

## Seaford WWTF Influent Pump Station Calculations

### Peak Design Flow

Q= 8,400,000 GPD

### Peak Design Flow (Qp) \*

Peak Flow (GPM) =

Qp= 5830 GPM

### Forcemain Sizing Required for 2.5 FPS

$D = 0.175 * (Qp * 0.1334 * 100/2.5)^{0.5}$

D (in.)= 30.9 INCHES

### Pipe Diameter- PVD DR 18 Force Main

Velocity @ Design V (FPS) =

18

24 inch ID

7.33

4.12 fps

← Velocity with max flow

### Pipe Diameter- Discharge D.I.

Velocity @ Design V (FPS) =

12 inch ID

4.12 fps

← Flow is divided by 4. Each Suction Pipe handles 1/4 the Peak Flow

### System Head

High Point = 19.15 Grit Structure MWL

Pump Off = -7.50 Maintain Level Elevation

Static Head = 26.65 FT

## Seaford WWTF Influent Pump Station Calculations

### Suction Pipe

10 inch pipe	Num.	Eq. Length	Head Loss
90° bend	1	26	26
45° bend	0	13	0
tee	0	17	0
tee (cross)	0	51	0
reducer	1	15	15
check valve	0	65	0
gate valve	1	6	6
wye	0	13	0
pipe		-	7
			<b>54</b>

### Discharge Pipe

12 inch pipe	Num.	Eq. Length	Head Loss
90° bend	1	32	32
45° bend	1	15	15
tee	0	20	0
tee (cross)	0	60	0
reducer	0	18	0
check valve	1	80	80
gate valve	1	7	7
wye	0	15	0
pipe		-	39
			<b>173</b>

### Discharge Pipe- After Reducer

18 inch pipe	Num.	Eq. Length	Head Loss
90° bend	1	50	50
45° bend	1	21	21
tee	3	29	87
tee (cross)	1	87	87
reducer	1	27	27
check valve	0	125	0
gate valve	1	10	10
wye	0	21	0
pipe		-	11
			<b>293</b>

### Discharge Pipe (Meter Neck)

16 inch pipe	Num.	Eq. Length	Head Loss
90° bend	2	44	88
45° bend	0	19	0
tee	1	26	26
tee (cross)	1	78	78
reducer	2	24	48
check valve	0	110	0
gate valve	0	9	0
wye	0	19	0
pipe		-	7
			<b>247</b>

### Forcemain- After Manifold

18 inch pipe	Num.	Eq. Length	Head Loss
90° bend	2	50	100
45° bend	0	21	0
tee	1	29	29
tee (cross)	0	87	0
reducer	1	27	27
check valve	0	125	0
gate valve	1	10	10
wye	0	21	0
pipe		-	65
			<b>231</b>

## Seaford WWTF Influent Pump Station Calculations

### Forcemain- After Reducer in Vertical

24 inch pipe	Num.	Eq. Length	Head Loss
90° bend	3	67	201
45° bend	0	30	0
tee	1	42	42
tee (cross)	1	126	126
reducer	1	33	33
check valve	0	155	0
gate valve	0	15	0
wye	0	25	0
pipe			25
			<b>427</b>

use C = 130

### Hazen - Williams for friction loss:

$$h = 10.44 * L_e * ((gpm)^{1.85}) / (C^{1.85} * D^{4.8655})$$

For Peak Design Flow Qp= **5830** GPM

h1=	8.74	FEET (Suction)	Quadplex- Divide Flow by 4
h2=	14.24	FEET (Discharge)	
h3=	4.06	FEET (Meter Neck)	
h4=	3.12	FEET (Forcemain)	
h5=	0.26	FEET (Velocity-24")	
Static =	26.65		
TDH =	<b>57.07</b>	FEET	

## Seaford WWTF Influent Pump Station Calculations

Pump Selection = Flygt NT 3153

GPM	h1	h2	h3	h4	h5	Static Head	Total
0	0.00	0.00	0.00	0.00	0.00	26.65	26.65
400	0.06	0.10	0.03	0.02	0.00	26.65	26.86
800	0.22	0.36	0.10	0.08	0.00	26.65	27.42
1300	0.54	0.89	0.25	0.19	0.01	26.65	28.54
1450	0.67	1.09	0.31	0.24	0.02	26.65	28.96
1700	0.89	1.46	0.42	0.32	0.02	26.65	29.76
2000	1.21	1.97	0.56	0.43	0.03	26.65	30.85
2450	1.76	2.86	0.82	0.63	0.05	26.65	32.76
2800	2.25	3.67	1.05	0.80	0.06	26.65	34.47
3200	2.88	4.69	1.34	1.03	0.08	26.65	36.67
3600	3.58	5.84	1.66	1.28	0.10	26.65	39.11
4000	4.35	7.09	2.02	1.55	0.12	26.65	41.79
4400	5.19	8.46	2.41	1.85	0.15	26.65	44.72
4800	6.10	9.94	2.83	2.17	0.18	26.65	47.87
5200	7.07	11.53	3.29	2.52	0.21	26.65	51.26
5600	8.11	13.22	3.77	2.89	0.24	26.65	54.88
5830	8.74	14.24	4.06	3.12	0.26	26.65	57.07
6230	9.88	16.10	4.59	3.52	0.30	26.65	61.04
6630	11.08	18.07	5.15	3.95	0.34	26.65	65.24
7030	12.35	20.13	5.74	4.41	0.38	26.65	69.66
7430	13.68	22.30	6.36	4.88	0.43	26.65	74.30
7830	15.08	24.58	7.01	5.38	0.48	26.65	79.16

## Seaford WWTF Influent Pump Station Calculations

**\*\*Duplex-** Each pump pumps 1/2 the flow in Suction and Discharge pipe then flow combines

h1	h2	Total
0.00	0.00	<b>26.65</b>
0.02	0.04	<b>26.76</b>
0.06	0.15	<b>27.05</b>
0.15	0.37	<b>27.63</b>
0.18	0.45	<b>27.85</b>
0.25	0.60	<b>28.26</b>
0.33	0.82	<b>28.82</b>
0.49	1.19	<b>29.82</b>
0.62	1.52	<b>30.70</b>
0.80	1.95	<b>31.84</b>
0.99	2.42	<b>33.11</b>
1.21	2.94	<b>34.50</b>
1.44	3.51	<b>36.02</b>
1.69	4.13	<b>37.65</b>
1.96	4.78	<b>39.41</b>
2.25	5.49	<b>41.29</b>
2.42	5.91	<b>42.42</b>
2.74	6.68	<b>44.49</b>
3.07	7.50	<b>46.67</b>
3.43	8.36	<b>48.96</b>
3.80	9.26	<b>51.37</b>
4.18	10.20	<b>53.89</b>

**\*\*Triplex-** Each pump pumps 1/3 the flow in Suction and Discharge pipe then flow combines

h1	h2	Total
0.00	0.00	<b>26.65</b>
0.01	0.03	<b>26.74</b>
0.03	0.11	<b>26.97</b>
0.07	0.26	<b>27.44</b>
0.09	0.32	<b>27.62</b>
0.12	0.43	<b>27.96</b>
0.16	0.58	<b>28.41</b>
0.23	0.85	<b>29.22</b>
0.29	1.09	<b>29.94</b>
0.38	1.39	<b>30.86</b>
0.47	1.73	<b>31.89</b>
0.57	2.10	<b>33.02</b>
0.68	2.51	<b>34.25</b>
0.80	2.95	<b>35.58</b>
0.93	3.42	<b>37.01</b>
1.06	3.92	<b>38.54</b>
1.14	4.22	<b>39.46</b>
1.29	4.78	<b>41.13</b>
1.45	5.36	<b>42.91</b>
1.62	5.97	<b>44.77</b>
1.79	6.62	<b>46.73</b>
1.98	7.29	<b>48.78</b>

**\*\*Quadplex-** Each pump pumps 1/4 the flow in Suction and Discharge pipe then flow combines

h1	h2	Total
0.00	0.00	<b>26.65</b>
0.00	0.03	<b>26.74</b>
0.02	0.11	<b>26.96</b>
0.04	0.26	<b>27.41</b>
0.05	0.32	<b>27.59</b>
0.07	0.43	<b>27.91</b>
0.09	0.58	<b>28.35</b>
0.14	0.85	<b>29.12</b>
0.17	1.09	<b>29.82</b>
0.22	1.39	<b>30.71</b>
0.28	1.73	<b>31.70</b>
0.33	2.10	<b>32.79</b>
0.40	2.51	<b>33.97</b>
0.47	2.95	<b>35.25</b>
0.54	3.42	<b>36.63</b>
0.62	3.92	<b>38.10</b>
0.67	4.22	<b>38.99</b>
0.76	4.78	<b>40.60</b>
0.85	5.36	<b>42.31</b>
0.95	5.97	<b>44.10</b>
1.05	6.62	<b>45.99</b>
1.16	7.29	<b>47.96</b>

**Seaford WWTF Influent Pump Station Design Pump Curve Data**

Simplex	
Flugt NT 3153 Pump	
GPM	TDH (ft)
0.0	89.0
200.0	81.0
400.0	74.0
600.0	67.0
800.0	61.0
1000.0	53.0
1200.0	48.0
1400.0	41.0
1600.0	34.0
1800.0	26.0
2000.0	17.0
2100.0	13.0

Duplex	
Flugt NT 3153 Pump	
GPM	TDH (ft)
0.0	89.0
400.0	81.0
800.0	74.0
1200.0	67.0
1600.0	61.0
2000.0	53.0
2400.0	48.0
2800.0	41.0
3200.0	34.0
3600.0	26.0
4000.0	17.0
4200.0	13.0

Triplex	
Flugt NT 3153 Pump	
GPM	TDH (ft)
0.0	89.0
600.0	81.0
1200.0	74.0
1800.0	67.0
2400.0	61.0
3000.0	53.0
3600.0	48.0
4200.0	41.0
4800.0	34.0
5400.0	26.0
6000.0	17.0
6300.0	13.0

Quadplex	
Flugt NT 3153 Pump	
GPM	TDH (ft)
0.0	89.0
800.0	81.0
1600.0	74.0
2400.0	67.0
3200.0	61.0
4000.0	53.0
4800.0	48.0
5600.0	41.0
6400.0	34.0
7200.0	26.0
8000.0	17.0
8400.0	13.0



Seaford WWTF Influent Pump Station Design Pump Curve VFD Data

60 HZ

Flygt NT 3153 Pump	
GPM	TDH (ft)
0.00	89.00
200.00	81.00
400.00	74.00
600.00	67.00
800.00	61.00
1000.00	53.00
1200.00	48.00
1400	41
1600.00	34.00
1800.00	26.00
2000.00	17.00

55 HZ

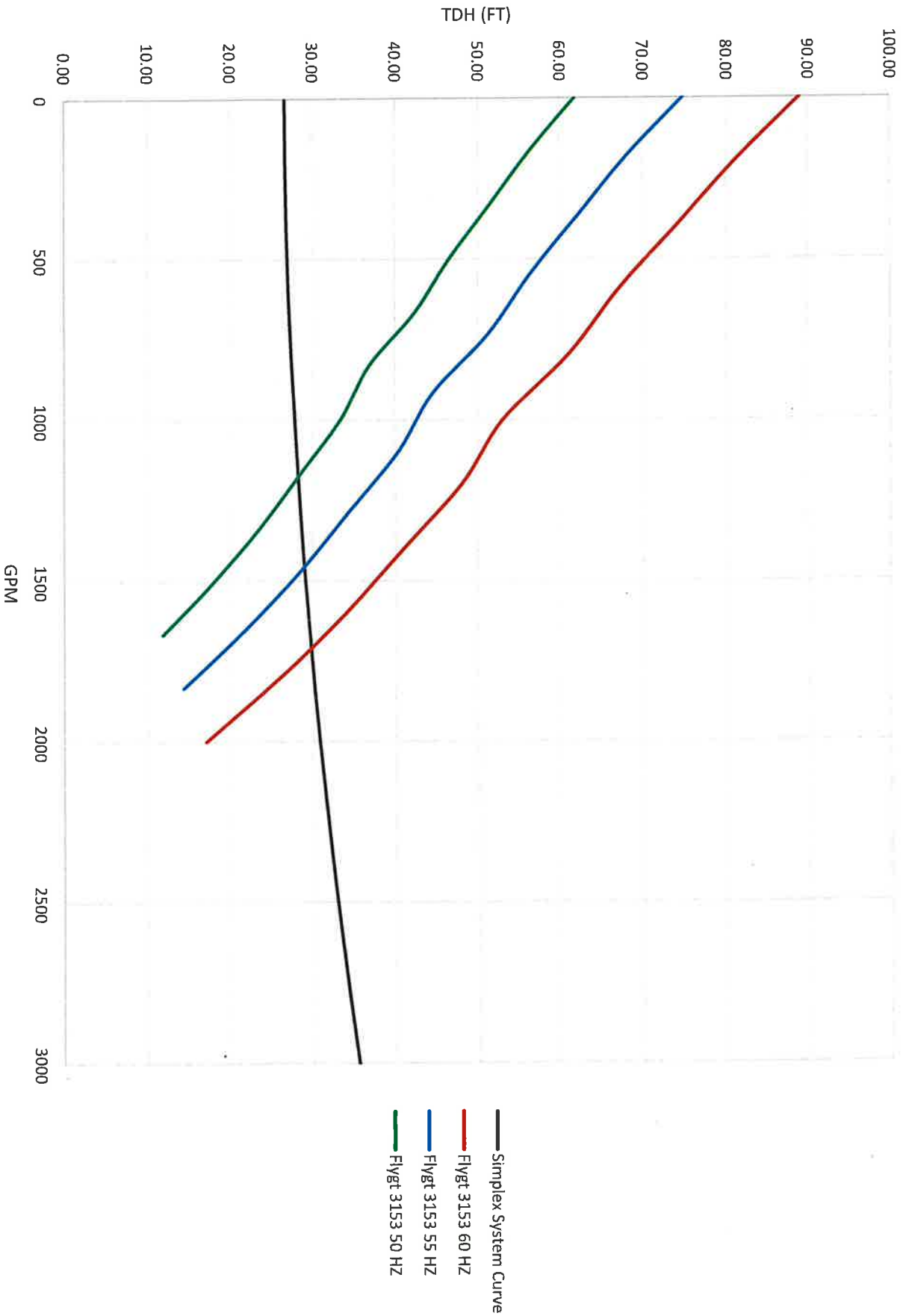
Flygt NT 3153 Pump	
GPM	TDH (ft)
0.00	74.78
183.33	68.06
366.67	62.18
550.00	56.30
733.33	51.26
916.67	44.53
1100.00	40.33
1283.33	34.45
1466.67	28.57
1650.00	21.85
1833.33	14.28

50 HZ

Flygt NT 3153 Pump	
GPM	TDH (ft)
0.00	61.81
166.67	56.25
333.33	51.39
500.00	46.53
666.67	42.36
833.33	36.81
1000.00	33.33
1166.67	28.47
1333.33	23.61
1500.00	18.06
1666.67	11.81



# VFD Pump Curve



## Seaford WWTF Influent Pump Station Calculations

### Usable Volume Calculation

	Level Depth (ON)	Level Depth (OFF)
	6.5	3
Gross Volume =		
in CF	567.0	181.6
in GAL	4,241	1,358
		Net Usable Wet Well Volume
		2,883 gal

Note: Depth is relative to bottom of wet well which is Elev. -13.4. The appropriate volume of the Grout Wedge was removed from each volume calculation, respectively. The grout wedge has a volume of 207.35 CF

Pump Station Design Data: Seaford WWTF Wet Well Sizing Criteria

Tmin= 6.9 minutes

### Average Daily Flow

Qp= 1,700 GPM  
2,448,000 GPD

### WET WELL DESIGN CALCULATIONS:

#### Wet Well Volume (Vmin)

$$V_{min} (GAL) = (T_{min} * Q_p) / 4$$

Vmin = 2,933 GAL, 392 CF

## Seaford WWTF Influent Pump Station Calculations

### Usable Volume Calculation

	Level Depth (ON)	Level Depth (OFF)
	8	3
Gross Volume =		
in CF	745.7	181.6
in GAL	5,578	1,358
Net Usable Wet Well Volume		
	4,220 gal	

Note: Depth is relative to bottom of wet well which is Elev. -13.4. The appropriate volume of the Grout Wedge was removed from each volume calculation, respectively. The grout wedge has a volume of 207.35 CF

Pump Station Design Data: Seaford WWTF Wet Well Sizing Criteria

Tmin= 6 minutes

#### Average Daily Flow

Qp= 5,830 GPM  
8,395,200 GPD

#### WET WELL DESIGN CALCULATIONS:

##### Wet Well Volume (Vmin)

$$Vmin (GAL) = (Tmin * Qp) / 4$$

Vmin = 8,745 GAL, 1169 CF

## Seaford WWTF Influent Pump Station Calculations

### Wet Well Volume

	Level Depth (ON)	
	8.5	
Gross Volume =		
in CF	805.3	
in GAL	6,023	

Note: Depth is relative to bottom of wet well which is Elev. -13.4. The volume of the Grout Wedge was removed from the volume calculation. The grout wedge has a volume of 207.35 CF

### Wet Well Detention Time (ADF)

Q (ADF)	2083	gpm
Detention Time (Volume/Q)	2.89	min