.M.	3:00 PM	0.0102	10,213	115,957	126,667	15,142	15,992	
4:00 PM - 5:00 P.M.	4:00 PM	0.0089	8,936	124,894	134,583	16,161	17,223	
5:00 PM - 6:00 P.M.	5:00 PM	0.0089	8,936	133,830	142,500	17,181	18,455	
6:00 PM - 7:00 P.M.	6:00 PM	0.0089	8,936	142,766	150,417	18,200	19,687	
7:00 PM - 8:00 P.M.	7:00 PM	0.0094	9,362	152,128	158,333	19,645	21,345	
8:00 PM - 9:00 P.M.	8:00 PM	0.0094	9,362	161,489	166,250	21,090	23,002	
9:00 PM - 10:00 P.M.	9:00 PM	0.0098	9,787	171,277	174,167	22,961	25,085	
10:00PM - 11:00 P.M.	10:00 PM	0.0094	9,362	180,638	182,083	24,406	26,743	
11:00 PM - 12:00 A.M.	11:00 PM	0.0094	9,362	190,000	190,000	25,851	28,400	Actual Capacity
Equalized Average Flowrate:		7,917	gal/hr					
		190,000	gpd					
		0.190	MGD					

Actual flow rate pumped during the day if using the actual tank capacity of 43,600 gallons*:	7,704.3	gal/hour*
	128	gpm
	0.185	MGD
Actual peaking factor the process units will handle:	1.0	

*Value found by iteration to obtain max volume in storage equal to actual tank capacity

CUMULATIVE FLOW ANALYSIS

Hourly Flow for November 06, 2006

2006 AADF:	0.122	MGD
ADF:	0.151	MGD
PHF:	0.281	MGD
PHF Peaking Factor:	**2.3**	(PHF/2006 AADF=0.122)

TIME	GPM	*MG/Hr*	Estimated Volume *gallons*	Cumulative Volume *gallons*	Equalized Cumulative *Volume (gallons)*	Volume in Storage *(gallons)*
12:00 AM	106.8	0.0064	6,406	6,406	6,302	104
1:00 AM	51.1	0.0031	3,064	9,470	12,604	0
2:00 AM	41.8	0.0025	2,507	11,977	18,906	0
3:00 AM	46.4	0.0028	2,785	14,763	25,208	0
4:00 AM	37.1	0.0022	2,228	16,991	31,510	0
5:00 AM	13.9	0.0008	836	17,827	37,812	0
6:00 AM	65.0	0.0039	3,900	21,726	44,114	0
7:00 AM	37.1	0.0022	2,228	23,955	50,416	0
8:00 AM	78.9	0.0047	4,735	28,690	56,718	0
9:00 AM	190.3	0.0114	11,420	40,110	63,020	5,118
10:00 AM	55.7	0.0033	3,342	43,452	69,322	2,159
11:00 AM	139.3	0.0084	8,356	51,809	75,624	4,213
12:00 PM	102.1	0.0061	6,128	57,937	81,926	4,039
1:00 PM	111.4	0.0067	6,685	64,622	88,228	4,422
2:00 PM	185.7	0.0111	11,142	75,763	94,530	9,261
3:00 PM	176.4	0.0106	10,585	86,348	100,832	13,544
4:00 PM	167.1	0.0100	10,027	96,375	107,134	17,270
5:00 PM	83.6	0.0050	5,014	101,389	113,436	15,981
6:00 PM	106.8	0.0064	6,406	107,795	119,738	16,086
7:00 PM	130.0	0.0078	7,799	115,595	126,040	17,583
8:00 PM	130.0	0.0078	7,799	123,394	132,342	19,080
9:00 PM	195.0	0.0117	11,699	135,092	138,644	24,477
10:00 PM	143.9	0.0086	8,635	143,727	144,946	26,810
11:00 PM	125.3	0.0075	7,521	151,248	151,248	28,028

Equalized Average Flowrate	**6,302**	gal/hr
Eq.ADF	151,248	gpd
	0.151	MGD

Projected hourly flow at buildout for a Peak Hour Event

Buildout 3MADF:	0.190	MGD	
Buildout PHF:	0.436	MGD	(equiv to 296.5 gpm; occurred at 5:00pm)
Normalization Factor (new AADF/Eq.ADF)	**1.3**		

Time Period	Time	Adjusted Est. Q *(MG/hr)*	Adjusted Volume *(gallons)*	Cumulative Volume *(gallons)*	Equalized Cumulative Volume *(gallons)*	Volume In Storage *(gallons)*	Volume In Storage for actual avail. Vol *(gallons)*
MIDNIGHT-1:00 A.M.	12:00 AM	0.0080	8,048	8,048	7,917	131	0
1:00 AM - 2:00 A.M.	1:00 AM	0.0038	3,849	11,897	15,833	0	0
2:00 AM - 3:00 A.M.	2:00 AM	0.0031	3,149	15,046	23,750	0	0
3:00 AM - 4:00 A.M.	3:00 AM	0.0035	3,499	18,545	31,667	0	0
4:00 AM - 5:00 A.M.	4:00 AM	0.0028	2,799	21,344	39,583	0	0
5:00 AM - 6:00 A.M.	5:00 AM	0.0010	1,050	22,394	47,500	0	0
6:00 AM - 7:00 A.M.	6:00 AM	0.0049	4,899	27,293	55,417	0	0
7:00 AM - 8:00 A.M.	7:00 AM	0.0028	2,799	30,092	63,333	0	0
8:00 AM - 9:00 A.M.	8:00 AM	0.0059	5,948	36,041	71,250	0	0
9:00 AM - 10:00 A.M.	9:00 AM	0.0143	14,346	50,387	79,167	6,430	5,976
10:00 AM - 11:00 A.M.	10:00 AM	0.0042	4,199	54,586	87,083	2,712	1,804
11:00 AM - 12:00 P.M.	11:00 AM	0.0105	10,497	65,083	95,000	5,292	3,931
12:00 P.M. - 1:00 P.M.	12:00 PM	0.0077	7,698	72,781	102,917	5,074	3,258
1:00 PM - 2:00 P.M.	1:00 PM	0.0084	8,398	81,179	110,833	5,555	3,285
2:00 PM - 3:00 P.M.	2:00 PM	0.0140	13,996	95,175	118,750	11,634	8,911
3:00 PM - 4:00 P.M.	3:00 PM	0.0133	13,297	108,471	126,667	17,014	13,837
4:00 PM - 5:00 P.M.	4:00 PM	0.0126	12,597	121,068	134,583	21,694	18,063
5:00 PM - 6:00 P.M.	5:00 PM	0.0063	6,298	127,366	142,500	20,076	15,991
6:00 PM - 7:00 P.M.	6:00 PM	0.0080	8,048	135,414	150,417	20,207	15,668
7:00 PM - 8:00 P.M.	7:00 PM	0.0098	9,797	145,212	158,333	22,088	17,095
8:00 PM - 9:00 P.M.	8:00 PM	0.0098	9,797	155,009	166,250	23,969	18,521
9:00 PM - 10:00 P.M.	9:00 PM	0.0147	14,696	169,705	174,167	30,748	24,847
10:00PM - 11:00 P.M.	10:00 PM	0.0108	10,847	180,552	182,083	33,679	27,324
11:00 PM - 12:00 A.M.	11:00 PM	0.0094	9,448	190,000	190,000	35,209	28,400 Actual Capacity

Equalized Average Flowrate:	7,917	gal/hr
	190,000	gpd
	0.190	MGD

Actual flow rate pumped during the day if using the actual tank capacity of 43,600 gallons*:	8,370.6	gal/hour*
	140	gpm
	0.201	MGD
Actual peaking factor the process units will handle:	1.1	

*Value found by iteration to obtain max volume in storage equal to actual tank capacity

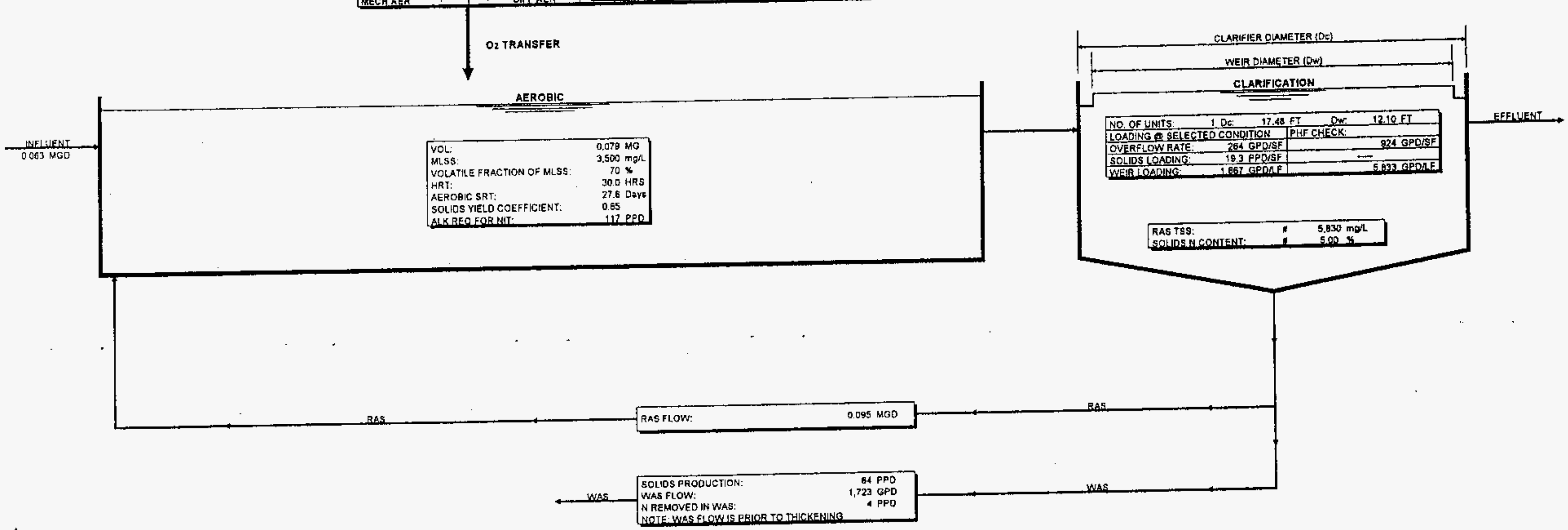
CYPRESS LAKES WASTEWATER TREATMENT PLANT
PRELIMINARY ENGINEERING REPORT
WASTEWATER CHARACTERISTICS (NOV 2003 TO NOV 2006)

	Flow (MGD)	BOD_5 (mg/L)	TSS (mg/L)	BOD Load (lb/d)	Date	Day
Nov-03	0.113	150	190	141.4	11/05/03	W
Dec-03	0.125	220	270	229.4	12/03/03	W
Jan-04	0.109	330	330	300.0	01/14/04	W
Feb-04	0.123	260	260	266.7	02/11/04	W
Mar-04	0.122	300	240	305.2	03/10/04	W
Apr-04						
May-04	0.098	290	390	237.0	05/05/04	W
Jun-04	0.101	230	270	193.7	06/02/04	W
Jul-04	0.098	200	170	163.5	07/14/04	W
Aug-04						
Sep-04	0.126	270	460	283.7	09/08/04	W
Oct-04	0.112	290	140	270.9	10/06/04	W
Nov-04	0.109	260	310	236.4	11/03/04	W
Dec-04	0.112	180	110	168.1	12/01/04	W
Jan-05	0.119	470	480	466.5	01/13/05	Th
Feb-05	0.161	70	110	94.0	02/03/05	Th
Mar-05	0.130	180	260	195.2	03/03/05	Th
Apr-05	0.132	160	50	176.1	04/14/05	Th
May-05	0.081	530	110	358.0	05/12/05	Th
Jun-05	0.108	140	520	126.1	06/09/05	Th
Jul-05	0.084	240	84	168.1	07/07/05	Th
Aug-05	0.096	860	230	688.6	08/04/05	Th
Sep-05	0.103	235	135	201.9	mo. Avg	Th
Oct-05	0.115	530	140	508.3	10/27/05	Th
Nov-05	0.137	100	140	114.3	11/30/05	W
Dec-05	0.127	330	300	349.5	12/08/05	Th
Jan-06	0.142	220	380	260.5	01/19/06	Th
Feb-06	0.129	200	350	215.2	02/16/06	Th
Mar-06	0.113	950	200	895.3	03/02/06	Th
Apr-06	0.122	290	270	295.1	04/06/06	Th
May-06	0.105	240	40	210.2	05/04/06	Th
Jun-06	0.086	220	260	157.8	06/08/06	Th
Jul-06	0.106	180	200	159.1	07/05/06	W
Aug-06	0.098	210	230	171.6	08/02/06	W
Sep-06	0.111	170	230	157.4	09/06/06	W
Oct-06	0.101	300	310	252.7	10/04/06	W
Nov-06	0.124	87	150	90.0	11/01/06	W
Average	0.114	245	229	228		
Max	0.161	530	480	508		
Min	0.081	70	40	90		

APPENDIX B
PROCESS UNITS CAPACITIES AT BUILDOUT FLOWS

FLOW CHARACTERISTICS		INFLUENT CHARACTERISTICS		CONDITION	TEMPERATURE	EFFLUENT QUALITY	
AVERAGE DAILY FLOW:	0.063 MGD	CBOD5:	245 mg/L	ADF	10 DEG. C	SOL CBOD5:	2.0 mg/L
MMF PEAKING FACTOR	1.25	TSS:	229 mg/L	MMF	20 DEG. C	REFRACT ORG N:	1.0 mg/L
MDF PEAKING FACTOR:	1.50	TKN:	40 mg/L	MDF	30 DEG. C	AMMONIA, AS N:	0.1 mg/L
PHF FACTOR:	3.50	REFRACT ORG N.	1.0 mg/L			NITRATE, AS N:	31.0 mg/L
		TP:	7 mg/L			TN:	32.1 mg/L
						TP:	4.5 mg/L

OXYGEN REQUIREMENTS		OPERATING DO		DIFFUSED AERATION	
O_2 REQ FOR CBOD5 REM:	167 PPD	@ ADF:	2.00 mg/L	ALPHA:	0.55
O_2 REQ FOR NIT.	75 PPD	@ MMF:	2.00 mg/L	BETA:	0.97
NET O_2 REQ:	243 PPD	@ MDF:	1.00 mg/L	SOTE:	9.00 %
		O2 OPTIONS		EFF SAT D:	3.60 FT
MECH AER	DIFF AER			REQ AIR FLOW:	252 SCFM



ABBREVIATIONS

ADF	AVERAGE DAILY FLOW	ALK	ALKALINITY AS CALCIUM CARBONATE
MMF	MAXIMUM MONTHLY FLOW	MLSS	MIXED LIQUOR SUSPENDED SOLIDS
MDF	MAXIMUM DAILY FLOW	N	NITROGEN
PHF	PEAK HOURLY FLOW	NIT	NITRIFICATION
MGD	MILLION GALLONS PER DAY	DN	DENITRIFICATION
GPD	GALLONS PER DAY	DNP	DENITRIFICATION POTENTIAL
PPD	POUNDS PER DAY	HRT	HYDRAULIC RETENTION TIME
DEG C	DEGREES CENTIGRADE	SRT	SOLIDS RETENTION TIME
CBOD5	5-DAY CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND	HRS	HOURS
TSS	TOTAL SUSPENDED SOLIDS	RAS	RETURN ACTIVATED SLUDGE
TKN	TOTAL KJELDAHL NITROGEN, AS N	WAS	WASTE ACTIVATED SLUDGE
REFRACT ORG N	REFRACTORY ORGANIC NITROGEN, AS N	IR	INTERNAL RECYCLE
TP	TOTAL PHOSPHORUS	NO	NUMBER
COD	CHEMICAL OXYGEN DEMAND	MIX INT	MIXING INTENSITY
mg/L	MILLIGRAMS PER LITER	ATM P	ATMOSPHERIC PRESSURE
SOL	SOLUBLE	RH	RELATIVE HUMIDITY
VOL	VOLUME	DIFF AER	DIFFUSED AERATION
MG	MILLION GALLONS	MECH AER	MECHANICAL AERATION
REQ	REQUIRED	SOR	STANDARD OXYGENATION RATE
LF	LINEAL FOOT	SOTE	STANDARD OXYGEN TRANSFER EFFICIENCY
SF	SQUARE FOOT	EFF SAT D	EFFECTIVE SATURATION DEPTH
O_2	OXYGEN	HP	HORSEPOWER
DO	DISSOLVED OXYGEN	SCFM	STANDARD CUBIC FEET PER MINUTE

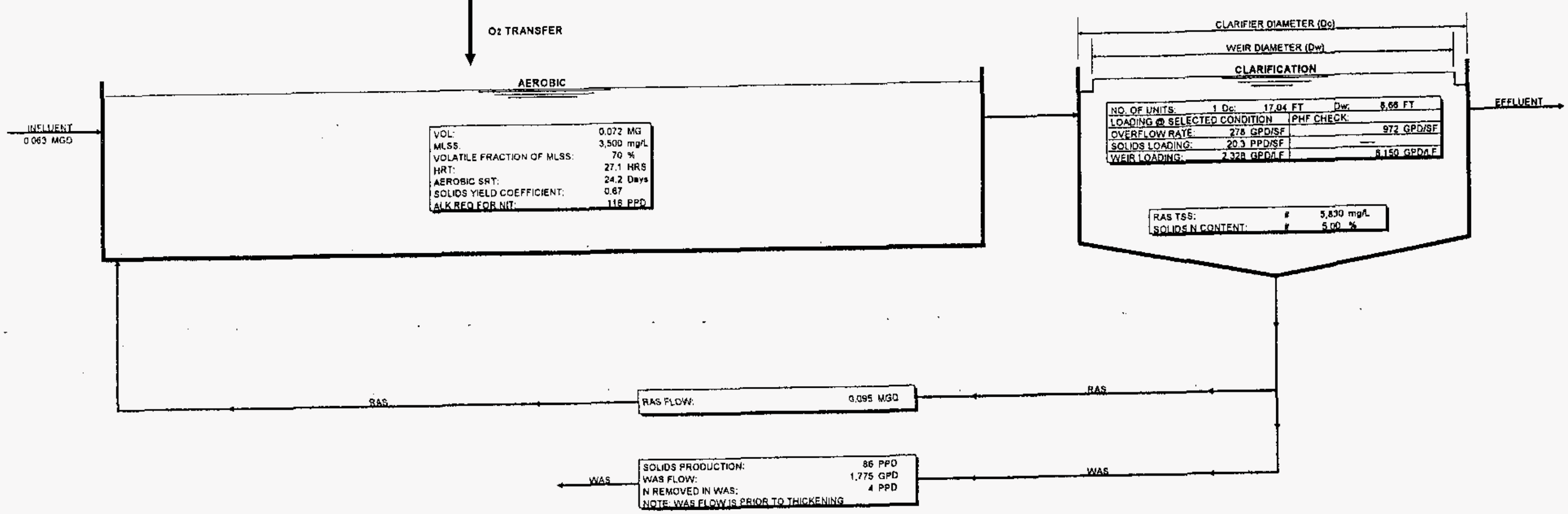
CYPRESS LAKES WWTP

TRAINS 1 AND 2 - AT BUILDOUT - PROCESS ANALYSIS AND EXPECTED PERFORMANCE FOR PROJECTED FLOWS AND LOADINGS

PROJECT No.: 40605	DATE: MAY 19, 2006	PREPARED BY: HDR

FLOW CHARACTERISTICS		INFLUENT CHARACTERISTICS		CONDITION	TEMPERATURE	EFFLUENT QUALITY	
AVERAGE DAILY FLOW:	0.063 MGD	CBOD5	245 mg/L	ADF	10 DEG. C	SOL CBOD5:	2.1 mg/L
MMF PEAKING FACTOR:	1.25	TSS.	229 mg/L	MMF	20 DEG. C	REFRACT ORG N:	1.0 mg/L
MDF PEAKING FACTOR:	1.50	TKN	40 mg/L	MDF	30 DEG. C	AMMONIA, AS N:	0.1 mg/L
PHF FACTOR:	3.50	REFRACT ORG N:	1.0 mg/L			NITRATE, AS N:	30.8 mg/L
		TP	7 mg/L			TN:	31.8 mg/L
						TP:	4.3 mg/L

OXYGEN REQUIREMENTS		OPERATING DO		DIFFUSED AERATION	
O2 REQ FOR CBOD5 REM:	163 PPD	@ ADF:	2.00 mg/L	ALPHA:	0.70
O2 REQ FOR NIT:	75 PPD	@ MMF:	2.00 mg/L	BETA:	0.97
NET O2 REQ:	238 PPD	@ MDF:	1.00 mg/L	SOTE.	12.00 %
MECH AER	DIFF AER	O2 OPTIONS		EFF SAT D:	3.60 FT
				REQ AIR FLOW	146 SCFM



ABBREVIATIONS

ADF	AVERAGE DAILY FLOW	ALK	ALKALINITY AS CALCIUM CARBONATE
MMF	MAXIMUM MONTHLY FLOW	MLSS	MIXED LIQUOR SUSPENDED SOLIDS
MDF	MAXIMUM DAILY FLOW	N	NITROGEN
PHF	PEAK HOURLY FLOW	NIT	NITRIFICATION
MGD	MILLION GALLONS PER DAY	DN	DENITRIFICATION
GPD	GALLONS PER DAY	DNP	DENITRIFICATION POTENTIAL
PPD	POUNDS PER DAY	HRT	HYDRAULIC RETENTION TIME
DEG C	DEGREES CENTIGRADE	SRT	SOLIDS RETENTION TIME
CBOD5	5-DAY CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND	HRS	HOURS
TSS	TOTAL SUSPENDED SOLIDS	RAS	RETURN ACTIVATED SLUDGE
TKN	TOTAL KJELDAHL NITROGEN, AS N	WAS	WASTE ACTIVATED SLUDGE
REFRACT ORG N	REFRACTORY ORGANIC NITROGEN, AS N	IR	INTERNAL RECYCLE
TP	TOTAL PHOSPHORUS	NO.	NUMBER
COD	CHEMICAL OXYGEN DEMAND	MIX INT	MIXING INTENSITY
mg/L	MILLIGRAMS PER LITER	ATM P	ATMOSPHERIC PRESSURE
SOL	SOLUBLE	RH	RELATIVE HUMIDITY
VOL	VOLUME	DIFF AER	DIFFUSED AERATION
MG	MILLION GALLONS	MECH AER	MECHANICAL AERATION
REQ	REQUIRED	SOR	STANDARD OXYGEN TRANSFER RATE
LF	LINEAL FOOT	SOTE	STANDARD OXYGEN TRANSFER EFFICIENCY
SF	SQUARE FOOT	EFF SAT D	EFFECTIVE SATURATION DEPTH
O2	OXYGEN	HP	HORSEPOWER
DO	DISSOLVED OXYGEN	SCFM	STANDARD CUBIC FEET PER MINUTE

CYPRESS LAKES WWTP

TRAIN 3

PROCESS ANALYSIS AND EXPECTED PERFORMANCE FOR PROJECTED FLOWS AND LOADINGS

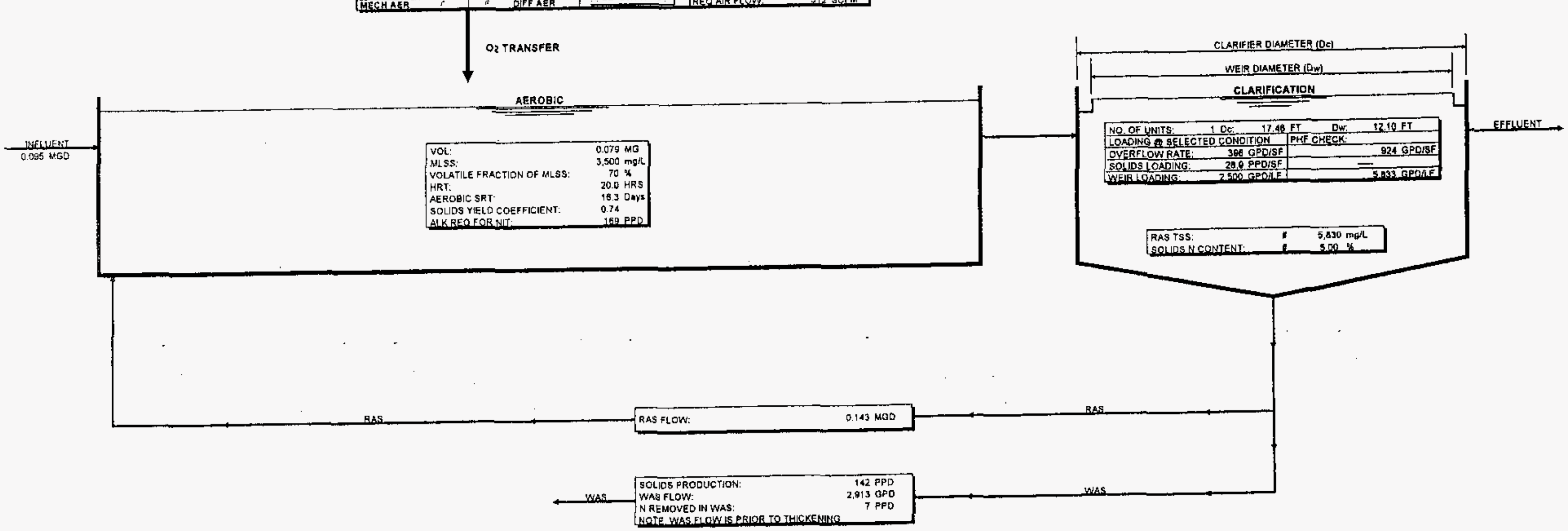
PROJECT No.: 40605	DATE: MAY 19, 2006	PREPARED BY: HDR

FLOW CHARACTERISTICS		INFLUENT CHARACTERISTICS		CONDITION	TEMPERATURE	EFFLUENT QUALITY	
AVERAGE DAILY FLOW:	0.063 MGD	CBOD5:	245 mg/L	ADF	10 DEG. C	SOL CBOD5:	2.5 mg/L
MMF PEAKING FACTOR	1.25	TSS	229 mg/L	MMF	20 DEG. C	REFRACT ORG N:	1.0 mg/L
MDF PEAKING FACTOR	1.50	TKN:	40 mg/L	MDF	30 DEG. C	AMMONIA, AS N:	0.1 mg/L
PHF FACTOR.	3.50	REFRACT ORG N.	1.0 mg/L			NITRATE, AS N:	30.0 mg/L
		TP:	7 mg/L			TN:	31.1 mg/L
						TP:	3.7 mg/L

PRINT OPTIONS

SHEET OPTIONS

OXYGEN REQUIREMENTS		OPERATING DO		DIFFUSED AERATION	
O_2 REQ FOR CBOD5 REM:	227 PPD	@ ADF:	2.00 mg/L	ALPHA:	0.55
O_2 REQ FOR NIT:	109 PPD	@ MMF:	2.00 mg/L	BETA:	0.97
NET O_2 REQ:	337 PPD	@ MDF:	1.00 mg/L	SOTE:	9.00 %
		O2 OPTIONS		EFF SAT D:	3.60 FT
MECH AER	DIFF AER			REQ AIR FLOW:	312 SCFM



ABBREVIATIONS

ADF	AVERAGE DAILY FLOW	ALK	ALKALINITY AS CALCIUM CARBONATE
MMF	MAXIMUM MONTHLY FLOW	MLSS	MIXED LIQUOR SUSPENDED SOLIDS
MDF	MAXIMUM DAILY FLOW	N	NITROGEN
PHF	PEAK HOURLY FLOW	NIT	NITRIFICATION
MGD	MILLION GALLONS PER DAY	DN	DENITRIFICATION
GPD	GALLONS PER DAY	DNP	DENITRIFICATION POTENTIAL
PPD	POUNDS PER DAY	HRT	HYDRAULIC RETENTION TIME
DEG C	DEGREES CENTIGRADE	SRT	SOLIDS RETENTION TIME
CBOD5	5-DAY CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND	HRS	HOURS
TSS	TOTAL SUSPENDED SOLIDS	RAS	RETURN ACTIVATED SLUDGE
TKN	TOTAL KJELDAHL NITROGEN, AS N	WAS	WASTE ACTIVATED SLUDGE
REFRACT ORG N	REFRACTORY ORGANIC NITROGEN, AS N	IR	INTERNAL RECYCLE
TP	TOTAL PHOSPHORUS	NO.	NUMBER
COD	CHEMICAL OXYGEN DEMAND	MIX INT	MIXING INTENSITY
mg/L	MILLIGRAMS PER LITER	ATM P	ATMOSPHERIC PRESSURE
SOL	SOLUBLE	RH	RELATIVE HUMIDITY
VOL	VOLUME	DIFF AER	DIFFUSED AERATION
MG	MILLION GALLONS	MECH AER	MECHANICAL AERATION
REQ	REQUIRED	SOR	STANDARD OXYGENATION RATE
LF	LINEAL FOOT	SOTE	STANDARD OXYGEN TRANSFER EFFICIENCY
SF	SQUARE FOOT	EFF SAT D	EFFECTIVE SATURATION DEPTH
O2	OXYGEN	HP	HORSEPOWER
DO	DISSOLVED OXYGEN	SCFM	STANDARD CUBIC FEET PER MINUTE

CYPRESS LAKES WWTP

TRAINS 1 AND 2 - AT BUILDOUT - PROCESS ANALYSIS AND EXPECTED PERFORMANCE FOR PROJECTED FLOWS AND LOADINGS

PROJECT No.: 40605	DATE: MAY 19, 2006	PREPARED BY: HDR

FLOW CHARACTERISTICS	
AVERAGE DAILY FLOW:	0.063 MGD
MMF PEAKING FACTOR:	1.25
MDF PEAKING FACTOR:	1.50
PHF FACTOR:	3.50

INFLUENT CHARACTERISTICS	
CBOD5:	245 mg/L
TSS:	229 mg/L
TKN:	40 mg/L
REFRACT ORG N:	1.0 mg/L
TP:	7 mg/L

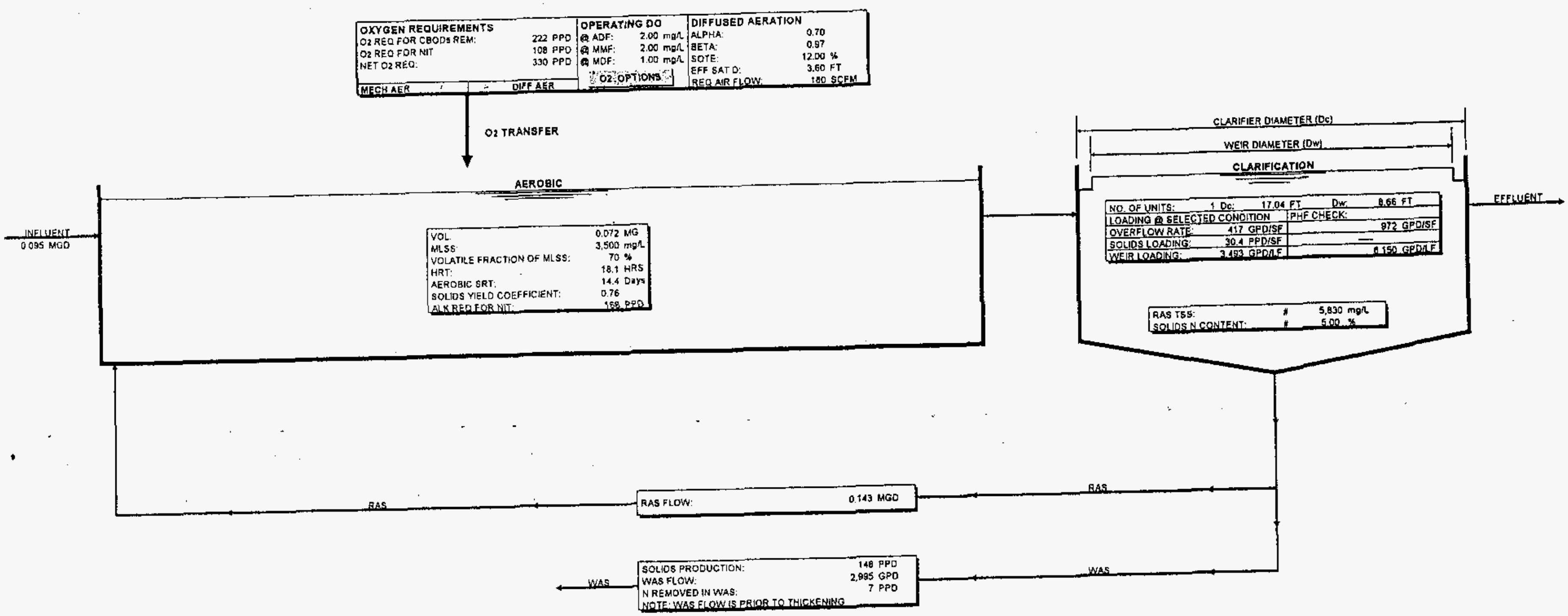
CONDITION
ADF
MMF
MDF

TEMPERATURE
10 DEG. C
20 DEG. C
30 DEG. C

EFFLUENT QUALITY	
SOL CBOD5:	2.7 mg/L
REFRACT ORG N:	1.0 mg/L
AMMONIA, AS N:	0.1 mg/L
NITRATE, AS N:	29.7 mg/L
TN:	30.8 mg/L
TP:	3.5 mg/L

PRINT OPTIONS

SHEET OPTIONS



ABBREVIATIONS

ADF	AVERAGE DAILY FLOW	ALK	ALKALINITY AS CALCIUM CARBONATE
MMF	MAXIMUM MONTHLY FLOW	MLSS	MIXED LIQUOR SUSPENDED SOLIDS
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PHF	PEAK HOURLY FLOW	NIT	NITRIFICATION
MGD	MILLION GALLONS PER DAY	DN	DENITRIFICATION
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DEG C	DEGREES CENTIGRADE	SRT	SOLIDS RETENTION TIME
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TSS	TOTAL SUSPENDED SOLIDS	RAS	RETURN ACTIVATED SLUDGE
TKN	TOTAL KJELDAHL NITROGEN, AS N	WAS	WASTE ACTIVATED SLUDGE
REFRACT ORG N	REFRACTORY ORGANIC NITROGEN, AS N	IR	INTERNAL RECYCLE
TP	TOTAL PHOSPHORUS	NO.	NUMBER
COD	CHEMICAL OXYGEN DEMAND	MIX INT	MIXING INTENSITY
mg/L	MILLIGRAMS PER LITER	ATM P	ATMOSPHERIC PRESSURE
SOL	SOLUBLE	RH	RELATIVE HUMIDITY
VOL	VOLUME	DIFF AER	DIFFUSED AERATION
MG	MILLION GALLONS	MECH AER	MECHANICAL AERATION
REQ	REQUIRED	SOR	STANDARD OXYGENATION RATE
LF	LINEAL FOOT	SOTE	STANDARD OXYGEN TRANSFER EFFICIENCY
SF	SQUARE FOOT	EFF SAT D	EFFECTIVE SATURATION DEPTH
O2	OXYGEN	HP	HORSEPOWER
DO	DISSOLVED OXYGEN	SCFM	STANDARD CUBIC FEET PER MINUTE

CYPRESS LAKES WWTP

TRAIN 3

PROCESS ANALYSIS AND EXPECTED PERFORMANCE FOR PROJECTED FLOWS AND LOADINGS

PROJECT No.: 40605	DATE: MAY 19, 2006	PREPARED BY: HDR

CYPRESS LAKES WWTP
PRELIMINARY ENGINEERING REPORT
EXTENDED AERATION CAPACITY
AT 0.190 MGD 3MADF

	Train 1	Train 2	Train 3	
A. Design Criteria				
3MADF = 0.190 MGD		0.190		MGD
Tank Volume	79,100	79,100	71,600	Gallons
Percentage of Total Flow:	33%	33%	33%	%
3MADF to Each Aeration Train:	0.063	0.063	0.063	MGD
MDF to Each Aeration Train:	0.095	0.095	0.095	MGD
MLSS:	3,500	3,500	3,500	mg/L
Volatile Fraction of MLSS:	70%	70%	70%	
A. All units in service at AADF				
Maximum Return Activated Sludge (RAS) to each Aeration Train:	0.095	0.095	0.095	MGD
Hydraulic Retention Time:	30.0	30.0	27.1	hr
Solids Retention Time:	27.7	27.7	24.7	day
Effluent $cBOD_5$:	2.0	2.0	2.1	mg/L
B. Class I Reliabity at AADF (100% of Flow w/ Largest unit out of service)*				
AADF to Each Aeration Train w/ Largest Unit Out of Service:	0.095	Out of service	0.095	MGD
Maximum Return Activated Sludge (RAS) to each Aeration Train:	0.143	-	0.143	MGD
Hydraulic Retention Time - AADF Class I Reliability:	20.0	-	18.1	hr
Solids Retention Time - AADF Class I Reliability:	16.2	-	14.3	day
Effluent $cBOD_5$ - AADF Class I Reliability:	2.5	-	2.7	mg/L
C. All units in service at MDF				
Maximum Return Activated Sludge (RAS) to each Aeration Train:	0.143	0.143	0.143	MGD
Hydraulic Retention Time:	20.0	20.0	18.1	hr
Solids Retention Time:	16.2	16.2	14.3	day
Effluent $cBOD_5$:	2.5	2.5	2.7	mg/L
D. Class I Reliabity at MDF (100% of Flow w/ Largest unit out of service)*				
MDF to Each Aeration Train w/ Largest Unit Out of Service:	0.143	Out of service	0.143	MGD
Hydraulic Retention Time - AADF Class I Reliability:	13.3	-	12.1	hr
Solids Retention Time - AADF Class I Reliability:	9.8	-	8.7	day
Effluent $cBOD_5$ - AADF Class I Reliability:	3.4	-	3.7	mg/L

* For Class I Reliability, Trains 1&2 operating and Train 3 out of service.

CYPRESS LAKES WWTP
PRELIMINARY ENGINEERING REPORT
CLARIFIERS LOADINGS
AT 0.190 MGD 3MADF

	Values		
A. Design Criteria	**PF=1.5**	**PF=1.0**	**Units**
3MADF:	0.190	0.190	MGD
MDF:	0.285	0.285	MGD
Peak Flow after Proposed Flow Equalization	1.5	1.0	
Design Peak Flow w/ Flow Equalization Provided:	0.285	0.190	MGD
Class I Reliability - 100% of Total Design Flow with Largest Unit out of Service:	0.285	0.190	MGD
MLSS:	3,500	3,500	mg/L
Return Activated Sludge (RAS) Flow:	0.285	0.285	MGD
No. of Existing Clarifiers:	3	3	
Surface Area of Existing Clarifiers 1 and 2 (each):	240	240	$ft.^2$
Surface Area of Existing Clarifier 3:	228	228	$ft.^2$
Weir Length of Existing Clarifiers 1 and 2 (2x19-ft each -per survey):	38	38	ft.
Weir Length of Existing Clarifier 3: (2x13.6-ft -per survey)	27	27	ft.
B. Surface Overflow Rate			
Maximum Allowable Surface Overflow Rate at PHF for Existing Clarifiers:	1,000	1,000	gpd/ft^2
Design Peak Flow Surface Overflow Rate for Existing Clarifiers 1 and 2 (each):	396	264	gpd/ft^2
Design Peak Flow Surface Overflow Rate for Existing Clarifier 3:	417	278	gpd/ft^2
Class 1 Reliability Design Peak Flow SOR of Existing Clarifiers	609	406	gpd/ft^2
C. Solids Loading Rate			
Maximum Allowable Solids Loading Rate at MDF for Existing Clarifiers:	35	35	$lbs/day*ft^2$
MDF Solids Loading Rate for Existing Clarifiers 1 and 2 (each):	23	19	$lbs/day*ft^2$
MDF Solids Loading Rate for Existing Clarifier 3:	24	20	$lbs/day*ft^2$
Class 1 Reliability MDF Solids Loading Rate	35.55	30	$lbs/day*ft^2$
D. Weir Loading Rate			
Maximum Allowable Weir Loading Rate at Design Peak Flow:	20,000	20,000	gal/day*ft.
Design Peak Flow Weir Loading Rate for Existing Clarifiers 1 and 2 (each):	2,500	1,667	gal/day*ft.
Design Peak Flow Weir Loading Rate for Existing Clarifiers 3:	3,519	2,346	gal/day*ft.
Class 1 Reliability Design Peak Flow Weir Loading Rate	4,385	2,923	gal/day*ft.

CYPRESS LAKES WWTP
PRELIMINARY ENGINEERING REPORT
FILTERS LOADINGS
AT 0.190 MGD 3MADF

	Values		
A. Design Criteria	**PF=1.5**	**PF=1.0**	**Units**
3MADF:	0.190	0.190	MGD
Peak Flow after Proposed Flow Equalization	1.5	1.0	
Design Peak Flow w/ Flow Equalization Provided:	0.285	0.190	MGD
Maximum Allowable Loading Rate:	4.0	4.0	gpm/sqft.
B. Existing Gravity Sand Filters - One Unit Out of Service			
No. of Filters:	3	3	Units
Total Surface Area:	140	140	sqft.
Total Design Surface Area: (Largest filter out of service)	90	90	sqft.
Design Peak Flow Loading Rate for Existing Filters	2.2	1.5	gpm/sqft.
Design Peak Flow Loading Rate with a Single Unit Operating (Largest unit out of service and second unit on backwash)	4.9	3.3	gpm/sqft.

CYPRESS LAKES WWTP
PRELIMINARY ENGINEERING REPORT
CHLORINE CONTACT CHAMBER CAPACITIES
AT 0.190 MGD 3MADF

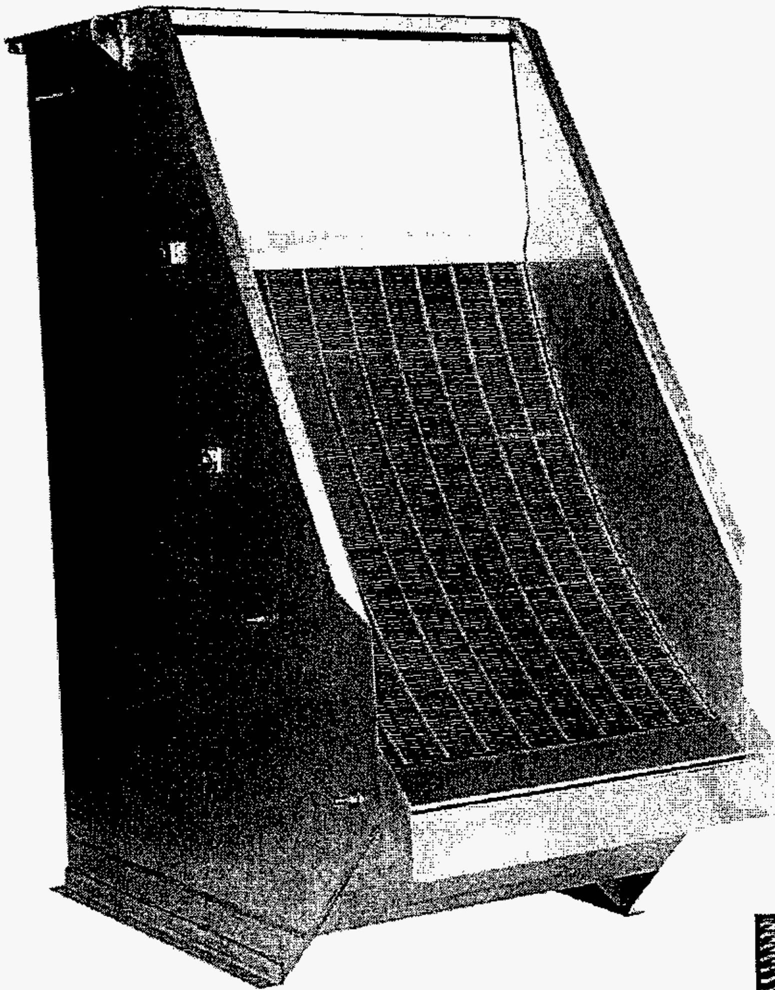
	Values		
A. Design Criteria	**PF=1.5**	**PF=1.0**	**Units**
3MADF:	0.190	0.190	MGD
MDF	0.285	0.285	MGD
Peak Flow after Proposed Flow Equalization	1.5	1.0	
Design Peak Flow w/ Flow Equalization Provided:	0.285	0.190	MGD
Class I Reliability (100% Design Peak Flow):	0.285	0.190	MGD
Minimum Detention Time:	15	15	minutes
B. Existing Chlorine Contact Chambers			
No. of Trains:	2	2	
Volume Per Train:	2,500	2,500	gallons
Total Volume:	5,000	5,000	gallons
C. Capacities at Peak Design Flow			
Maximum Detention Time at Peak Design Flow with all Units in Service:	25	38	Minutes
Chlorine Residual at CT=120	4.8	3.2	mg/L
Detention Time at Class 1 Reliability PHF with Largest Unit Out of Service:	13	19	Minutes
Chlorine Residual at CT=120	9.5	6.3	mg/L

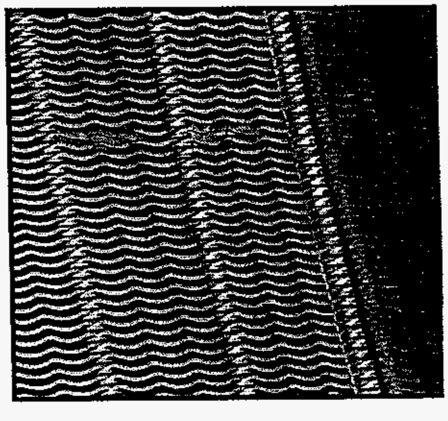
APPENDIX C
STATIC SCREEN AND SCREENINGS WASHING AND DEWATERING PRESS

STATIC SCREEN AND SCREENINGS WASHING AND DEWATERING PRESS

-MANUFACTURER'S DATA-

VULCAN
INDUSTRIES, INC.





Model SS
STATO SCREEN

Model SS STATO SCREEN

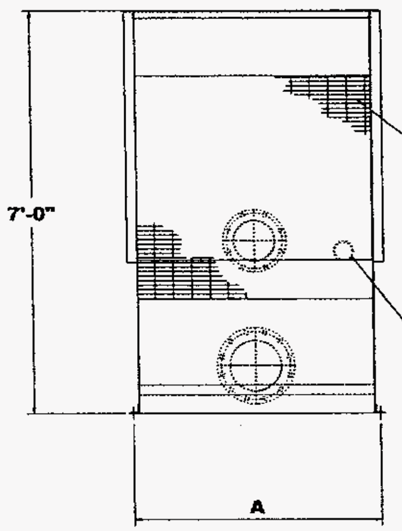
The Model SS Stato Screen is a non-mechanical screening device for separating solids from liquids. Because there are no mechanical parts and the unit requires no power, these screens can be installed with minimal capital investment. With a wide range of uses the Stato Screen is ideal for municipal waste water and industrial applications.

CONSTRUCTION

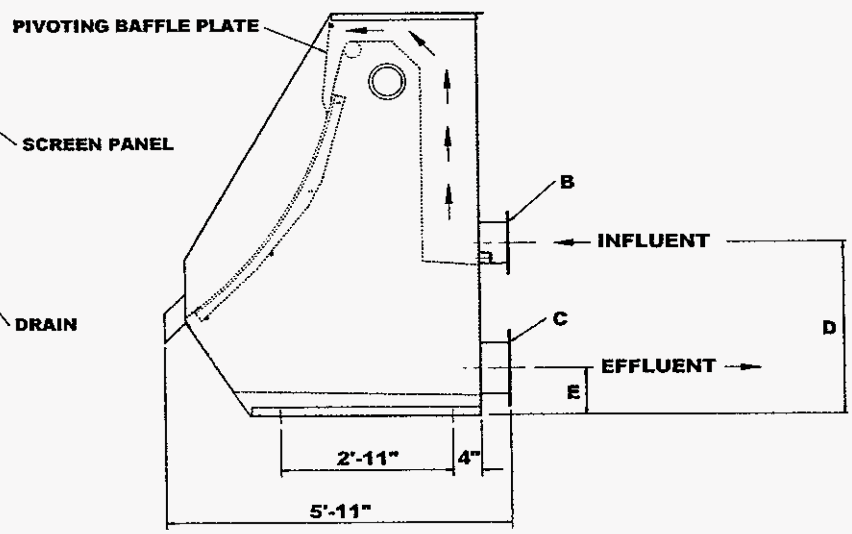
Available in 304 or 316 Stainless Steel with flanged inlet and outlet pipes. Hinged enclosures and spray systems are available.

OPERATION / FEATURES

Wastewater is pumped through the pipe inlet into the influent chamber. As the influent level rises it flows over the weir and beneath the pivoting baffle plate. The liquids and solids flow over the triple-arc wave wire screen panel, and wastewater falls through the screen openings, while gravity and the addition of more screenings push captured solids toward the point of discharge. The water that falls though the screen enters the effluent distribution chamber and flows through the outlet pipe. A drip lip at the bottom of the screen directs any excess water to the effluent chamber. When the solids reach the bottom of the screen they slide off into a container, conveyor, or other suitable receiving device. Vulcan Industries offers a wide array of post-screening and dewatering devices. To assemble the most cost effective and efficient array of screening and post screening devices, please contact your Vulcan Industries representative.



FRONT VIEW



SIDE VIEW

	Screen Openings							
INCH	0.010	0.020	0.030	0.040	0.060	0.080	0.100	0.200
MM	0.25	0.50	.75	1.0	1.5	2.0	2.5	5.0
Model	**Design Flow (GPM)***							
SS-18	30	60	90	140	180	200	220	260
SS-24	40	80	120	200	260	300	240	280
SS-36	60	200	27	320	340	360	430	500
SS-48	140	500	630	700	740	780	860	950
SS-60	170	640	780	870	920	960	1070	1200
SS-72	210	800	950	1050	1100	1150	1300	1550
SS-120	330	1200	1450	1600	1700	1800	2000	2400

* Flow rates are based upon clean water flow.

Model	A	B	C	D	E
SS-18	20 1/2"	4"	6"	3'	7"
SS-24	26 1/2"	6"	8"	3'	8"
SS-36	38 1/2"	6"	8"	3'	8"
SS-48	50 1/2"	8"	10"	3'	9"
SS-60	62 1/2"	10"	12"	3'	10"
SS-72	74 1/2"	10"	12"	3'	10"
SS-120	122 1/2"	12"	18"	3'	13"

VULCAN INDUSTRIES, INC.

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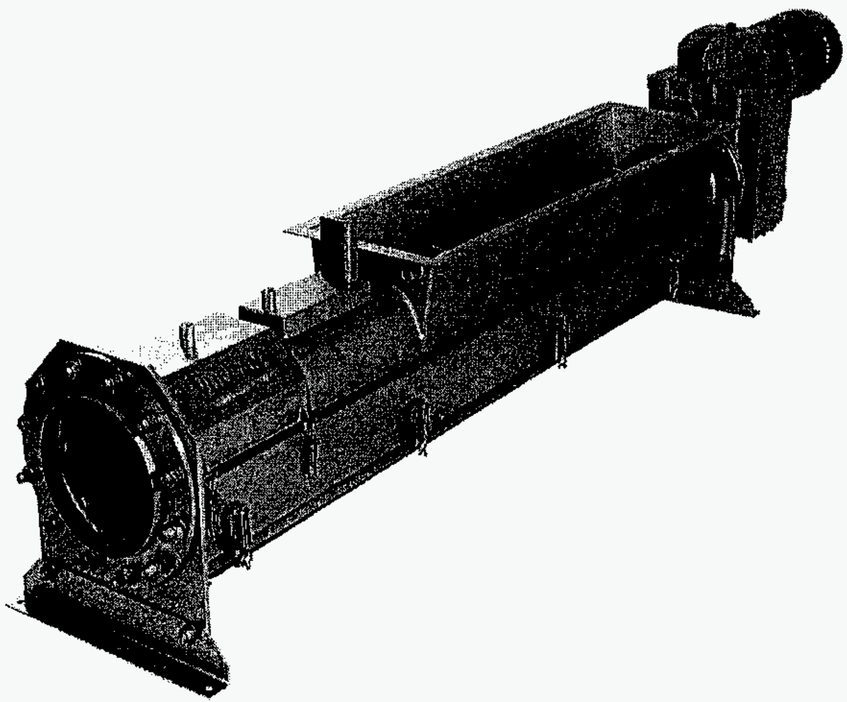
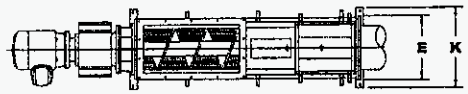
Missouri Valley, Iowa 51555 USA
712-642-2755 Fax 712-642-4256
Email: info@vulcanindustries.com
www.vulcanindustries.com

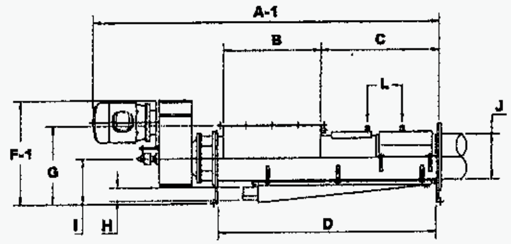
![VULCAN INDUSTRIES, INC.]

VULCAN
INDUSTRIES, INC.

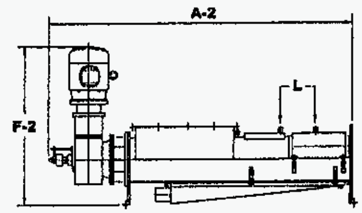


Model EWP WASHING PRESS





PARALLEL DRIVE



RIGHT ANGLE DRIVE

Type	Input Capacity of Raw Screenings	
	Continuous Mode	Batch Mode
EWP 150	Up to 49 ft³/hr	Up to 16.3 ft³/hr
EWP 250	Up to 99 ft³/hr	Up to 33 ft³/hr
EWP 400	Up to 247 ft³/hr	Up to 82.3 ft³/hr

Type	Wash Water Requirements
EWP 150	19 gpm at 35 psi minimum
EWP 250	19 gpm at 35 psi minimum
EWP 400	27 gpm at 35 psi minimum

Type	A-1	A-2	B	C	D	E	F-1	F-2	G	H	I	J	K	L	MOTOR
EWP 150/600	81"	70.25"	24"x7"	25"	50.75"	12.5"	22.25"	36.5"	15.5"	2"	10.5"	6"ø	16"	1/2"	3 HP
EWP 150/800	89"	78.25"	32"x7"	25"	58.75"	12.5"	22.25"	36.5"	15.5"	2"	10.5"	6"ø	16"	1/2"	3 HP
EWP 150/1000	96.75"	86.25"	40"x7"	25"	66.75"	12.5"	22.25"	36.5"	15.5"	2"	10.5"	6"ø	16"	1/2"	3 HP
EWP 150/1200	104.75"	94.25"	48"x7"	25"	74.75"	12.5"	22.25"	36.5"	15.5"	2"	10.5"	6"ø	16"	1/2"	3 HP
EWP 250/600	85.5"	74.75"	24"x10"	29"	57"	16"	24"	40"	19"	4"	12"	10"ø	20"	1/2"	5 HP
EWP 250/800	93.5"	82.75"	32"x10"	29"	65"	16"	24"	40"	19"	4"	12"	10"ø	20"	1/2"	5 HP
EWP 250/1000	101.25"	90.75"	40"x10"	29"	73"	16"	24"	40"	19"	4"	12"	10"ø	20"	1/2"	5 HP
EWP 250/1200	109.25"	98.5"	48"x10"	29"	81"	16"	24"	40"	19"	4"	12"	10"ø	20"	1/2"	5 HP
EWP 400/600	116.75"	97.75"	24"x16"	42"	70"	23.5"	39"	62"	25"	4"	14.5"	16"ø	26"	3/4"	10 HP
EWP 400/800	124.75"	105.75"	32"x16"	42"	78"	23.5"	39"	62"	25"	4"	14.5"	16"ø	26"	3/4"	10 HP
EWP 400/1000	132.5"	113.5"	40"x16"	42"	86"	23.5"	39"	62"	25"	4"	14.5"	16"ø	26"	3/4"	10 HP
EWP 400/1200	140.5"	121.5"	48"x16"	42"	94"	23.5"	39"	62"	25"	4"	14.5"	16"ø	26"	3/4"	10 HP

Model EWP
WASHING PRESS

VULCAN
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Rev. 1

Model EWP WASHING PRESS

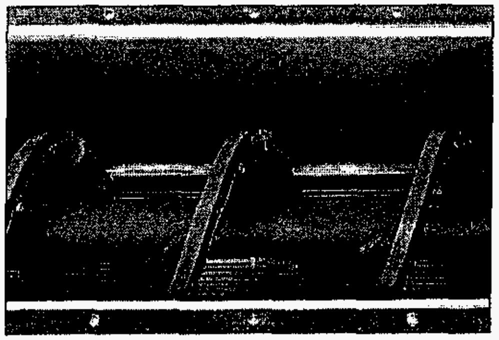
The Model EWP Washing Press is a spiral press used to wash organic matter out of screenings material. The Washing Press washes, dewaters, compresses and transports screenings to a conveyor, container or other suitable receiving device.

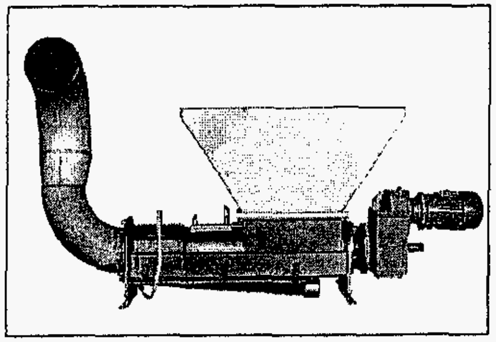
CONSTRUCTION

The Washing Press consists of a press body with separate washing and dewatering sections, hollow shaft spiral, axial thrust bearing (*see photo on right*), gear reducer and motor, drain pan, washwater headers and sequencing valves.

The press body is constructed of stainless steel. A wedge wire drain constructed of individual profile bars is mounted on the bottom of the press and extends from the inlet hopper to the washing section. The wedge wire, with 2 mm spacings, guarantees clog-free drainage of the washwater.

The spiral, of alloy steel construction, is welded to the hollow shaft. The hollow shaft contains perforations located in the washing zone to introduce washwater to the screenings from the inside out. A nylon brush is attached to the trailing edge of the spiral to ensure debris is thoroughly removed from the drainage area. The drain pan is constructed of stainless steel, and is located directly under the press body. A flushing nozzle periodically rinses the drain pan. Sealed with a gasket, and secured with a latching system, the drain pan is easily removed for service.





Above: A detail of the axial thrust bearing that connects the gear reducer to the press body and the shafted spiral. This bearing handles the load created during compaction and carries the overhung load of the spiral. This protects the gear reducer and extends the life of the unit.

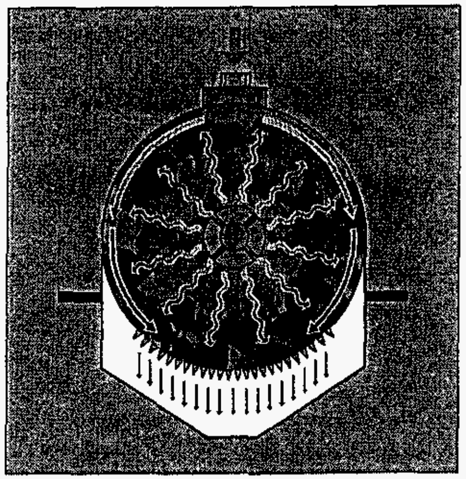
Left Above: Note the substantial construction of the shafted spiral. A nylon brush is affixed to the trailing edge of the spiral to ensure the drain is clean, even when greasy material is present. Beneath the spiral you can see the wedgewire drain. The profiled bars used in the drain construction allow for greater flow and prevent blinding. The spiral is cantilevered off the thrust bearing and does not rest in the housing. This reduces wear on the nylon brush and the press body by eliminating metal-to-metal contact.

Left Below: Here you see a Model EWP 250/600 Washing Press with an inlet hopper and discharge pipe. The inlet hopper can be directly connected to a primary screening device such as a Mensch Crawler™ Bar Screen or Stair Screen, or can be fed by a conveyor. The discharge pipe can be fitted with a bagging assembly, or feed directly into a receiving container.

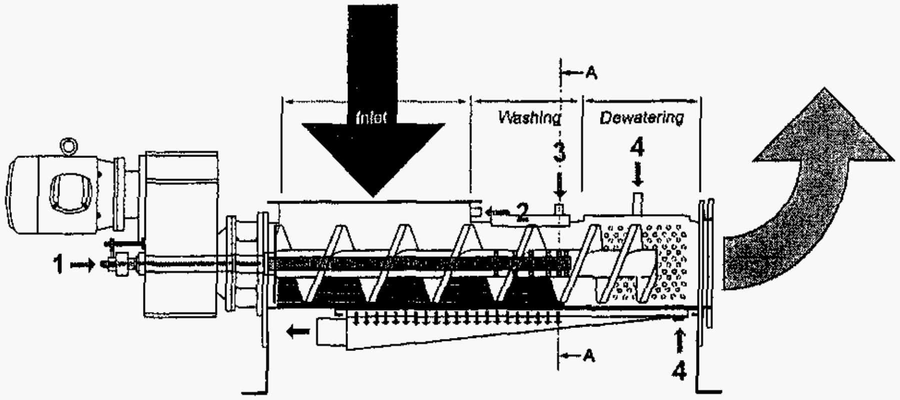
OPERATION

The Washing Press receives the screenings from a primary screening device or conveyor through the inlet hopper. The spiral transports the screenings from the inlet to the washing zone where they are compacted and washed. In the washing zone, washwater is injected into the screenings from the openings in the hollow shaft of the spiral, and from a nozzle at the top of the unit.

To maximize washing, after the press compacts the screenings the spiral reverses, pulling apart the compacted screenings. The cycle is repeated a minimum of four times, recompacting the screenings and squeezing out excess washwater. The repetition helps the press achieve up to **90% organic removal** from the screenings. As the screenings move into the dewatering zone, the pitch of the spiral continues to decrease, further compacting the screenings for maximum water extraction prior to entering the discharge pipe. From inlet hopper to discharge, the **screenings volume is reduced by up to 85%.**



Section A-A through the washing zone.



Valve Operations

1 Injects washwater into the washing zone through the hollow shaft spiral

2 Sprays water over screenings as they enter the inlet hopper

3 Introduces washwater into the top of the washing zone

4 Flushes dewatering zone and drain pan

APPENDIX D
EQUALIZATION BASIN TRANSFER PUMPS

EQUALIZATION BASIN PUMPING STATION

-CALCULATIONS-

Client: Cypress Lakes Utilities, Inc.
Project: WWTP Improvements - Equalization Basin Pumping Station
Project No: 000000000052589
Calculations: System Head Curve with 6" DI and PVC Force Main
Performed by: J R Voorhees
Date: February 12, 2007

High Point Pump Discharge Elevation =	142.05	Feet
High Level Pumps 'On' Elevation =	133.49	Feet
Low Level Pumps 'Off' Elevation =	123.49	Feet

Pipe Segment Identification		Q - average 0 gpm Segment A	Q - average 0 gpm Segment B	Q - average 0 gpm Segment C	Q - average Pump Discharge 4x6 Increaser	Q - average Pump Discharge Elbow	
Nominal Pipe Diameter, Inches		6.00	6.00	6.00	4.00	4.00	
Diameter, D (in.)		6.22	6.065	6.065	4.00	4.00	3
Pipe Material		DIP - Class 53	Sch 40 PVC	Sch 40 SST	CI	CI	
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		28	76	1.5	0	0	0
H&W Friction Coeff "C"		120	140	130	120	100	100
Flowrate in Segment, (gpm)		0	0	0	0	0	0
Flowrate per Pipe, (gpm)		0	0	0	0	0	0
Flowrate per Pipe, Q (ft^3/s)		0.0	0.0	0.0	0.0	0.0	0.0
Area per Pipe, A (ft^3)		0.21101	0.20063	0.20063	0.08727	0.09	0.05
Velocity, V (ft/s)		0.0	0.0	0.0	0.0	0.0	0.0
Minor Loss Contributions:							
90 elbow @	0.45	2	2			1	
45 or smaller elbow @	0.30		5				
tee, straight through @	0.60		1				
tee, line to branch @	1.80						
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00			1			
gate valve @	0.20						
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00						
wye @	0.30						
increasers and reducers @	0.25				1		
swing check valve @	2.60	1					
plug valve	0.40	1					
Sum of Minor Loss Coefficients		3.90	3.00	1.00	0.25	0.45	0.00
Friction Loss, Hf (ft)		0.00	0.00	0.00	0.00	0.00	0.00
Minor Loss, Hm (ft)		0.00	0.00	0.00	0.00	0.00	0.00
Total Headloss, HL (ft)		0.00	0.00	0.00	0.00	0.00	0.00

Total Friction and Minor Headloss: 0.00 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	18.56	Feet
Minimum Static Headloss	8.56	Feet

MAXIMUM TOTAL DYNAMIC HEAD	**18.56**	Feet
MINIMUM TOTAL DYNAMIC HEAD	**8.56**	Feet

Minor Loss Calculations							
90 elbow @	0.45	0.90	0.90	0.00	0.00	0.45	0.00
45 or smaller elbow @	0.30	0.00	1.50	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.60	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	1.00	0.00	0.00	0.00
gate valve @	0.20	0.00	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.25	0.00	0.00
swing check valve @	2.60	2.60	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.40	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		**3.90**	**3.00**	**1.00**	**0.25**	**0.45**	**0.00**

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High Point Pump Discharge Elevation =	142.05	Feet
High Level Pumps 'On' Elevation =	133.49	Feet
Low Level Pumps 'Off' Elevation =	123.49	Feet

Pipe Segment Identification		Q - average 200 gpm Segment A	Q - average 200 gpm Segment B	Q - average 200 gpm Segment C	Q - average Pump Discharge 4x6 Increaser	Q - average Pump Discharge Elbow		
Nominal Pipe Diameter, Inches		6.00	6.00	6.00	4.00	4.00		
Diameter, D (in.)		6.22	6.065	6.065	4.00	4.00	3	
Pipe Material		DIP - Class 53	Sch 40 PVC	Sch 40 SST	CI	CI		
Number of Pipes		1	1	1	1	1	1	
Length, L (feet)		28	76	1.5	0	0	0	
H&W Friction Coeff "C"		120	140	130	120	100	100	
Flowrate in Segment, (gpm)		200	200	200	200	200	0	
Flowrate per Pipe, (gpm)		200	200	200	200	200	0	
Flowrate per Pipe, Q (ft^3/s)		0.4	0.4	0.4	0.4	0.4	0.0	
Area per Pipe, A (ft^3)		0.21101	0.20063	0.20063	0.08727	0.09	0.05	
Velocity, V (ft/s)		2.1	2.2	2.2	5.1	5.1	0.0	
Minor Loss Contributions:								
90 elbow @	0.45	2	2			1		
45 or smaller elbow @	0.30		5					
tee, straight through @	0.60		1					
tee, line to branch @	1.80							
tee, branch to line @	1.80							
inlet, sharp @	0.50							
inlet, flared @	0.25							
submerged exit @	1.00			1				
gate valve @	0.20							
butterfly valve @	0.35							
3-way plug valve thru branch	1.55							
protruding inlet or exit @	1.00							
wye @	0.30							
increasers and reducers @	0.25				1			
swing check valve @	2.60	1						
plug valve	0.40	1						
Sum of Minor Loss Coefficients		3.90	3.00	1.00	0.25	0.45	0.00	
Friction Loss, Hf (ft)		0.10	0.24	0.01	0.00	0.00	0.00	
Minor Loss, Hm (ft)		0.27	0.23	0.08	0.10	0.18	0.00	
								Total Friction and Minor Headloss:
Total Headloss, HL (ft)		0.37	0.47	0.08	0.10	0.18	0.00	1.20 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	18.56	Feet
Minimum Static Headloss	8.56	Feet

MAXIMUM TOTAL DYNAMIC HEAD	19.76	Feet
MINIMUM TOTAL DYNAMIC HEAD	9.76	Feet

Minor Loss Calculations							
90 elbow @	0.45	0.90	0.90	0.00	0.00	0.45	0.00
45 or smaller elbow @	0.30	0.00	1.50	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.60	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	1.00	0.00	0.00	0.00
gate valve @	0.20	0.00	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.25	0.00	0.00
swing check valve @	2.60	2.60	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.40	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		3.90	3.00	1.00	0.25	0.45	0.00

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High Point Pump Discharge Elevation =	142.05	Feet
High Level Pumps 'On' Elevation =	133.49	Feet
Low Level Pumps 'Off' Elevation =	123.49	Feet

Pipe Segment Identification		Q - average 400 gpm Segment A	Q - average 400 gpm Segment B	Q - average 400 gpm Segment C	Q - average Pump Discharge 4x6 Increaser	Q - average Pump Discharge Elbow	
Nominal Pipe Diameter, Inches		6.00	6.00	6.00	4.00	4.00	
Diameter, D (in.)		6.22	6.065	6.065	4.00	4.00	3
Pipe Material		DIP - Class 53	Sch 40 PVC	Sch 40 SST	CI	CI	
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		28	76	1.5	0	0	0
H&W Friction Coeff "C"		120	140	130	120	100	100
Flowrate in Segment, (gpm)		400	400	400	400	400	0
Flowrate per Pipe, (gpm)		400	400	400	400	400	0
Flowrate per Pipe, Q (ft^3/s)		0.9	0.9	0.9	0.9	0.9	0.0
Area per Pipe, A (ft^3)		0.21101	0.20063	0.20063	0.08727	0.09	0.05
Velocity, V (ft/s)		4.2	4.4	4.4	10.2	10.2	0.0
Minor Loss Contributions:							
90 elbow @	0.45	2	2			1	
45 or smaller elbow @	0.30		5				
tee, straight through @	0.60		1				
tee, line to branch @	1.80						
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00			1			
gate valve @	0.20						
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00						
wye @	0.30						
increasers and reducers @	0.25				1		
swing check valve @	2.60	1					
plug valve	0.40	1					
Sum of Minor Loss Coefficients		3.90	3.00	1.00	0.25	0.45	0.00
Friction Loss, Hf (ft)		0.37	0.86	0.02	0.00	0.00	0.00
Minor Loss, Hm (ft)		1.08	0.91	0.30	0.40	0.73	0.00
Total Headloss, HL (ft)		1.45	1.77	0.32	0.40	0.73	0.00

Total Friction and Minor Headloss: 4.67 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	18.56	Feet
Minimum Static Headloss	8.56	Feet

MAXIMUM TOTAL DYNAMIC HEAD	23.23	Feet
MINIMUM TOTAL DYNAMIC HEAD	13.23	Feet

Minor Loss Calculations							
90 elbow @	0.45	0.90	0.90	0.00	0.00	0.45	0.00
45 or smaller elbow @	0.30	0.00	1.50	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.60	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	1.00	0.00	0.00	0.00
gate valve @	0.20	0.00	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.25	0.00	0.00
swing check valve @	2.60	2.60	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.40	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		**3.90**	**3.00**	**1.00**	**0.25**	**0.45**	**0.00**

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High Point Pump Discharge Elevation =	142.05	Feet
High Level Pumps 'On' Elevation =	133.49	Feet
Low Level Pumps 'Off' Elevation =	123.49	Feet

		Q - average	Q - average	Q - average	Q - average	Q - average	
Pipe Segment Identification		500 gpm Segment A	500 gpm Segment B	500 gpm Segment C	Pump Discharge 4x6 Increaser	Pump Discharge Elbow	
Nominal Pipe Diameter, Inches		6.00	6.00	6.00	4.00	4.00	
Diameter, D (in.)		6.22	6.065	6.065	4.00	4.00	3
Pipe Material		DIP - Class 53	Sch 40 PVC	Sch 40 SST	CI	CI	
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		28	76	1.5	0	0	0
H&W Friction Coeff "C"		120	140	130	120	100	100
Flowrate in Segment, (gpm)		500	500	500	500	500	0
Flowrate per Pipe, (gpm)		500	500	500	500	500	0
Flowrate per Pipe, Q (ft^3/s)		1.1	1.1	1.1	1.1	1.1	0.0
Area per Pipe, A (ft^3)		0.21101	0.20063	0.20063	0.08727	0.09	0.05
Velocity, V (ft/s)		5.3	5.5	5.5	12.7	12.7	0.0
Minor Loss Contributions:							
90 elbow @	0.45	2	2			1	
45 or smaller elbow @	0.30		5				
tee, straight through @	0.60		1				
tee, line to branch @	1.80						
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00			1			
gate valve @	0.20						
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00						
wye @	0.30						
increasers and reducers @	0.25				1		
swing check valve @	2.60	1					
plug valve	0.40	1					
Sum of Minor Loss Coefficients		3.90	3.00	1.00	0.25	0.45	0.00
Friction Loss, Hf (ft)		0.56	1.30	0.03	0.00	0.00	0.00
Minor Loss, Hm (ft)		1.68	1.43	0.48	0.63	1.13	0.00
Total Headloss, HL (ft)		2.24	2.73	0.51	0.63	1.13	0.00

Total Friction and Minor Headloss: 7.24 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	18.56	Feet
Minimum Static Headloss	8.56	Feet

MAXIMUM TOTAL DYNAMIC HEAD	**25.80**	Feet
MINIMUM TOTAL DYNAMIC HEAD	**15.80**	Feet

Minor Loss Calculations							
90 elbow @	0.45	0.90	0.90	0.00	0.00	0.45	0.00
45 or smaller elbow @	0.30	0.00	1.50	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.60	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	1.00	0.00	0.00	0.00
gate valve @	0.20	0.00	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.25	0.00	0.00
swing check valve @	2.60	2.60	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.40	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		**3.90**	**3.00**	**1.00**	**0.25**	**0.45**	**0.00**

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High Point Pump Discharge Elevation =	142.05	Feet
High Level Pumps 'On' Elevation =	133.49	Feet
Low Level Pumps 'Off' Elevation =	123.49	Feet

Pipe Segment Identification		Q - average 600 gpm Segment A	Q - average 600 gpm Segment B	Q - average 600 gpm Segment C	Q - average Pump Discharge 4x6 Increaser	Q - average Pump Discharge Elbow	
Nominal Pipe Diameter, Inches		6.00	6.00	6.00	4.00	4.00	
Diameter, D (in.)		6.22	6.065	6.065	4.00	4.00	3
Pipe Material		DIP - Class 53	Sch 40 PVC	Sch 40 SST	CI	CI	
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		28	76	1.5	0	0	0
H&W Friction Coeff "C"		120	140	130	120	100	100
Flowrate in Segment, (gpm)		600	600	600	600	600	0
Flowrate per Pipe, (gpm)		600	600	600	600	600	0
Flowrate per Pipe, Q (ft^3/s)		1.3	1.3	1.3	1.3	1.3	0.0
Area per Pipe, A (ft^3)		0.21101	0.20063	0.20063	0.08727	0.09	0.05
Velocity, V (ft/s)		6.3	6.6	6.6	15.3	15.3	0.0
Minor Loss Contributions:							
90 elbow @	0.45	2	2			1	
45 or smaller elbow @	0.30		5				
tee, straight through @	0.60		1				
tee, line to branch @	1.80						
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00			1			
gate valve @	0.20						
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00						
wye @	0.30						
increasers and reducers @	0.25				1		
swing check valve @	2.60	1					
plug valve	0.40	1					
Sum of Minor Loss Coefficients		3.90	3.00	1.00	0.25	0.45	0.00
Friction Loss, Hf (ft)		0.79	1.82	0.04	0.00	0.00	0.00
Minor Loss, Hm (ft)		2.42	2.06	0.69	0.91	1.63	0.00
Total Headloss, HL (ft)		3.21	3.88	0.73	0.91	1.63	0.00

Total Friction and Minor Headloss: 10.35 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	18.56	Feet
Minimum Static Headloss	8.56	Feet

MAXIMUM TOTAL DYNAMIC HEAD	**28.91**	Feet
MINIMUM TOTAL DYNAMIC HEAD	**18.91**	Feet

Minor Loss Calculations							
90 elbow @	0.45	0.90	0.90	0.00	0.00	0.45	0.00
45 or smaller elbow @	0.30	0.00	1.50	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.60	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	1.00	0.00	0.00	0.00
gate valve @	0.20	0.00	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.25	0.00	0.00
swing check valve @	2.60	2.60	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.40	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		3.90	3.00	1.00	0.25	0.45	0.00

Client: Cypress Lakes Utilities, Inc.
Project: WWTP Improvements - Equalization Basin Pumping Station
Project No: 000000000052589
Calculations: System Head Curve with 6" DI and PVC Force Main
Performed by: J R Voorhees
Date: February 12, 2007

High Point Pump Discharge Elevation =	142.05	Feet
High Level Pumps 'On' Elevation =	133.49	Feet
Low Level Pumps 'Off' Elevation =	123.49	Feet

Pipe Segment Identification		Q - average 800 gpm Segment A	Q - average 800 gpm Segment B	Q - average 800 gpm Segment C	Q - average Pump Discharge 4x6 Increaser	Q - average Pump Discharge Elbow	
Nominal Pipe Diameter, Inches		6.00	6.00	6.00	4.00	4.00	
Diameter, D (in.)		6.22	6.065	6.065	4.00	4.00	3
Pipe Material		DIP - Class 53	Sch 40 PVC	Sch 40 SST	CI	CI	
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		28	76	1.5	0	0	0
H&W Friction Coeff "C"		120	140	130	120	100	100
Flowrate in Segment, (gpm)		800	800	800	800	800	0
Flowrate per Pipe, (gpm)		800	800	800	800	800	0
Flowrate per Pipe, Q (ft^3/s)		1.8	1.8	1.8	1.8	1.8	0.0
Area per Pipe, A (ft^3)		0.21101	0.20063	0.20063	0.08727	0.09	0.05
Velocity, V (ft/s)		8.4	8.9	8.9	20.4	20.4	0.0
Minor Loss Contributions:							
90 elbow @	0.45	2	2			1	
45 or smaller elbow @	0.30		5				
tee, straight through @	0.60		1				
tee, line to branch @	1.80						
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00			1			
gate valve @	0.20						
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00						
wye @	0.30						
increasers and reducers @	0.25				1		
swing check valve @	2.60	1					
plug valve	0.40	1					
Sum of Minor Loss Coefficients		3.90	3.00	1.00	0.25	0.45	0.00
Friction Loss, Hf (ft)		1.34	3.10	0.07	0.00	0.00	0.00
Minor Loss, Hm (ft)		4.30	3.66	1.22	1.61	2.90	0.00
Total Headloss, HL (ft)		5.64	6.76	1.29	1.61	2.90	0.00

Total Friction and Minor Headloss: 18.20 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	18.56	Feet
Minimum Static Headloss	8.56	Feet

MAXIMUM TOTAL DYNAMIC HEAD	**36.76**	Feet
MINIMUM TOTAL DYNAMIC HEAD	**26.76**	Feet

Minor Loss Calculations							
90 elbow @	0.45	0.90	0.90	0.00	0.00	0.45	0.00
45 or smaller elbow @	0.30	0.00	1.50	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.60	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	1.00	0.00	0.00	0.00
gate valve @	0.20	0.00	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.25	0.00	0.00
swing check valve @	2.60	2.60	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.40	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		**3.90**	**3.00**	**1.00**	**0.25**	**0.45**	**0.00**

Client: Cypress Lakes Utilities, Inc.
Project: WWTP Improvements - Equalization Basin Pumping Station
Project No: 000000000052589
Calculations: System Head Curve with 6" DI and PVC Force Main
Performed by: J R Voorhees
Date: February 12, 2007

High Point Pump Discharge Elevation =	142.05	Feet
High Level Pumps 'On' Elevation =	133.49	Feet
Low Level Pumps 'Off' Elevation =	123.49	Feet

		Q - average	Q - average	Q - average	Q - average	Q - average		
Pipe Segment Identification		1000 gpm Segment A	1000 gpm Segment B	1000 gpm Segment C	Pump Discharge 4x6 Increaser	Pump Discharge Elbow		
Nominal Pipe Diameter, Inches		6.00	6.00	6.00	4.00	4.00		
Diameter, D (in.)		6.22	6.065	6.065	4.00	4.00	3	
Pipe Material		DIP - Class 53	Sch 40 PVC	Sch 40 SST	CI	CI		
Number of Pipes		1	1	1	1	1	1	
Length, L (feet)		28	76	1.5	0	0	0	
H&W Friction Coeff "C"		120	140	130	120	100	100	
Flowrate in Segment, (gpm)		1000	1000	1000	1000	1000	0	
Flowrate per Pipe, (gpm)		1000	1000	1000	1000	1000	0	
Flowrate per Pipe, Q (ft^3/s)		2.2	2.2	2.2	2.2	2.2	0.0	
Area per Pipe, A (ft^3)		0.21101	0.20063	0.20063	0.08727	0.09	0.05	
Velocity, V (ft/s)		10.5	11.1	11.1	25.5	25.5	0.0	
Minor Loss Contributions:								
90 elbow @	0.45	2	2			1		
45 or smaller elbow @	0.30		5					
tee, straight through @	0.60		1					
tee, line to branch @	1.80							
tee, branch to line @	1.80							
inlet, sharp @	0.50							
inlet, flared @	0.25							
submerged exit @	1.00			1				
gate valve @	0.20							
butterfly valve @	0.35							
3-way plug valve thru branch	1.55							
protruding inlet or exit @	1.00							
wye @	0.30							
increasers and reducers @	0.25				1			
swing check valve @	2.60	1						
plug valve	0.40	1						
Sum of Minor Loss Coefficients		3.90	3.00	1.00	0.25	0.45	0.00	
Friction Loss, Hf (ft)		2.03	4.68	0.11	0.00	0.00	0.00	
Minor Loss, Hm (ft)		6.72	5.72	1.91	2.52	4.53	0.00	Total Friction and Minor Headloss:
Total Headloss, HL (ft)		8.75	10.40	2.01	2.52	4.53	0.00	28.21 Feet

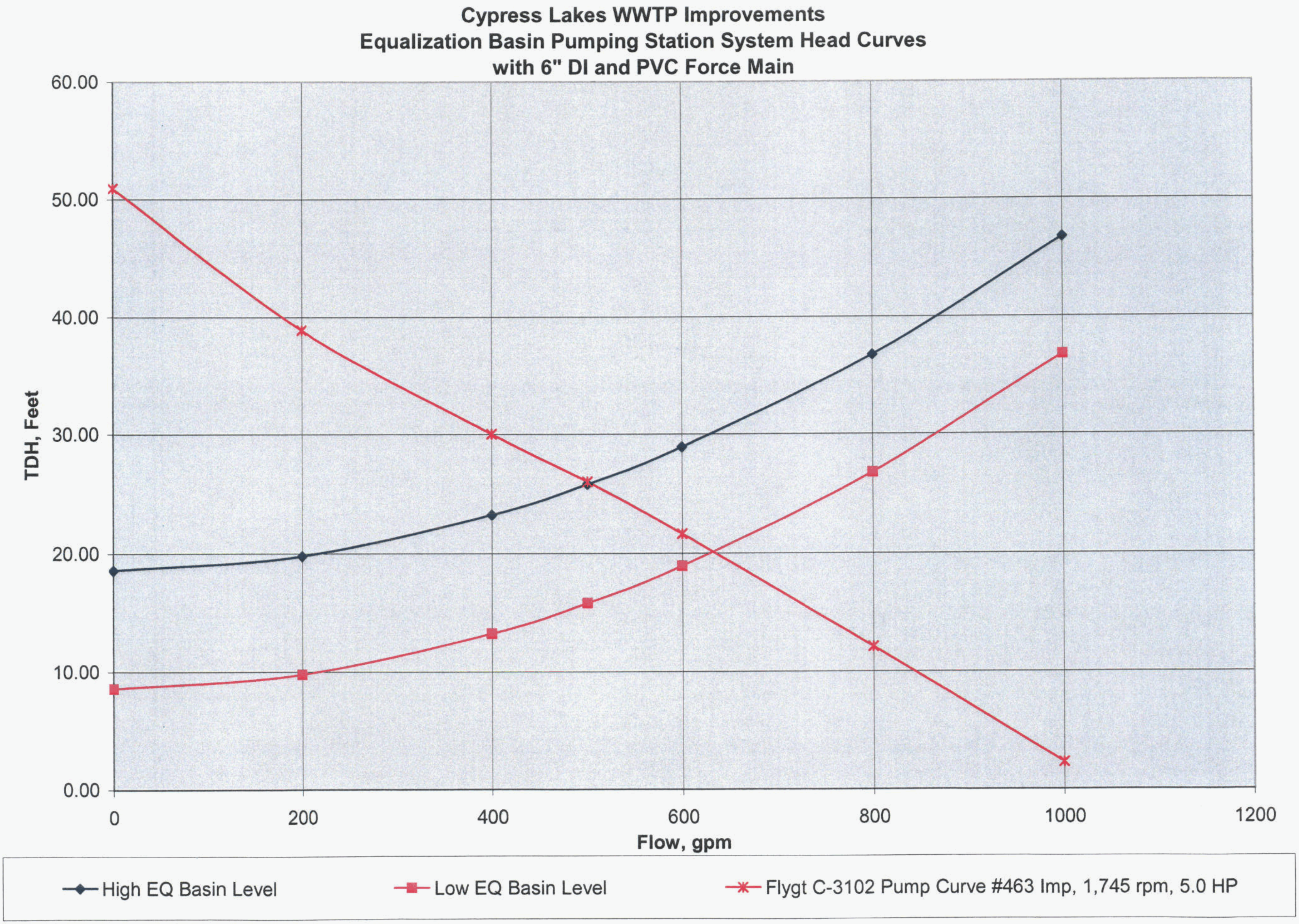
Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	18.56	Feet
Minimum Static Headloss	8.56	Feet

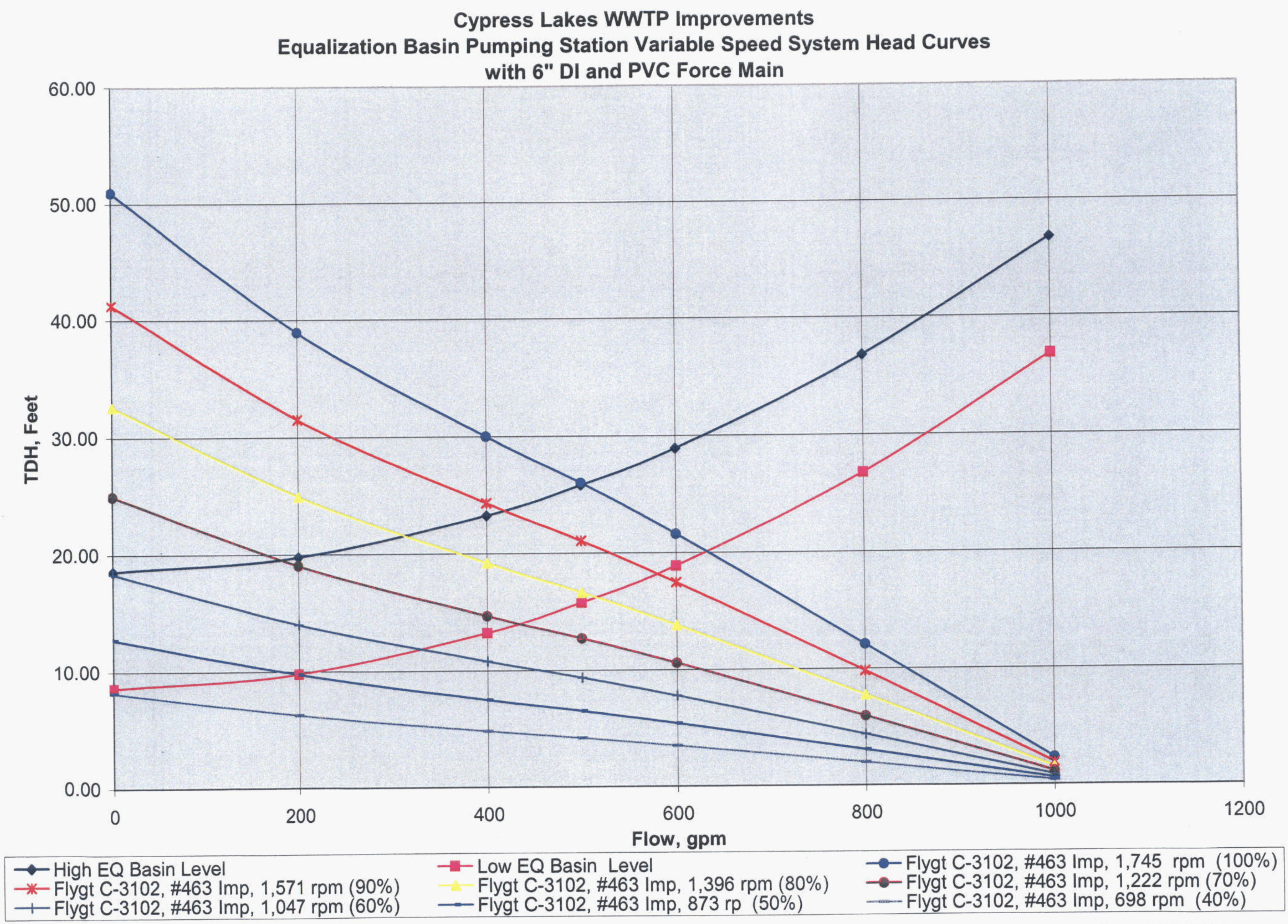
MAXIMUM TOTAL DYNAMIC HEAD	46.77	Feet
MINIMUM TOTAL DYNAMIC HEAD	36.77	Feet

Minor Loss Calculations							
90 elbow @	0.45	0.90	0.90	0.00	0.00	0.45	0.00
45 or smaller elbow @	0.30	0.00	1.50	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.60	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	1.00	0.00	0.00	0.00
gate valve @	0.20	0.00	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.25	0.00	0.00
swing check valve @	2.60	2.60	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.40	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		**3.90**	**3.00**	**1.00**	**0.25**	**0.45**	**0.00**


Cypress Lakes WWTP Improvements
Equalization Basin Pumping Station System Head Curves
with 6" DI and PVC Force Main
TDH, Feet
60.00
50.00
40.00
30.00
20.00
10.00
0.00
0
200
400
600
800
1000
1200
Flow, gpm
High EQ Basin Level
Low EQ Basin Level
Flygt C-3102 Pump Curve #463 Imp, 1,745 rpm, 5.0 HP

Cypress Lakes WWTP Improvements
Equalization Basin Pumping Station System Head Curves
6-Inch Transfer Force Main

X - Flow	Y - Max TDH	Y - Min TDH	Model C-3102 Flygt Pump Curve w/ #463 Impeller - Speed 1,745 rpm 5.0 HP		
0	18.56	8.56	50.90		
200	19.76	9.76	38.90		
400	23.23	13.23	30.00		
500	25.80	15.80	26.00		
600	28.91	18.91	21.60		
800	36.76	26.76	12.10		
1000	46.77	36.77	2.30		



Printed On 6/29/2007

Cypress Lakes WWTP Improvements
Equalization Basin Pumping Station System Head Curves
6-Inch DI and PVC Force Main
Variable Speed Pump Curves for Flygt Model C-3102, Impeller #463

X - Flow	Y - Max TDH	Y - Min TDH	Model C-3102 *Flygt Pump Curve* w/ #463 Impeller - Speed 1,745 rpm 5.0 HP 100% Speed	Model C-3102 *Flygt Pump Curve* w/ #463 Impeller - Speed 1,571 rpm 5.0 HP 90% Speed	Model C-3102 *Flygt Pump Curve* w/ #463 Impeller - Speed 1,396 rpm 5.0 HP 80% Speed	Model C-3102 *Flygt Pump Curve* w/ #463 Impeller - Speed 1,222 rpm 5.0 HP 70% Speed	Model C-3102 *Flygt Pump Curve* w/ #463 Impeller - Speed 1,047 rpm 5.0 HP 60% Speed	Model C-3102 *Flygt Pump Curve* w/ #463 Impeller - Speed 873 rpm 5.0 HP 50% Speed	Model C-3102 *Flygt Pump Curve* w/ #463 Impeller - Speed 698 rpm 5.0 HP 40% Speed
0	18.56	8.56	50.90	41.23	32.58	24.94	18.32	12.73	8.14
200	19.76	9.76	38.90	31.51	24.90	19.06	14.00	9.73	6.22
400	23.23	13.23	30.00	24.30	19.20	14.70	10.80	7.50	4.80
500	25.80	15.80	26.00	21.06	16.64	12.74	9.36	6.50	4.16
600	28.91	18.91	21.60	17.50	13.82	10.58	7.78	5.40	3.46
800	36.76	26.76	12.10	9.80	7.74	5.93	4.36	3.03	1.94
1000	46.77	36.77	2.30	1.86	1.47	1.13	0.83	0.58	0.37
				0.00	0.00	0.00	0.00	0.00	0.00

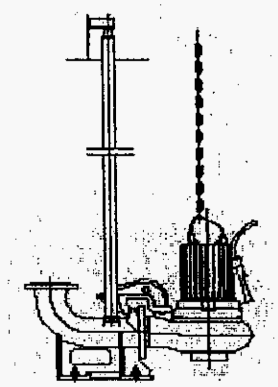
EQUALIZATION BASIN TRANSFER PUMPS

-MANUFACTURER'S DATA-

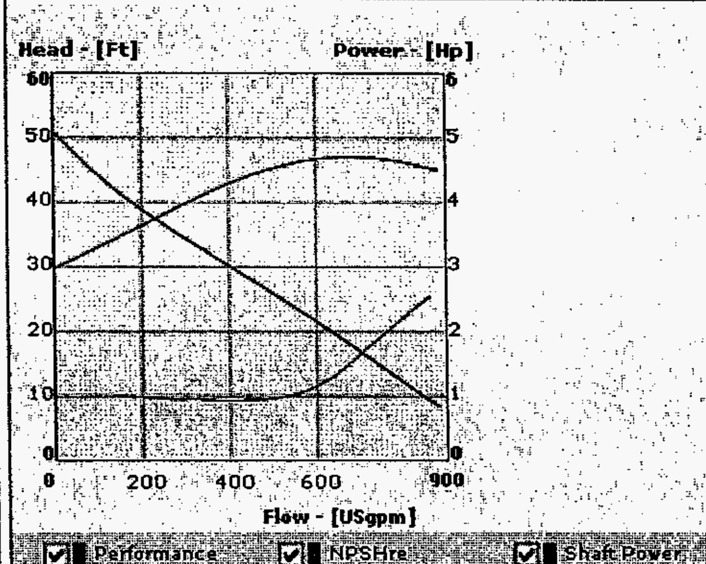
FLYGT

PRODUCT: NP 3102 MT

Product picture



Curves ⊕ **Enlarge**



Pump Data

Curve id: 63-463-00-3703 Impeller: 463 Poles: 4 - pole Motor: 18-11-4AL Frequency: 60 Hz

Motor Data

Rated output power Hp (kW)	Ø	Nominal voltage (V)	Full load current (A)	Locked rotor current (A)	Locked rotor kVA	Locked rotor code letter kVA/Hp	Poles/rpm
5 (3.7)	3	230	14	83	33	H	4/1745
5 (3.7)	3	460	6.8	42	33	H	4/1745

Pump motor Hp	Efficiency			Power factor		
	100% load	75% load	50% load	100% load	75% load	50% load
5	85	85	83.5	0.81	0.75	0.63

Cable Data

HP	Cables	Volts	Max. length (Ft)	Cable size/Nominal OD.	Conductors (In one cable)	Type	Part number
5	1	230 460	165 690	#12/7 0.83"-(21.0mm)	(3) 12 AWG (PWR) (2) 12 AWG (CTRL) (1) 12 AWG (GND) (1) 12 AWG (GC)	STD	942104

Available Discharge Connection Outlet Size

Outlet Drilled Flange	4"

Warm Liquid Data

Rtd. Amb. Temp.	Rtd. Curr.(1)	Rtd. Curr.(2)	De-rated Shaft Power
70° C / 158° F	6.8 A	14 A	4.9 Hp

Flygt

ITT Industries

FLYGT	PERFORMANCE CURVE	PRODUCT N 3102.181	TYPE MT
DATE 2005-08-16	PROJECT FLYGT US Catalog	CURVE NO 63-463-00-3703	ISSUE 2

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.81	0.75	0.63
EFFICIENCY	85.0 %	85.0 %	83.5 %
MOTOR DATA	—	—	—

RATED POWER	5	hp
STARTING CURRENT ...	42	A
RATED CURRENT ...	6.8	A
RATED SPEED	1745	rpm
TOT.MOM.OF INERTIA ...	0.027	kgm2
NO. OF BLADES	2	

IMPELLER DIAMETER: 172 mm

MOTOR #	STATOR	REV
18-11-4AL	1 YSER	11

FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4

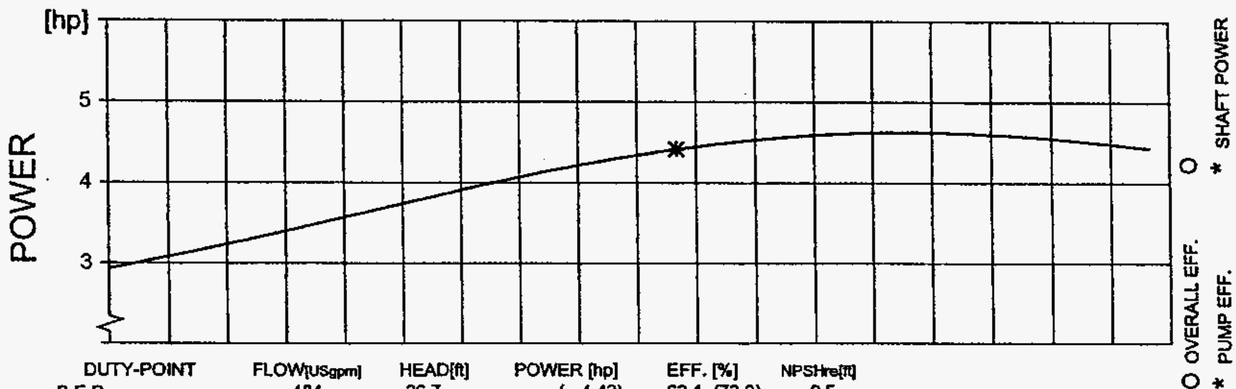
GEARTYPE	RATIO
—	—

COMMENTS

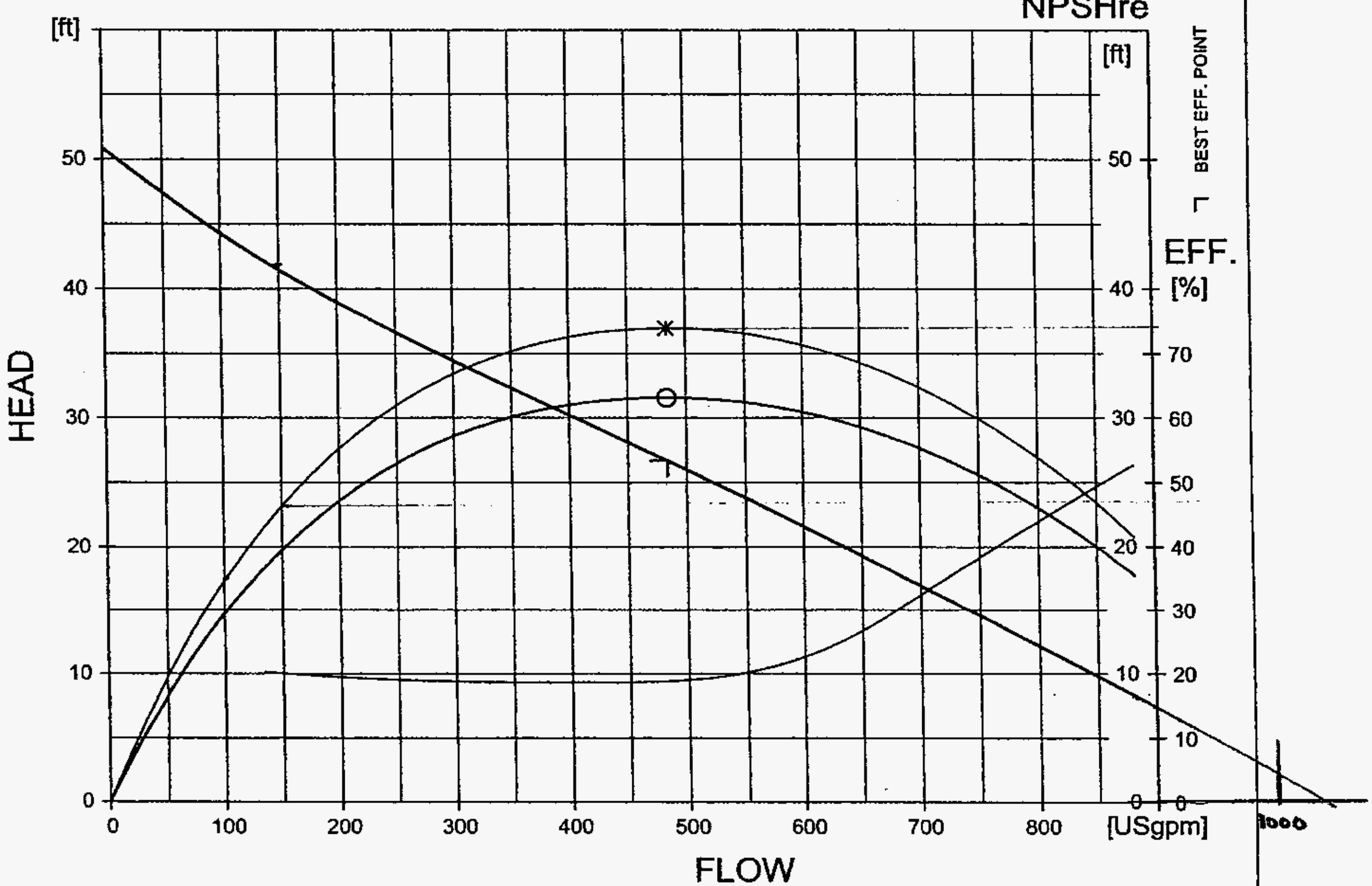
NEMA Code Letter: H
Installs: NP/NS

INLET/OUTLET: -/ 4 inch

IMP. THROUGHLET: —



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
B.E.P.	484	26.7	(4.42)	63.1 (73.9)	9.5



FUSCAT 1.0 (20031201)

NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

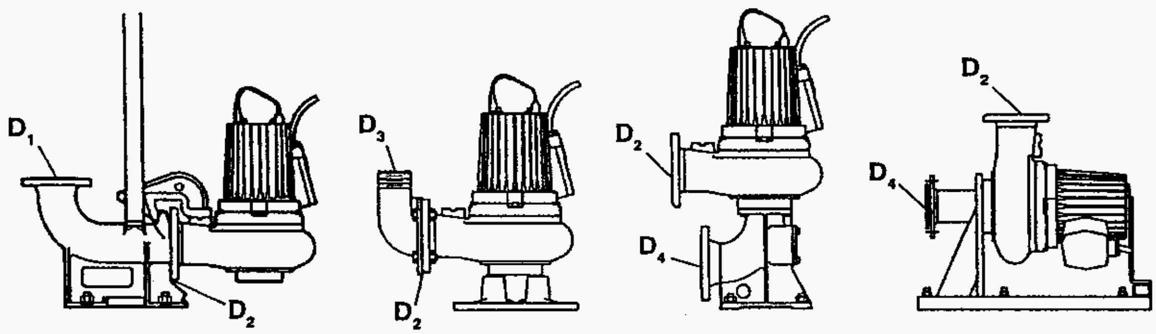
FLYGT CURVE

N-3102

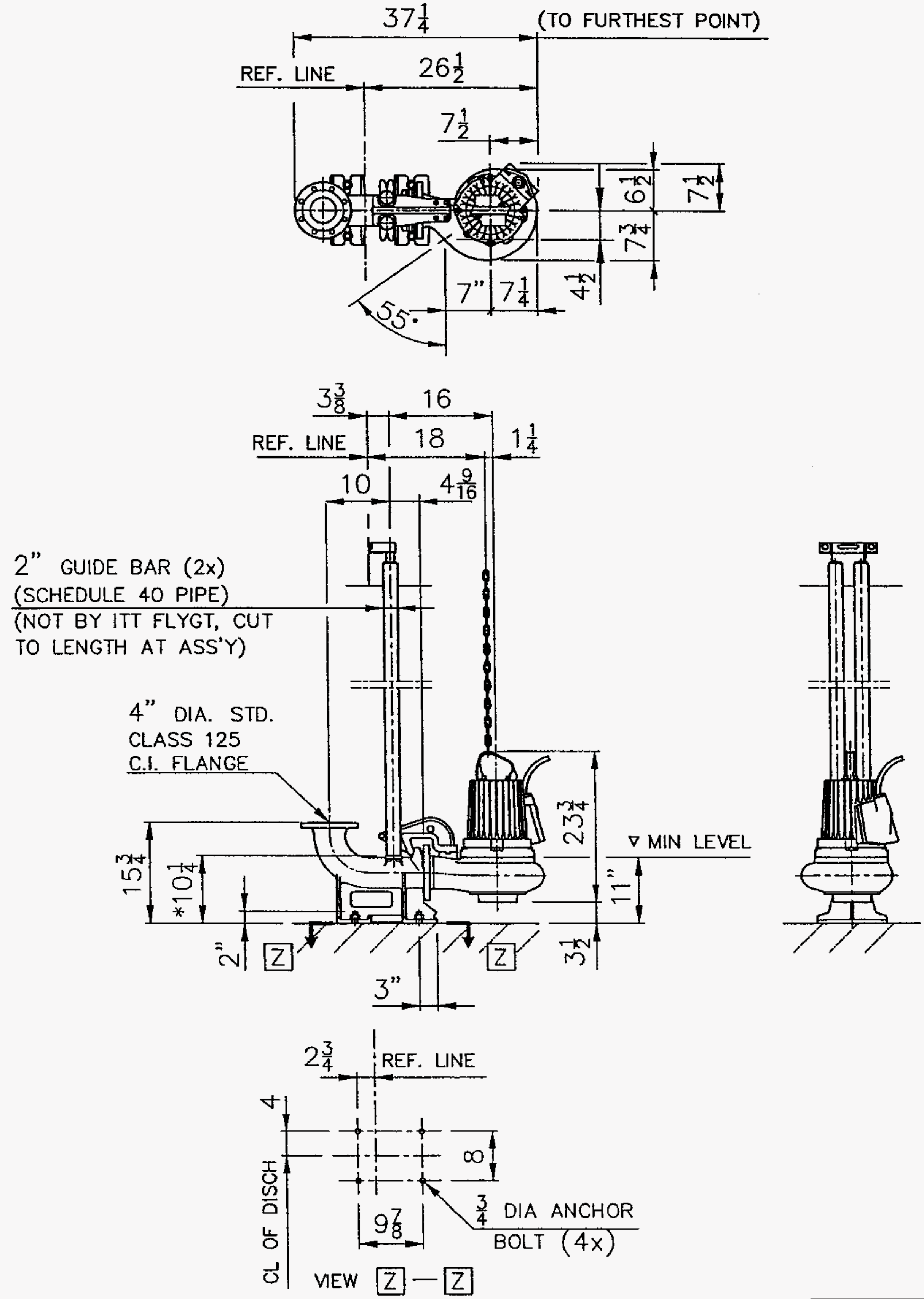
FLYGT | **Impeller/Motor/Nominal Sizes** | Issued: 5/02 | Supersedes: 8/00

PUMP MODEL	IMPELLER CODE	HP RATING				VAC	D1	D2	D3	D4
		NP	NS	NT	NZ					
3102 3Ø	422 LT 423 LT	5.0	5.0	–	–	200 230/460 575	4" or 6"	4" or 6"	4" or 6"	–
	462 MT 463 MT	5.0	5.0	–	–		4"	4"	4"	–
	464 MT 465 MT	5.0	5.0	3.7	3.7		4"	4"	4"	4"
3102 1Ø	464 MT 465 MT	3.9	3.9	–	–	230	4"	4"	4"	–

LT= High Volume MT= Standard



NP NS NT NZ



ALL DIMENSIONS IN INCHES

* DIMENSION TO ENDS OF GUIDE BARS

Weight (LBS)	
Pump	Disch
240	80

FLYGT AUTOCAD DRAWING	Denomination: Dimensional drwg NP 3102 MT 4"/ 4"	Drawn by Sors	Checked by RB
		Date 000905	Reg no 5399
		Scale	660 23 00

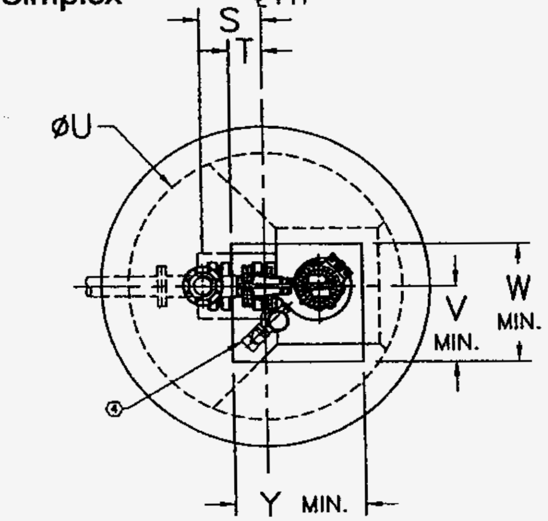
CP/NP-3102

e-Catalog	FLYGT	Lift Station Dimensions	Issued: 7/05	Supersedes: 5/05

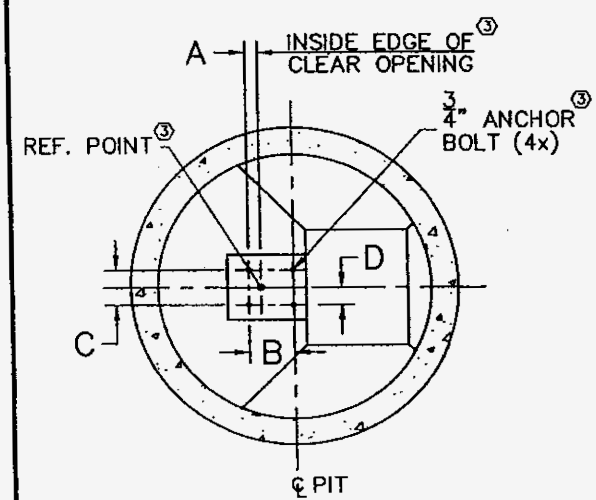
NOTES:

1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT FOR ELEVATION VIEW.
3. LOCATE ANCHOR BOLTS USING INSIDE EDGE OF CLEAR OPENING AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO CLEAR OPENING.
4. ITT FLYGT MIX-FLUSH VALVE.

Simplex

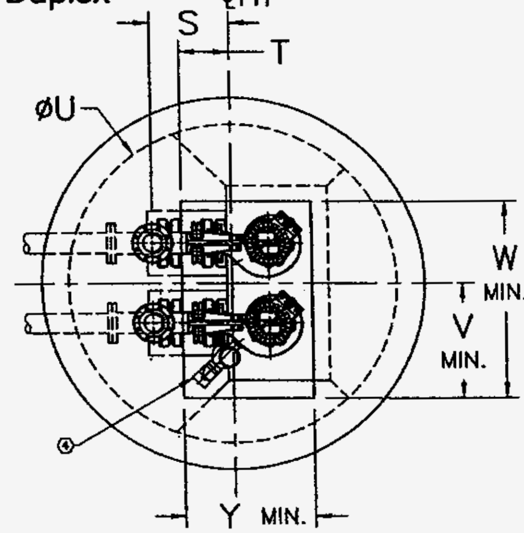


TOP VIEW

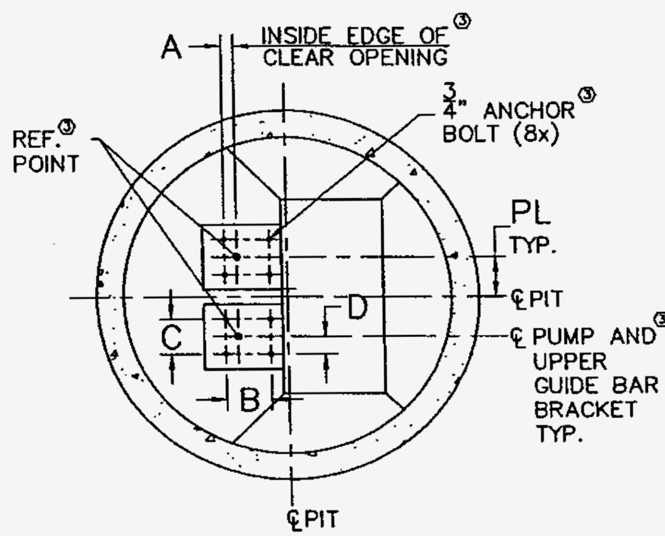


BASE SECTION

Duplex



TOP VIEW



BASE SECTION

ALL DIMENSIONS ARE IN INCHES

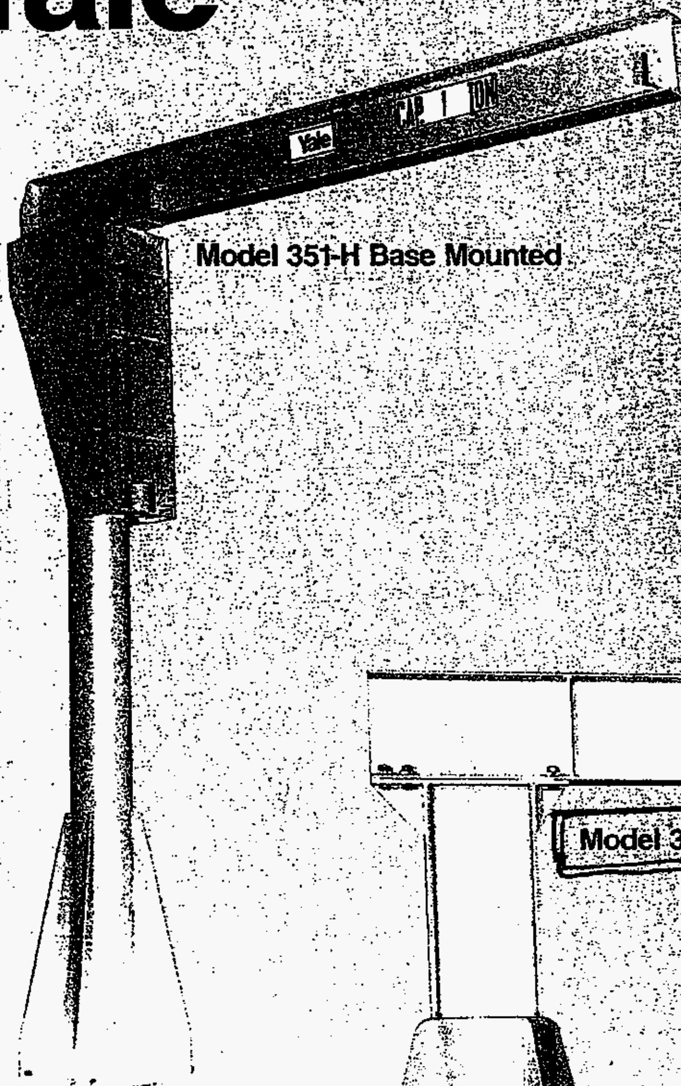
MODEL	NOM. SIZE	VERSION					SIMPLEX						DUPLEX						
			A	B	C	D	S	T	U	V	W	Y	S	T	U	PL	V	W	Y
CP/NP	4"	MT	$2\frac{3}{4}$	$9\frac{7}{8}$	8	4	$13\frac{3}{4}$	$7\frac{1}{4}$	60	17	$26\frac{1}{2}$	$28\frac{1}{2}$	$17\frac{1}{2}$	11	72	9	26	$44\frac{1}{2}$	$28\frac{1}{2}$
CP/NP	4"	LT	$2\frac{3}{4}$	$9\frac{7}{8}$	8	4	$13\frac{3}{4}$	$7\frac{1}{4}$	60	16	$25\frac{1}{2}$	$28\frac{1}{2}$	$17\frac{1}{2}$	11	72	9	25	$43\frac{1}{2}$	$28\frac{1}{2}$
CP/NP	6"	LT	$4\frac{1}{4}$	11	10	5	11	$3\frac{3}{8}$	60	$17\frac{1}{2}$	27	$28\frac{1}{2}$	$14\frac{3}{8}$	$6\frac{3}{4}$	72	9	$26\frac{1}{2}$	45	$28\frac{1}{2}$
CP	8"	LT	$5\frac{1}{2}$	11	10	5	$8\frac{7}{8}$	0	60	$17\frac{1}{2}$	27	$28\frac{1}{2}$	$11\frac{3}{8}$	$2\frac{1}{2}$	72	9	$26\frac{1}{2}$	45	$28\frac{1}{2}$

APPENDIX D-1
JIB CRANE AND CHAIN HOIST

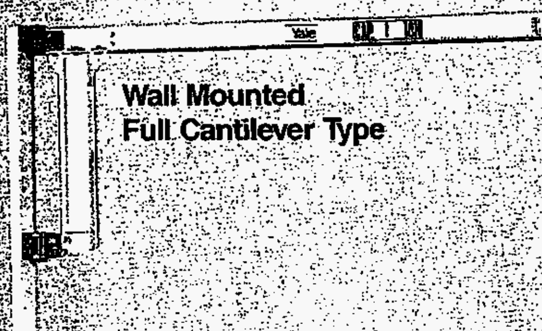
Yale® Jib Cranes

3618B

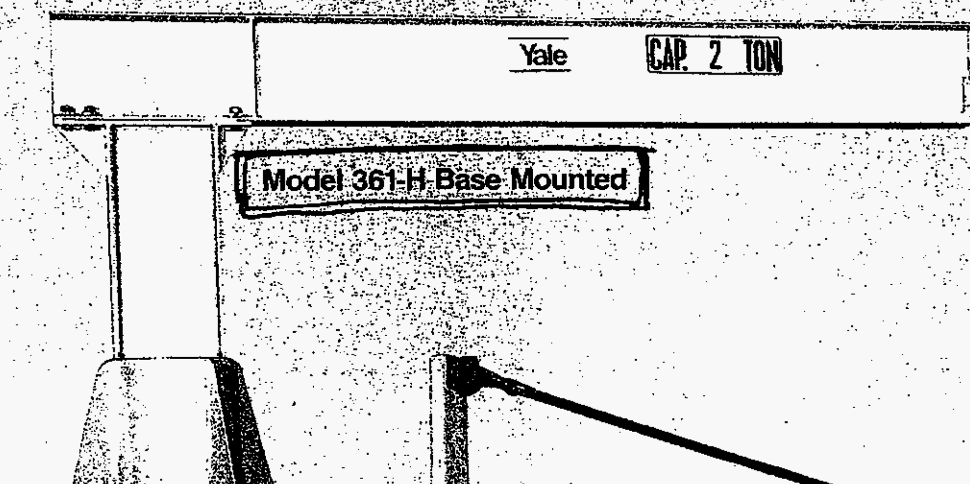
Yale®



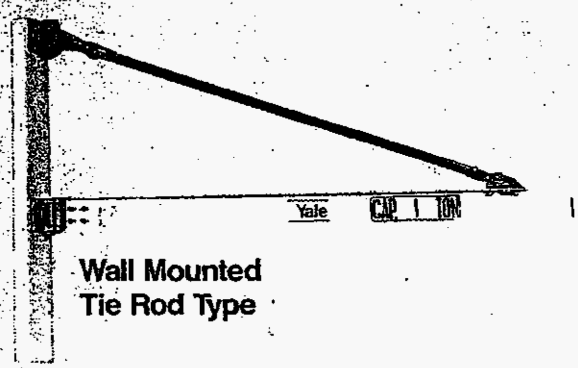
Model 351-H Base Mounted



Wall Mounted
Full Cantilever Type



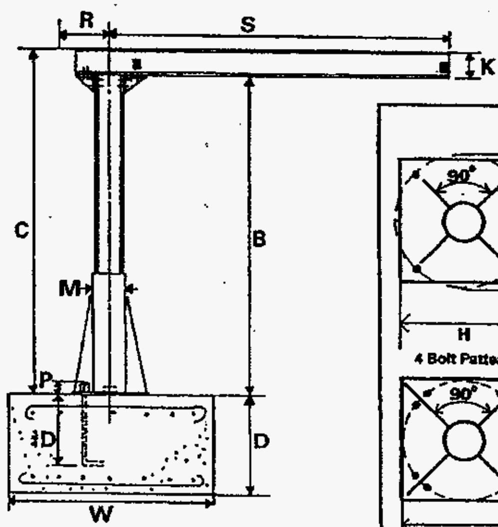
Model 361-H Base Mounted

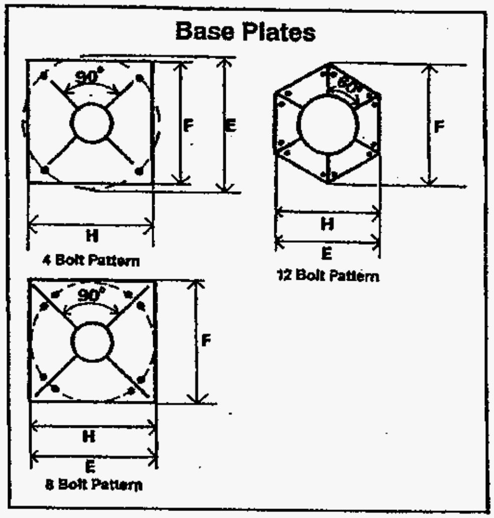


Wall Mounted
Tie Rod Type

361-H Base Mounted Jib Crane

- Capacities ¼ to 3 tons
- Less deflection for reduced load swing and bounce
- Economical — costs less than conventional models
- Greatly reduces installation time
- Easily adjustable from floor level





Capacity in tons	Boom radius (ft) S	Boom height (ft) B	Overall height C	I-beam size (in) K	Mast dia. (in) M	Found depth D (in)	Rotation clearance (in) R	Dim. P (in)	Anchor bolt dia. (in)	Bolt circle dia. (in) E	Bolt pattern no.	Foundation width (in) W	H	Base plate width (in) F	Approx net weight lbs
¼	8	10	10′ 6″	6	10	36	12	4	¾	30	4	48	24	24	675
¼	10	10	10′ 6″	6	10	36	12	4	¾	30	4	48	24	24	690
¼	12	10	10′ 8″	8	10	36	12	4	¾	30	4	48	24	24	720
¼	14	10	10′ 8″	8	10	36	12	4	¾	30	4	48	24	24	800
¼	16	10	10′ 10″	10	10	36	12	4	¾	30	4	48	24	24	960
½	8	10	10′ 8″	8	10	36	12	4	¾	30	4	48	24	24	785
½	10	10	10′ 8″	8	10	36	12	4	¾	30	4	48	24	24	810
½	12	10	10′ 10″	10	10	36	12	4	¾	30	4	48	24	24	1030
½	14	10	10′ 10″	10	12	42	15	4	¾	30	8	54	30	30	1080
½	16	10	11′ 0″	12	12	42	15	4	¾	30	8	54	30	30	1250
1	8	10	10′ 8″	8	12	42	15	4	¾	30	8	54	30	30	845
1	10	10	10′ 10″	10	12	42	15	4	¾	30	8	54	30	30	980
1	12	10	11′ 0″	12	12	42	15	4	¾	30	8	54	30	30	1200
1	14	10	11′ 0″	12	14	42	15	4	1	30	8	60	30	30	1260
1	16	10	11′ 0″	12	18	42	24	4	1	42	12	72	42	48½	1740
2	8	10	11′ 0″	12	18	42	24	4	1	42	12	72	42	48½	1410
2	10	10	11′ 0″	12	18	42	24	4	1	42	12	72	42	48½	1490
2	12	10	11′ 3″	15	18	42	24	4	1	42	12	72	42	48½	1770
2	14	10	11′ 3″	15	18	42	24	4	1	42	12	72	42	48½	2300
2	16	10	11′ 3″	15	20	42	24	4	1	42	12	84	42	48½	2380
3	8	10	11′ 3″	15	18	42	24	4	1	42	12	96	42	48½	2100
3	10	10	11′ 3″	15	20	42	24	4	1	42	12	72	42	48½	2230
3	12	10	11′ 3″	15	20	42	24	4	1	42	12	84	42	48½	2320
3	14	10	11′ 6″	18	20	42	24	4	1	42	12	84	42	48½	2590
3	16	10	11′ 6″	18	20	42	24	4	1	42	12	84	42	48½	3960

Note: Dimensions shown are not certified for construction and are subject to change without notice. Many other models available, please consult the factory.

The unique (patent pending) design of the Yale 361-H base mounted jib crane helps eliminate dangerous deflection. Deflection can cause the load to run uncontrollably to the lowest point on the I-beam. This may result in dangerous load bounce and swing.

In conventional jibs, the head rotating around the pipe mast may cause the pipe to flex, resulting in deflection of the I-beam.

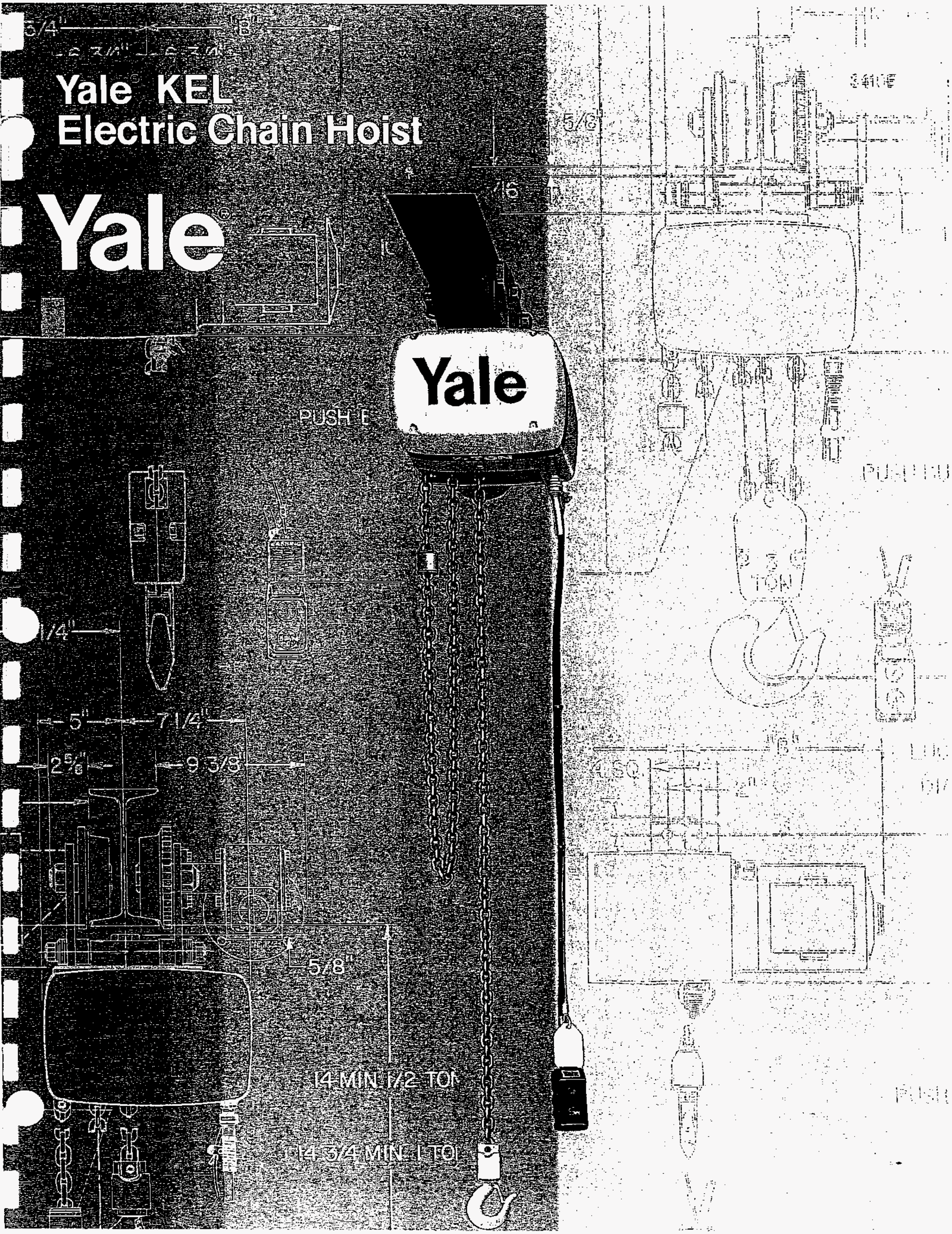
This cannot occur in the 361-H jib because the entire mast rotates inside the pipe base assembly that is supported from top to bottom by heavy duty gusset plates.

The self-aligning roller cage is connected to the mast which is constructed of rugged H-beam. The bottom bearing is a heavy duty thrust bearing designed to handle the axial load. Top entry collector rings are available as an option.

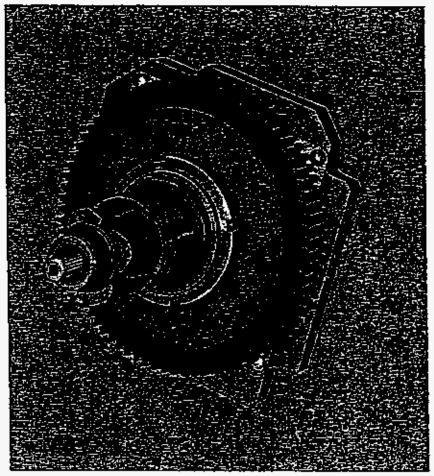
The unique design of the 361-H allows us to standardize on many components resulting in quick deliveries at a substantial cost savings to you! Contact your nearest Yale hoist distributor and compare.

Yale® KEL Electric Chain Hoist

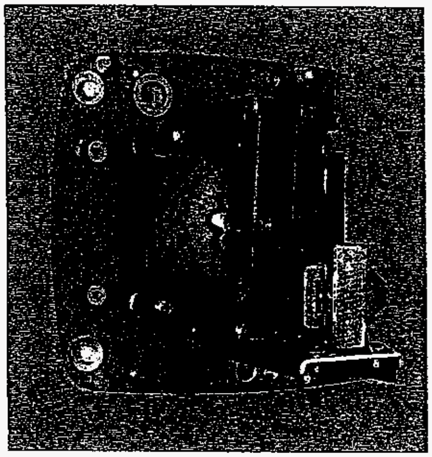
Yale®



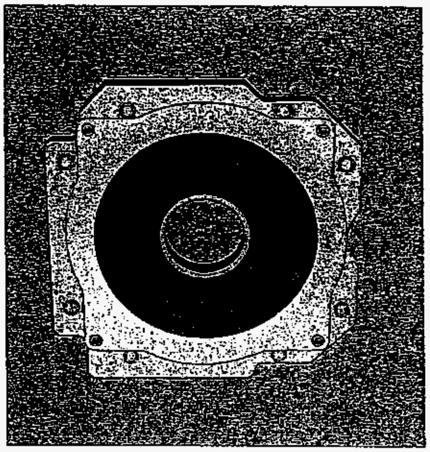
Yale® Features



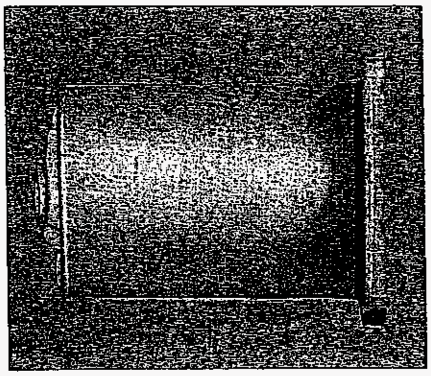
Load Limiting Device—Standard
The Yale KEL electric Chain Hoist is furnished with a built-in load limiter as standard equipment. This slip-clutch type load limiter is designed to help prevent damaging overloads. The load limiter is pre-set at the factory to function within a given range above the hoist's rated capacity. This permits unimpeded operation of the hoist within its rated capacity. Additionally, the load limiting device protects the hoist should the chain become jammed.



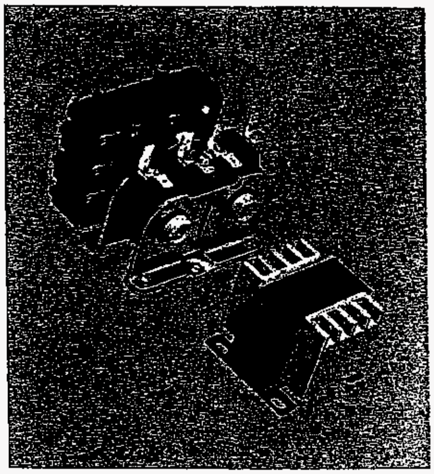
Disc-Type Motor Brake
This positive-acting, non-asbestos brake is opened by a specially designed solenoid only when the hoist motor is on. It closes instantly when the power is cut off to hold the load in place. The brake will hold the full rated capacity of the hoist and is enclosed against dirt, water and oil.



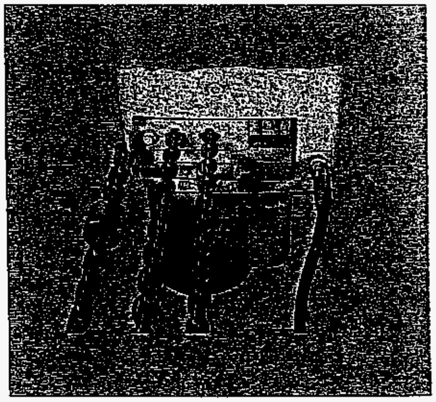
Roller-Clutch Type Load Brake—Standard
Unique one-way design controls lowering action with an infinite number of stopping positions. Load brake minimizes downslip and operates with power on or off. Brake is located on output side of gear reduction and operates independently of the gear train.



Heavy Duty Dual Voltage Motors
Dual-voltage motors are specifically designed for hoist duty and meet NEMA specifications. Standard voltages are 115/230-1-60 and 230/460-3-60. A simple reconnection changes voltage on these models. Other voltages are available. Motors have class B insulation and are 30 minute rated with a 75°C rise over a 40°C ambient temperature. All motors are tested to protect against internal short circuits and have thermostats inbedded in the motor windings for additional protection. The KEL can be CSA approved. The motors are TENV.

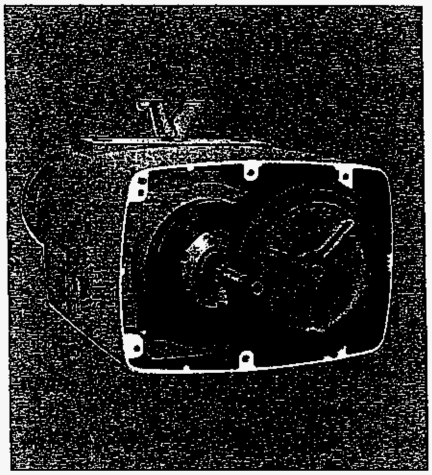


Controls
Magnetic contactor controls use double-break principle for longer life. Hand-grip pushbutton control station is suspended from hoist frame by a shielded cable. They are mechanically interlocked at the contactor and pushbutton station. Standard controls are 24 volt with 115 volt optional. All control enclosures are designed to the intent of NEMA 3R and 12.

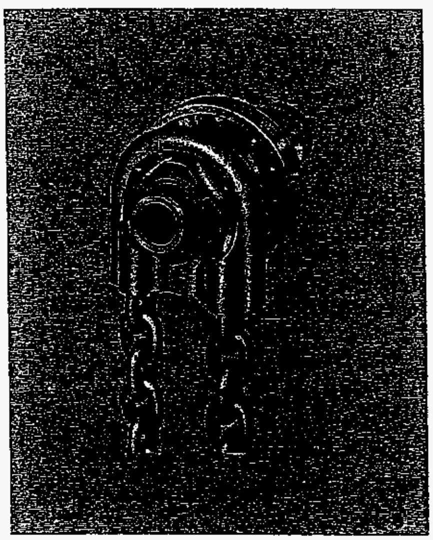


Hook Travel Limiting Device
Adjustable limit stop or load block activate load limiter upon contact with hoist housing to protect against damage from accidental over travel. An optional electrical limit switch is also available.

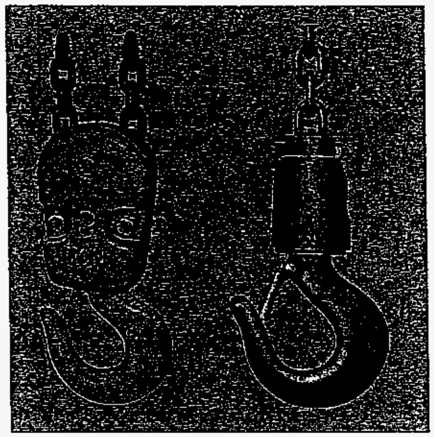
KEL
Electric Chain Hoist



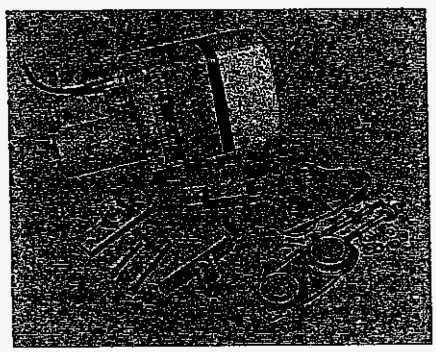
Gears, Pinions and Bearings
Gears and driving pinion are made of forged and hardened alloy steel for long life. Gear teeth are precision cut, full depth and feature modified involute design to minimize friction and give smooth operation. Intermediate pinion is cut from hardened bar stock. Serrated spline connections assure positive drive. Precision ball bearings have ample provision for thrust load and the entire gear train operates in an oil bath.



Chain Guide and Load Sheave
Chain guide prevents twisting of chain on load sheave. Load sheave is mounted on precision ball bearings and has four pockets for proper support of load and reduction of chain wear.



Chain, Bottom Block and Hook
Each link of the load chain is die-formed, electrically welded and heat-treated. Bottom block on two and three ton units is enclosed with ductile iron sheave mounted on bearings. Load hooks are drop-forged with hook latches standard.

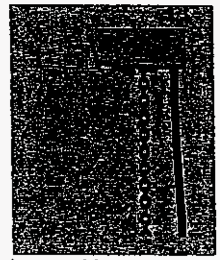


Wide Variety of Suspensions
Available suspensions are: lug, rotating and non-rotating top hooks, rotating and non-rotating clevises, plain trolley, RT motorized trolley, TT tractor trolley and geared trolley.

Accessories

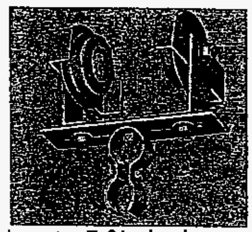
Current collectors (collector brackets and stems), tag lines, power cord trolleys, cable reels, coiled cord, and electric cord suspension kits are among the safe and effective power delivery systems that Yale can provide for your KEL Electric Chain Hoist. Optional power cord can be supplied to the correct length for your application when you order your KEL (specify on order).

Chain Containers



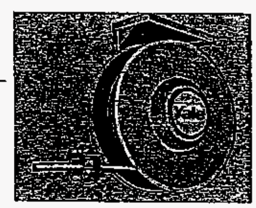
Chain containers are recommended for the KEL hoist to keep the slack chain out of the way when it may be a hazard to operations or personnel. If you order a chain container with your KEL, one of two types will be supplied. Either a vinyl coated, synthetic fabric, bag type container or a metal bucket type container will be furnished, depending on the lift you require. Chain containers are offered for lifts to 75 feet on $\frac{1}{2}$ and 1 ton units, $37\frac{1}{2}$ feet on 2 ton units, and 25 feet on 3 ton units. Containers for longer lift units may be available by special order.

Power Cord Trolley



Supports $\frac{1}{4}$ inch to $1\frac{1}{4}$ inch outside diameter power cords. Adjusts to ASI beams from 3 inches to 10 inches high and from $2\frac{3}{8}$ inches to $5\frac{3}{32}$ inches in width. For best results space trolleys at 8 foot intervals. Recommended for use with trolley mounted hoists.

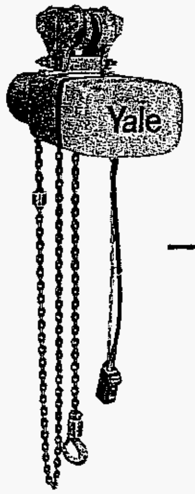
Cable Reel



Recommended to keep power cord taut on trolley suspended hoists. Weather and dust tight, reels work well in many applications.

Yale Geared Upper & Lower Limit Switch
Recommended when travel of bottom hook must be limited periodically. Maximum lift when limit switch is furnished: $\frac{1}{2}$ and 1 ton—96 feet, 2 ton—48 feet, 3 ton—32 feet.

KEL
Plain Trolley Type



1 Ton Plain Trolley

Specifications (All dimensions in inches)

Capacity	Std. Lift	Speed FPM	Motor HP	Motor Amperage* Single Phase 115	Single Phase 230	Three Phase 230/460	Three Phase 575	"B" Dim.	Model No.	Approx. Net Wt.	Approx. Ship. Wt.	Min. Head-room
½ Ton	10	15	½	9.0	4.5	2.0	1.7	12⅛	KEL½-10PT15S1	140	160	13⅞
	10	30	1	15.0	7.5	3.5	2.0	12⅝	KEL½-10PT30S1	150	170	13⅞
	10	60	2	NA	NA	5.5	4.0	15⅞	KEL½-10PT60S1	155	175	13⅞
1 Ton	10	15	1	15.0	7.5	3.5	2.0	12⅝	KEL1-10PT15S1	165	185	14⅝
	10	30	2	NA	NA	5.5	4.0	15⅞	KEL1-10PT30S1	170	190	14⅝
	10	42	3	NA	NA	8.5	6.0	19¼	KEL1-10PT42S1	185	205	14⅝
2 Ton	10	7½	1	15.0	7.5	3.5	2.0	12⅝	KEL2-10PT7S2	180	200	18¾
	10	15	2	NA	NA	5.5	4.0	15⅞	KEL2-10PT15S2	190	210	18¾
	10	21	3	NA	NA	8.5	6.0	19¼	KEL2-10PT21S2	210	230	18¾
3 Ton	10	10	2	NA	NA	5.5	4.0	15⅞	KEL3-10PT10S3	260	295	22⅝
	10	14	3	NA	NA	8.5	6.0	19¼	KEL3-10PT14S3	270	305	22⅝

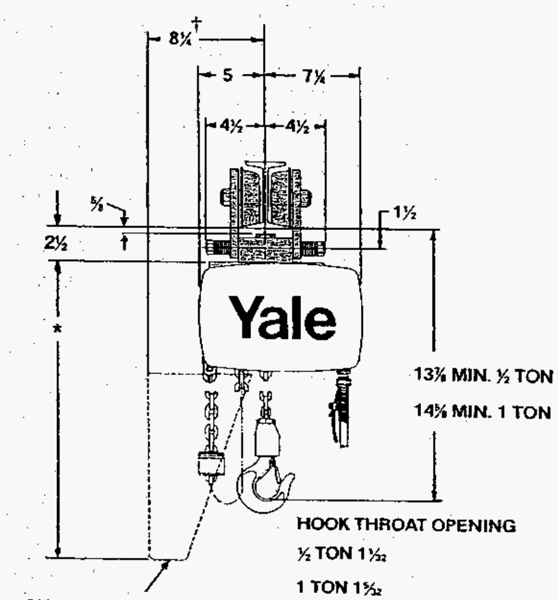
*Minimum circuit ampacity

Standard Lift: 10 Feet. Available Voltages 115/230-1-60 (½ and 1 hp only). 200-3-60, 230/460-3-60, 575-3-60. Two speed units available 3 phase only.

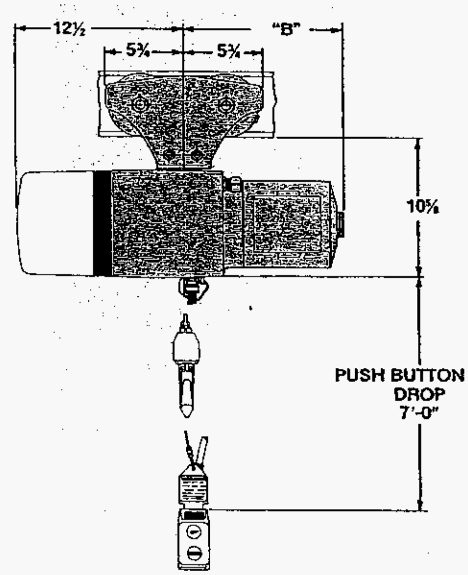
Headroom dimension shown is for standard or bronze hooks. For Bullard hooks add 1½ inches for ½ and 1 ton, and ¾ inches for 2 and 3 ton.

Air-powered KAL also available. See bulletin #3310. For KEW electric wire rope hoist, see bulletin #3420. Specifications subject to change without notice.

½ and 1 ton



*CHAIN CONTAINER WHEN USED FOR:
30' LIFT-20¾"
50' LIFT-22¾"
75' LIFT-23¾"
†Add 5" for Lifts over 50'



NOTE:
TROLLEY WILL ADJUST FROM 5" x 10# TO 12" x 31.8# AMERICAN STD. I-BEAMS
DIM. SHOWN ARE FOR MIN. SIZE I-BEAM
WHEEL TREAD DIA.—4
WHEEL BASE—6½
MIN. RADIUS CURVE—2'-6"

APPENDIX E
IN-PLANT LIFT STATION PUMPS

IN-PLANT DRAINAGE
PUMPING STATION PUMPS

-CALCULATIONS-

Client: Cypress Lakes Utilities, Inc.
Project: WWTP Improvements - In-Plant Drainage Pumping Station
Project No: 000000000052589
Calculations: System Head Curve with 2" PVC Force Main
Performed by: J R Voorhees
Date: April 2, 2007

High Point Pump Discharge Elevation =	135.20	Feet
High Level Pumps 'On' Elevation =	124.00	Feet
Low Level Pumps 'Off' Elevation =	121.00	Feet

		Q - average	Q - average	Q - average	Q - average	Q - average	
Pipe Segment Identification		0 gpm Segment A	0 gpm	0 gpm			
Nominal Pipe Diameter, Inches		2.00	2.00	2.00	2.00	2.00	2.00
Inside Diameter, D (in.)		1.939	1.939	1.939	1.939	1.939	1.939
Pipe Material		Sch 80 PVC					
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		80	0	0	0	0	0
H&W Friction Coeff "C"		140	140	140	140	140	140
Flowrate in Segment, (gpm)		0	0	0	0	0	0
Flowrate per Pipe, (gpm)		0	0	0	0	0	0
Flowrate per Pipe, Q (ft^3/s)		0.0	0.0	0.0	0.0	0.0	0.0
Area per Pipe, A (ft^3)		0.02051	0.02051	0.02051	0.02051	0.02	0.02
Velocity, V (ft/s)		0.0	0.0	0.0	0.0	0.0	0.0
Minor Loss Contributions:							
90 elbow @	0.60	6					
45 or smaller elbow @	0.30	2					
tee, straight through @	0.60						
tee, line to branch @	1.80	1					
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00						
ball valve @	0.10	1					
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00	1					
wye @	0.30						
increasers and reducers @	0.25						
ball check valve @	12.00	1					
plug valve	0.40						
Sum of Minor Loss Coefficients		19.10	0.00	0.00	0.00	0.00	0.00
Friction Loss, Hf (ft)		0.00	0.00	0.00	0.00	0.00	0.00
Minor Loss, Hm (ft)		0.00	0.00	0.00	0.00	0.00	0.00
Total Headloss, HL (ft)		0.00	0.00	0.00	0.00	0.00	0.00

Total Friction and Minor Headloss: 0.00 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	14.20	Feet
Minimum Static Headloss	11.20	Feet

MAXIMUM TOTAL DYNAMIC HEAD	**14.20**	Feet
MINIMUM TOTAL DYNAMIC HEAD	**11.20**	Feet

Minor Loss Calculations							
90 elbow @	0.60	3.60	0.00	0.00	0.00	0.00	0.00
45 or smaller elbow @	0.30	0.60	0.00	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.00	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	1.80	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
ball valve @	0.10	0.10	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	1.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
ball check valve @	12.00	12.00	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		**19.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Client: Cypress Lakes Utilities, Inc.
Project: WWTP Improvements - In-Plant Drainage Pumping Station
Project No: 000000000052589
Calculations: System Head Curve with 2" PVC Force Main
Performed by: J R Voorhees
Date: April 2, 2007

High Point Pump Discharge Elevation =	135.20	Feet
High Level Pumps 'On' Elevation =	124.00	Feet
Low Level Pumps 'Off' Elevation =	121.00	Feet

Pipe Segment Identification		Q - average 20 gpm Segment A	Q - average 0 gpm	Q - average 0 gpm	Q - average	Q - average	
Nominal Pipe Diameter, Inches		2.00	2.00	2.00	2.00	2.00	2.00
Inside Diameter, D (in.)		1.939	1.939	1.939	1.939	1.939	1.939
Pipe Material		Sch 80 PVC					
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		80	0	0	0	0	0
H&W Friction Coeff "C"		140	140	140	140	140	140
Flowrate in Segment, (gpm)		20	0	0	0	0	0
Flowrate per Pipe, (gpm)		20	0	0	0	0	0
Flowrate per Pipe, Q (ft^3/s)		0.0	0.0	0.0	0.0	0.0	0.0
Area per Pipe, A (ft^3)		0.02051	0.02051	0.02051	0.02051	0.02	0.02
Velocity, V (ft/s)		2.2	0.0	0.0	0.0	0.0	0.0
Minor Loss Contributions:							
90 elbow @	0.60	6					
45 or smaller elbow @	0.30	2					
tee, straight through @	0.60						
tee, line to branch @	1.80	1					
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00						
ball valve @	0.10	1					
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00	1					
wye @	0.30						
increasers and reducers @	0.25						
ball check valve @	12.00	1					
plug valve	0.40						
Sum of Minor Loss Coefficients		19.10	0.00	0.00	0.00	0.00	0.00
Friction Loss, Hf (ft)		0.91	0.00	0.00	0.00	0.00	0.00
Minor Loss, Hm (ft)		1.39	0.00	0.00	0.00	0.00	0.00
Total Headloss, HL (ft)		2.30	0.00	0.00	0.00	0.00	0.00

Total Friction and Minor Headloss: 2.30 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	14.20	Feet
Minimum Static Headloss	11.20	Feet

MAXIMUM TOTAL DYNAMIC HEAD	16.50	Feet
MINIMUM TOTAL DYNAMIC HEAD	13.50	Feet

Minor Loss Calculations							
90 elbow @	0.60	3.60	0.00	0.00	0.00	0.00	0.00
45 or smaller elbow @	0.30	0.60	0.00	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.00	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	1.80	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
ball valve @	0.10	0.10	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	1.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
ball check valve @	12.00	12.00	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		**19.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Client: Cypress Lakes Utilities, Inc.
Project: WWTP Improvements - In-Plant Drainage Pumping Station
Project No: 000000000052589
Calculations: System Head Curve with 2" PVC Force Main
Performed by: J R Voorhees
Date: April 2, 2007

High Point Pump Discharge Elevation =	135.20	Feet
High Level Pumps 'On' Elevation =	124.00	Feet
Low Level Pumps 'Off' Elevation =	121.00	Feet

Pipe Segment Identification		Q - average 40 gpm Segment A	Q - average 0 gpm	Q - average 0 gpm	Q - average	Q - average	
Nominal Pipe Diameter, Inches		2.00	2.00	2.00	2.00	2.00	2.00
Inside Diameter, D (in.)		1.939	1.939	1.939	1.939	1.939	1.939
Pipe Material		Sch 80 PVC					
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		80	0	0	0	0	0
H&W Friction Coeff "C"		140	140	140	140	140	140
Flowrate in Segment, (gpm)		40	0	0	0	0	0
Flowrate per Pipe, (gpm)		40	0	0	0	0	0
Flowrate per Pipe, Q (ft^3/s)		0.1	0.0	0.0	0.0	0.0	0.0
Area per Pipe, A (ft^3)		0.02051	0.02051	0.02051	0.02051	0.02	0.02
Velocity, V (ft/s)		4.3	0.0	0.0	0.0	0.0	0.0
Minor Loss Contributions:							
90 elbow @	0.60	6					
45 or smaller elbow @	0.30	2					
tee, straight through @	0.60						
tee, line to branch @	1.80	1					
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00						
ball valve @	0.10	1					
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00	1					
wye @	0.30						
increasers and reducers @	0.25						
ball check valve @	12.00	1					
plug valve	0.40						
Sum of Minor Loss Coefficients		19.10	0.00	0.00	0.00	0.00	0.00
Friction Loss, Hf (ft)		3.28	0.00	0.00	0.00	0.00	0.00
Minor Loss, Hm (ft)		5.58	0.00	0.00	0.00	0.00	0.00
Total Headloss, HL (ft)		8.86	0.00	0.00	0.00	0.00	0.00

Total Friction and Minor Headloss: 8.86 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	14.20	Feet
Minimum Static Headloss	11.20	Feet

MAXIMUM TOTAL DYNAMIC HEAD	23.06	Feet
MINIMUM TOTAL DYNAMIC HEAD	20.06	Feet

Minor Loss Calculations							
90 elbow @	0.60	3.60	0.00	0.00	0.00	0.00	0.00
45 or smaller elbow @	0.30	0.60	0.00	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.00	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	1.80	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
ball valve @	0.10	0.10	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	1.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
ball check valve @	12.00	12.00	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		19.10	0.00	0.00	0.00	0.00	0.00

Client: Cypress Lakes Utilities, Inc.
Project: WWTP Improvements - In-Plant Drainage Pumping Station
Project No: 000000000052589
Calculations: System Head Curve with 2" PVC Force Main
Performed by: J R Voorhees
Date: April 2, 2007

High Point Pump Discharge Elevation =	135.20	Feet
High Level Pumps 'On' Elevation =	124.00	Feet
Low Level Pumps 'Off' Elevation =	121.00	Feet

		Q - average	Q - average	Q - average	Q - average	Q - average	
Pipe Segment Identification		60 gpm Segment A	0 gpm	0 gpm			
Nominal Pipe Diameter, Inches		2.00	2.00	2.00	2.00	2.00	2.00
Inside Diameter, D (in.)		1.939	1.939	1.939	1.939	1.939	1.939
Pipe Material		Sch 80 PVC					
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		80	0	0	0	0	0
H&W Friction Coeff "C"		140	140	140	140	140	140
Flowrate in Segment, (gpm)		60	0	0	0	0	0
Flowrate per Pipe, (gpm)		60	0	0	0	0	0
Flowrate per Pipe, Q (ft^3/s)		0.1	0.0	0.0	0.0	0.0	0.0
Area per Pipe, A (ft^3)		0.02051	0.02051	0.02051	0.02051	0.02	0.02
Velocity, V (ft/s)		6.5	0.0	0.0	0.0	0.0	0.0
Minor Loss Contributions:							
90 elbow @	0.60	6					
45 or smaller elbow @	0.30	2					
tee, straight through @	0.60						
tee, line to branch @	1.80	1					
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00						
ball valve @	0.10	1					
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00	1					
wye @	0.30						
increasers and reducers @	0.25						
ball check valve @	12.00	1					
plug valve	0.40						
Sum of Minor Loss Coefficients		19.10	0.00	0.00	0.00	0.00	0.00
Friction Loss, Hf (ft)		6.95	0.00	0.00	0.00	0.00	0.00
Minor Loss, Hm (ft)		12.55	0.00	0.00	0.00	0.00	0.00
Total Headloss, HL (ft)		19.49	0.00	0.00	0.00	0.00	0.00

Total Friction and Minor Headloss: 19.49 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	14.20	Feet
Minimum Static Headloss	11.20	Feet

MAXIMUM TOTAL DYNAMIC HEAD	33.69	Feet
MINIMUM TOTAL DYNAMIC HEAD	30.69	Feet

Minor Loss Calculations							
90 elbow @	0.60	3.60	0.00	0.00	0.00	0.00	0.00
45 or smaller elbow @	0.30	0.60	0.00	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.00	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	1.80	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
ball valve @	0.10	0.10	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	1.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
ball check valve @	12.00	12.00	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		19.10	0.00	0.00	0.00	0.00	0.00

Client: Cypress Lakes Utilities, Inc.
Project: WWTP Improvements - In-Plant Drainage Pumping Station
Project No: 000000000052589
Calculations: System Head Curve with 2" PVC Force Main
Performed by: J R Voorhees
Date: April 2, 2007

High Point Pump Discharge Elevation =	135.20	Feet
High Level Pumps 'On' Elevation =	124.00	Feet
Low Level Pumps 'Off' Elevation =	121.00	Feet

		Q - average	Q - average	Q - average	Q - average	Q - average	
Pipe Segment Identification		80 gpm Segment A	0 gpm	0 gpm			
Nominal Pipe Diameter, Inches		2.00	2.00	2.00	2.00	2.00	2.00
Inside Diameter, D (in.)		1.939	1.939	1.939	1.939	1.939	1.939
Pipe Material		Sch 80 PVC					
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		80	0	0	0	0	0
H&W Friction Coeff "C"		140	140	140	140	140	140
Flowrate in Segment, (gpm)		80	0	0	0	0	0
Flowrate per Pipe, (gpm)		80	0	0	0	0	0
Flowrate per Pipe, Q (ft^3/s)		0.2	0.0	0.0	0.0	0.0	0.0
Area per Pipe, A (ft^3)		0.02051	0.02051	0.02051	0.02051	0.02	0.02
Velocity, V (ft/s)		8.7	0.0	0.0	0.0	0.0	0.0
Minor Loss Contributions:							
90 elbow @	0.60	6					
45 or smaller elbow @	0.30	2					
tee, straight through @	0.60						
tee, line to branch @	1.80	1					
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00						
ball valve @	0.10	1					
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00	1					
wye @	0.30						
increasers and reducers @	0.25						
ball check valve @	12.00	1					
plug valve	0.40						
Sum of Minor Loss Coefficients		19.10	0.00	0.00	0.00	0.00	0.00
Friction Loss, Hf (ft)		11.83	0.00	0.00	0.00	0.00	0.00
Minor Loss, Hm (ft)		22.30	0.00	0.00	0.00	0.00	0.00
Total Headloss, HL (ft)		34.13	0.00	0.00	0.00	0.00	0.00

Total Friction and Minor Headloss: 34.13 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	14.20	Feet
Minimum Static Headloss	11.20	Feet

MAXIMUM TOTAL DYNAMIC HEAD	**48.33**	Feet
MINIMUM TOTAL DYNAMIC HEAD	**45.33**	Feet

Minor Loss Calculations							
90 elbow @	0.60	3.60	0.00	0.00	0.00	0.00	0.00
45 or smaller elbow @	0.30	0.60	0.00	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.00	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	1.80	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
ball valve @	0.10	0.10	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	1.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
ball check valve @	12.00	12.00	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		19.10	0.00	0.00	0.00	0.00	0.00

Client: Cypress Lakes Utilities, Inc.
Project: WWTP Improvements - In-Plant Drainage Pumping Station
Project No: 000000000052589
Calculations: System Head Curve with 2" PVC Force Main
Performed by: J R Voorhees
Date: April 2, 2007

High Point Pump Discharge Elevation =	135.20	Feet
High Level Pumps 'On' Elevation =	124.00	Feet
Low Level Pumps 'Off' Elevation =	121.00	Feet

Pipe Segment Identification		Q - average 100 gpm Segment A	Q - average 0 gpm	Q - average 0 gpm	Q - average	Q - average	
Nominal Pipe Diameter, Inches		2.00	2.00	2.00	2.00	2.00	2.00
Inside Diameter, D (in.)		1.939	1.939	1.939	1.939	1.939	1.939
Pipe Material		Sch 80 PVC					
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		80	0	0	0	0	0
H&W Friction Coeff "C"		140	140	140	140	140	140
Flowrate in Segment, (gpm)		100	0	0	0	0	0
Flowrate per Pipe, (gpm)		100	0	0	0	0	0
Flowrate per Pipe, Q (ft^3/s)		0.2	0.0	0.0	0.0	0.0	0.0
Area per Pipe, A (ft^3)		0.02051	0.02051	0.02051	0.02051	0.02	0.02
Velocity, V (ft/s)		10.8	0.0	0.0	0.0	0.0	0.0
Minor Loss Contributions:							
90 elbow @	0.60	6					
45 or smaller elbow @	0.30	2					
tee, straight through @	0.60						
tee, line to branch @	1.80	1					
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00						
ball valve @	0.10	1					
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00	1					
wye @	0.30						
increasers and reducers @	0.25						
ball check valve @	12.00	1					
plug valve	0.40						
Sum of Minor Loss Coefficients		19.10	0.00	0.00	0.00	0.00	0.00
Friction Loss, Hf (ft)		17.87	0.00	0.00	0.00	0.00	0.00
Minor Loss, Hm (ft)		34.85	0.00	0.00	0.00	0.00	0.00
Total Headloss, HL (ft)		52.72	0.00	0.00	0.00	0.00	0.00

Total Friction and Minor Headloss: 52.72 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	14.20	Feet
Minimum Static Headloss	11.20	Feet

MAXIMUM TOTAL DYNAMIC HEAD	66.92	Feet
MINIMUM TOTAL DYNAMIC HEAD	63.92	Feet

Minor Loss Calculations							
90 elbow @	0.60	3.60	0.00	0.00	0.00	0.00	0.00
45 or smaller elbow @	0.30	0.60	0.00	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.00	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	1.80	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
ball valve @	0.10	0.10	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	1.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
ball check valve @	12.00	12.00	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		**19.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Client: Cypress Lakes Utilities, Inc.
Project: WWTP Improvements - In-Plant Drainage Pumping Station
Project No: 000000000052589
Calculations: System Head Curve with 2" PVC Force Main
Performed by: J R Voorhees
Date: April 2, 2007

High Point Pump Discharge Elevation =	135.20	Feet
High Level Pumps 'On' Elevation =	124.00	Feet
Low Level Pumps 'Off' Elevation =	121.00	Feet

Pipe Segment Identification		Q - average 120 gpm Segment A	Q - average 0 gpm	Q - average 0 gpm	Q - average	Q - average	
Nominal Pipe Diameter, Inches		2.00	2.00	2.00	2.00	2.00	2.00
Inside Diameter, D (in.)		1.939	1.939	1.939	1.939	1.939	1.939
Pipe Material		Sch 80 PVC					
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		80	0	0	0	0	0
H&W Friction Coeff "C"		140	140	140	140	140	140
Flowrate in Segment, (gpm)		120	0	0	0	0	0
Flowrate per Pipe, (gpm)		120	0	0	0	0	0
Flowrate per Pipe, Q (ft^3/s)		0.3	0.0	0.0	0.0	0.0	0.0
Area per Pipe, A (ft^3)		0.02051	0.02051	0.02051	0.02051	0.02	0.02
Velocity, V (ft/s)		13.0	0.0	0.0	0.0	0.0	0.0
Minor Loss Contributions:							
90 elbow @	0.60	6					
45 or smaller elbow @	0.30	2					
tee, straight through @	0.60						
tee, line to branch @	1.80	1					
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00						
ball valve @	0.10	1					
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00	1					
wye @	0.30						
increasers and reducers @	0.25						
ball check valve @	12.00	1					
plug valve	0.40						
Sum of Minor Loss Coefficients		19.10	0.00	0.00	0.00	0.00	0.00
Friction Loss, Hf (ft)		25.04	0.00	0.00	0.00	0.00	0.00
Minor Loss, Hm (ft)		50.18	0.00	0.00	0.00	0.00	0.00
Total Headloss, HL (ft)		75.23	0.00	0.00	0.00	0.00	0.00

Total Friction and Minor Headloss: 75.23 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	14.20	Feet
Minimum Static Headloss	11.20	Feet

MAXIMUM TOTAL DYNAMIC HEAD	89.43	Feet
MINIMUM TOTAL DYNAMIC HEAD	86.43	Feet

Minor Loss Calculations							
90 elbow @	0.60	3.60	0.00	0.00	0.00	0.00	0.00
45 or smaller elbow @	0.30	0.60	0.00	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.00	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	1.80	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
ball valve @	0.10	0.10	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	1.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
ball check valve @	12.00	12.00	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		19.10	0.00	0.00	0.00	0.00	0.00

Client: Cypress Lakes Utilities, Inc.
Project: WWTP Improvements - In-Plant Drainage Pumping Station
Project No: 000000000052589
Calculations: System Head Curve with 2" PVC Force Main
Performed by: J R Voorhees
Date: April 2, 2007

High Point Pump Discharge Elevation =	135.20	Feet
High Level Pumps 'On' Elevation =	124.00	Feet
Low Level Pumps 'Off' Elevation =	121.00	Feet

		Q - average	Q - average	Q - average	Q - average	Q - average	
Pipe Segment Identification		140 gpm Segment A	0 gpm	0 gpm			
Nominal Pipe Diameter, Inches		2.00	2.00	2.00	2.00	2.00	2.00
Inside Diameter, D (in.)		1.939	1.939	1.939	1.939	1.939	1.939
Pipe Material		Sch 80 PVC					
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		80	0	0	0	0	0
H&W Friction Coeff "C"		140	140	140	140	140	140
Flowrate in Segment, (gpm)		140	0	0	0	0	0
Flowrate per Pipe, (gpm)		140	0	0	0	0	0
Flowrate per Pipe, Q (ft^3/s)		0.3	0.0	0.0	0.0	0.0	0.0
Area per Pipe, A (ft^3)		0.02051	0.02051	0.02051	0.02051	0.02	0.02
Velocity, V (ft/s)		15.2	0.0	0.0	0.0	0.0	0.0
Minor Loss Contributions:							
90 elbow @	0.60	6					
45 or smaller elbow @	0.30	2					
tee, straight through @	0.60						
tee, line to branch @	1.80	1					
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00						
ball valve @	0.10	1					
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00	1					
wye @	0.30						
increasers and reducers @	0.25						
ball check valve @	12.00	1					
plug valve	0.40						
Sum of Minor Loss Coefficients		19.10	0.00	0.00	0.00	0.00	0.00
Friction Loss, Hf (ft)		33.31	0.00	0.00	0.00	0.00	0.00
Minor Loss, Hm (ft)		68.30	0.00	0.00	0.00	0.00	0.00
Total Headloss, HL (ft)		101.61	0.00	0.00	0.00	0.00	0.00

Total Friction and Minor Headloss: 101.61 Feet

Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	14.20	Feet
Minimum Static Headloss	11.20	Feet

MAXIMUM TOTAL DYNAMIC HEAD	**115.81**	Feet
MINIMUM TOTAL DYNAMIC HEAD	**112.81**	Feet

Minor Loss Calculations							
90 elbow @	0.60	3.60	0.00	0.00	0.00	0.00	0.00
45 or smaller elbow @	0.30	0.60	0.00	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.00	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	1.80	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
ball valve @	0.10	0.10	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	1.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
ball check valve @	12.00	12.00	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		19.10	0.00	0.00	0.00	0.00	0.00

Client: Cypress Lakes Utilities, Inc.
Project: WWTP Improvements - In-Plant Drainage Pumping Station
Project No: 000000000052589
Calculations: System Head Curve with 2" PVC Force Main
Performed by: J R Voorhees
Date: April 2, 2007

High Point Pump Discharge Elevation =	135.20	Feet
High Level Pumps 'On' Elevation =	124.00	Feet
Low Level Pumps 'Off' Elevation =	121.00	Feet

Pipe Segment Identification		Q - average 160 gpm Segment A	Q - average 0 gpm	Q - average 0 gpm	Q - average	Q - average	
Nominal Pipe Diameter, Inches		2.00	2.00	2.00	2.00	2.00	2.00
Inside Diameter, D (in.)		1.939	1.939	1.939	1.939	1.939	1.939
Pipe Material		Sch 80 PVC					
Number of Pipes		1	1	1	1	1	1
Length, L (feet)		80	0	0	0	0	0
H&W Friction Coeff "C"		140	140	140	140	140	140
Flowrate in Segment, (gpm)		160	0	0	0	0	0
Flowrate per Pipe, (gpm)		160	0	0	0	0	0
Flowrate per Pipe, Q (ft^3/s)		0.4	0.0	0.0	0.0	0.0	0.0
Area per Pipe, A (ft^3)		0.02051	0.02051	0.02051	0.02051	0.02	0.02
Velocity, V (ft/s)		17.3	0.0	0.0	0.0	0.0	0.0
Minor Loss Contributions:							
90 elbow @	0.60	6					
45 or smaller elbow @	0.30	2					
tee, straight through @	0.60						
tee, line to branch @	1.80	1					
tee, branch to line @	1.80						
inlet, sharp @	0.50						
inlet, flared @	0.25						
submerged exit @	1.00						
ball valve @	0.10	1					
butterfly valve @	0.35						
3-way plug valve thru branch	1.55						
protruding inlet or exit @	1.00	1					
wye @	0.30						
increasers and reducers @	0.25						
ball check valve @	12.00	1					
plug valve	0.40						
Sum of Minor Loss Coefficients		19.10	0.00	0.00	0.00	0.00	0.00
Friction Loss, Hf (ft)		42.64	0.00	0.00	0.00	0.00	0.00
Minor Loss, Hm (ft)		89.21	0.00	0.00	0.00	0.00	0.00
Total Headloss, HL (ft)		131.86	0.00	0.00	0.00	0.00	0.00

Total Friction and Minor Headloss: 131.86 Feet

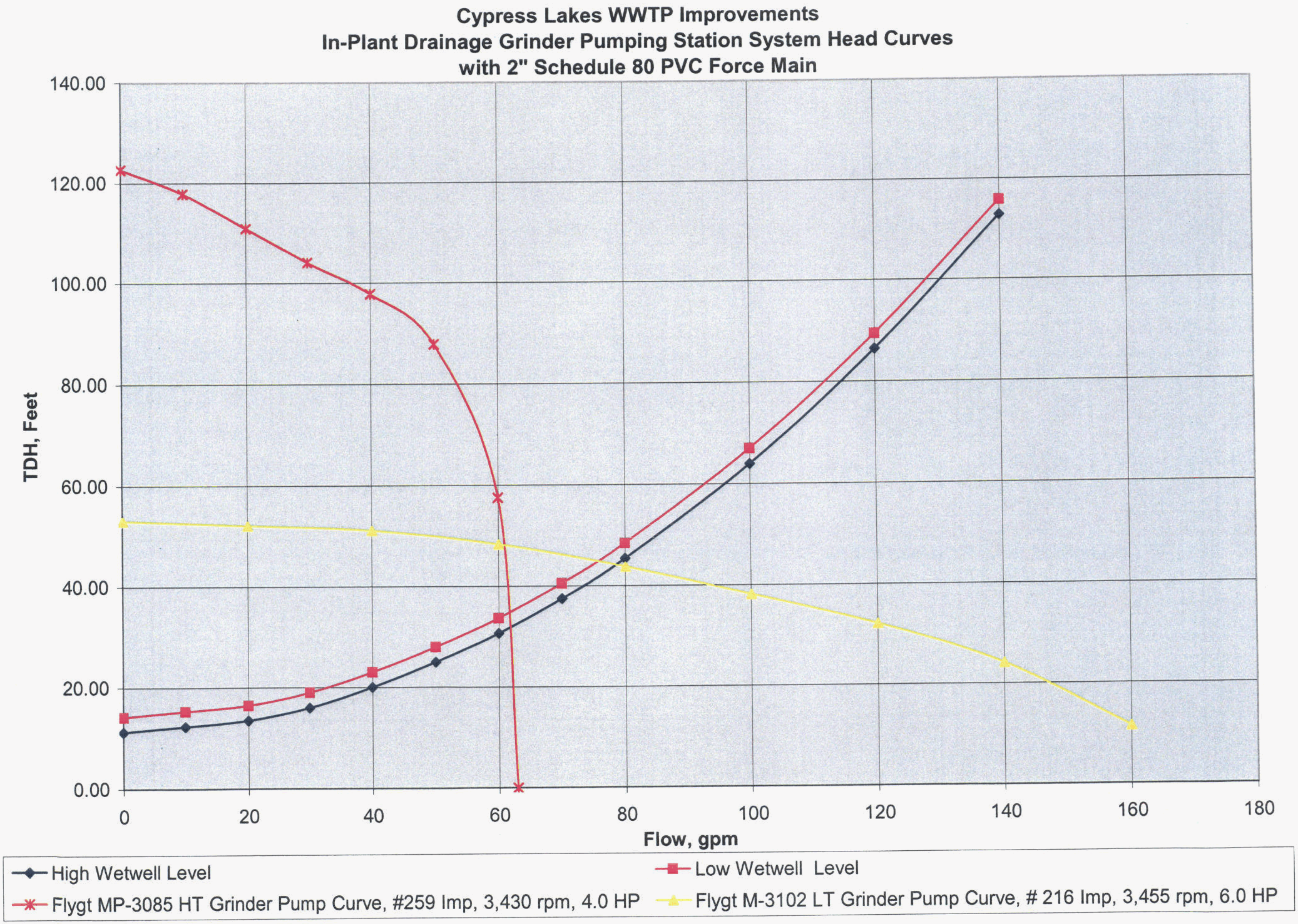
Per Hazen & Williams:
Hf = [.002083] * [L] * [(100/C)^1.85] * [Q^1.85] / [D^4.8655]

Hm = [sumK] * [(V^2) / (2*g)]
where g=32.2 ft/sec^2

Maximum Static Headloss	14.20	Feet
Minimum Static Headloss	11.20	Feet

MAXIMUM TOTAL DYNAMIC HEAD	**146.06**	Feet
MINIMUM TOTAL DYNAMIC HEAD	**143.06**	Feet

Minor Loss Calculations							
90 elbow @	0.60	3.60	0.00	0.00	0.00	0.00	0.00
45 or smaller elbow @	0.30	0.60	0.00	0.00	0.00	0.00	0.00
tee, straight through @	0.60	0.00	0.00	0.00	0.00	0.00	0.00
tee, line to branch @	1.80	1.80	0.00	0.00	0.00	0.00	0.00
tee, branch to line @	1.80	0.00	0.00	0.00	0.00	0.00	0.00
inlet, sharp @	0.50	0.00	0.00	0.00	0.00	0.00	0.00
inlet, flared @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
submerged exit @	1.00	0.00	0.00	0.00	0.00	0.00	0.00
ball valve @	0.10	0.10	0.00	0.00	0.00	0.00	0.00
butterfly valve @	0.35	0.00	0.00	0.00	0.00	0.00	0.00
3-way plug valve thru branch	1.55	0.00	0.00	0.00	0.00	0.00	0.00
protruding inlet or exit @	1.00	1.00	0.00	0.00	0.00	0.00	0.00
wye @	0.30	0.00	0.00	0.00	0.00	0.00	0.00
reducer @	0.25	0.00	0.00	0.00	0.00	0.00	0.00
ball check valve @	12.00	12.00	0.00	0.00	0.00	0.00	0.00
plug valve	0.40	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Losses		19.10	0.00	0.00	0.00	0.00	0.00


Cypress Lakes WWTP Improvements
In-Plant Drainage Grinder Pumping Station System Head Curves
with 2" Schedule 80 PVC Force Main
TDH, Feet
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
0
20
40
60
80
100
120
140
160
180
Flow, gpm
High Wetwell Level
Low Wetwell Level
Flygt MP-3085 HT Grinder Pump Curve, #259 Imp, 3,430 rpm, 4.0 HP
Flygt M-3102 LT Grinder Pump Curve, # 216 Imp, 3,455 rpm, 6.0 HP

Cypress Lakes WWTP Improvements
In-Plant Drainage Pumping Station System Head Curves
2-Inch Sch 80 PVC Transfer Force Main

X - Flow	Y - Max TDH (Min Wetwell Level)	Y - Min TDH (Max Wetwell Level)	Model MP-3102 LT Flygt Grinder Pump Curve w/ #216 Impeller - Speed 3,455 rpm 6.0 HP	Model MP-3085 HT Flygt Grinder Pump Curve w/ #259 Impeller - Speed 3,430 rpm 4.0 HP	
0	14.20	11.20	52.90	122.60	
10	15.30	12.30	0.00	117.80	
20	16.50	13.50	52.00	110.90	
30	19.00	16.00	0.00	104.10	
40	23.06	20.06	51.00	97.80	
50	28.00	25.00	0.00	87.80	
60	33.69	30.69	48.20	57.40	
63			0.00	0.00	
70	40.50	37.50	0.00		
80	48.33	45.33	43.70		
100	66.92	63.92	38.10		
120	89.43	86.43	32.10		
140	115.81	112.81	24.10		
160			11.40		

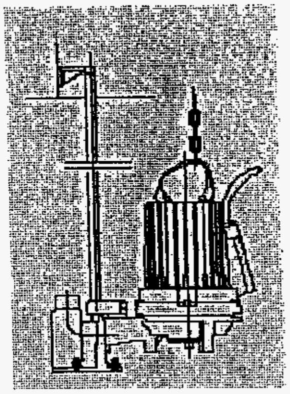
IN-PLANT DRAINAGE PUMPING STATION PUMPS

-MANUFACTURER DATA-

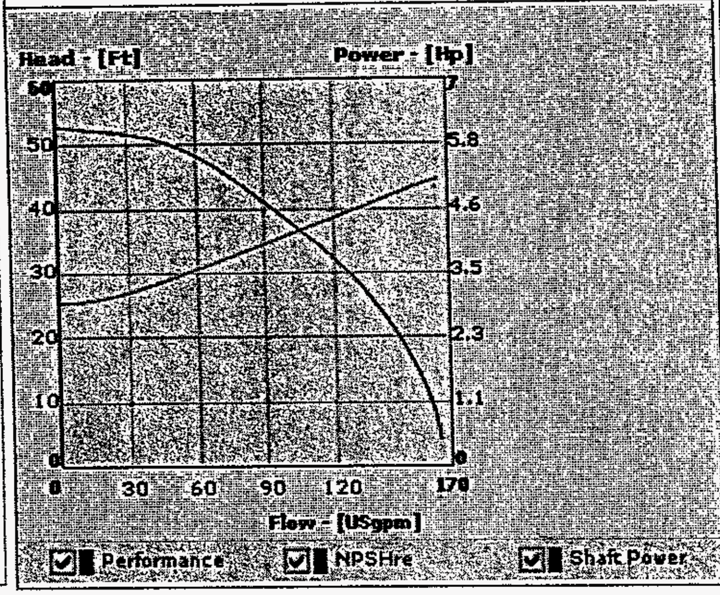
FLYGT

PRODUCT: MP 3102 LT

Product picture



Curves Enlarge



Pump Data				
Curve id: 63-216-00-5210	Impeller: 216	Poles: 2 - pole	Motor: 18-10-2AL	Frequency: 60 Hz

Motor Data

Rated output power Hp (kW)	Ø	Nominal voltage (V)	Full load current (A)	Locked rotor current (A)	Locked rotor kVA	Locked rotor code letter kVA/Hp	Poles/rpm
6 (4.5)	3	460	7.6	61	49	K	2/3485

Pump motor Hp	Efficiency			Power factor		
	100% load	75% load	50% load	100% load	75% load	50% load
6	80	79.5	76	0.92	0.9	0.84

Cable Data

HP	Cables	Volts	Max. length (Ft)	Cable size/Nominal OD.	Conductors (In one cable)	Type	Part number
6	1	460	545	#12/7 0.83"-(21.0mm)	(3) 12 AWG (PWR) (2) 12 AWG (CTRL) (1) 12 AWG (GND) (1) 12 AWG (GC)	STD	942104

Available Outlet Size	
Outlet Drilled Flange	2"

Flygt

ITT Industries

FLYGT	PERFORMANCE CURVE	PRODUCT M 3102.170	TYPE LT
DATE 2005-08-16	PROJECT FLYGT US Catalog	CURVE NO 63-216-00-5210	ISSUE 1

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.94	0.93	0.90
EFFICIENCY	79.5 %	80.0 %	77.5 %
MOTOR DATA	—	—	—

RATED POWER	6	hp
STARTING CURRENT ...	52	A
RATED CURRENT ...	7.5	A
RATED SPEED	3455	rpm
TOT.MOM.OF INERTIA ...	—	
NO. OF BLADES	6	

IMPELLER DIAMETER: 120 mm

MOTOR #	STATOR	REV
18-10-2AL	12YSER	11

FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	2

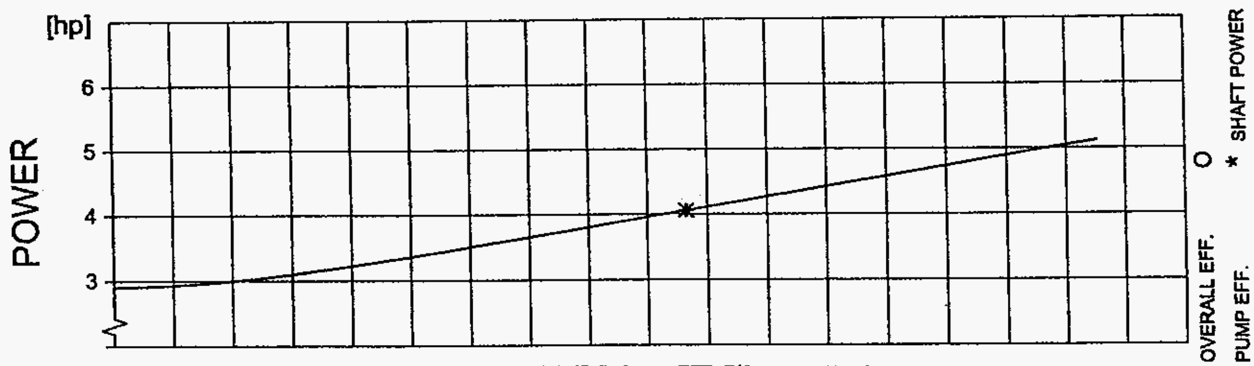
GEARTYPE	RATIO
—	—

COMMENTS

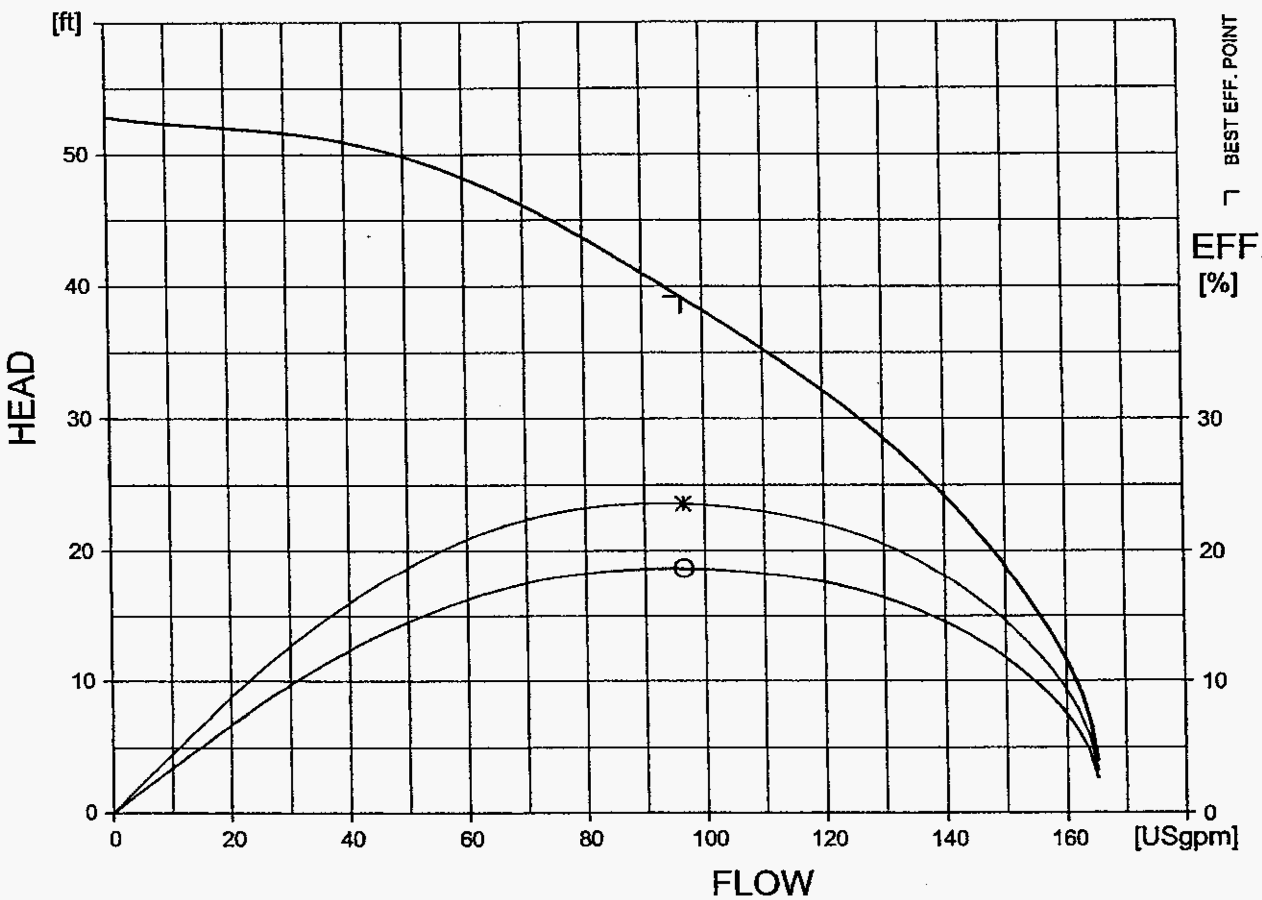
NEMA Code Letter: H
Installs: MF/MP

INLET/OUTLET: -/ 2 inch

IMP. THROUGHLET: —



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
B.E.P.	96.5	39.2	(4.07)	18.7 (23.6)	



FUSCAT 1.0 (20031201)

Performance with clear water and ambient temp 40 °C

FLYGT CURVE

M-3102

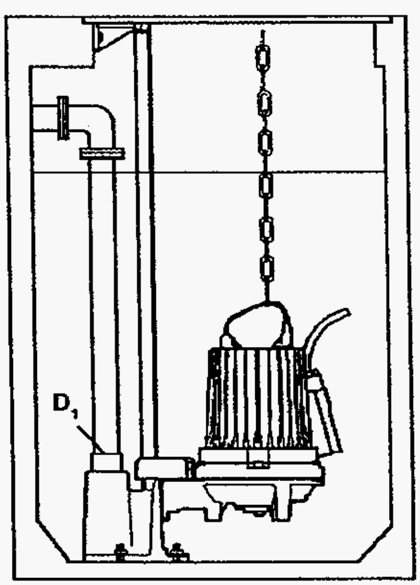
Impeller/Motor/Nominal Sizes

Issued: 7/05 | Supersedes: 11/04

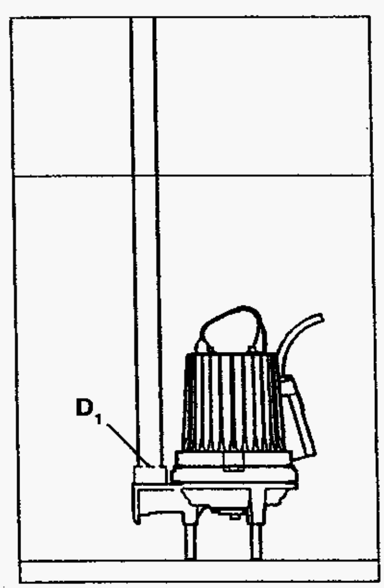
GRINDER MODEL	IMPELLER CODE	HP RATING MP	HP RATING MF	VAC	D1
M-3102 3Ø	212 LT	6.0	6.0	200 230/460 575	2"
	262 HT 263 HT 267 HT	6.0	--		2"
		--	6.0		1.5"

GRINDER MODEL	IMPELLER CODE	HP RATING MP	HP RATING MF	VAC	D1
M-3102 1Ø	216 LT	5.4	5.4	230	2"
	267 HT	5.4	--		2"
		--	5.4		1.5"

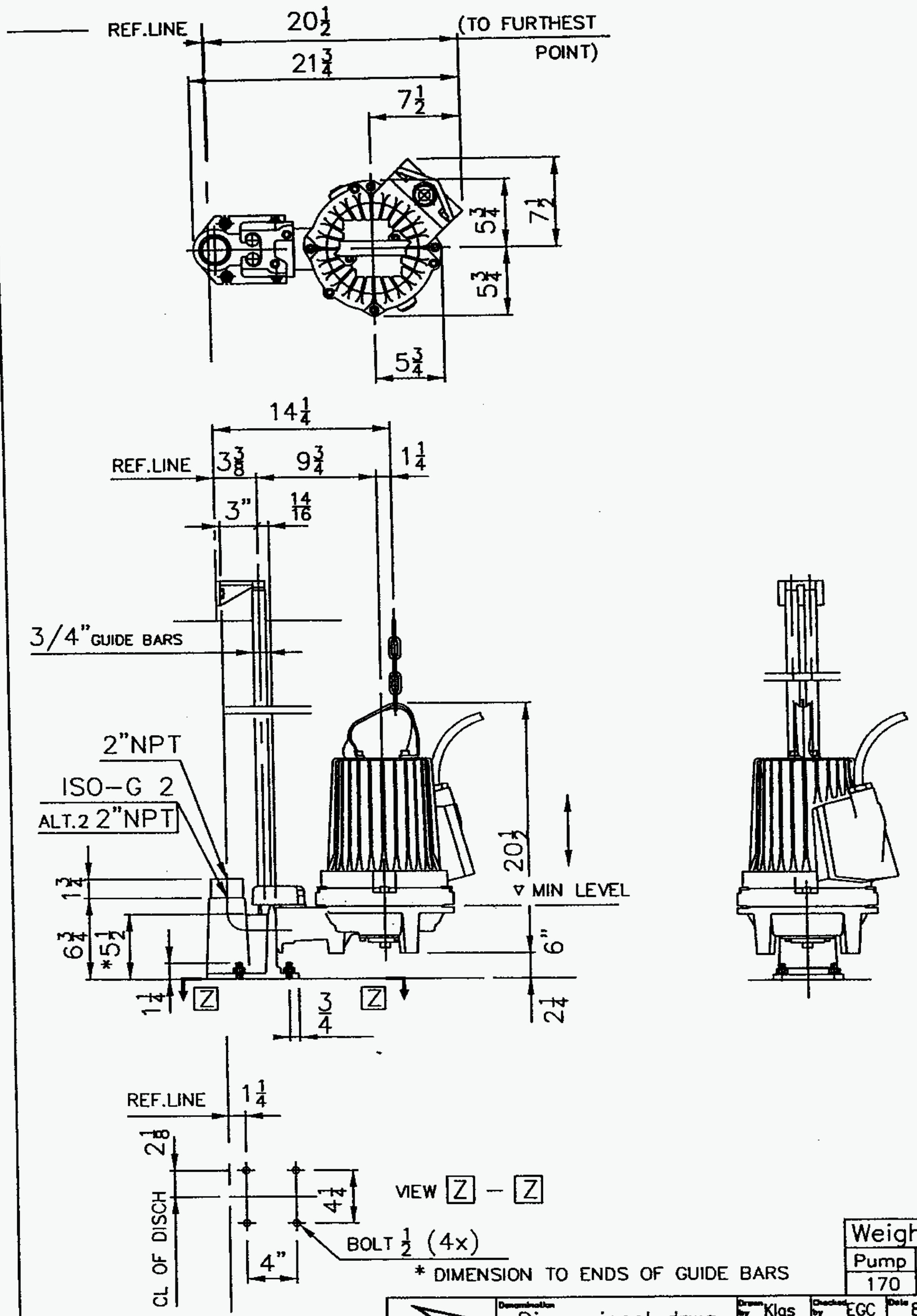
Notice:
For other than domestic grinder pump usage, please consult Flygt Engineering for evaluation of product application.



MP



MF



* DIMENSION TO ENDS OF GUIDE BARS

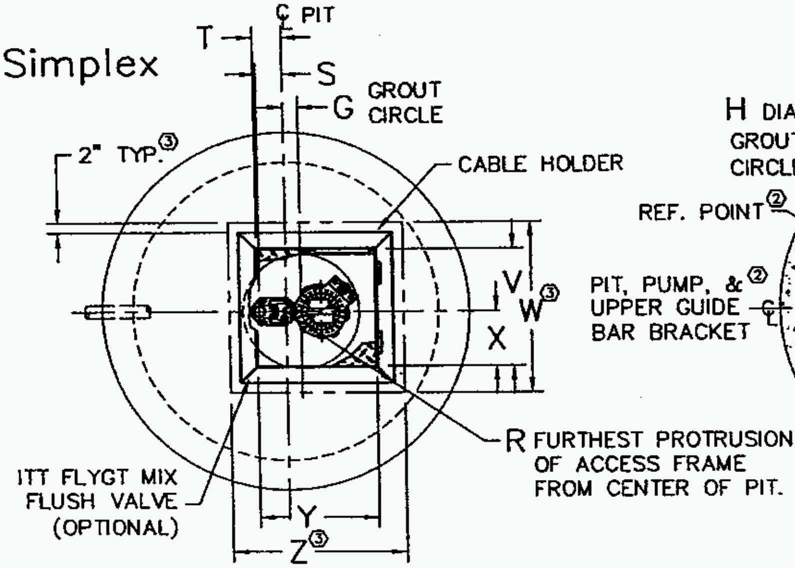
Weight (lbs)	
Pump	Disch
170	15

AUTOCAD DRAWING	Dimensional drwg MP 3102 LT	Drawn by Klas	Checked by EGC	Date 880203
		Scale 1:10		Reg no 5399
		538 67 00		E

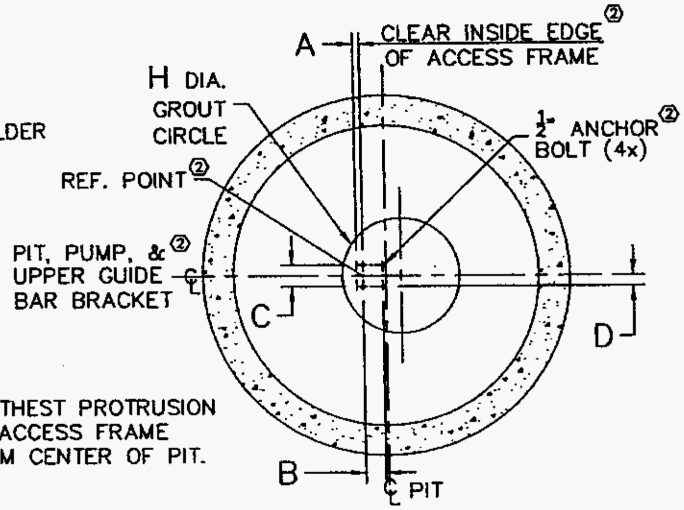
MP-3102

e-Catalog	FLYGT	**Lift Station Dimensions**	Issued: 2/03	Supersedes: 7/02

Simplex



TOP VIEW

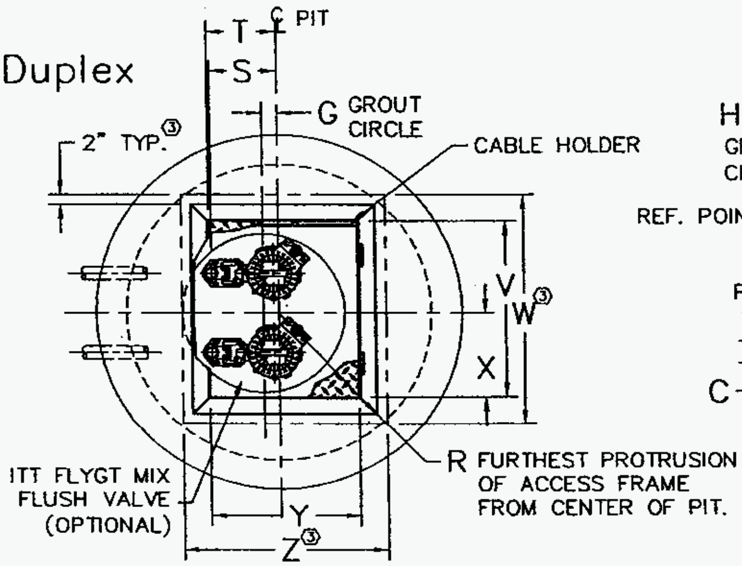


BASE SECTION

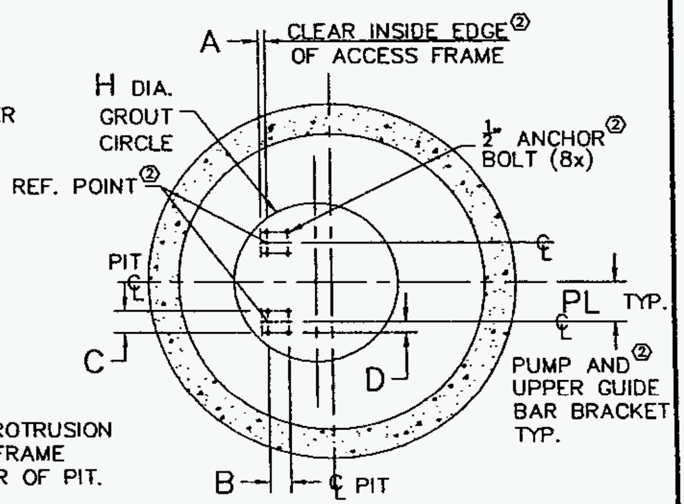
ALL DIMENSIONS ARE IN INCHES

DIMENSIONAL CHART																							
MODEL	NOM. SIZE	VERSION	STATION													COVER							
			A	B	C	D	F	G	H	R	S	T	U	CV	MW	SIZE	V	W	X	Y	Z	AD
MP	2"	HT	1¼	4	4½	2½	6¾	3	23	26½	5¼	5¾	60	8⅞	6	FLE-4 24 x 24	21½	35	11	21½	35	4
MP	2"	LT	1¼	4	4½	2½	6¾	3	23	26½	5¼	5¾	60	8⅞	6	FLE-4 24 x 24	21½	35	11	21½	35	4

Duplex



TOP VIEW



BASE SECTION

ALL DIMENSIONS ARE IN INCHES

DIMENSIONAL CHART																								
MODEL	NOM. SIZE	VERSION	STATION														COVER							
			A	B	C	D	F	G	H	R	S	T	U	CV	MW	PL	SIZE	V	W	X	Y	Z	AD
MP	2"	HT	1¼	4	4½	2½	6¾	3	32	29	13¼	13¾	60	8⅞	6	8	FLE-5 30 x 36	33½	49	17	27½	41	4
MP	2"	LT	1¼	4	4½	2½	6¾	3	32	28¾	14	14½	60	8⅞	6	8	FLE-5 30 x 36	33½	49	17	27½	41	4

APPENDIX F
BLOWERS – MANUFACTURER DATA –

CENTRIFUGAL BLOWERS

-MANUFACTURER DATA-

HOFFMAN
AIR & FILTRATION SYSTEMS
ISO 9001 REGISTERED

41 SPECIFICATIONS

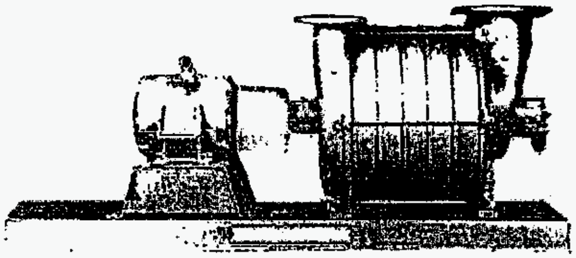
TECHNICAL DATA

Number of stages: 1 through 10 (11 for 50 Hz).
Inlet connection: 6" (152mm) flange, ANSI 125# drilling.
Outlet connection: 3" (76mm) flange, ANSI 125# drilling. (5" available)
Operating speed: 3450 RPM.
Seals (air): One carbon ring each end.
Seals (gas): Two carbon rings each end with inert gas taps on the inlet end.
Bearings: Ball, 10 year minimum life per AFBMA L_{10} standards.
Lubrication: Grease standard (oil system available).
Impeller diameter: 16" (406mm).
Impeller tip speed: 245 FPS (113m/sec).
First critical speed: 4311 RPM (10 stage).
Direct drive: Yes, also available for V-belt drive.
Vibration tolerance: 0.28"/sec (7.1mm/sec).
Shaft end: 1-1/16" (27mm) diameter, outlet end drive standard.
Rotor balance: Impellers are statically balanced individually. Complete rotating assemblies are dynamically balanced.
Maximum casing pressure: 25 PSIG.

DIMENSIONS

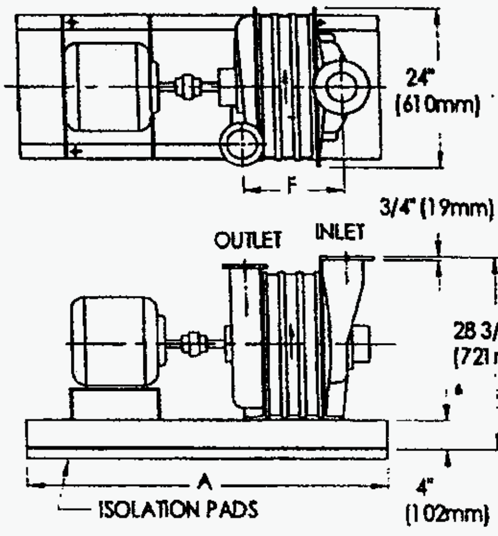
Model	A Inches	A (mm)	F Inches	F (mm)	Weight LBS	Weight KG	Rotor WK^2 (lb. ft.^{2})
4101B	45"	(1143)	5-5/16"	(135)	475	215	2
4102B	45"	(1143)	8-11/16"	(221)	550	250	4
4103B	45"	(1143)	11-7/16"	(291)	665	302	6
4104B	54"	(1372)	14-3/16"	(361)	780	354	8
4105B	54"	(1372)	16-15/16"	(430)	895	406	9
4106B	64"	(1626)	19-11/16"	(500)	1010	458	11
4107B	64"	(1626)	22-7/16"	(570)	1125	510	13
4108B	72"	(1829)	25-3/16"	(640)	1250	567	15
4109B	72"	(1829)	27-15/16"	(710)	1365	620	17
4110B	72"	(1829)	30-11/16"	(780)	1500	681	19

Information is approximate, subject to change, and not to be used for construction purposes.



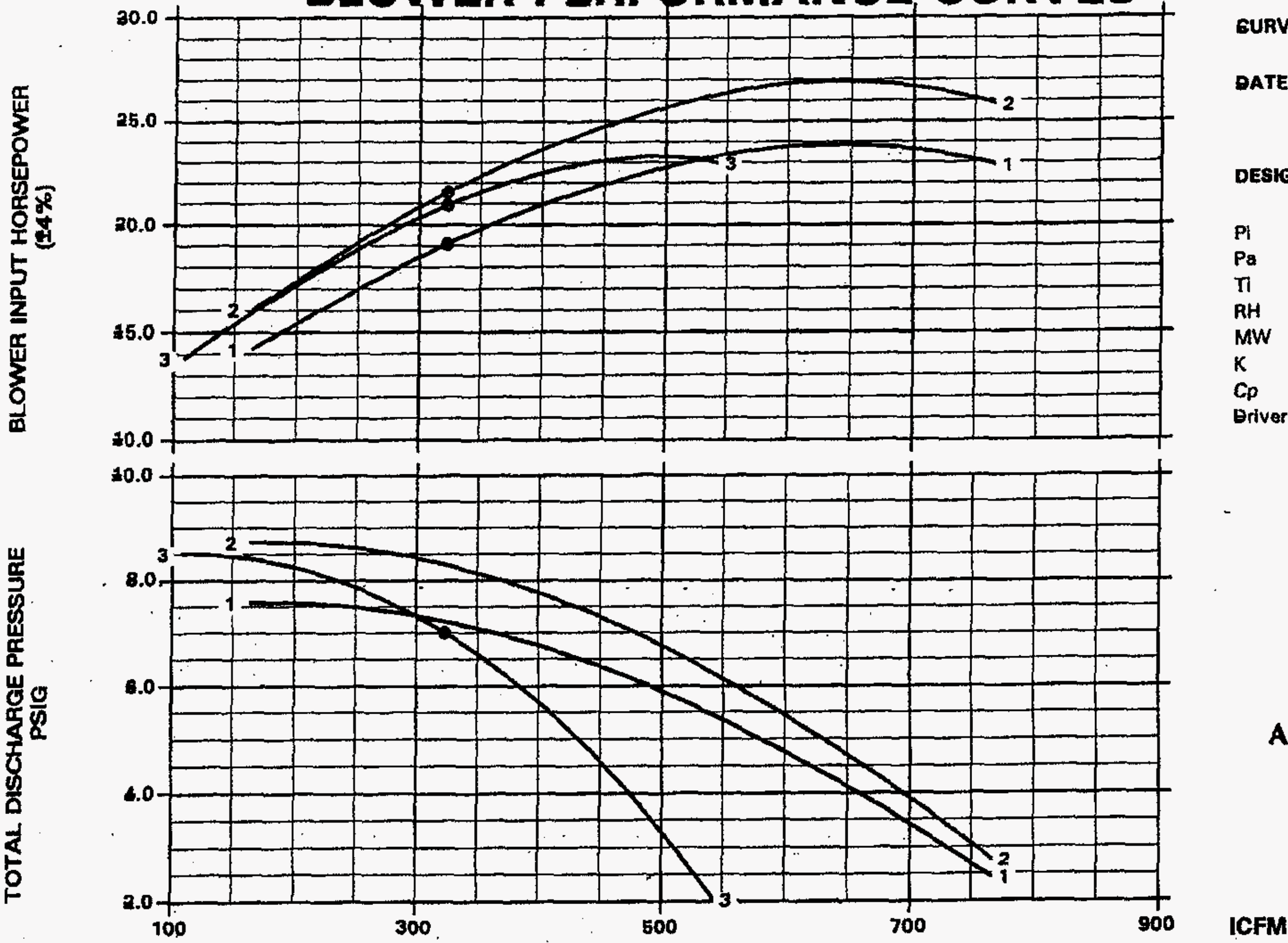
MATERIALS OF CONSTRUCTION

Casing: Heads, Sections and Bearing Housing: Cast Iron ASTM A48, Class 30.
Tie rods: 1/2" (13mm) diameter cold drawn steel.
Joint sealing compound: RTV silicone.
Shaft: Carbon steel, AISI 1045 (stainless steel available).
Impellers: Cast aluminum. Heresite and other coatings for special applications.
Base: Formed steel.
Motor pedestal: Formed plate.
Finish: Blue enamel over rust inhibitive primer.
Base pads: Cork strips.



(#/5.00)

BLOWER PERFORMANCE CURVES



CURVE NO: New & Rebuilt

DATE: 04/04/07

DESIGN INLET CONDITIONS

Pi	=	14.70	PSIA
Pa	=	14.70	PSIA
Ti	=	100.00	DEG F
RH	=	36.00%	
MW	=	28.71	
K	=	1.398	
Cp	=	0.243	

Driver: V-Belt (60 Hz)

HOFFMAN®
AIR & FILTRATION SYSTEMS

* same units as shown in axis of curves or in design inlet conditions.

USER: Aeration Tank # 3

Curve	Model #	Impeller 1 Qty PN	Impeller 2 Qty PN	Impeller 3 Qty PN	Design Point *Flow*	HP*	PSIG	%RH	Temp F	PSIA	RPM	Inlet Throttled
1	4108C	8/10041112	0/	0/	323.1	19.1	7.00	36.0	100.00	14.70	4810.	No
2	4108C	8/10041112	0/	0/	323.1	21.5	7.00	36.0	40.00	14.70	4810.	No
3	4108C	8/10041112	0/	0/	323.1	20.9	7.00	36.0	40.00	14.70	4810.	Yes
4												
5												

GARDNER DENVER

Technical & Performance Data
42 Series
Centrifugal Products

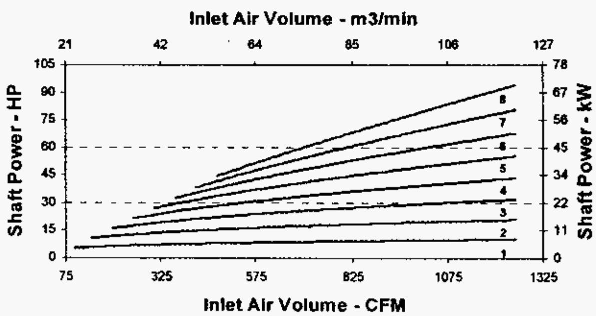
DESIGN STANDARD
{ Offered }

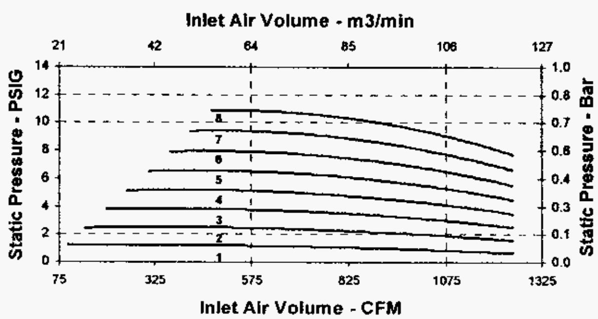
Number of Stages	1-8 (60 & 50 Hz)
Inlet Connection	6" Flange, ANSI 125# Drilling
Outlet Connection	6" Flange, ANSI 125# Drilling
Operating Speed	3550 RPM (60 Hz), 2925 RPM (50 Hz)
Casing Pressure	25 PSIG (1.73 bar)
Air Seals	Carbon Ring Type
Bearings	Anti-friction Type, designed for extended L_{10} life
Lubrication	AEON® CF Grease *(AEON® CF Oil)*
Impeller	24.0 inches (610 millimeters) Diameter (statically balanced)
Impeller Tip Speed	372 feet/second (113 meters/second)
Drive Type	Direct Coupled (Inlet drive is standard)
Drive Shaft	1.625 inches (41.28 millimeters) Diameter
Vibration	.235 in/sec. (5.97 mm/sec.) Peak Velocity
Rotor	Factory Balanced Per ISO 1940, ANSI S2.19

MATERIAL STANDARD
{ Offered }

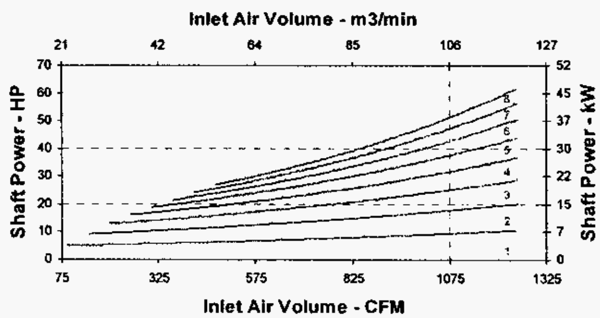
Casing	ASTM A48 Class 30 Gray Cast Iron
Bearing Housings	ASTM A48 Class 30 Gray Cast Iron
Bearing Cap	ASTM A48 Class 30 Gray Cast Iron
Tie Rods	ASTM A307 Zinc Plated Threaded Rod
Carbon Ring Seal	ASTM C695 Fine Grain Molded Graphite ASTM A48 Class 30 Gray Cast Iron Housing
Joint Sealing	RTV Silicone Compound
Shaft	ASTM A108 Grade 1045 HRS *(Stainless Steel)*
Impeller	ASTM SC64C Sr-319 Cast Aluminum
Blower Base	ASTM A36 Hot Rolled Structural Steel
Motor Pedestal	ASTM A36 Hot Rolled Structural Steel
Isolation Base Pads	ASTM D2000 Neoprene 70 MC-2 11# Cork
Finish	Two Part Epoxy GDI 171 CF Blue

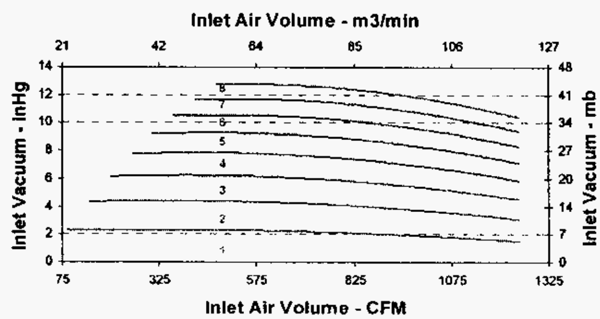
PRESSURE PERFORMANCE
14.7 PSIA [1 Bar], 68°F [20°C], 36% RH, Speed: 3550 RPM





VACUUM PERFORMANCE
29.9 inHg [1 Bar], 68°F [20°C], 36% RH, Speed: 3550 RPM





PRODUCT & PERFORMANCE NOTES

1. Information is approximate and subject to change without notice
2. Performances noted above are typical and not job specific
3. Consult authorized Gardner Denver sales representative for job specific blower or exhauster performance sizing
4. Factory ASME PTC-10 test offered for performance verification

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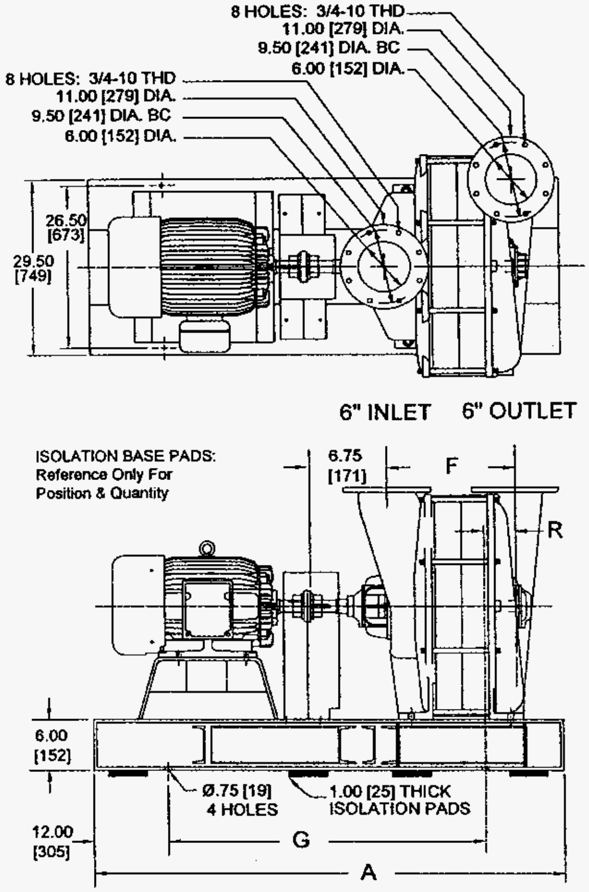
GARDNER DENVER ISO 9001 CERTIFIED QUALITY SYSTEM

"Over 145 Years of Leadership"

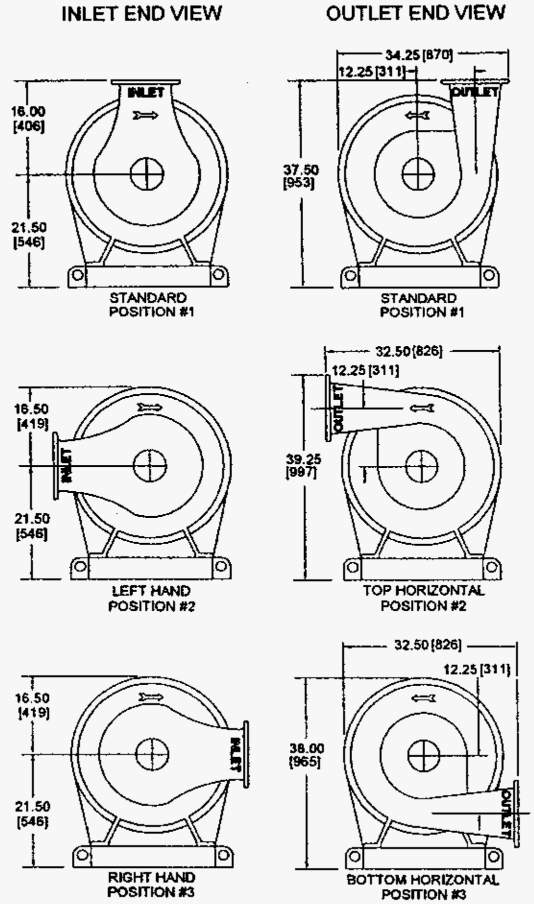
![Gardner Denver]

Dimensional Data
42 Series
Centrifugal Products

GENERAL ARRANGEMENT



FLANGE ORIENTATIONS



DIMENSIONAL DATA – inches [millimeters]

FRAME	A	F	G	R
4201	48.75 [1238]	9.25 [235]	24.75 [629]	4.50 [114]
4202	60.75 [1543]	12.69 [322]	36.75 [933]	2.00 [51]
4203	60.75 [1543]	16.13 [410]	36.75 [933]	4.50 [114]
4204	72.75 [1848]	19.56 [497]	48.75 [1238]	2.00 [51]
4205	72.75 [1848]	23.00 [584]	48.75 [1238]	2.00 [51]
4206	72.75 [1848]	26.44 [672]	48.75 [1238]	4.50 [114]
4207	84.75 [2153]	29.88 [759]	60.75 [1543]	2.00 [51]
4208	84.75 [2153]	33.31 [846]	60.75 [1543]	2.00 [51]

WEIGHTS – lb [kg] & INERTIA – lb-ft² [kg-m²]

FRAME	PKG. LESS MOTOR	BARE UNIT	WK^2
4201	749 [340]	590 [268]	9 [0.38]
4202	925 [420]	760 [345]	18 [0.76]
4203	1103 [500]	930 [422]	27 [1.14]
4204	1294 [587]	1100 [499]	36 [1.53]
4205	1494 [678]	1300 [590]	46 [1.91]
4206	1666 [756]	1470 [667]	55 [2.29]
4207	1836 [833]	1640 [744]	64 [2.67]
4208	2035 [923]	1810 [821]	73 [3.06]

PRODUCT NOTES

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2. Position #1 is standard inlet & outlet orientation
3. A and G dimensions may vary depending on motor frame size

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"Over 145 Years of Leadership"

GARDNER DENVER

Technical & Performance Data
42 Series
Centrifugal Products

DESIGN STANDARD *(Offered)*

Number of Stages	1-8 (60 & 50 Hz)
Inlet Connection	6" Flange, ANSI 125# Drilling
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Operating Speed	3550 RPM (60 Hz), 2925 RPM (50 Hz)
Casing Pressure	25 PSIG (1.73 bar)
Air Seals	Carbon Ring Type
Bearings	Anti-friction Type, designed for extended L_{10} life
Lubrication	AEON® CF Grease *(AEON® CF Oil)*
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Impeller Tip Speed	372 feet/second (113 meters/second)
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Bearing Cap	ASTM A48 Class 30 Gray Cast Iron
Tie Rods	ASTM A307 Zinc Plated Threaded Rod
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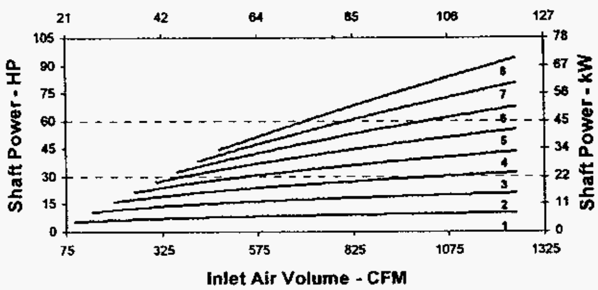
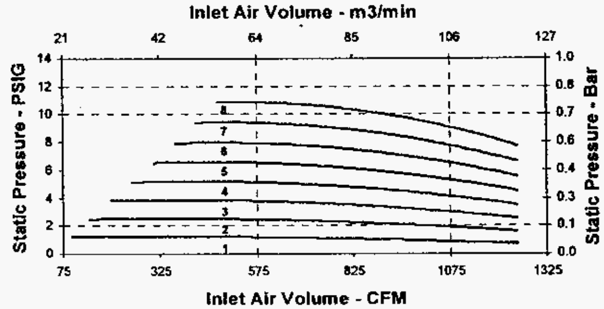
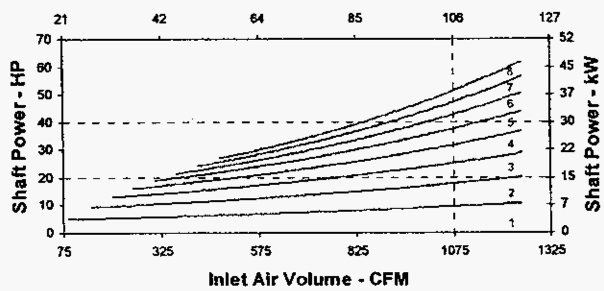
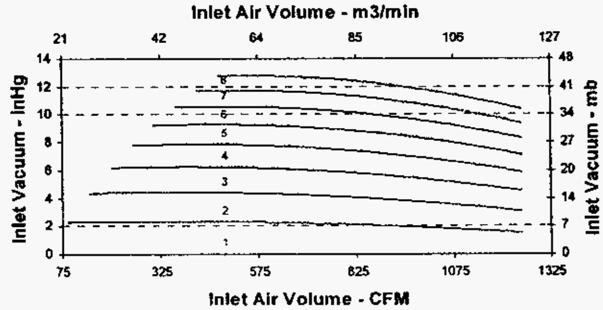




VACUUM PERFORMANCE
29.9 inHg [1 Bar], 68°F [20°C], 36% RH, Speed: 3550 RPM





PRODUCT & PERFORMANCE NOTES

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GARDNER DENVER ISO 9001 CERTIFIED QUALITY SYSTEM

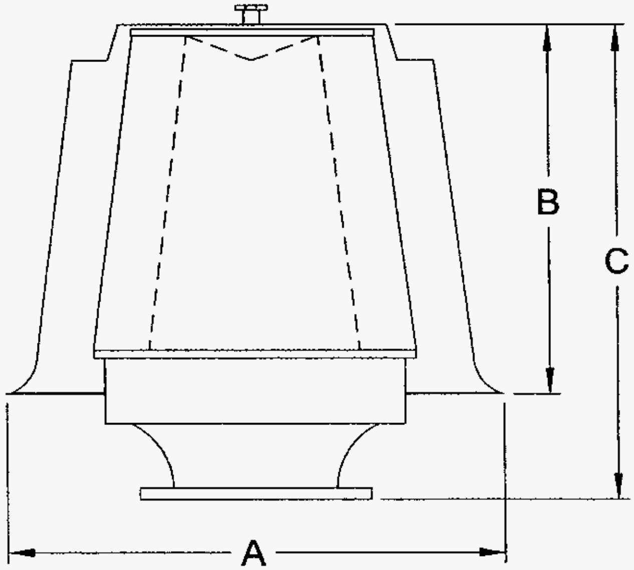
"Over 145 Years of Leadership"

Accessories

Intake Filter Silencers - Cartridge

Centrifugal Products

DIMENSIONAL DATA



SPECIFICATIONS

FLG. FIT: ASME 125# (iron) and 150# (steel) ANSI drilling

ELEMENT EFFCY: Ultra: 99.97% efficiency @ 1-micron nom.
Hi-Flow: 98% efficiency @ 10-micron nom.

NOISE ATTENUATION: Octave Band Center Freq (Hz)

Hz	63	125	250	500	1000	2000	4000	8000
Attenuation (dB)	9	14	17	19	21	19	17	15

MATERIALS OF CONSTRUCTION

HOUSING: Carbon Steel, 10 Ga.

FINISH: Polyester Powder Coat

LID: 3" – 8": Carbon Steel, 10 Ga.
10" – 18": ASTM B209 Aluminum, .125 Ga.

STANDARD 1/8 INCH TAP & PLUG TO MOUNT DIFFERENTIAL GAUGE

ELEMENT CORE: Expanded Flattened Galv. Steel, 24 Ga.

ELEMENT END CAP: Galv. Steel, 22 Ga.

ELEMENT MEDIA: Proprietary Synthetic Formulation

CONN. SIZE	P/N WITH ULTRA	CFM FLOW ULTRA	P/N WITH HI-FLOW	CFM FLOW HI-FLOW	A	B	C	WEIGHT	P/N ULTRA ELEMENT	P/N HI-FLOW ELEMENT
5" FLG	VP1012702	1100	VP1012710	1300	16.50	8.00	17.50	28	VP1011566	VP1012698
6" FLG	VP1009813	1350	VP1012711	1620	16.50	8.00	17.50	30	VP1011566	VP1012698
6" FLG	VP1011082	2000	VP1012712	2400	25.25	11.25	21.25	49	VP1012694	VP1008206
6" FLG	VP1010621	2250	VP1012714	2700	25.25	15.50	24.25	53	VP1012695	VP1012699
8" FLG	VP1012447	2500	VP1012715	3000	25.25	11.25	21.25	56	VP1012694	VP1008206
8" FLG	VP1012703	2900	VP1012716	3450	25.25	15.50	24.25	60	VP1012695	VP1012699
8" FLG	VP1010679	3300	VP1012717	4000	27.25	20.00	29.00	58	VP1012696	VP1012700
10" FLG	VP1012704	3750	VP1012718	4500	25.25	11.25	21.25	57	VP1012694	VP1008206
10" FLG	VP1012705	4000	VP1012719	4800	25.25	15.50	24.25	61	VP1012695	VP1012699
10" FLG	VP1010680	4250	VP1012579	5100	27.25	20.00	29.00	58	VP1012696	VP1012700
12" FLG	VP1010782	5150	VP1012720	6200	25.25	15.50	24.25	61	VP1012695	VP1012699
12" FLG	VP1011062	6100	VP1011044	7300	27.25	20.00	29.00	62	VP1012696	VP1012700
12" FLG	VP1012706	8250	VP1012721	9900	38.00	26.00	34.50	72	VP1012697	VP1012701
14" FLG	VP1012707	10000	VP1012722	12000	38.00	26.00	34.50	97	VP1012697	VP1012701
16" FLG	VP1012708	11000	VP1012723	13200	38.00	26.00	34.50	107	VP1012697	VP1012701
18" FLG	VP1012709	12000	VP1012724	14400	38.00	26.00	34.50	117	VP1012697	VP1012701

PRODUCT NOTES

1. Information is approximate, subject to change without notice, and not for construction use unless certified
2. Flow is at three inches water column pressure drop
3. All dimensions are in inches and weights in pounds

Gardner Denver Engineered Products Division
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"Over 145 Years of Leadership"

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Accessories
Expansion Joints
Centrifugal Products

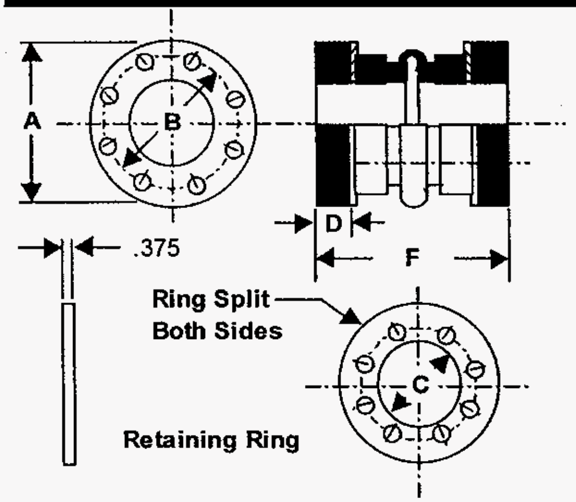
SPECIFICATIONS

TEMPERATURE:	300° F	PRESSURE:	
VACUUM:	16" Hg	3" – 12":	150 PSIG
FLG. FIT:	125# (iron)	14":	135 PSIG
	150# (steel)	16" – 20":	110 PSIG
	ANSI drilling	24":	104 PSIG

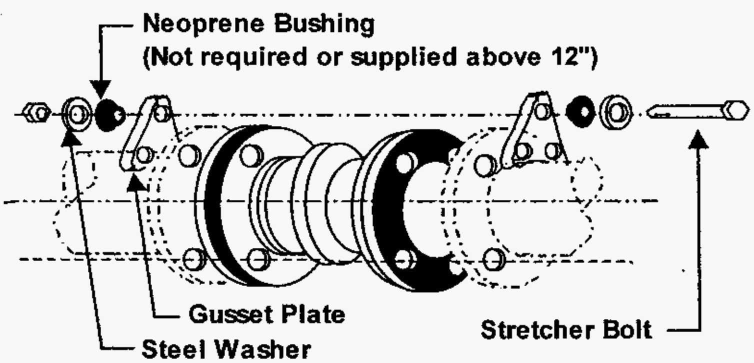
MATERIALS OF CONSTRUCTION

- Polyester Reinforced EPDM
- Cast Ductile Iron Retaining Rings (Galvanized)
- Galvanized Control Units

DIMENSIONAL DATA – Without Control Units



DIMENSIONAL DATA – With Control Units



Nominal Size I.D.	Part Number W/o C.U.	Part Number W / C.U.	A	B	C	D	F	# Bolt Holes	Weight W/o C.U.	Weight W / C.U.
3	HF00485044	HF00485074	7.50	6.00	4.13	0.44	6.00	4	8.50	17.00
4	HF00485045	HF00485075	9.00	7.50	5.13	0.44	6.00	8	10.00	18.00
5	HF00485046	HF00485076	10.00	8.50	6.13	0.44	6.00	8	12.50	21.00
6	HF00485047	HF00485077	11.00	9.50	7.13	0.44	6.00	8	16.50	26.00
8	HF00485048	HF00485078	13.50	11.75	9.25	0.50	6.00	8	22.00	35.00
10	HF00485049	HF00485079	16.00	14.25	11.25	0.50	8.00	12	34.00	53.00
12	HF00485050	HF00485080	19.00	17.00	13.38	0.50	8.00	12	45.00	65.00
14	HF00485051	HF00485081	21.00	18.75	15.50	0.56	8.00	12	55.00	82.00
16	HF00485059	HF00485082	23.50	21.25	17.50	0.56	8.00	16	64.00	91.00
18	HF00485060	HF00485083	25.00	22.75	19.63	0.63	8.00	16	71.00	100.00
20	HF00485052	HF00485084	27.50	25.00	21.63	0.63	8.00	20	82.00	111.00
24	HF00485061	HF00485085	32.00	29.50	25.88	0.75	10.00	20	102.00	148.00
30	HF00896822	HF00896821	38.75	36.00	31.50	0.75	10.00	28	150.00	213.00

PRODUCT NOTES

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2. All dimensions are in inches and weights in pounds

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GARDNER DENVER

Accessories

Butterfly Valves – Wafer Style

Centrifugal Products

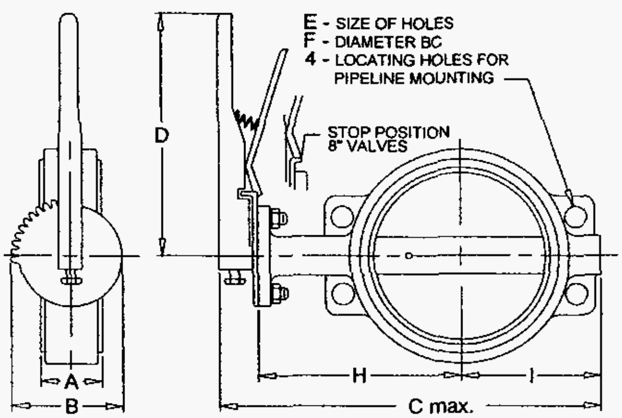
SPECIFICATIONS (3" – 8" VALVES)

TYPE:	Wafer – Double Seated
PRESSURE:	200 PSI CWP Max
FLG. FIT:	ASME 125# (iron) and 150# (steel) ANSI drilling
FLOW:	Bi-Directional
BODY:	ASTM A126 Class B ANSI B16.1 Cast Iron
DISC:	ASTM B148 Aluminum Bronze
SEAT:	EPDM
SEAT TEMP.:	Maximum 275°F
SHAFT:	ASTM A582 416 Stainless Steel
ACTUATOR:	10 position locking lever

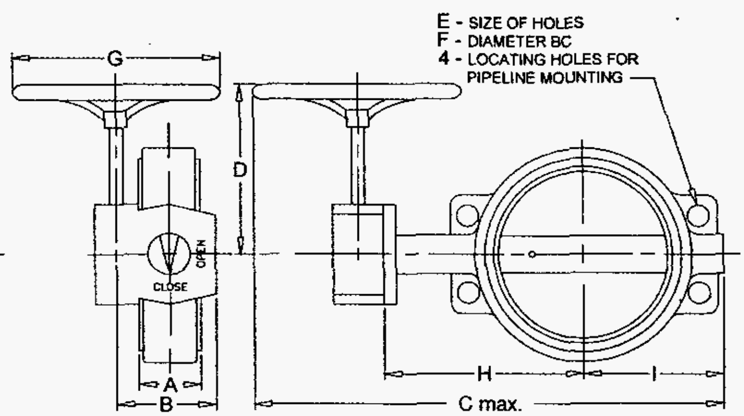
SPECIFICATIONS (10" – 24" VALVES)

TYPE:	Wafer – Double Seated
PRESSURE:	200 PSI CWP Max
FLG. FIT:	ASME 125# (iron) and 150# (steel) ANSI drilling
FLOW:	Bi-Directional
BODY:	10" & 12" ASTM A126 Class B ANSI B16.1 Cast Iron 14" – 24" ASTM A395 ANSI B16.42 Ductile Iron
DISC:	ASTM B148 Aluminum Bronze
SEAT:	EPDM
SEAT TEMP.:	Maximum 275°F < 18 inch valves ≥ 225°F
SHAFT:	ASTM A582 416 Stainless Steel
ACTUATOR:	Hand wheel gear

DIMENSIONAL DATA – Lever Actuator



DIMENSIONAL DATA – Gear Actuator



PART No.	SIZE	ACT.	A	B	C	D	E	F	G	H	I	WGT.
VP1005971	3	Lever	1.88	2.25	12.38	10.50	.69	6.00	N/A	7.13	4.00	11.8
VP1005972	4	Lever	2.13	2.25	14.00	10.50	.69	7.50	N/A	7.88	4.88	13.1
VP1005973	5	Lever	2.25	2.25	15.00	10.50	.81	8.50	N/A	8.38	5.38	19.8
VP1005974	6	Lever	2.25	2.25	16.00	10.50	.81	9.50	N/A	8.88	5.88	21.8
VP1005368	8	Lever	2.50	3.34	19.75	14.00	.81	11.75	N/A	10.25	7.75	36.0
VP1024063	10	Gear	2.75	6.36	27.28	9.04	.94	14.25	12	11.50	8.25	73.7
VP1005976	12	Gear	3.13	6.36	30.53	9.04	.94	17.00	12	13.25	9.75	101.7
VP1024065	14	Gear	3.13	6.36	33.03	9.04	1.06	18.75	18	14.50	11.00	126.7
VP1024066	16	Gear	3.50	10.00	39.09	11.08	1.06	21.25	18	15.75	12.00	194.4
VP1024067	18	Gear	4.25	10.00	42.91	11.08	1.25	22.75	18	16.63	15.00	242.4
VP1024068	20	Gear	5.25	13.80	45.00	12.6	1.25	25.00	18	18.88	14.63	396.0
VP1024069	24	Gear	6.13	13.80	51.63	13.3	1.25	29.50	18	22.13	18.00	572.0

PRODUCT NOTES

1. Specifications subject to change without notice
2. All dimensions are in inches and weights in pounds
3. Flange gaskets are not needed; seat face seals against mating flange

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GARDNER DENVER ISO 9001 CERTIFIED QUALITY SYSTEM

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GARDNER DENVER

Accessories

Check Valves

Centrifugal Products

SPECIFICATIONS

BODY: Cast Iron (Flanged & Wafer) 125#/150# Drilling
Carbon Steel (Threaded)

SEALING MEMBER: High Quality Silicone, 500° F Max. Rating

INTERNALS: Aluminum

DESIGN: Springless & Seatless

CWP THREADED: 150 PSI Rating

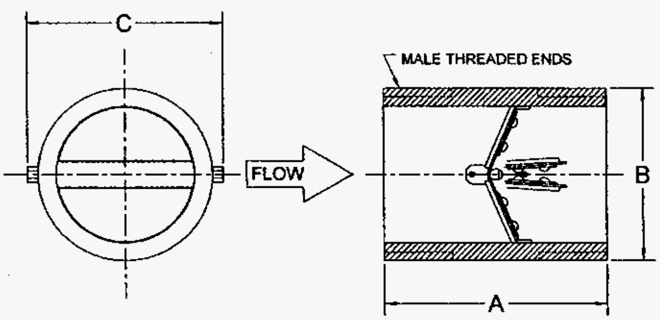
CWP FLANGED: 50 PSI (2"-14") & 125 PSI (16"-24") Rating

CWP WAFER: 125 PSI Rating

DIMENSIONAL DATA – Threaded Type

PART NO.	SIZE	A	B	C	WGT.
BA1006200000	2.0	4.00	2.38	2.81	2.0
BA1006210000	2.5	5.00	2.88	3.31	2.8
BA1006220000	3.0	5.50	3.50	4.12	4.5
BA1006230000	4.0	6.00	4.50	5.12	6.9
BA1006240000	5.0	7.00	5.56	6.19	11.0

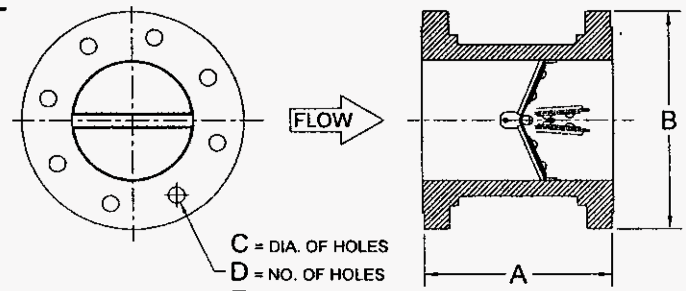
THREADED CHECK VALVE



DIMENSIONAL DATA – Flange Type (FF)

PART NO.	SIZE	A	B	C	D	E	WGT.
BA1006010000	2.0	4.50	6.00	0.75	4	4.75	12.5
BA1006020000	2.5	5.00	7.00	0.75	4	5.50	19.0
BA1006030000	3.0	5.00	7.50	0.75	4	6.00	22.0
BA1006040000	4.0	5.50	9.00	0.75	8	7.50	31.0
BA1006050000	5.0	6.00	10.00	0.88	8	8.50	37.0
BA1006060000	6.0	7.00	11.00	0.88	8	9.50	53.0
BA1006070000	8.0	9.00	13.50	0.88	8	11.75	86.0
BA1006080000	10.0	11.00	16.00	1.00	12	14.25	127.0
BA1006090000	12.0	13.00	19.00	1.00	12	17.00	210.0
BA1006100000	14.0	15.00	21.00	1.13	12	18.75	220.0
BA1006110000	16.0	17.00	23.50	1.13	16	21.25	375.0
BA1006120000	18.0	19.00	25.00	1.25	16	22.75	440.0
BA1006130000	20.0	21.00	27.50	1.25	20	25.00	525.0
BA1006140000	24.0	25.00	32.00	1.38	20	29.50	775.0

FLANGED CHECK VALVE

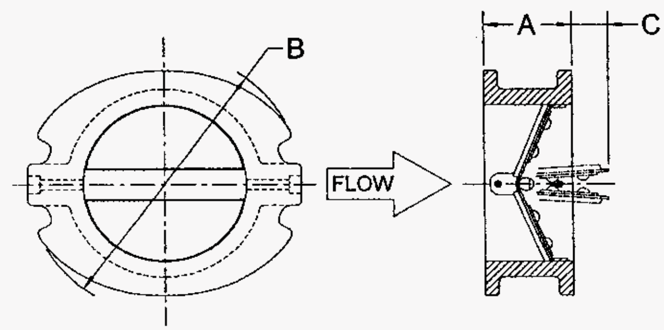


C = DIA. OF HOLES
D = NO. OF HOLES
E = DIA. BOLT CIRCLE

DIMENSIONAL DATA – Wafer Type

PART NO.	SIZE	A	B	C	WGT.
BA1006510000	2.0	1.38	4.25	0.50	4.0
BA1006520000	2.5	1.62	5.50	0.56	7.0
BA1006530000	3.0	1.88	6.00	0.69	10.0
BA1006540000	4.0	2.38	7.50	0.88	12.0
BA1006550000	5.0	2.88	9.00	1.13	15.0
BA1006560000	6.0	3.38	10.50	1.50	25.0
BA1006570000	8.0	4.38	13.00	2.25	45.0
BA1006580000	10.0	5.38	14.87	2.50	70.0
BA1006590000	12.0	6.38	17.50	3.00	120.0
BA1006600000	14.0	7.38	21.00	3.25	175.0
BA1006610000	16.0	8.38	23.50	3.75	220.0
BA1006620000	18.0	9.38	25.00	4.25	230.0
BA1006630000	20.0	10.38	27.50	4.75	320.0
BA1006640000	24.0	12.38	32.00	5.75	410.0

WAFER CHECK VALVE



PRODUCT NOTES

1. Information is approximate, subject to change without notice, and not for construction use unless certified
2. All dimensions are in inches and weights in pounds

Gardner Denver Engineered Products Division
100 Gardner Park, Peachtree City, GA 30269
Phone: 800-982-3009 / 770-632-5000
Fax: 770-486-5628
E-mail: blowersmktg@gardnerdenver.com
Web: www.gardnerdenver.com

GARDNER DENVER ISO 9001 CERTIFIED QUALITY SYSTEM

"Over 145 Years of Leadership"

Date: 4/19/2007

Project:	Cypress Lakes WWT
Customer:	HDR Engineering
Sales Order Number:	
Application Engineer:	Jim Ward
Comments:	450 SCFM @ 8 PSIG New & Reman 4206A Blowers Aeration RTanks # 1 & 2

Gas Mix: Air(100%)

Model: 42, 6 Stage(s) (6 x 136), 4085 RPM

Corrected Values	Original Unit	English Unit	Metric Unit
Inlet Set # 1			
Barometer	14.70 PSIA	14.70 PSIA	1.01 Bars (A)
Inlet Pres.	0.00 PSIG	14.70 PSIA	1.01 Bars (A)
Inlet Temp.	100.00 Deg F	100.00 Deg F	37.78 Deg C
Inlet Flow	450.00 SCFM	489.11 ICFM	830.97 m^3/hr(A)
Dis. Pres.	8.00 PSIG	8.00 PSIG	0.55 Bars (G)
Rel. Humid.	50.00 %	50.00 %	50.00 %
Inlet Set # 2			
Barometer	14.70 PSIA	14.70 PSIA	1.01 Bars (A)
Inlet Pres.	0.00 PSIG	14.70 PSIA	1.01 Bars (A)
Inlet Temp.	40.00 Deg F	40.00 Deg F	4.44 Deg C
Inlet Flow	450.00 SCFM	424.34 ICFM	720.93 m^3/hr(A)
Dis. Pres.	8.00 PSIG	8.00 PSIG	0.55 Bars (G)
Rel. Humid.	50.00 %	50.00 %	50.00 %

Measured Values	Plot Unit	English Unit	Metric Unit
Inlet Set # 1			
Surge Flow Rate	171.11 ICFM	171.11 ICFM	290.71 m^3/hr(A)
Surge Pressure	8.49 PSIG	8.49 PSIG	0.59 Bars (G)
Pres. Rise to Surge	0.49 PSIG	0.49 PSIG	0.03 Bars (G)
Max. Vol. Turndown	65.02 %	65.02 %	65.02 %
Pressure @ Design	8.04 PSIG	8.04 PSIG	0.55 Bars (G)
Power @ Design	37.61 HP	37.61 HP	28.04 KW
Effic. @ Design	38.74 %	38.74 %	38.74 %
Temp. @ Design	290.74 Deg F	290.74 F	143.74 C
Inlet Set # 2			
Surge Flow Rate	171.11 ICFM	171.11 ICFM	290.71 m^3/hr(A)
Surge Pressure	9.41 PSIG	9.41 PSIG	0.65 Bars (G)
Pres. Rise to Surge	1.40 PSIG	1.41 PSIG	0.10 Bars (G)
Max. Vol. Turndown	59.68 %	59.68 %	59.68 %
Pressure @ Design	8.00 PSIG	8.00 PSIG	0.55 Bars (G)
Power @ Design	39.07 HP	39.07 HP	29.13 KW
Effic. @ Design	36.85 %	36.85 %	36.85 %
Temp. @ Design	245.04 Deg F	245.04 F	118.35 C

CF Select version 1.2

Gas Mix: Air(100%)

Model: 42, 6 Stage(s) (6 x 136), 4085 RPM

Gas Parameters	English Unit	Metric Unit
Inlet Set # 1		
Molecular Weight	28.62 lbm/lbmol	28.62 kg/kgmol
R Value	54.00 ft. lbf/lbm.R	0.29 kJ/kg.K
Density	0.07 lbm/ft^3	1.12 kg/m^3
Sp. Heat @ Const. P	0.24 BTU/lbm.R	1.02 kJ/kg.K
Ratio of Sp. Heats	1.40	1.40
Saturated Vapor Pres.	0.95 PSIA	0.07 Bars (A)
Partial Pres. of Gas	14.22 PSIA	0.98 Bars (A)
Partial Pres. of Vapor	0.47 PSIA	0.03 Bars (A)
Inlet Set # 2		
Molecular Weight	28.92 lbm/lbmol	28.92 kg/kgmol
R Value	53.43 ft. lbf/lbm.R	0.29 kJ/kg.K
Density	0.08 lbm/ft^3	1.27 kg/m^3
Sp. Heat @ Const. P	0.24 BTU/lbm.R	1.01 kJ/kg.K
Ratio of Sp. Heats	1.40	1.40
Saturated Vapor Pres.	0.12 PSIA	0.01 Bars (A)
Partial Pres. of Gas	14.64 PSIA	1.01 Bars (A)
Partial Pres. of Vapor	0.06 PSIA	0.00 Bars (A)

Gas Mix: Air(100%)

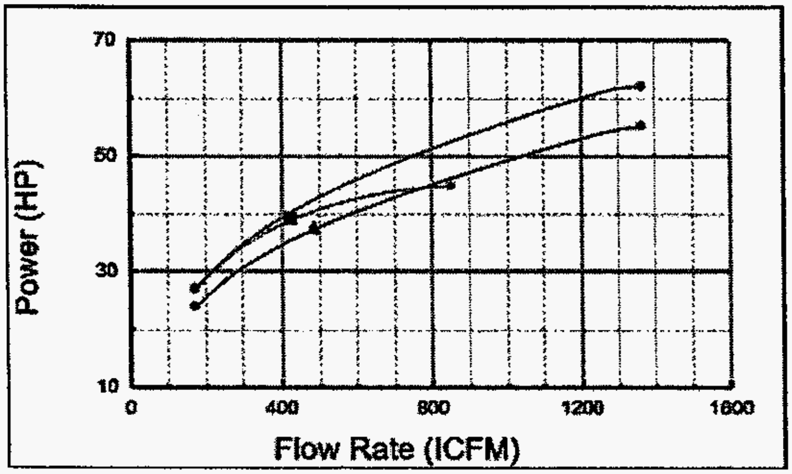
Model: 42, 6 Stage(s) (6 x 136), 4085 RPM

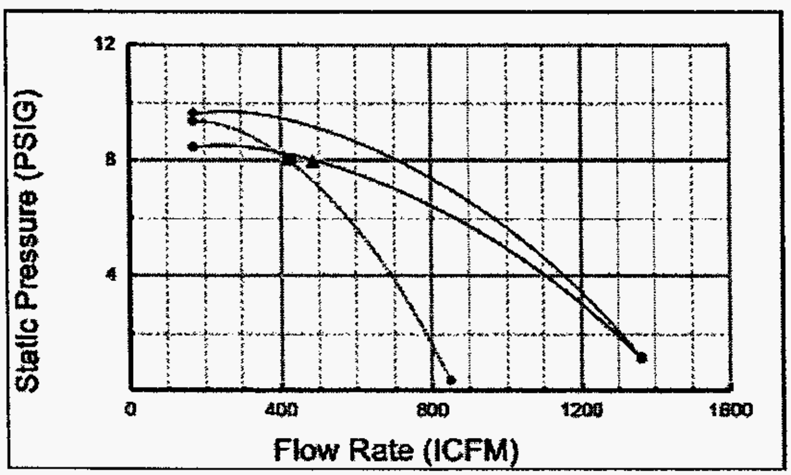
Date: 4/19/2007

GARDNER DENVER

Legend for Inlet Conditions

#1 ▲ #2 ■ #3 ▼ #4 ◆ STD ●





CF Select

CF Select version 1.2

POSITIVE DISPLACEMENT BLOWERS

-MANUFACTURER DATA-

UNIVERSAL BLOWER PAC, INC
The Original Manufacturer

April 3, 2007

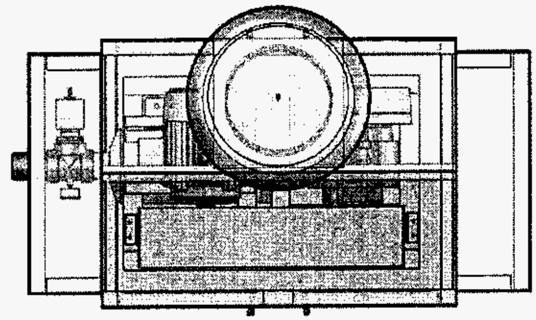
Project: Cypress Lakes WWTP
Customer: TSC Jacobs
Proposal: Two (2) 4M Blower Packages

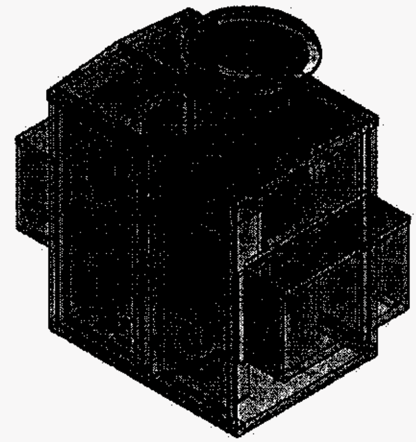
Notes:

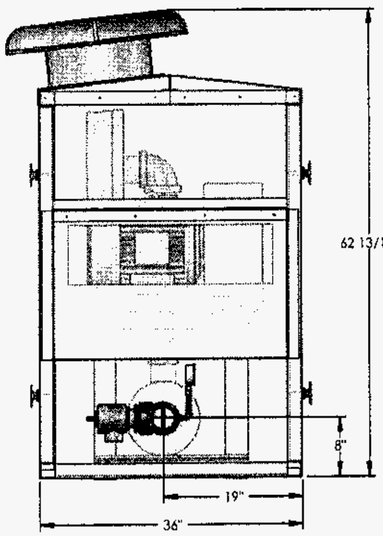
- This proposal is for two Gardner Denver Sutorbilt model 4M blower packages utilizing 15 HP TEFC NEMA frame motors.
- The attached drawing is from a similar project. This configuration can be modified to meet dimensional constraints or other customer needs.
- The unit will operate within an Attenu-Pac full enclosure at an estimated noise level of 73 dbA at 1m in a free field. We can provide a fiberglass hood in lieu of the Attenu-Pac, however, attenuation will be limited.
- Specifications have been provided.

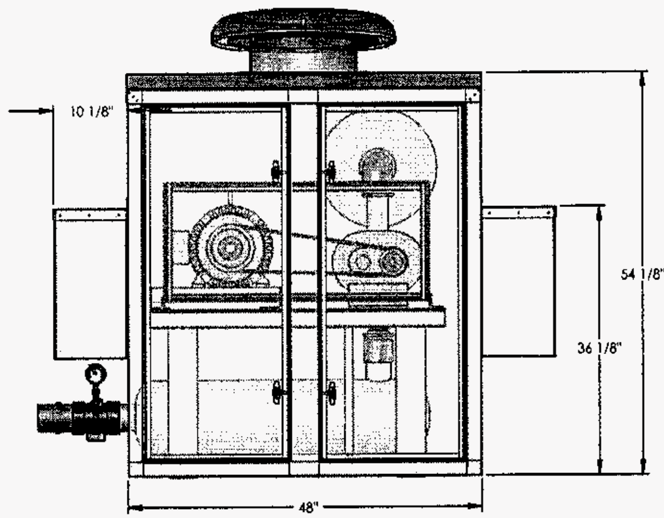
440 Park 32 West Drive | Noblesville, IN 46062-9252 | PH 317-773-7256 | FX 317-776-5086
website: www.universalblowerpac.com **email:** aplacek@universalblowerpac.com

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
-	-	See Sheet 1	-	-









UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ±1/16 ANGULAR: MACH± BEND ±5 TWO PLACE DECIMAL ±1.00 THREE PLACE DECIMAL ±0.25	DRAWN	[illegible]	[illegible]
	CHECKED		
	ENG APPR.		
PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF UNIVERSAL BLOWER PAC, INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF UNIVERSAL BLOWER PAC, INC. IS PROHIBITED.	MATERIAL STOCK SIZE FINISH DO NOT SCALE DRAWING		

UNIVERSAL BLOWER PAC, INC.
UNIVERSAL BLOWER PAC, INC.
440 PARK 32 WEST DRIVE
NOBLESVILLE, IN 46060-9259
PHONE: 317-773-7256
www.universalblowerpac.com

TITLE:

SIZE	DWG. NO.	
C	06063A	
SCALE: 1:12	WEIGHT:	SHEET 2 OF 2

GD Sutorbilt

Application: Sludge Holding / Equalization
Customer Name: TSC Jacobs
Comments:

Application Engineer:
Sales Order Number:

GAS MIXTURE: Air(100%)
MACHINE SELECTION: 4M-LegendP
SERVICE: Pressure

CORRECTED VALUES	**ORIGINAL UNITS**
Inlet Set #1	
Barometer	14.696 PSIA
Inlet Pres.	0.000 PSIG
Inlet Temp.	100.00 F
Inlet Flow	200.00 SCFM
Dis. Pres.	7.500 PSIG
Rel. Humid.	85.0 %
Delta Pressure	7.500 PSIG

MEASURED VALUES	**PLOT UNITS**
Inlet Set #1	
Blower Speed	2,471 RPM
% of Max. Speed	68.6 %
Blower Power **	10.3 HP
Efficiency	60.7 %
Discharge Temp.	205.1 F
Estimated Noise	84.7 dBA

** Drive losses not included

GAS PARAMETERS	**ENGLISH UNITS**	**METRIC UNITS**
Inlet Set #1		
Molecular Weight	28.57 lbm/lbmol	28.57 kg/kgmol
R Value	54.09 ft.lbf/lbm.R	0.29 kJ/kg.K
Density	0.069 lbm/ft^3	1.111 kg/m^3
Sp. Heat @ Const. P	0.247 BTU/lbm.R	1.034 kJ/kg.K
Ratio of Sp. Heats	1.40	1.40
Saturated Vapor Pres.	12.7941 PSIA	0.8821 Bars(A)
Partial Pres. of Gas	13.8896 PSIA	0.9577 Bars(A)
Partial Pres. of Vapor	0.8064 PSIA	0.0556 Bars(A)

Date: 4/3/2007 PROJECT: Cypress Lakes WWTP

GAS MIXTURE: Air(100%)
MACHINE SELECTION: 4M-LegendP