TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.

November 5, 2004

Mr. Robert J. VanLier, P.E.
Office of Wastewater Engineering
Department of Environmental Quality
900 Natural Resources Drive, Suite 600
Charlottesville, VA 22903

Re: Loudoun County
Loudoun County Detention Center

Dear Mr. VanLier:

We are in receipt of you letter of October 12, 2004 and in accordance with our telephone conversation on October 21, 2004 we respond as follows:

Item #1

Enclosed are 3 sets of new drawings with your comments and the Town of Leesburg's comments addressed. Drawings are stamped as you have requested.

Item #2

Flow estimates have been revised in accordance with our conversation. Attached is a copy of the revised flow rates, pump station calculations and pump curve. The Town of Leesburg has requested that the peak factor be revised to 4. This brought the peak flow to 208 gpm. With the comments that you requested for an increase from 10 gpd to 25 gpd for the staff and the reduction for the inmates from 115 gpd to 100 gpd the actual peak flow is 217 gpm which is the number used for the new pump design.

Item #3

The Pump station electrical power is being fed from the adult detention center main switch gear. This facility has a diesel generator for emergency power. The generator has been sized to handle the load of the pump station.

We are requesting a waiver on the 24-hour holding pond. This is a new sewer system and will be installed and tested in accordance with the latest SCAT Regulation requirements to keep infiltration to a minimum. The installation and testing will be inspected by qualified inspectors to insure compliance with the regulations.

Item #4

Attached is a copy of a letter by the Town of Leesburg dated October 26, 2004 sent to you that states that the sanitary sewer system downstream of the receiving manhole has adequate capacity to handle the additional flows generated from this site.

711 N. Courthouse Road | Richmond, Virginia 23236
TEL 804.794.3500 FAX 804.794.7639 www.timmons.com
VIRGINIA | NORTH CAROLINA | WEST VIRGINIA
Site Development | Residential | Infrastructure | Technology

Item #5

Pump under current monitoring has been included in the project. Please see electrical drawing sheet 7, note 17h.

Item #6

Sheet 2 of the new drawings attached, has indicated a 100 ft. radius buffer zone.

Item #7

The steps have been eliminated from the wet well.

We trust the above meets with your approval. If you require additional information please advise.

Respectfully Submitted,
Timmons Group

Alfred R. Williams, P.E.
Project Manager

cc: Brian Houston, Timmons Group

Enclosures:

Exhibit 1 - Pump Station Capacity Estimation

Source	Qty1	Unit1	GP(Unit1)	Qty2	Unit2	GP(Unit2)	ADD	PF	Peak Dmd	Peak Dmd
Bus Maintenance	75	staff	25	100	drivers	25	4,375	4.0	17,500	12 gpm
Washing Bays	800,000 gal / year ; 200 days / year ; 2 hours of flow / day						4,000	12.0	48,000	33 gpm
Work Release	12	inmates	100	110	staff	25	3,950	5.0	19,750	14 gpm
Juvenile DC	60	inmates	100	64	staff	25	7,600	5.0	38,000	26 gpm
Adult DC	500	inmates	100	108	staff	25	52,700	5.0	263,500	183 gpm
Public Safety	225	staff	25				5,625	4.0	22,500	16 gpm
Sum of Individual Peaks:							*78,250*	*4.0*	*313,000*	*217 gpm*
> **Composite, per Town of Leesburg peaking formula:**							*78,250*	*6.2*	*485,407*	*337 gpm*
Composite, per Timmons Group peaking formula:							*78,250*	*5.7*	*447,827*	*311 gpm*

Selected Method - Sum of Individual Peaks:	**78,250**	**4.0**	***313,000***	***217 gpm***

Inmates GP changed to 100, Staff GP changed to 25 at the request of DEQ
Peak factor changed to 4 by the direction of the Town of Leesburg

New design flow = 217 gpm

Notes:

1 JDC - 54 inmates, 60 max. Expansion will add 36 new shift staff to the 28 current.
2 ADC - Future expansion from 444 to 500 inmates.
3 Public Safety - Now, 2 shifts of 225 each. Later, 3 shifts of 150 each.
4 Washing Bay usage per emails on 6/25/04 and 6/28/04

RANDOLPH W. SHOEMAKER
Director
Department of Utilities

The Town of
Leesburg, Virginia

25 West Market Street ▪ P.O. Box 88 ▪ 20178 ▪ 703-771-2750 ▪ Metro: 703-478-1821 ▪ FAX: 703-737-7185 ▪ www.leesburgva.gov

October 26, 2004

Mr. Robert J. VanLier, P.E.
Commonwealth of Virginia
Department of Environmental Quality
900 Natural Resources Drive, Suite 600
Charlottesville, VA 22903

RE: Loudoun County
Adult Detention Center

Dear Rob:

I have been asked by the engineering firm of Timmons Group to respond to comment No. 4 of your October 12, 2004 letter.

Town of Leesburg is the provider of the Utility service to the County's support facility complex which includes the Adult Detention Center. The sanitary sewer system downstream of this facility has adequate capacity to handle the additional flows generated from this site.

Should you have any questions, please feel free to call me at 703-771-2750.

Sincerely,

Aref Etemadi
Deputy Director of Utilities

cc: Randolph W. Shoemaker, Director of Utilities
Zaman Nouri, Loudoun County (faxed)
Al Williams, Timmons Group (faxed)

Loudon County DGS PS
Timmons
A. Williams, P.E.

G.R.A.S.P. ver: 6.043
10/25/04

PUMP DATA SHEET

Gorman-Rupp Eng. Sys. Catalog

Selection file: (untitled)

Curve: T4A-B-4

Catalog: GR-ES60.MPC v 1

Design Point: Flow: 217 US gpm
Head: 65 ft

Pump: **T-SERIES - Adjustable** **Size: T4A-B**
Speed: 1490 rpm Dia: 9.75 in

Limits: Temperature: --- °F Sphere size: 3 in
Pressure: --- psi_g Power: --- bhp

Specific Speed: Ns: --- Nss: ---

Dimensions: Suction: 4 in Discharge: 4 in

Motor: --- hp NEMA Standard TEFC Enclosure
sized for Max Power on Design Curve

Fluid: Water Temperature: 60 °F
SG: 1
Viscosity: 1.122 cP
Vapor pressure: 0.2568 psi_a
Atm pressure: 14.7 psi_a

NPSHa: --- ft

Piping: System: ---
Suction: --- in
Discharge: --- in

---- Data Point ----

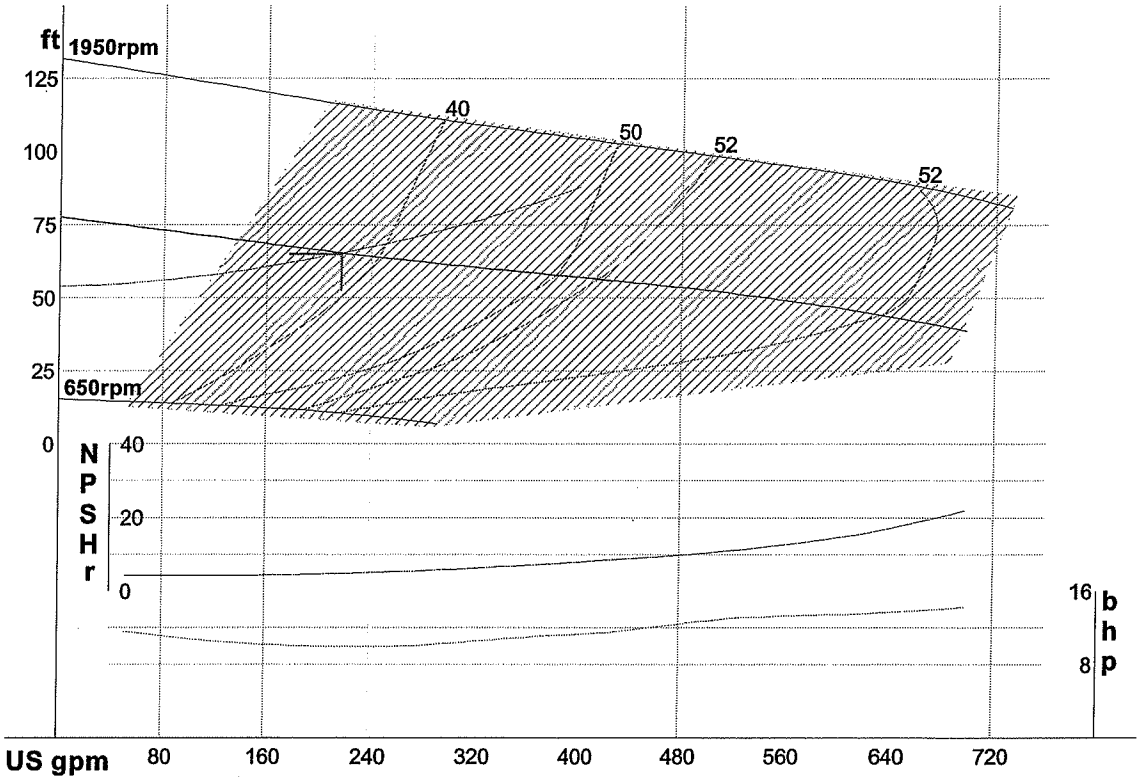
Flow: 217 US gpm
Head: 65.6 ft
Eff: 35%
Power: 10.2 bhp
NPSHr: 4.91 ft

-- Design Curve --

Shutoff Head: 77.7 ft
Shutoff dP: 33.6 psi
Min Flow: - US gpm
BEP: 52% eff
@ 519 US gpm
NOL Pwr: 14.2 bhp
@ 698 US gpm

-- Max Curve --

Max Pwr: 29.8 bhp
@ 733 US gpm



--- PERFORMANCE EVALUATION ---

Flow US gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Motor kW	Hrs/yr	Cost /kWh
260	1490	63.4	41	10.1	5.28				
217	1490	65.6	35	10.2	4.91				
174	1490	68	28	10.5	4.73				
130	1490	70.4	21	10.9	4.54				
86.8	1490	72.8	14	11.3	4.36				

PERFORMANCE CHART NO. T4A-4 2-21-79

Consult factory on operating conditions above 1500 rpm when TDSL exceeds 19 feet.

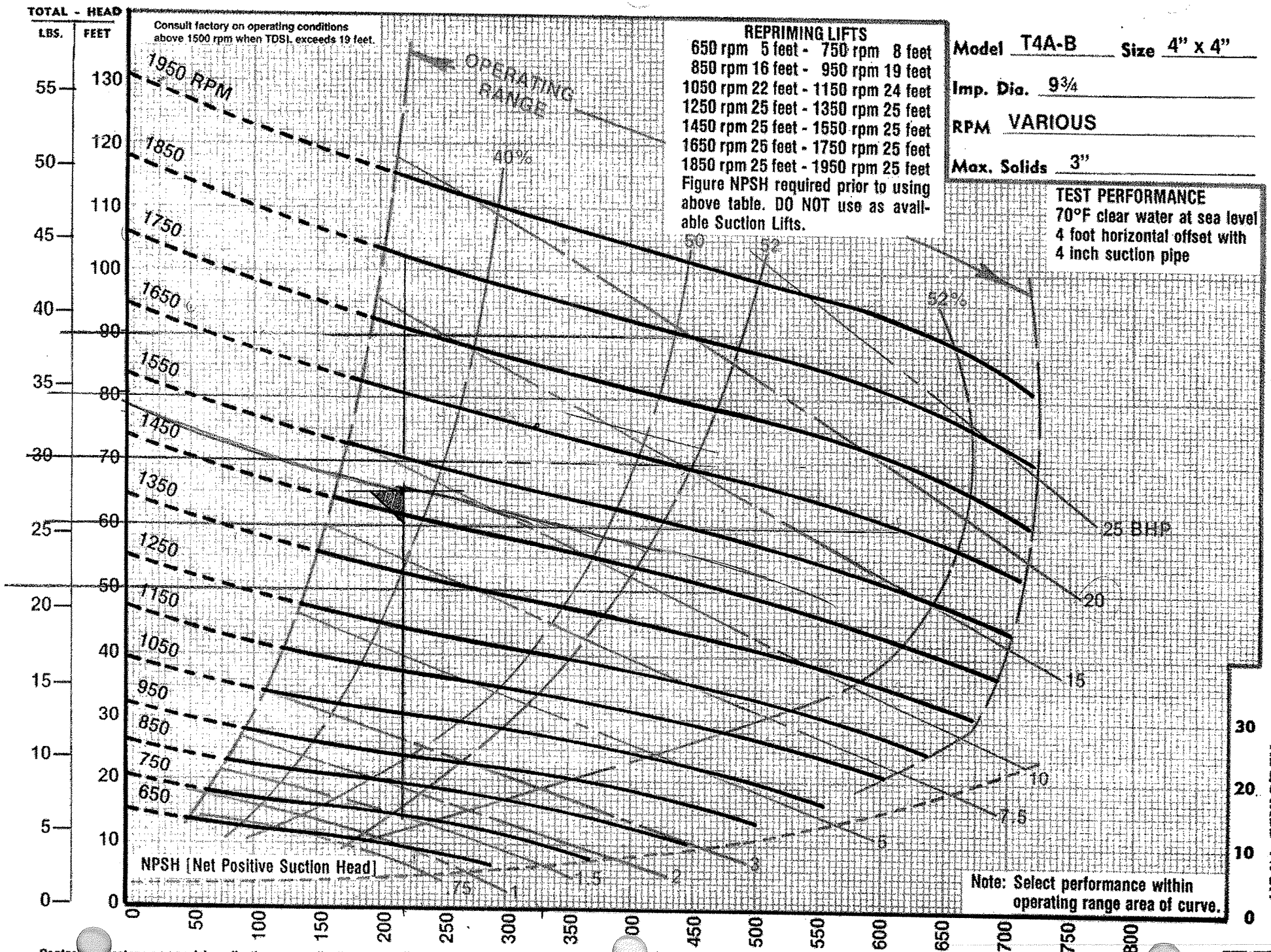
REPRIMING LIFTS

650 rpm 5 feet - 750 rpm 8 feet
850 rpm 16 feet - 950 rpm 19 feet
1050 rpm 22 feet - 1150 rpm 24 feet
1250 rpm 25 feet - 1350 rpm 25 feet
1450 rpm 25 feet - 1550 rpm 25 feet
1650 rpm 25 feet - 1750 rpm 25 feet
1850 rpm 25 feet - 1950 rpm 25 feet

Figure NPSH required prior to using above table. DO NOT use as available Suction Lifts.

Model T4A-B Size 4" x 4"
Imp. Dia. 9¾
RPM VARIOUS
Max. Solids 3"

TEST PERFORMANCE
70°F clear water at sea level
4 foot horizontal offset with
4 inch suction pipe



Contact factory on special applications or applications exceeding priming or other performance limitations indicated.
For Pump Performance Certification Apply to the Company.

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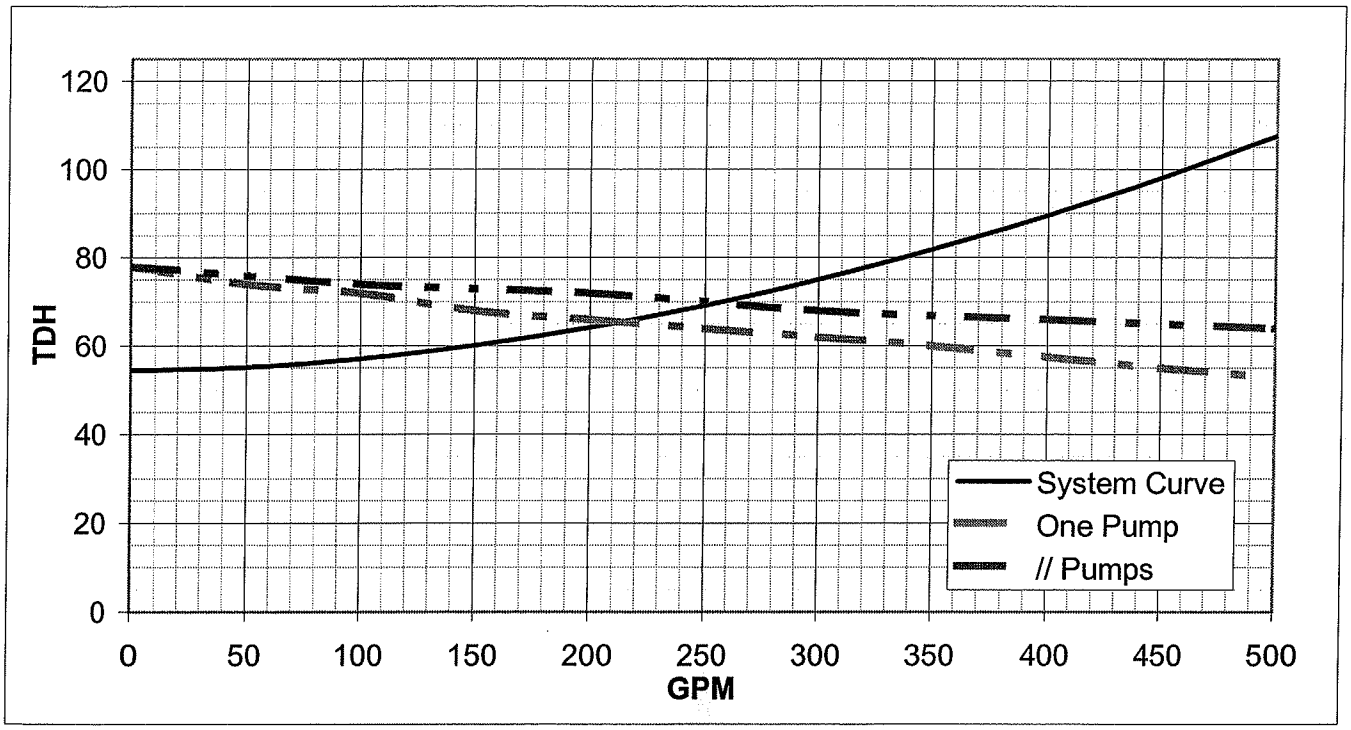
Pump Station System Performance

Project: Loudoun DGS Pump Station
Project No: 21831-201

Prepared by: Al Williams
Prepared on: July 26, 2004
Date Revised: October 21, 2004

Force Main Head Loss

Description	Value	Units	Notes
Force Main "c" Value	110		(Hazen Williams)
Force Main Diameter	6	in	
Flowrate	217	gpm	250/65 & 750/100
Velocity	*2.47*	fps	
Force Main Length	1,552	ft	
Force Main Friction Loss	*9.35*	ft	
Force Main Discharge	378	ft	
Pump Station LWL	323.3	ft	
System Static Head	*54.44*	ft	
Total Dynamic Head	65.81	ft	



Click here to go to table from which the above curves are created.

Force Main Retention Time

Description	Value	Units	Notes
Daily Flowrate	76,750	gpd	
Force Main Volume	*2,279*	gals	
Force Main Retention Time	0.71	hours	

Discharge Side Fitting Friction Losses			
FittingLoss Fittings		Qty	Head Loss
1	Full Open GV	1	3.48
2	1/3 Sudden Enl	1	3.48
3	1/4 Sudden Contraction		
4	1/2 Sudden Contraction		
5	3/4 Sudden Contraction		
6	45° Elbow	10	75.99
7	Ordinary Entrance		
8	Doubling Enlargement		
9	LR 90° Bend		
10	Tee (Run)	2	22.12
11	MR 90° Bend		
12	Tee (Run Reduced 1/4)		
14	Quadrupling Enlargement		
15	90° Bend	4	65.25
16	Tee (Run Reduced 1/2)		
17	1/4 Closed GV		
18	Square Elbow		
19	Tee (Branch)	1	34.13
20	180° Bend		
21	Full Open Swin	1	40.21
22	Full Open AV		
23	1/2 Closed GV		
24	Full Open Globe Valve		
25	3/4 Closed GV		
	Other		
6"	Equivalent Length		*244.65*

Wastewater Pump Station Calculations

Project: Loudoun DGS Pump Station
Project No: 21831-201

Prepared by: Al Williams
Prepared on: July 26, 2004
Date Revised: October 21, 2004

Pump Station Capacity

Description	*Value*	*Units*	*Notes*
Average Daily Flowrate	**0.078**	MGD	
Calculated Peak Factor - Option	0.16		Based on $Q_p = 3.5\left(Q_a^{0.807}\right)$
Calculated Peak Capacity	1.500	MGD	
Peak Factor Used	**4.00**		
Design Flowrate	**217**	gpm	

Wet Well Sizing

Description	*Value*	*Units*	*Notes*
Wetwell Diameter	**8.00**	feet	
Minimum Pump Cycle	**15**	min	
Unit Volume	376	gal/ft	
Wet Well Drawdown Volume	-	gal	Based on $V = \frac{TP}{4}$
Minimum Flowrate (VFD Operation)	**-**	gpm	
Minimum Operating Depth	-	ft	

Control Settings

100-year Flood Plain Elevation	**n/a**	ft	From FEMA Maps
Top of Wet Well	**340.00**	ft	From Site Survey
Lowest Invert In	**327.00**	ft	0 feet of safety included
High Level Alarm	326.25	ft	**0.75' Below Influent Line**
Lag Pump On	325.50	ft	**0.75' Below High Level Alarm**
Lead Pump On	324.75	ft	**0.75' Below Lag Pump On**
Both Pumps Off	323.25	ft	**1.50' Below Both Pump Off**
Pump entrance diameter	**6.00**	inches	
Minimum Submergence	1.21	ft	H.I. Stds: $S=(1+2.3F)D$ where $F=v(gD)^{-0.5}$
Suction Entrance Elevation	321.25	ft	**2.00' Below Both Pump Off**
Wetwell Floor	320.25	ft	**12" Below Suction Entrance**
Depth of Wet Well	**19.75**	ft	6

Pump Station Head Loss - Discharge Side

Description	*Value*	*Units*	*Notes*
Pump Station Pipe Diameter	**6**	inch	
Pump Station Pipe "c" value	**110**		(Hazen-Williams)
Equivalent Length of Fittings	244.65	ft	From Fitting Friction Loss Table at Right
Straight Pipe Quantity	**20**	ft	
Total Equivalent Length	264.65	ft	
Pump Station Head Loss	1.59	ft	

Net Positive Suction Head Calculations

Project: Loudoun DGS Pump Station
Project No: 21831-201

Prepared by: Al Williams
Prepared on: July 26, 2004
Date Revised: October 21, 2004

SUCTION LIFT

Description	Value	Units	Notes
LWL	323.25	ft	From PS Calcs
Pump Suction C/L	**342.13**	ft	From Plans
Static (LWL to Pump)	18.88	ft	
Suction Pipe Diameter	**6**	in	
"c" Factor	**110**		
Length of Suction Pipe	21	ft	From Plans - Enter 0 if Submersible
Equivalent Length of Fittings	49	ft	From Fitting Friction Loss Table at Right
Total Equivalent Length	71	ft	
Suction Line Friction	0.43	ft	
SUCTION LIFT	*19.30*	ft	

NPSH VERIFICATION

Description	Value	Units	Notes
Site Elevation	**339**	ft AMSL	From Site Plan - Grade Adjacent to Wetwell
NPSHa at Site Elevation	33.57	ft	Interpolated From Air Properties Table
Total Suction Lift	19.30	ft	
Vapor Pressure 74° Liquid	**1.00**	ft	By Gorman-Rupp
Safety Factor	**2.00**	ft	By Gorman-Rupp
NPSHa for Design	11.27	ft	
NPSHr for Design	**4.00**	ft	From Pump Curve
NPSH EXCESS	**7.27**	ft	Okay

REPRIME LIFT

Description	Value	Units	Notes
Reprime Lift Available	**25.00**	ft	From Manufacturer's Information
Reprime Lift Required	*17.38*	ft	**Okay**

Buoyancy Calculations

Project: Loudoun DGS Pump Station
Project No: 21831-201

Prepared by: Al Williams
Prepared on: July 26, 2004
Date Revised: October 21, 2004

Wet Well Buoyancy

Description	Value	Units	Notes
Outer Diameter	**9.0**	ft	
Inner Diameter	8.0	ft	
Depth	19.8	ft	
Concrete Volume	264	ft^3	
Wetwell Weight	38,236	lb	Based on 145 lb/ft^3
Displaced Volume	1,256	ft^3	
Buoyancy Force	78,402	lb	
Buoyant Weight of Wetwell	-40,166	lbs	Wetwell is buoyant

Base Buoyancy Credit

Description	Value	Units	Notes
Base Diameter	**10.0**	ft	
Base Thickness	**0.5**	ft	
Concrete / Displaced Volume	39	ft^3	
Base Weight	5,694	lb	Based on 145 lb/ft^3
Buoyancy Force	2,450	lb	
Buoyant Weight of Base	3,244	lb	
Buoyant Weight of Structure	*-36,922*	lb	**Structure is buoyant without soil**

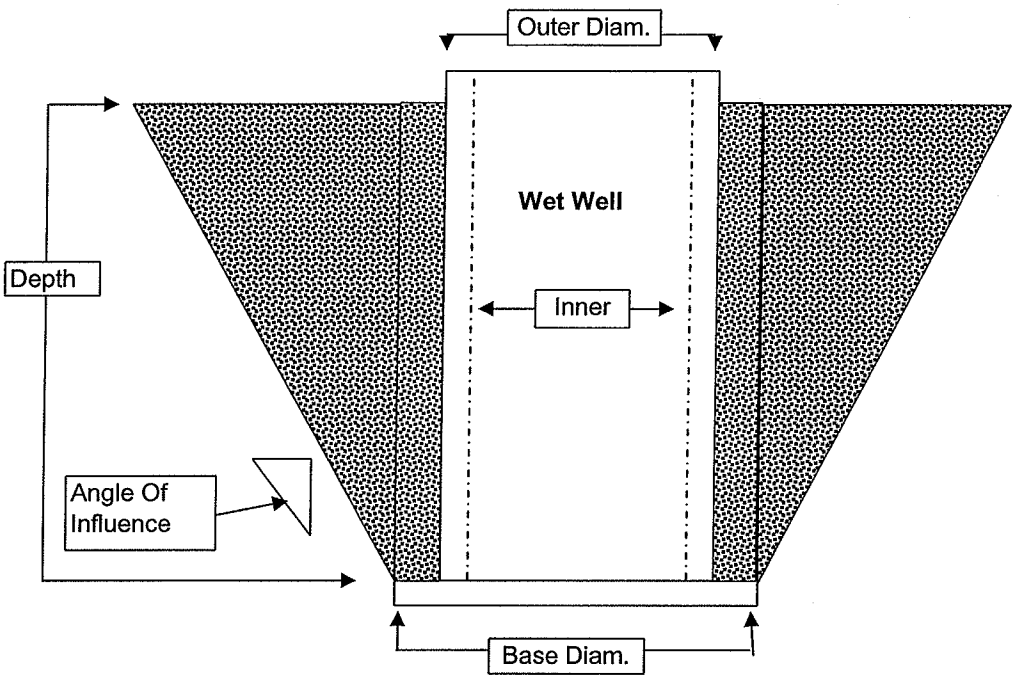
Soil Impact

Description	Value	Units	Notes
Angle of Influence	**15.0**	degrees	
Angle of Influence	0.262	radians	
Top of Triangle	4	ft	
Top Diameter	19	ft	
Bottom Diameter	10	ft	
Saturated Soil Density	**110.0**	lb/ft^3	From Geotechnical Report / Estimate
Depth of Soil above Base	**16.3**	ft	
Volume of Soil	1,677	ft^3	/olume of Soil (frustrum of cone, less wetwell
Buoyant Weight of Soil	79,803	lb	

Buoyancy Float Check

Description	Value	Units	Notes
Total Difference	**42,881**	lb	Structure is not buoyant with soil

Buoyancy Calculations

Project: Loudoun DGS Pump Station
Project No: 21831-201

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