M. A. Day Engineering, PC

3 Van Wyck Lane
Suite 2
Wappingers Falls, New York 12590
Phone: 845-223-3202
Fax: 845-223-3206

Engineering Report for the Water Supply System

for the

Summit Woods Subdivision

175-Unit Single-Family Residential Project

Town of East Fishkill
Dutchess County, New York

Report Prepared for:

ABD Fishkill, LLC
1995 Broadway – Suite 1200
New York, New York 10023

July 20, 2008
Revised: May 8, 2010

1.0 Purpose:

The purpose of this report is to address the design of the proposed water supply, treatment and storage system for the "Summit Woods" 175-unit detached single-family residential project proposal. The proposed water supply system will serve the proposed 175-unit residential project located on NYS Route 52 in the Hamlet of Stormville, in the Town of East Fishkill, Dutchess County, New York.

2.0 Background:

The project involves the development of a 325-acre parcel into a 175-unit detached unit, single family residential project to be called "Summit Woods". The project is located on the south side of NYS Route 52 in the Hamlet of Stormville, in the Town of East Fishkill, Dutchess County, New York.

The project is currently undeveloped. A central water supply system is proposed to serve the site. Three new wells were installed on the site and yield tests have been completed as part of the Hydrogeological Analysis included in the appendices of this DEIS. Test data indicates that the wells can provide a minimum yield of 63 gallons per minute. The following is a summary of the well data:

	Well #1:	**Well #2:**	**Well #3:**
Depth of Well	425'	500'	400'
Depth of Casing	50'	70'	62'
Diameter of Casing	6"	6"	6"
Stabilized Yield	63 gpm	Not Used	65 gpm

Hydrogeological testing was done on these wells by Legette, Brashears and Graham and the report was previously submitted. During the hydrogeological for these wells, it was determined that there is a slight interconnection between well #1 and well #2. Therefore, the yield for well #2 has not been considered.

In March of 2009, a fourth production well (Well #4) was installed by Tompkins Well Drilling. The well was drilled to a depth of 300 feet below existing grade and completed using a 6" diameter steel well casing. This well was analyzed by Ground Water Investigations (GWI) and their findings were placed in a report dated April, 2010. The study prepared by GWI has been included at the end of this report.

It has been anticipated that the approximately 85,300 gallons of water will be required to meet average daily demand for the project site. This is based on 175 lots x 3.75 bedrooms per lot x 130 gallons per day per bedroom.

Permanent underground lawn and garden sprinkler systems will be prohibited by deed restrictions.

The hydrogeological report states that a conservative recharge estimate of between 118,200 and 137,900 gpd could be expected during extreme drought conditions for the bedrock aquifer underlying the site.

As stated earlier, the average daily flow requirements for the 175-unit project is equal to approximately 85,300 gallons per day or 59 gallons per minute. Since the average daily flow demand is met with the largest well out of service, a third well is not required.

Chemical analyses were conducted on samples taken from wells #1 and #3 immediately after the pump test was completed. These samples were analyzed for parameters specified in the NYSDOH Sanitary Code, Part 5, Subpart 5-1. In addition wells #1 and #2 are located within 200 feet of a surface-water body which required the wells to be sampled for microparticulate analysis (MPA) to determine if the wells are under the influence of nearby surface water. *All tests were acceptable with the exception of radium 226 and 228. These parameters will be retested before the final water system design is submitted to the Dutchess County Health Department and the New York State Department of Health. Any treatment required at that time will be submitted as part of the design of the final water treatment facility design.*

MPA testing was completed for Well #4 by GWI. The results of which indicate that at the well is not under the influence of groundwater. See the analyses in the accompanying report.

The results of the original well tests are included in the Appendices of the 72-hour pump test included in the appendix of the LBG report. The results of the 72-hour pump test for Well #4 are included in the appendices of the GWI report.

3.0 Design Parameters:

3.1 Water Demand Data:

As stated previously, the proposed water supply system will serve 175 single-family residential subdivision. The system shall be designed to serve 487.5 gallons per day of domestic flow per residence.

3.1.1 Average Daily Demand:

Average Daily Demand = 175 units x 487.5 GPD/house ≈ 85,300 gpd ≈ 60 gpm

3.1.2 Maximum Daily Demand:

Maximum Daily Demand = 2 x 85,300 gpd = 170,600 gpd ≈ 120 gpm. This complies with the Ten States Standards since the MDD can be met if the largest well (Well #3) is out of service. The remaining two wells can provide 63 gpm each.

3.1.3 Peak Hourly Demand:

Peak Hourly Demand = 85,300 gpd x 6 (peaking factor) = 511,800 gpd ≈ 355 gpm

3.2 Wells and Well Pump Selection:

Based on the fact that the remaining two wells can meet the anticipated average daily demand with the largest well (Well #3) out of service, it is concluded that the well capacity is adequate.

Refer to figure one on the following page for the hydraulic analysis.

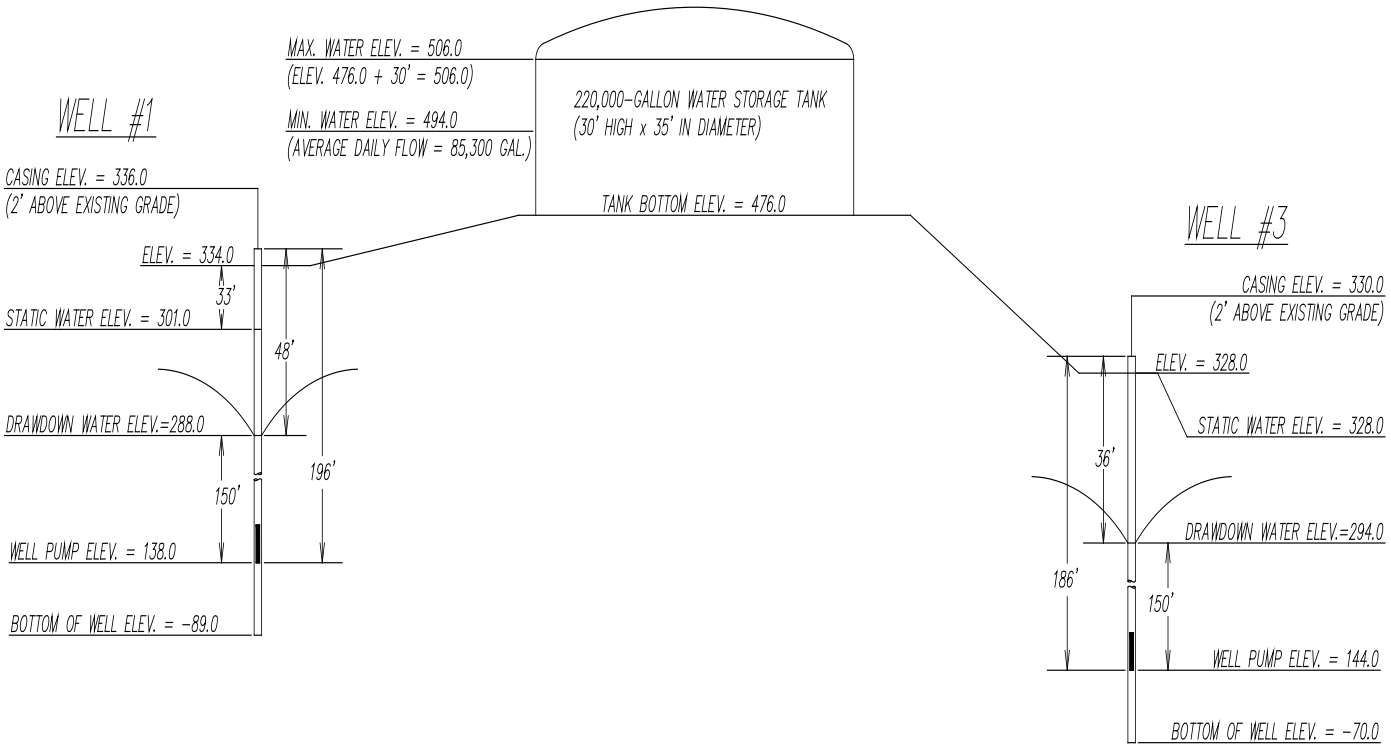


Figure 1 - Well-to-Tank Schematic

For purposes of well pump selection, it is assumed that the well pumps will have to overcome a "worst-case" head of approximately 365'. This is based on the following:

1) The well pump in Well #3 has failed.
2) The well pump in Well #1 shall be set 196' down the well (elev. = 138').
3) The static water level in Well #1 was measured to be at elevation 301'.
4) The top of the storage tank (fill line) is set to elevation 506'.
5) Under worst-case conditions, the dynamic water elevation shall be 10' above Well #1 well pump (elev. = 148').
6) It is estimated that the friction head from the well pump line to the proposed pump house shall be approximately 6' based on a proposed 4" diameter well pump line for approximately 2000 lineal feet. There will be an additional head loss of approximately 0.5 feet from the proposed pump house to the proposed atmospheric storage tank based on 3,440 lineal feet of 8" PVC water line. Therefore, for purposes of this report assume the friction head to be approximately 7'.

Under static pumping conditions, (best-case) the positive suction head for Well #1 shall be approximately 163'. The static head would then be approximately 205' (506'-301'). Therefore, the TDH for the "best-case" scenario shall be approximately 212' (205'+7').

Under worst-case pumping conditions, the positive suction head shall be 10'. The static head would then be approximately 358' (506'-148')). Therefore, the TDH for the "worst-case" scenario shall be 365' (358'+7').

The well pumps have been selected so as to provide the average daily demand under the system head requirements. The average daily demand has been determined to be approximately 60 gpm as stated earlier herein. This office recommends the use of a 16 stage "Goulds" 7.5 HP submersible well pump (model no. 55GS75) pump in each well. These pumps can provide a minimum flow rate of 53 gpm against a "worse-case" total dynamic head of approximately 365' and a maximum flow rate of 67 gpm against a "best-case" head of 212'.

3.3 Atmospheric Storage Tank Size Selection:

The atmospheric tank size shall be based on the average daily demand plus fire flow capacity. "Ten States" requires that the size of the atmospheric storage tank be at least equal to the average daily demand. Therefore, a 220,000-gallon storage tank is proposed. This will provide 85,300 gallons of storage for the average daily flow component and 134,700 gallons for fire volume component. This will provide 1500 gallons per minute of fire flow volume for 90 minutes. The tank shall be a 35' diameter by 30' high "Aquastore" glass-fused-to steel tank.

3.4 Chlorination System:

Sodium hypochlorite shall be used for disinfection. The system shall consist of two (2) 50-gallon polyethylene crocks ("LMI" - model no. 26350), two (2) chemical feed pumps ("Chem-Tech" - model no. 030) and one (1) anti-siphon valve ("LMI" - model no. 27048) for each chemical feed pump. The system shall be installed so that each well shall be served by a chemical feed pump. The chemical feed pumps shall operate only when their respective well pump operates.

3.5 Hydraulic Design:

As required by "Ten States Standards", the water supply system shall be designed so as to provide a minimum pressure of 35 psi under all conditions at the water main in front of each proposed lot.

The system schematic shall be as follows:

Supply from the two wells shall be pumped via two submersible well pumps into the pump house, metered, chlorinated and sent to the 220,000-gallon atmospheric storage tanks. On demand, supply shall flow from the atmospheric storage tank, by gravity, to distribution.

3.5.1 System Head:

Proposed lot #128 is the lot at the highest elevation in the subdivision. As currently proposed the first floor of the lot is set at about elevation 430. The elevation at the

roadway is 412. Therefore, the water main at the street is at elevation 407'. Under worst case conditions (the elevation in the water tank drops to elevation 494), the pressure in the water main in front of lot 128 would be approximately 38 psi ((494'-407')/2.31). The best case scenario would be when the water level in the tank is at elevation 506'. The pressure at the main in front of lot 128 would be 42 psi ((506'-407')/2.31).

Lot #19, as currently proposed, is at the lowest elevation in the subdivision. The water main in the street in front of lot 19 will be at elevation 326. Therefore, the best and worst case scenario for this lot would be 78 psi and 73 psi, respectively.

The water supply system, as proposed, will meet the requirements of "Ten States Standards" with respect to system pressures.

3.6 System Controls:

3.6.1 Storage Tanks:

The water level in the 220,000-gallon storage tank shall be controlled by use of a level sensor that shall be installed in the supply line of the storage tank. The sensors shall determine the level in the water tank by static pressure in the water line. If needed the well pumps will operate in a lead and lag sequence until the tank is full.

4.0 Maintenance and Ownership:

The owner has agreed to set up a Homeowner's Association which will own and maintain the water supply system for the proposed subdivision.

Section 2.1

Water Supply System Construction Specifications

1.0 Pump House Specifications:

1.1 Well Pumps:

This office recommends the use of a 16 stage "Goulds" 7.5 HP submersible well pump (model no. 55GS75) pump in each well. These pumps can provide a minimum flow rate of 53 gpm against a “worse-case” total dynamic head of approximately 365’ and a maximum flow rate of 67 gpm against a “best-case” head of 212’.

The pumps shall be 3 phase, 230 volts.

The pump shall have a minimum capacity of 60 GPM against a total dynamic head of 365 feet. The maximum working pressure shall be 125 PSI. The maximum working temperature shall be 212 degrees. The rotation shall be right hand when viewed from motor end.

The motor shall be a 7.5 HP, 3 phase, NEMA Standard. The motor shall be protected against water damage. The shaft shall be stainless steel. Overload protection must be provided with starter.

Furnish and install two well pumps (one per well).

GOULDS PUMPS

60 Hz High Capacity 4" Submersible Pumps

MODEL GS

33GS, 40GS, 55GS, 60GS, 75GS, 80GS

SPECIFICATIONS

Model	Flow Range GPM	Horsepower Range	Best Eff. GPM	Discharge Connection	Minimum Well Size	Rotation①
33GS	10 – 50	1 – 10	33	2"	4"	CCW
40GS	20 – 65	1½ – 7½	40	2"	4"	CCW
55GS	20 – 80	1½ – 10	55	2"	4"	CCW
60GS	40 – 80	1½ – 7½	60	2"	4"	CCW
75GS	40 – 100	3 – 10	75	2"	4"	CCW
80GS	50 – 120	3 – 7½	80	2"	4"	CCW

① Rotation is counterclockwise when observed from pump discharge end.

"GS" SERIES MATERIALS OF CONSTRUCTION

Part Name	Material
Discharge Head	AISI 303 SS
Check Valve Poppet	AISI 304 SS
Check Valve Seal/ Seat Assembly	BUNA, FDA compliant, AISI 304 SS
C.V. Retaining Ring	AISI 302 SS
Adapter Ring	AISI 302 SS
Bearing Spider	Glass Filled Engineered Composite
Upthrust Washer	AISI 304 SS, Powder Metal
Bearing	Urethane, FDA compliant
Shaft Retaining Ring	AISI 301 SS
Diffuser	Glass Filled Engineered Composite
Impeller	
Bowl	AISI 304 SS
Intermediate Sleeve①	AISI 304 SS, Powder Metal
Intermediate Shaft Coupling②	AISI 304 SS, Powder Metal
Intermediate Bearing Spider①	Glass Filled Engineered Composite
Intermediate Bearing Spider②	AISI 303 SS
Bearing	Urethane, FDA compliant
Shim	AISI 304 SS
Spacer	AISI 304 SS, Powder Metal
Screws – Cable Guard	AISI 304 SS
Motor Adapter	AISI 303 SS
Casing	AISI 304 SS
Shaft	
Coupling	AISI 304 SS, Powder Metal
Cable Guard	AISI 304 SS
Suction Screen	AISI 304 SS

① and ② – See Repair Part page for where used.

FEATURES

■ **Powered for Continuous Operation:** All ratings are within the working limits of the motor as recommended by the motor manufacturer. Pump can be operated continuously without damage to the motor.

■ **Field Serviceable:** Pump can be rebuilt in the field to like new condition with common tools and readily available spare parts.
NOTE: The Model GS has left hand casing threads.

■ **Sand Resistant Construction:** Field proven over almost four decades, face clearance design and floating impellers for an extremely abrasion resistant configuration.

■ **Stainless Steel Metal Parts:** AISI types 302, 303 and 304 are corrosion resistant, non-toxic and non-leaching.

■ **FDA Compliant Non-Metallic Parts:** Impellers, diffusers and bearing spiders are constructed of a glass filled engineered composite. This material is corrosion resistant and non-toxic.

■ **Discharge Head:** Precision cast 303 stainless steel for superior strength and durability. Cast in loop for safety line.

■ **Motor Adapter:** Precision cast 303 stainless steel is extremely rigid for accurate alignment of liquid end to motor. Generous space for removal of motor mounting nuts with regular open-end wrench.

■ **Bowls:** Stainless steel for strength and abrasive resistance.

■ **Check Valve:** Built in check valve constructed of stainless steel and low compression, FDA compliant, BUNA rubber for excellent abrasive resistance and quiet, efficient operation.

■ **Stainless Steel Casing:** Polished stainless steel is attractive and durable in the most corrosive water.

■ **Hex Shaft Design:** Six sided shafts for positive impeller drive.

■ **Shaft Coupling:** Exposed for ease of field alignment to motor shaft and to check pump rotation.

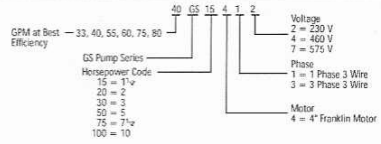
■ **Upthrust Plate:** Factory installed, internal water lubricated thrust bearing to help prevent upthrust damage. Bearing protects internal components if pump is operated beyond maximum recommended capacity.

■ **Urethane Upper and Middle Bearings:** Fluted design for free passage of abrasives and excellent resistance to sand damage.

■ **Franklin Electric Motor:**

- Corrosion resistant stainless steel construction through 10 HP.
- Built-in surge arrestor is provided on single phase motors through 5 HP.
- Stainless steel splined shaft.
- Hermetically sealed windings.
- Replaceable motor lead assembly.
- UL 778 recognized.
- NEMA mounting dimensions.
- Control box is required with 3 wire single phase units.
- Three phase units require a magnetic starter with three leg protection. Magnetic starter and heaters must be ordered separately.

ORDER NUMBER CODE



1

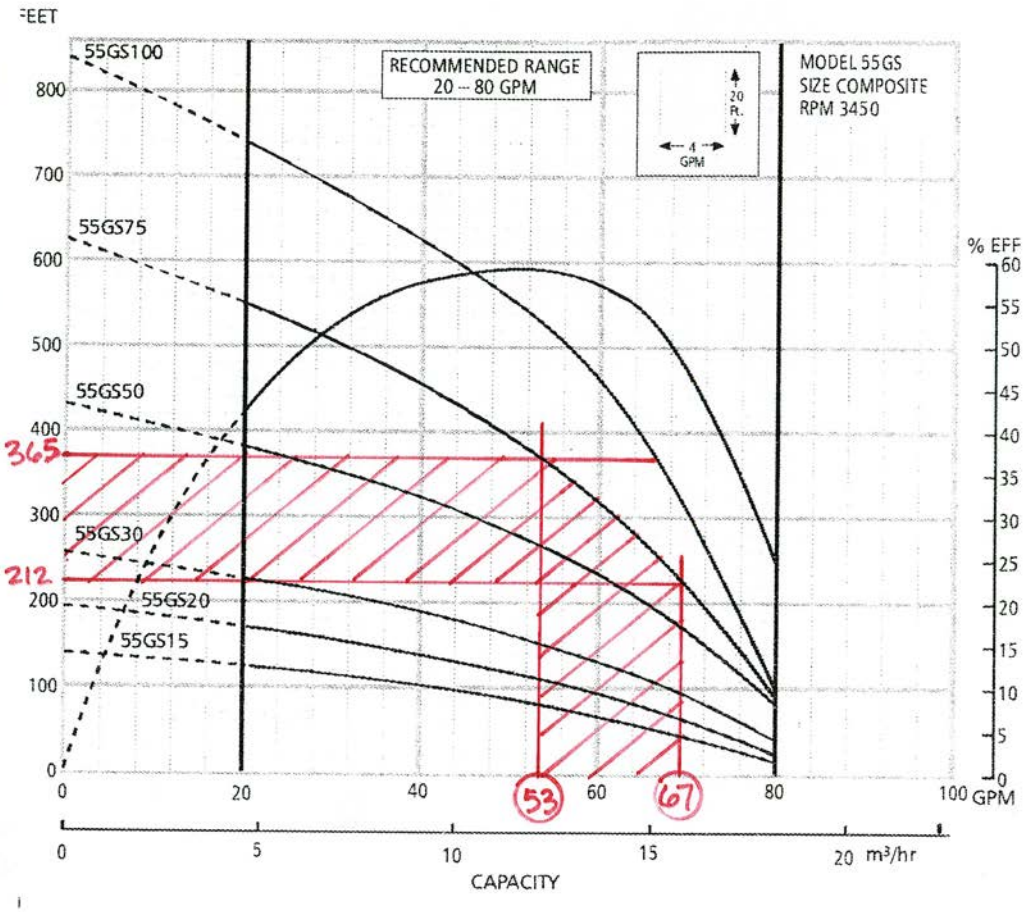
AGENCY LISTINGS

Canadian Standards Association
Classified ANSI/NSF 61-1992

Goulds Pumps is ISO 9001 Registered.

Goulds Pumps

ITT Industries



Pump Curves for a Model 55GS Submersible Pumps

Model 55GS

SELECTION CHART

Horsepower Range 1½ – 5, Recommended Range 20 – 80 GPM, 60 Hz, 3450 RPM

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																									
			20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	
55GS15	1½	0	78	71	64	54	42	24																				
		20	61	51	37																							
		30	49	35																								
		40	32																									
		50																										
		60																										
Shut-off PSI			52	43	35	26	17	9																				
55GS20	2	0		76	71	65	58	50	41	28																		
		20	69	63	56	48	37	24																				
		30	62	55	46	35	21																					
		40	54	45	34																							
		50	43	32																								
		60	29																									
Shut-off PSI			76	67	58	50	41	32	24	15																		
55GS30	3	0		80	76	72	68	63	58	52	44	35																
		20	75	71	67	62	56	49	42	32																		
		30	70	66	61	55	48	40	30																			
		40	65	60	54	47	39	28																				
		50	59	53	46	37	26																					
		60	52	45	36	25																						
Shut-off PSI			102	94	85	76	68	59	50	42	33	24																
55GS50	5	0				80	78	76	73	71	68	65	62	58	55	50	46	40	34	27								
		20		80	77	75	73	70	67	64	61	57	53	49	44	39	32	25										
		30	79	77	75	72	70	67	64	60	57	53	48	43	38	31	24											
		40	77	74	72	69	66	63	60	56	52	47	42	37	30	23												
		50	74	71	69	66	63	59	55	51	47	42	36	29	22													
		60	71	68	65	62	59	55	51	46	41	35	28	20														
Shut-off PSI			178	169	161	152	143	135	126	117	109	100	91	83	74	65	57	48	39	31								

Horsepower Range 7½ – 10, Recommended Range 20 – 80 GPM, 60 Hz, 3450 RPM

Pump Model	HP	PSI	Depth to Water in Feet/Ratings in GPM (Gallons per Minute)																									
			20	60	100	140	180	220	260	300	340	380	420	460	500	540	580	620	660	700	740	780	820	860	900	940	980	
55GS75	7½	0			79	76	73	70	66	62	58	52	46	39	31	22												
		20		78	76	73	69	66	61	57	52	45	38	30	20													
		30	80	77	74	71	67	63	59	54	48	41	33	24														
		40	78	75	72	69	65	61	56	51	44	37	28															
		50	76	73	70	67	63	58	53	47	40	32	23															
		60	75	72	68	64	60	55	50	43	36	27																
Shut-off PSI			261	243	226	209	191	174	157	139	122	105	88	70	53	36												
55GS100	10	0			80	78	76	75	73	71	68	66	63	60	56	51	47	41	35	28								
		20		80	78	76	74	73	70	68	65	62	59	55	51	46	40	33	26									
		30		79	77	75	73	71	69	67	64	61	57	53	48	42	36	29	22									
		40	79	78	76	74	72	70	68	65	62	59	55	50	45	39	32	25										
		50	78	77	75	73	71	69	66	63	60	56	52	47	42	35	28	21										
		60	77	76	74	72	70	67	65	61	58	54	49	44	38	31	24											
Shut-off PSI			353	336	319	301	284	267	250	232	215	198	180	163	146	128	111	94	76	59								

Models 33GS, 40GS, 55GS, 60GS, 75GS, 80GS
Repair Parts

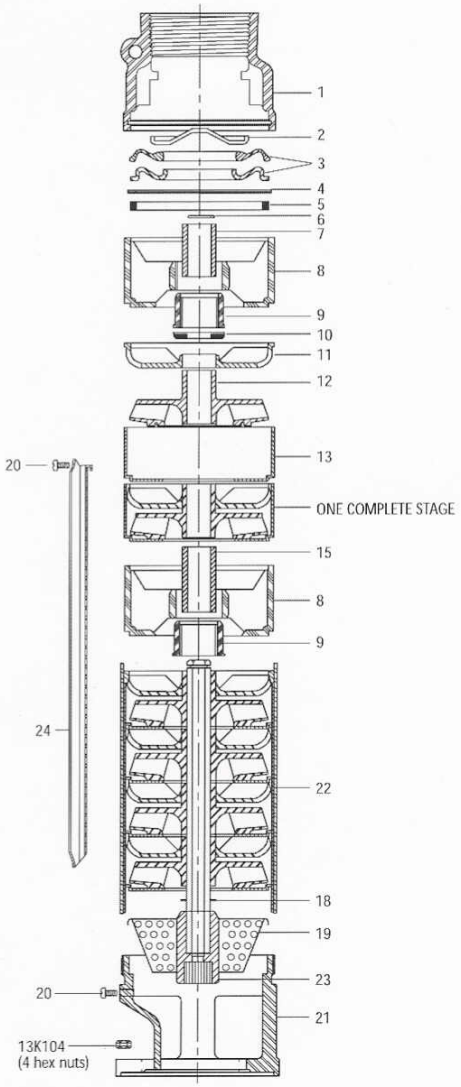
GOULDS PUMPS

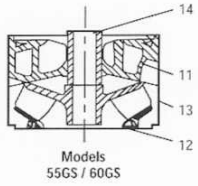
Item No.	Description		Current Models ③					
		HP	33GS	40GS	55GS	60GS	75GS	80GS
	Number of Stages	1	6	—	—	—	—	—
		1½	8	5	5	4	—	—
		2	10	6	7	5	—	—
		3	14	8	9	7	7	5
		5	22 ①	14	15 ①	11 ①	11	9
		7½	34 ②	21 ①	22 ②	17 ①	16	14
		10	44 ②	—	29 ②	—	21 ②	—
1 - 5	Discharge Head Assembly		7K1582	7K1582	7K1582	7K1582	7K1582	7K1582
2	Check Valve Poppet		7K1366	7K1366	7K1366	7K1366	7K1366	7K1366
3	Check valve seal and seat assembly		7K2123	7K2123	7K2123	7K2123	7K2123	7K2123
4	Check valve retaining ring		7K1364	7K1364	7K1364	7K1364	7K1364	7K1364
5	Adapter ring		7K2074	7K2074	7K2074	7K2074	7K2074	7K2074
6	Shaft retaining ring		7K817	7K817	7K817	7K817	7K817	7K817
7	Upper shaft sleeve		7K1571	7K1571	7K1571	7K1571	7K1571	7K1571
8	Bearing spider (upper & some int.) ①		7K1593	7K1593	7K1593	7K1593	—	—
9	Bearing ① ②		7K1594	7K1594	7K1594	7K1594	7K1594	7K1594
10	Upthrust washer		7K1575	7K1575	7K1575	7K1575	7K1575	7K1575
11	Diffuser		7K1590	7K1590	7K1591	7K1591	7K1592	7K1592
12	Impeller		7K1739	7K1587	7K1779	7K1588	7K1787	7K1589
13	Bowl		7K1584	7K1584	7K1585	7K1585	7K1586	7K1586
14	Diffuser shaft sleeve		—	—	7K1571	7K1571	7K1573	7K1573
15	Intermediate shaft sleeve ①		7K1572	7K1572	7K1572	7K1572	—	—
16	Intermediate bearing spider ②		7K2246	—	7K2246	—	7K2246	—
17	Lower shaft retaining ring ②		7K1629	—	7K1629	—	7K1629	—
18	Shim		7K1574	7K1574	7K1574	7K1574	7K1574	7K1574
19	Stainless steel strainer		7K1370	7K1370	7K1370	7K1370	7K1370	7K1370
20	Cable guard screws		13K91	13K91	13K91	13K91	13K91	13K91
21	Motor adapter		7K1363	7K1363	7K1363	7K1363	7K1363	7K1363
22	Casings	1	7K1991	—	—	—	—	—
		1½	7K1992	7K1998	7K2000	7K2006	—	—
		2	7K2007	7K1991	7K2001	7K1453	—	—
		3	7K1994	7K1992	7K2002	7K2001	7K2010	7K2013
		5	7K1995	7K1994	7K2003	7K2008	7K2011	7K2014
		Upper 7½	7K2332	7K1999	7K2341	7K2009	7K2012	7K2015
		Lower 7½	7K2328		7K2332			
		Upper 10	7K2336	—	7K1618	—	7K1677	—
		Lower 10	7K1677		7K2331		7K2333	
23	Shaft and Coupling Assemblies	1	7K1605	—	—	—	—	—
		1½	7K1606	7K1610	7K1662	7K1661	—	—
		2	7K1768	7K1605	7K1663	7K1662	—	—
		3	7K1631	7K1606	7K1784	7K1663	7K1631	7K1648
		5	7K1769	7K1631	7K1785	7K1664	7K1689	7K1649
		Upper 7½	7K2269	7K1611	7K2262	7K1665	7K1871	7K1650
		Lower 7½	7K2303		7K2301			
		Upper 10	7K2275	—	7K2276	—	7K2277	—
		Lower 10	7K2311		7K2310		7K2309	
24	Cable guards	1	7K2040	—	—	—	—	—
		1½	7K2042	7K2039	7K2043	7K2041	—	—
		2	7K2044	7K2040	7K2045	7K2043	—	—
		3	7K2046	7K2042	7K2047	7K2045	7K2046	7K2044
		5	7K2051	7K2046	7K2052	7K2049	7K2051	7K2048
		7½	7K2316	7K2050	7K2319	7K2054	7K2055	7K2053
		10	7K1901	—	7K2318	—	7K2321	—

① Indicates model with one intermediate bearing spider.
② Indicates model with split cases and shafts.
③ These models are identified by 4 cable guard screws.

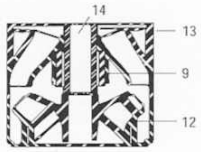
Models 33GS, 40GS, 55GS, 60GS, 75GS, 80GS
Repair Parts

GOULDS PUMPS

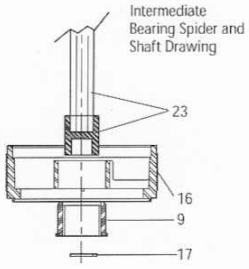




Models
55GS / 60GS



Models
75GS / 80GS



GOULDS PUMPS

SINGLE PHASE MOTOR SPECIFICATIONS (60 HERTZ) 3450 RPM

Type	Goulds Pumps Model Number	Franklin Motor Model Prefix	HP	Volts	Hz	S.F.	Rated Input (2) Amps	Rated Input Watts	Maximum (S.F. Load) (2) Amps	Maximum (S.F. Load) Watts	(1) Line to Line Res. M = Main S = Start	Locked Rotor Amps	KVA Code	Inverse Time Breaker	Dual Element Time Delay Fuse
4" 2 wire	S06942	244508	1	230	60	1.40	8.2	1200	9.8	1600	2.2-2.7	48.7	M	25	20
	S07942	244309	1½	230	60	1.30	10.6	1780	13.1	2250	1.5-1.9	66.6	L	30	20
4" 3 wire	S06940	214508	1	230	60	1.40	Y8.2 B8.2 R0	1200	Y9.8 B9.8 R0	1600	2.2-2.7M 9.9-12.1S	41.8	L	25	20
	S07940	224300	1½	230	60	1.30	Y10.0 B9.9 R1.3	1700	Y11.5 B11.0 R1.3	2150	1.7-2.2M 8.0-9.7S	52.0	J	30	20
	S08940	224301	2	230	60	1.25	Y10.0 B9.3 R2.6	2100	Y13.2 B11.9 R2.6	2650	1.8-2.3M 5.8-7.2S	51.0	G	25	20
	S09940	224302	3	230	60	1.15	Y14.0 B11.2 R6.1	3020	Y17.0 B12.6 R6.0	3430	1.0-1.5M 4.0-4.9S	82.0	G	40	30
	S10940	224303	5	230	60	1.15	Y23.0 B15.9 R11.0	5250	Y27.5 B19.1 R10.8	5960	.68-1.0M 1.8-2.2S	121.0	F	60	45

(1) Main winding – black to yellow
Start winding – red to yellow

(2) Y = Yellow lead, line amps
B = Black lead, main winding amps
R = Red lead, start or auxiliary winding amps

Franklin Electric at 1-800-348-2420.
For additional motor data call

THREE PHASE MOTOR SPECIFICATIONS (60 HERTZ) 3450 RPM

Type	Goulds Pumps Number	Franklin Motor Prefix	HP	Volts	Hz	S.F.	Amps	S.F. Amps	Line to Line Res. Ohms	Locked Rotor Amps	KVA Code	Minimum Std. Cir. Br.	Delay Fuse	FURNAS Class 16 Starter Size	FURNAS Class 16 Htrs.
4" 3450 RPM, 3Ø	S06978	234503	1	200	60	1.4	4.6	5.4	3.8 – 4.5	30.9	M	15	10	16AD	K37
	S06970	234513	1	230	60	1.4	4.0	4.7	4.9 – 5.6	26.9	M	15	8	16AG	K34
	S06975	234523	1	460	60	1.4	2.0	2.4	19.9 – 23.0	13.5	M	15	4	16AH	K26
	S07978	234504	1½	200	60	1.3	5.6	6.8	2.5 – 3.0	38.2	K	15	10	16AD	K42
	S07970	234514	1½	230	60	1.3	4.9	5.9	3.2 – 4.0	33.2	K	15	10	16AG	K39
	S07975	234524	1½	460	60	1.3	2.5	3.1	13.0 – 16.0	16.6	K	15	5	16AH	K29
	S07979	234534	1½	575	60	1.3	2.0	2.4	20.3 – 25.0	13.3	K	15	4	16AE	K26
	S08978	234305	2	200	60	1.25	7.9	9.3	1.8 – 2.4	53.6	L	20	15	16AD	K50
	S08970	234315	2	230	60	1.25	6.9	8.1	2.3 – 3.0	46.6	L	20	15	16AG	K43
	S08975	234325	2	460	60	1.25	3.5	4.1	9.2 – 12.0	23.3	L	15	8	16AH	K33
	S08979	234335	2	575	60	1.25	2.8	3.2	14.6 – 18.7	18.6	L	15	5	16AE	K29
	S09978	234306	3	200	60	1.15	11.3	12.5	1.3 – 1.7	71.2	K	30	20	16AD	K55
	S09970	234316	3	230	60	1.15	9.8	10.9	1.8 – 2.2	61.9	K	25	20	16AG	K52
	S09975	234326	3	460	60	1.15	4.9	5.5	7.2 – 8.8	31	K	15	10	16AH	K37
	S09979	234336	3	575	60	1.15	3.9	4.4	11.4 – 13.9	24.8	K	15	8	16AE	K34
	S10978	234307	5	200	60	1.15	18.4	20.5	.74 – .91	122	K	50	35	16AD	K62
	S10970	234317	5	230	60	1.15	16.0	17.8	1.0 – 1.2	106	K	40	30	16AG	K61
	S10975	234327	5	460	60	1.15	8.0	8.9	4.0 – 4.9	53.2	K	20	15	16AH	K49
	S10979	234337	5	575	60	1.15	6.4	7.1	6.4 – 7.8	42.6	K	20	15	16AE	K42
	S119784	234308	7½	200	60	1.15	27.1	30.5	.46 – .57	188	K	70	50	16CD	K70
	S119704	234318	7½	230	60	1.15	23.6	26.4	.61 – .75	164	K	60	45	16BG	K67
	S119754	234328	7½	460	60	1.15	11.8	13.2	2.5 – 3.1	81.9	K	30	25	16AH	K55
	S119794	234338	7½	575	60	1.15	9.4	10.6	4.0 – 5.0	65.5	K	25	20	16AE	K52
	S129724	234339	10	460	60	1.15	17.0	18.5	1.8 – 2.3	116	L	45	30	16AH	K61
	S129794	234339	10	575	60	1.15	13.6	14.8	2.8 – 3.5	92.8	L	35	25	16AE	K57

16

Goulds Pumps
ITT Industries

1.2 Chemical Feed System:

A chemical feed system shall be installed so as to inject sodium hypochlorite into the raw water stream prior to being pumped into storage. The system shall be installed so that each pump serves one production well. Each pump shall operate when its respective well pump is in operation.

The chemical feed system shall consist of:

-two (2) polyethylene crocks as manufactured by “LMI” (model no. 26350),

-two (2) chemical metering pumps as manufactured by “Chem-Tech” (model no. 030),
-anti-siphon valves as manufactured by “LMI” (model no. 27048).

The crocks shall be calibrated in 5-gallon increments and will be able to be read without removing the lid. The metering pumps shall be fitted with the anti-siphon valves prior to start-up.

CHEM-TECH
Series 100 & 150

Metering Pumps

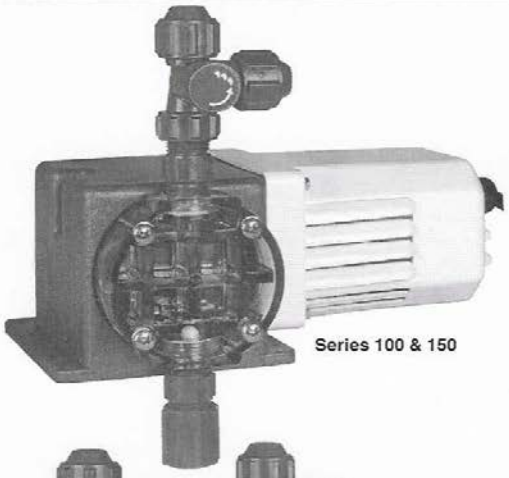
PULSAFEEDER®
A Unit of IDEX Corporation

Industry Leading Performance
The Series 100 & 150 positive displacement, diaphragm metering pumps are respected by professionals around the world for dependability, easy maintenance, and versatility in a wide range of water treatment applications.

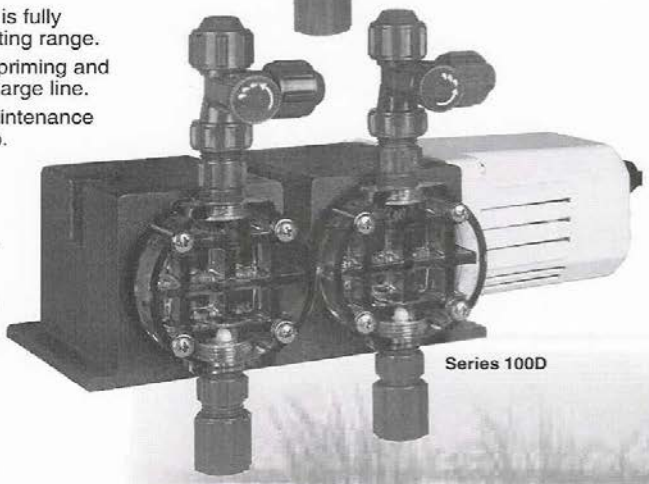
The Series 100D & 150D with dual head assemblies are ideal for metering two solutions at different outputs. Engineered with the same rugged compact economical design as the Series 100.

Operating Benefits

- **Versatility.** Range of models offering feed rates from 3 GPD to 100 GPD at operating pressures up to 100 PSI.
- **Feed Rate Control.** The output is fully adjustable over the entire operating range.
- **Bleed Valve Asembly.** Aids in priming and relieves pressure from the discharge line.
- **Sealed Gear Train.** Lowers maintenance and extends the life of the pump.
- **Guided 4-ball check valve.** Ensures accurate and reliable metering performance.
- **Chemical Resistant Materials.** Motor and gear shaft are treated with a special lubricant to extend the life of the pump in normal operating environments.
- **Simple Installation.** Injection back pressure valve assembly enables injection at an angle and inhibits siphoning.
- **Complete list of accessory fittings and assemblies available to enhance performance and simplify operation.**



Series 100 & 150



Series 100D

technology
innovation diversity
excellence

IDEX
IDEX CORPORATION

Chem-Tech Series 100 & 150 Specifications

MATERIALS OF CONSTRUCTION		
DESCRIPTION	**STANDARD PUMPS**	**MATERIALS FOR SPECIAL APPLICATIONS**
Pump Head	SAN	PVC, Polypropylene, or 316 SST
Diaphragm	Hypalon	Viton, PTFE Coated
Valve Seats	Hypalon	Viton, PTFE
Gaskets	PTFE	PTFE
Discharge Tubing	Polyethylene	1/2" NPT Connections
Suction Tubing	Flexible PVC	1/2" NPT Connections
Ball Checks	Ceramic	PTFE, 316 SST
Fittings	PVC	Polypropylene, 316 SST

NOTE: Maximum viscosity: 300 Cp., consult factory or chemical Resistance Guide for specific solutions, special components and accessories.

DIMENSIONS:
6+3/4"Hx8+7/8"Wx7+1/4"D (Series 100 & 150)
6+3/4"Hx12+5/16"Wx7+1/4"D (Series 100D)

TEMPERATURE LIMITATIONS:
125°F/51°C max.

ELECTRICAL REQUIREMENTS:
1/60 HP, 115V/60cy; 230V/60cy and 230V/60cy available on request

SHIPPING WEIGHT:
8 lbs./3.63 kg. (Series 100 & 150)
12 lbs./5.4 kg. (Series 100D)

Specifications subject to change without notice.

SPECIFICATIONS

Model Number	Max Pressure (psi/kgm²)	Output Capacity at Max PSI (gpd/lpd per head)	Strokes/ Minute	Amps 115v, Full Load
SERIES 100				
003	100/7	3/11.36	7	.30
007	100/7	7/26.50	13	.42
015	100/7	15/56.78	25	.59
024	100/7	24/90.84	51	.75
030	100/7	30/113.55	51	.79
SERIES 150				
068	60/4.2	68/257.38	51	1.0
100	60/4.2	100/378	70	1.0
SERIES 100D				
1144	50/3.5	4.0/15.1	7	.28
		4.0/15.1		
1145	50/3.5	5.0/18.9	7	.28
		4.0/15.1		
1155	50/3.5	5.0/18.9	7	.28
		5.0/18.9		
1244	75/5.25	6.5/24.6	13	.40
		6.5/24.6		
1245	75/5.25	7.5/28.4	13	.40
		6.5/24.6		
1255	75/5.25	7.5/28.4	13	.40
		7.5/28.4		
1264	60/4.2	12.0/45.4	13	.40
		8.0/30.3		
1265	60/4.2	12.0/45.5	13	.40
		9.0/34.4		
1344	75/5.25	14.0/53.0	25	.59
		14.0/53.0		
1345	75/5.25	18..0/68.1	25	.59
		14.0/53.0		
1355	75/5.25	18.0/68.1	25	.59
		18.0/68.1		
1364	60/4.2	25.0/94.6	25	.59
		15.0/56.8		
1365	60/4.2	25.0/94.6	25	.59
		19.0/71.9		
1444	75/5.25	30.0/113.5	51	.76
		30.0/113.5		
1445	75/5.25	30.0/124.9	51	.76
		33.0/113.5		
SERIES 150D				
1455	75/5.25	33.0/124.9	51	.76
		33.0/124.9		
1464	60/4.2	69.0/261.2	51	.76
		32.0/121.1		
1465	60/4.2	69.0/262.2	51	.76
		24.0/132.8		
1466	60/4.2	69.0/261.2	51	.76

An ISO Certified Company

IDEX CORPORATION

PULSAFEEDER®
A Unit of IDEX Corporation

NOVA-TECH INTERNATIONAL
800 Rockmead Dr Ste 120 • Houston, TX 77339-2151
Tel: (281) 359-8538 • Toll Free Tel: (866) 433-6682
Fax: (281) 359-8192 • Toll Free Fax: (866) 433-6684
sales@novatech-usa.com • www.novatech-usa.com

Brochure No. CTI-001
Printed in the USA 04/04

1.3 Double-Check Valve Assembly:

A ¾" "Hersey" double-check valve assembly (model no. FDC) shall be installed on the ¾" copper line serving the laboratory sink. The assembly shall be installed between 30" and 60" above the finished floor and 8" minimum from the wall. The assembly shall be installed horizontally and in accordance with the manufacturer's recommendations for installation. The water line shall be flushed prior to installing the assembly to prevent

fouling from debris left in the feed line. The unit shall be installed so as to be kept from freezing.

1.4 Joints & Fittings:

All joints & fittings shall be mechanical joint ductile iron compact C-153 as supplied by Griffin Pipe Products, Co., or equal. They shall meet or exceed the ANSI/AWWA C153/A21.53 standards.

1.5 Valves:

All valves used within the pump house which are greater than 2" in diameter shall be threaded double disc gate valves as manufactured by the Mueller Co. (Model No. a-2483-8), or equal. The valves shall meet or exceed all applicable requirements of ANSI/AWWA C-500 standards. The threaded ends shall comply with ANSI B2.1 standard. The valve body shall be iron-bronze mounted. The normal working pressure shall be 200 PSIG. And the maximum working pressure shall be 400 PSIG.

1.6 Emergency Power Generator:

The generator set shall be a 60 kW minimum, Natural Gas or Propane powered with an automatic transfer switch as supplied by "Kohler", or equal.

The generator shall be designed so as to automatically start and operate for 15 minutes every 168 hours under its full load.

The automatic transfer switch shall be designed and installed so as to sense the drop of utility power supply and automatically transfer power supply requirements to the generator set and lock-out the utility back feed possibility.

An automatic dialer shall notify a central message bureau to notify the Water Operator that the emergency generator is operating.

The generator and accompanying transfer switch shall be tested under its full load prior to issuance of a "Certificate of Completed Works".

Model: 60RZG

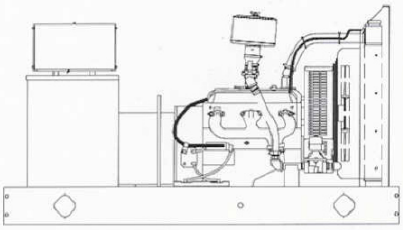
KOHLER POWER SYSTEMS

190-600 V Gas

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

Ratings Range

		60 Hz	50 Hz
Standby:	kW	54-64	45-53
	kVA	54-80	45-66
Prime:	kW	50-59	39-50
	kVA	50-74	40-62



Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Alternator features:
  - The Fast-Response™ III wound field (WF) design alternator provides excellent voltage response and short-circuit capability using an auxiliary power brushless exciter.
  - The unique Fast-Response™ II excitation system delivers excellent voltage response and short circuit capability using a permanent magnet (PM)-excited alternator.
  - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
  - Controllers are available for all applications. See controller features inside.
  - The electronic, isochronous governor incorporates an integrated drive-by-wire throttle body actuator delivering precise frequency regulation.

Generator Set Ratings

				Natural Gas				LP Gas			
				130°C Rise Standby Rating		105°C Rise Prime Rating		130°C Rise Standby Rating		105°C Rise Prime Rating	
Alternator	Voltage	Ph	Hz	kW/kVA	Amps	kW/kVA	Amps	kW/kVA	Amps	kW/kVA	Amps
4P10W/ 4P10	120/208	3	60	60/75	208	55/69	191	62/78	215	57/71	198
	127/220	3	60	60/75	197	55/69	180	61/76	200	55/69	180
	120/240	3	60	60/75	180	55/69	165	63/79	189	59/74	177
	120/240	1	60	54/54	225	50/50	208	54/54	225	50/50	208
	139/240	3	60	60/75	180	53/66	159	60/75	180	53/66	159
	220/380	3	60	60/75	114	55/69	104	60/75	114	56/70	106
	277/480	3	60	60/75	90	53/66	80	60/75	90	53/66	80
	347/600	3	60	60/75	72	53/66	64	60/75	72	53/66	64
	110/190	3	50	49/61	185	45/56	170	50/63	191	46/57	173
	115/200	3	50	47/59	170	42/52	150	47/59	170	42/52	150
	120/208	3	50	45/56	155	39/49	136	45/56	155	39/49	136
	110/220	1	50	45/45	205	40/40	182	45/45	205	40/40	182
	110/220	3	50	49/61	160	45/56	147	51/64	168	46/57	150
	220/380	3	50	49/61	93	45/56	85	50/63	96	46/57	87
	230/400	3	50	47/59	85	42/52	75	47/59	85	42/52	75
	240/416	3	50	45/56	78	39/49	68	45/56	78	39/49	68
4S7W/ 4S7	120/208	3	60	60/75	208	55/69	191	63/79	219	59/74	205
	127/220	3	60	60/75	197	55/69	180	63/79	207	59/74	194
	120/240	3	60	60/75	180	55/69	165	63/79	189	59/74	177
	120/240	1	60	54/54	225	50/50	208	57/57	238	53/53	221
	139/240	3	60	60/75	180	55/69	165	64/80	192	59/74	177
	220/380	3	60	60/75	114	55/69	104	63/79	120	59/74	112
	277/480	3	60	60/75	90	55/69	83	64/80	96	59/74	89
	347/600	3	60	60/75	72	55/69	66	64/80	77	59/74	71
	110/190	3	50	48/60	182	45/56	170	53/66	201	49/61	184
	115/200	3	50	49/61	176	45/56	162	53/66	191	50/62	179
	120/208	3	50	49/61	169	45/56	155	53/66	183	50/62	172
	110/220	3	50	48/60	157	45/56	147	53/66	173	49/61	160
	110/220	1	50	45/45	205	41/41	186	47/47	214	44/44	200
	220/380	3	50	48/60	91	45/56	85	53/66	100	49/61	92
	230/400	3	50	48/60	87	45/56	81	53/66	95	50/62	89
	240/416	3	50	49/61	85	45/56	78	53/66	92	50/62	86
4V7W/ 4V7	120/240	1	60	57/57	238	51/51	213	61/61	254	55/55	229
	110/220	1	50	47/47	214	42/42	191	51/51	232	46/46	209

RATINGS: All three-phase units are rated at 0.8 power factor. All single-phase units are rated at 1.0 power factor. *Standby Ratings:* Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Ratings are in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. *Prime Power Ratings:* Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528/1, overload power in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. For limited running time and base load ratings, consult the factory. Obtain the technical information bulletin (TIB-101) on ratings guidelines for the complete ratings definitions. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. GENERAL GUIDELINES FOR DERATION: *Altitude:* Derate 1.3% per 100 m (328 ft.) elevation above 200 m (656 ft.). *Temperature:* Derate 3.0% per 10°C (18°F) temperature above 25°C (77°F). For units having a weather housing with roof-mounted silencer or an enclosure with enclosed silencer, add 5°C (9°F) for 60 Hz and 10°C (18°F) for 50 Hz to the ambient temperature. Dual fuel engines are optimized to run on the primary fuel (natural gas) and, as a result, the LPG ratings may not be attained. For dual fuel engines, use the natural gas ratings for both the primary and secondary fuels.

G4-77 (60RZG) 1/06q

Alternator Specifications

Specifications	Alternator
Manufacturer	Kohler
Type	4-Pole, Rotating-Field
Exciter type	
Wound field (WF)	Wound Exciter Field with Separate Excitation Power Winding
Permanent magnet (PM)	Brushless, Permanent-Magnet
Leads: quantity, type	
4P10W/4P10, 4S7W/4S7	12, Reconnectable
4V7W/4V7	4, 110-120/220-240
Voltage regulator	Solid State, Volts/Hz
Insulation:	NEMA MG1
Material	Class H
Temperature rise	130°C, Standby
Bearing: quantity, type	1, Sealed
Coupling	Flexible Disc
Amortisseur windings	Full
Voltage regulation, no-load to full-load	
Wound field (WF) alternator	±0.25% Average
Permanent magnet (PM) alternator	±2% Average
550 controller (with 0.5% drift due to temperature variation)	3-Phase Sensing, ±0.25%
Unbalanced load capability	100% of Rated Standby Current
One-step load acceptance	100% of Rating

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Vacuum-impregnated windings with fungus-resistant epoxy varnish for dependability and long life.
- Superior voltage waveform from a two-thirds pitch stator and skewed rotor.
- Fast-Response™ III wound field (WF) brushless alternator with auxiliary power brushless exciter for excellent load response.
- Fast-Response™ II brushless alternator with brushless exciter for excellent load response.

Specifications	Alternator
Peak motor starting kVA:	(35% dip for voltages below)
480 V, 380 V 4P10W/4P10 (12 lead)	255 (60Hz), 180 (50Hz)
480 V, 380 V 4S7W/4S7 (12 lead)	270 (60Hz), 190 (50Hz)
240 V, 220 V 4V7W/4V7 (4 lead)	215 (60Hz), 175 (50Hz)

Application Data

Engine

Engine Specifications	60 Hz	50 Hz
Manufacturer	General Motors	
Engine: model, type	Industrial Powertrain Vortec 5.7 L, 4-Cycle Natural Aspiration	
Cylinder arrangement	V-8	
Displacement, L (cu. in.)	5.7 (350)	
Bore and stroke, mm (in.)	101.6 x 88.4 (4.00 x 3.48)	
Compression ratio	9.1:1	
Piston speed, m/min. (ft./min.)	318 (1044)	265 (870)
Main bearings: quantity, type	5, M400 Copper Lead	
Rated rpm	1800	1500
Max. power at rated rpm, kW (HP)	78.3 (105)	65.6 (88)
Cylinder head material	Cast Iron	
Piston type and material	High Silicon Aluminum	
Crankshaft material	Nodular Iron	
Valve (exhaust) material	Forged Steel	
Governor type	Electronic	
Frequency regulation, no-load to full-load	Isochronous	
Frequency regulation, steady state	±0.5%	
Frequency	Field-Convertible	
Air cleaner type, all models	Dry	

Exhaust

Exhaust System	60 Hz	50 Hz
Exhaust manifold type	Dry	
Exhaust flow at rated kW, m^3/min. (cfm)	16.4 (580)	13.6 (480)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	649 (1200)	
Maximum allowable back pressure, kPa (in. Hg)	10.2 (3.0)	
Exhaust outlet size at engine hookup, mm (in.)	76 (3.0) OD	

Engine Electrical

Engine Electrical System	60 Hz	50 Hz
Ignition system	Electronic, Distributor	
Battery charging alternator:		
Ground (negative/positive)	Negative	
Volts (DC)	12	
Ampere rating	70	
Starter motor rated voltage (DC)	12	
Battery, recommended cold cranking amps (CCA):		
Qty., rating for -18°C (0°F)	One, 630	
Battery voltage (DC)	12	

Fuel

Fuel System	60 Hz	50 Hz
Fuel type	LP Gas or Natural Gas	
Fuel supply line inlet	1 NPTF	
Natural gas/LPG fuel supply pressure, measured at the generator set fuel inlet downstream of any fuel system equipment accessories, kPa (in. H_2O)	1.74-2.74 (7.0-11.0)	

Fuel Composition Limits *	Nat. Gas	LP Gas
Methane, % by volume	90 min.	—
Ethane, % by volume	4.0 max.	—
Propane, % by volume	1.0 max.	85 min.
Propene, % by volume	0.1 max.	5.0 max.
C_4 and higher, % by volume	0.3 max.	2.5 max.
Sulfur, ppm mass	25 max.	
Lower heating value, kJ/m^3 (Btu/ft^3), min.	26.6 (890)	67.5 (2260)

* Fuels with other compositions may be acceptable. If your fuel is outside the listed specifications, contact your local distributor for further analysis and advice.

Application Data

Lubrication

Lubricating System	60 Hz	50 Hz
Type	Full Pressure	
Oil pan capacity, L (qt.)	4.7 (5.0)	
Oil pan capacity with filter, L (qt.)	6.2 (6.5)	
Oil filter: quantity, type	1, Cartridge	

Cooling

Radiator System	60 Hz	50 Hz
Ambient temperature, °C (°F) *	50 (122)	
Engine jacket water capacity, L (gal.)	6.8 (1.8)	
Radiator system capacity, including engine, L (gal.)	20.8 (5.5)	
Engine jacket water flow, Lpm (gpm)	117.3 (31)	98.4 (26)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	54.8 (3120)	45.7 (2600)
Water pump type	Centrifugal	
Fan diameter, including blades, mm (in.)	533 (21)	
Fan, kWm (HP)	4.5 (6.0)	2.6 (3.5)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)	

* Weather housing with roof-mounted silencer and enclosure with enclosed silencer reduce ambient temperature capability by 5°C (9°F) for 60 Hz and 10°C (18°F) for 50 Hz.

Remote Radiator System†	60 Hz	50 Hz
Exhaust manifold type	Dry	
Connection sizes:		
Water inlet, ID hose, mm (in.)	44.45 (1.75)	
Water outlet, ID hose, mm (in.)	38.10 (1.50)	
Static head allowable above engine, kPa (ft. H_2O)	4.32 (17.0)	

† Contact your local distributor for cooling system options and specifications based on your specific requirements.

Operation Requirements

Air Requirements	60 Hz	50 Hz
Radiator-cooled cooling air, m^3/min. (scfm)‡	170 (6000)	136 (4800)
Cooling air required for generator set when equipped with city water cooling or remote radiator, based on 14°C (25°F) rise and ambient temperature of 29°C (85°F), m^3/min. (cfm)	144 (5100)	125 (4400)
Combustion air, m^3/min. (cfm)	5.2 (185)	4.4 (155)
Heat rejected to ambient air:		
Engine, kW (Btu/min.)	30.9 (1760)	26.5 (1510)
Alternator, kW (Btu/min.)	7.7 (440)	6.9 (390)

‡ Air density = 1.20 kg/m^3 (0.075 lbm/ft^3)

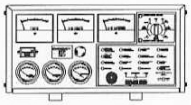
Fuel Consumption§	60 Hz	50 Hz
Natural Gas, m^3/hr. (cfh) at % load	**Standby Rating**	
100%	22.4 (790)	18.1 (640)
75%	19.4 (685)	15.6 (550)
50%	14.7 (520)	11.8 (415)
25%	9.9 (350)	7.8 (275)
Natural Gas, m^3/hr. (cfh) at % load	**Prime Rating**	
100%	21.2 (748)	17.1 (604)
75%	18.0 (636)	14.4 (510)
50%	13.8 (486)	11.0 (387)
25%	9.5 (335)	7.4 (263)
LP Gas, m^3/hr. (cfh) at % load	**Standby Rating**	
100%	9.3 (330)	7.9 (280)
75%	7.1 (250)	6.2 (220)
50%	5.4 (190)	4.7 (165)
25%	3.8 (135)	3.1 (110)
LP Gas, m^3/hr. (cfh) at % load	**Prime Rating**	
100%	8.4 (298)	7.2 (256)
75%	6.6 (232)	5.8 (204)
50%	5.1 (179)	4.4 (154)
25%	3.7 (130)	3.0 (105)

§ Fuel consumption is based on 1015 Btu/standard cu. ft. natural gas.

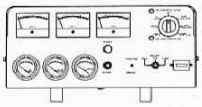
LP vapor conversion factors:
8.58 $ft.^3$ = 1 lb.
0.535 m^3 = 1 kg.
36.39 $ft.^3$ = 1 gal.

Controllers

Decision-Maker™ 550 Controller
Audiovisual annunciation with NFPA 110 Level 1 capability.
Programmable microprocessor logic and digital display features.
Alternator safeguard circuit protection.
12- or 24-volt engine electrical system capability.
Remote start, remote annunciation, and remote communication options.
Refer to G6-46 for additional controller features and accessories.



Decision-Maker™ 3+, 16-Light Controller
Audiovisual annunciation with NFPA 110 Level 1 capability.
Microprocessor logic, AC meters, and engine gauge features.
12- or 24-volt engine electrical system capability.
Remote start, prime power, and remote annunciation options.
Refer to G6-30 for additional controller features and accessories.



Decision-Maker™ 1 Controller
Single-light annunciation and basic controls with NFPA capability.
Relay logic, AC meters, and engine gauge features.
12-volt engine electrical system capability only.
Remote or automatic start options.
Refer to G6-29 for additional controller features and accessories.
Note: Not available with 600-volt alternator.

KOHLER CO., Kohler, Wisconsin 53044 USA
Phone 920-565-3381, Fax 920-459-1646
For the nearest sales and service outlet in the
US and Canada, phone 1-800-544-2444
KohlerPowerSystems.com

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65) 6264-6422, Fax (65) 6264-6455

Additional Standard Features

- Alternator Protection (standard with 550 controller)
- Battery Rack and Cables
- Electronic, Isochronous Governor
- Gas Fuel System (includes fuel mixer, secondary gas regulator, gas solenoid valve, and flexible fuel line between the engine and the skid-mounted fuel system components)
- Integral Vibration Isolation
- Oil Drain Extension
- Operation and Installation Literature

Available Accessories

Enclosed Unit

- ❑ Sound Enclosure (with enclosed critical silencer)
- ❑ Weather Enclosure (with enclosed critical silencer)
- ❑ Weather Housing (with roof-mounted silencer)

Open Unit

- ❑ Exhaust Silencer, Critical (kits: PA-324468, PA-352663)
- ❑ Flexible Exhaust Connector, Stainless Steel

Cooling System

- ❑ Block Heater [recommended for ambient temperatures below 10°C (50°F)]
- ❑ City Water Cooling
- ❑ Radiator Duct Flange
- ❑ Remote Radiator Cooling

Fuel System

- ❑ Automatic Changeover (natural gas to LP gas)
- ❑ Conversion Kit (natural gas to LP gas)
- ❑ Flexible Fuel Line (required when the generator set skid is spring mounted)
- ❑ Gas Filter
- ❑ LP Gas Liquid Withdrawal
- ❑ Manual Valve and Gas Solenoid Bypass
- ❑ Secondary Gas Solenoid Valve

Electrical System

- ❑ Battery
- ❑ Battery Charger, Equalize/Float Type
- ❑ Battery Heater

Engine and Alternator

- ❑ Alternator, Wound Field (WF)
- ❑ Alternator, Permanent Magnet (PM)
- ❑ Air Cleaner Restrictor Indicator
- ❑ Alternator Strip Heater
- ❑ CSA Certification
- ❑ Engine Fluids (oil and coolant) Added
- ❑ Line Circuit Breaker (NEMA1 enclosure)
- ❑ Line Circuit Breaker with Shunt Trip (NEMA1 enclosure)
- ❑ Optional Alternators
- ❑ Rated Power Factor Testing
- ❑ Rodent Guards
- ❑ Safeguard Breaker (not available with 550 controller)
- ❑ Skid End Caps
- ❑ Voltage Regulation, 1%
- ❑ Voltage Regulator Sensing, 3-Phase

Literature and Maintenance

- ❑ General Maintenance Literature Kit
- ❑ Maintenance Kit (includes standard air, oil, and fuel filters)
- ❑ NFPA 110 Literature
- ❑ Overhaul Literature Kit
- ❑ Production Literature Kit

Controller (550 and 16-Light)

- ❑ Common Failure Relay Kit
- ❑ Communication Products and PC Software (550 controller only)
- ❑ Customer Connection Kit
- ❑ Dry Contact Kit (isolated alarm)
- ❑ Engine Prealarm Sender Kit
- ❑ Local Emergency Stop Kit
- ❑ Prime Power Switch (550 controller only)
- ❑ Remote Annunciator Panel
- ❑ Remote Audiovisual Alarm Panel
- ❑ Remote Emergency Stop Kit
- ❑ Remote Mounting Cable
- ❑ Run Relay Kit

Miscellaneous Accessories

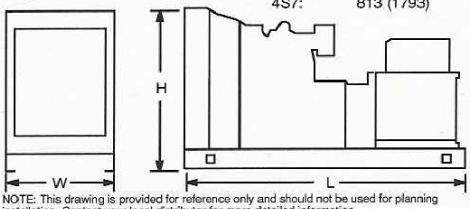
- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____

Dimensions and Weights

Overall Size, L x W x H, mm (in.) :

4P10/4V7:	Wide Skid	2200 x 1040 x 1172 (86.6 x 40.9 x 46.1)
	Narrow Skid	2200 x 865 x 1172 (86.6 x 34.0 x 46.1)
4S7:	Wide Skid	2200 x 1040 x 1211 (86.6 x 40.9 x 47.7)
	Narrow Skid	2200 x 865 x 1211 (86.6 x 34.0 x 47.7)

Weight (radiator model), wet, kg (lb.): 4P10/4V7: 755 (1665)
4S7: 813 (1793)



NOTE: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

DISTRIBUTED BY:

G4-77 (60RZG) 1/06q

1.7 Controls:

The controls shall be designed and installed in such a manner so as to perform as follows:

1.7.1 Well Pumps:

The well pumps shall operate in a lead/lag/alarm configuration. The lead pump shall operate when the water level in the 220,000-gallon water storage tanks drops 1’.

Once the tank is full the lead pump will stop operation. The second well pump will operate as lead at the next cycle. In the event that the lead pump cannot fill the tank, the second pump will act as lag pump until the tank is full. In the event that both pumps cannot fill the tank, the control system will send an alarm signal to a remote operator.

1.7.2 Control Systems Specifications:

This water supply system shall be controlled by and protected by an ACS, Brewster, New York, or equal.

The unit is to provide automatic operation of the transfer pumps and air compressor by sensing the pressure and water levels in the hydropnuematic tank.

The control is to be pre-wired in a NEMA 12 casketed clamp cover wall mounted enclosure that shall include the following:

Visually adjustable bourdon tube operated mercury contact pressure sensor(s), electrode level sensing relay with isolation transformer, a magnetic starter with all leg ambient compensated quick trip overloads for each motor, control relays and terminal blocks for power supply, motor connections and separately mounted components. Multi-colored circuitry shall be used within the control to facilitate trouble-shooting.

Door-mounted on the cabinet shall be:

HAND-OFF-AUTO selector and neon run light for each motor and a 4-1/2" diameter system pressure gauge.

Included with the control for separate mounting shall be:

A level sensing chamber with a NEMA 4 electrode holder and type 416 stainless steel electrode rod for installation on the head of the hydropnuematic tank shall be used to sense the level in the tank.

A level sensing device shall be provided and installed in the 220,000-gallon water storage tank to provide feedback to the well pumps.

A low flow cut-off protection and alarm shall be provided for the well pumps.

1.8 Electrical Service:

An electrical service consisting of 3-phase 220/240-volt current shall be supplied to the pump house through an approved weather head and entrance. The service entrance shall be installed so as to meet Federal, State and Local codes. A main disconnect switch shall be installed within the pump house in a readily accessible area. The switch shall be the main shut-off for the entire pump house. From the main disconnect switch, power shall be fed to an electrical distribution panel box.

A 24-circuit minimum panel box shall be installed in the booster station. The panel box shall be sized for 100 volts, as supplied by Square "D", or equal. Dedicated circuits shall be installed for the booster station lighting, outlets and heater.

All wiring shall be installed in properly sized rigid metal or PVC conduit.

All controls, and motor starters are to be NEMA type 4 enclosures unless otherwise noted.

1.9 Local & Remote Alarm:

A low flow alarm and pump cut-off shall be an integral part of the control system. The alarm shall consist of a locally mounted audio and visual alarm as well as a telemeter system which shall dial a remote messaging bureau who can notify the operator of the water system.

1.10 Natural-Gas Fired Heater:

The interior of the well house shall be equipped with a ceiling-mounted, thermostatically controlled, natural gas-fired heater. The heater shall be set to operate between the ranges of 45 degrees and 55 degrees.

2.0 Water main & Appurtenances:

The contractor shall provide all labor, material and equipment necessary to install, disinfect and test the water mains, valves, hydrants, corporation cocks, service laterals and curb cocks, etc. as specified on the plans.

2.1 Materials:

2.1.1 Pipe:

All water main shall be Ductile Iron Pipe (DIP) pipe conforming to AWWA C-151 specifications. Each pipe shall be furnished with bell and spigot ends.

2.1.2 Valves:

All valves shall be as manufactured by "Kennedy" meeting AWWA specifications for bury-type valves. The valves shall have iron body, mechanical joint end connections with "Mega Lug" restraint system, bronze mounted and equipped with double revolving gate discs, parallel seats and compression equalizing ridges. Valve stems are to be bronze, non-rising type. Gate seat rings shall be bronze. They shall be designed for a working pressure equal to 50% greater than the normal working pressure of the water system or 200 psi, whichever is greater.

The contractor shall provide, to the Owner, two (2) long handled wrenches to operate the gate valves.

2.1.3 Fittings:

Mechanical joint fittings shall be full body ductile iron class 54 pipe. The fittings shall consist of a cast iron body rubber gasket, gland and bolts with "Mega Lug" restraint system. Fittings shall be coated with coal tar pitch varnish. Bolts shall be high strength, corrosion resistant alloy with hexagon bolts. Fittings shall have an identical rating as the gate valves listed earlier herein.

2.1.4 Flushing Hydrants:

The Fire Hydrants shall be "Kennedy" Guardian, with 3-way, 5 ¼" valve openings, mechanical joint ends with "Mega Lug" restraints, meeting UL-246 and FM-1510.

2.1.5 Services:

The Contractor shall provide all labor, material and equipment including excavation, tapping, type "K" copper line, fittings, valves and valve boxes to the right-of-way line. The water service line shall be Type "K" copper meeting ASTM B 88 standards with compression fittings.

Corporation stop, curb stop and curb box to be "A.Y. McDonald", or equal.

The Contractor shall make all taps in conformance with the pipe and valve manufacturer's instructions. All service lines and fittings shall be rated for a minimum of 150 psi pressure rating.

2.1.6 Installation:

All pipe installation shall be in accordance with AWWA specifications.

The Contractor shall install all water piping on a firm, full and even bearing layout of sand bedding, a minimum of six (6) inch thick throughout the entire length. Should the Contractor encounter bedrock, a (6) inch bed of crushed stone or gravel bedding shall be required under the pipe. Over excavation in the trench shall be corrected with ¾" crushed stone. The trench shall be prepared in accordance with the manufacturer's specifications, but at no time will more than 40 feet of trench shall be left open.

The Contractor shall install all pipe with a minimum depth of bury of 5 feet. The Contractor shall conduct work to insure that the grade of the pipe is uniform and that it generally follows the grade of the proposed finished grade. The Contractor shall maintain a separation of 18 inches (vertical) between the water main and sanitary and storm sewer at crossings. A horizontal separation of 10' between the water main and sanitary and storm sewer shall be maintained everywhere else. Pipe deflection will not exceed the manufacturer's specifications.

Prior to placing the pipe in its trench, the Contractor shall inspect and clean the pipe. All debris shall be removed from the pipe. The bell and spigot shall also be inspected and cleaned as necessary.

Once the pipe is lowered onto the bedding, it shall be "locked" in with masons sand up to the spring line of the pipe. The sand shall be tamped. The remaining sand shall be installed and tamped in 6" lifts to a minimum depth of 6" above the top of the pipe. The remaining backfill shall be suitable run-of-trench free of any cobbles in excess of 4", frozen soil, organic debris and any other deleterious materials. The owner, and or his representative, reserves the right to reject the run-of-trench material. The run-of-trench shall be installed and tamped in 6" lifts to finished grade. The contractor shall leave a 4" topsoil crown on the trench to compensate for any settling over the trench.

At the end of each workday, the pipe shall be plugged to prevent debris from entering the pipe.

2.1.7 Testing:

All testing of the distribution system shall be in accordance with the accompanying plans or the current AWWA specifications.

It shall be the responsibility of the Contractor to pressure test the entire water distribution system. The Contractor has the option of testing the installation in sections or at the completion of the entire installation. The Engineer shall witness the tests so that certification can be made to the Owner & the Department of Health.

After the section of pipe to be tested has been properly installed, the pipe shall be tested in accordance with this specification. All air shall be removed from the system prior to the beginning of the test.

The test shall be of at least a 2-hour duration. Test pressures shall not vary more than 5 psi for the duration of the test. No valves shall be operated during the test.

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valve section thereof to maintain the hydrostatic pressure with 5 psi of the specified test pressure after the pipe has been filled with water and the air has been completely expelled. A drop in pressure in a test section shall not measure leakage over a period of time.

No pipe installation shall be accepted if the leakage is greater than that determined under these specifications.

The Contractor shall be responsible for the immediate repair of any leaks or deficiencies in the water main in the event of an unacceptable leakage test.

2.1.8 Disinfection:

The entire water distribution system shall be disinfected in accordance with current AWWA C-651 requirements (with the exception of the tablet method) and New York State Department of Health requirements after successful testing.

Disinfection and testing of all tanks shall be done in accordance with AWWA C-652 requirements.

Section 2.2

Water Supply Application

Section 2.3

Water Conservation Report

Section 2.4

Hydrogeological Report
and
Water Test Results

Section 2.5

Well Location Plan

Section 3.0

SPDES Permit Application

Section 4.0

Engineering Report
for the
Wastewater Treatment Facility

Engineering Report
Wastewater Treatment Facilities

Summit Woods
175-Unit Cluster Subdivision

Town of East Fishkill
Dutchess County, New York

General

The Applicant proposes to construct, operate and maintain a complete wastewater treatment facility to serve the Summit Woods Subdivision with a total design flow of 90,000 gpd.

The wastewater treatment facilities are designed to provide an effluent quality that meets the Draft SPDES effluent limits outlined by Mr. Thomas Rudolph of the NYSDEC. These are as follows:

BOD_5 = 5.0 mg/l
SS =10.0 mg/l
DO >=7.0 mg/l
NH_3 =1.5 mg/l (June – October)
NH_3 =2.2 mg/l (November – May)
TRC = 0.1 mg/l (If chlorine is used for disinfection)
Settable Solids <0.1 mg/l

The treated effluent will be piped to the Van Anden Kill which flows into the HJ-49 NYSDEC wetland.

The basic treatment units and processes to be provided are:

Comminution with emergency bypass screening
Aerated flow equalization
Primary clarification
Rotating biological contactor (RBC)
Secondary clarification
Rapid sand filtration
Disinfection by chlorination
Dechlorination by use of sodium metabisulfite
Aerobic sludge digestion
Sludge thickening

The treatment facilities are designed and located to minimize any impact from noise and odors to both on or off-site receptors.

Tertiary treatment will be used as part of the treatment process. This process will be used to further remove ammonia and remove nitrogen.

Total Design Flow

A design total daily flow of 90,000 gpd has been derived with subsequent confirmation by the Dutchess County Health Department. The derivation of the design total flow includes a consideration of mandated installation of water savings fixtures by using only 80% of the historically accepted design factors. The average daily flow calculations can be found on the following page.

175 homes (4 bdrm homes) @ 520 gpd/home ≈ 84,000 gallons per day

Rounding up, a value of 90,000 gpd or 62.5 gpm average is used.

Design Peak Hourly Flowrate

The design peak hourly flow rate is derived by using NYDEC's formula (Harmon's Factor):

$PF = 18 + P\ 5/4 + P^5$ where P is the population in thousands

Using 100 gpcd, the peaking factor is 3.829 and the design peak hourly flow rate is 344,612 gpd or 239.3 gpm.

Using 75 gpcd, the peaking factor is 3.7476 and the design peak hourly flow rate is 337,282 gpd or 234.2 gpm.

Wastewater treatment processes, particularly the biological processes, are affected by wide variations in the inflow rates. Therefore, flow equalization is provided to mitigate the deleterious effects that large variations in the flow rates could have.

Design Organic Loadings

For the purpose of design, the influent organic strengths, including all recycled sidestreams, are assumed to be that of a moderately strong domestic waste:

BOD_5	$\leq$ 300 mg/l
Suspended Solids	$\leq$ 300 mg/l

Comminutor and By-pass Screens

All raw wastewaters will first be subjected to size reduction via a comminutor. By-pass screening is provided for when the comminutor is off line for maintenance and/or repair or if an occasional peak inflow exceeds the comminutor capacity.

The comminutor selected has a hydraulic capacity of 275 gpm or 115% of the higher of the two peak flow rates previously calculated. Any flows in excess of the unit's capacity will be automatically diverted to the bar screens.

A gravel stop is provided immediately ahead of the communitor. This gravel stop must be periodically hand cleaned.

If the communitor fails to pass the inflow, the water level will rise until the weir in the by-pass channel stop slide gate is reached. As the water level continues to rise, the inflow is automatically diverted to the bar screen channel.

By-pass weir capacity = $3.33\ (0.667)H^{(1.5)}$

For H = 1" , capacity = .0534 cfs = 24gpm
For H = 3" , capacity = .2775 cfs = 125 gpm
For H = 6" , capacity = .785 cfs = 352 gpm

The floor of the by-pass channel will have a slope of about 2.2% through the bar screen. The opening between the fourteen ¼" bars will be 1.25" and the bars will be set at a 45° angle. The velocity through the bars at various flow rates is provided as Exhibit A.

At the average flow of 0.14 cfs (90,000 gpd) the velocity is just under 2 fps. At the anticipated peak flow rate of about 0.5325 cfs (239 gpm), the velocity is about 3.1 fps.

Flow Equalization

The purpose of the equalization tank is to store some of the wastewaters during periods of high inflow and to discharge the stored wastes during periods of low inflow. Assuming that all inflow occurs within a 16 hour period (2/3 of a day), then one third of the total wastewater must be stored for discharge during the remaining 8 hour period (1/3 of a day). Therefore, the minimum storage volume should be 30,000 gallons.

There will be minor sidestreams from the skimmers, sludge treatment and sand filter backwashing processes entering the equalization tank. The design outflow rate and storage volume should provide a minimal allowance to serve the sidestreams.

The equalization tank has an inside length of 50', an inside width of 12' and a working depth of 7' for an effective volume of 4,200 cf or 31,416 gallons. An additional 3" of depth between the design maximum water level and invert of influent piping will permit an additional storage volume of 150 cf (1,122 gallons) if necessary.

The design average flow is 62.5 gpm. Pumps are selected to transfer 63.5 gpm to include the equalized sidestream flows.

A row of air diffusers along both longitudinal sides will promote mixing and prevent anaerobic conditions. Diffused air will be provided at a rate of 175 cfm or greater than 5.5 cfm/1,000 gallons of tank capacity. The air will be supplied by a single blower; standby capacity will be provided via an identical blower that serves as common back up with the air supply for the sludge digester, RBC and sand filter aeration processes.

Duplex pumps are provided to transfer the wastewaters to the primary clarifier. Either pump is capable of transferring the designed flow rate. The pumps will be slide rail mounted to facilitate removal for maintenance, repair or replacement.

The pump controls will provide for automatic alternation of pumps used as the lead pump and simultaneous triggering of an alarm and operation of the lag pump if the preset high water level is attained.

The blowers and pumps will be connected to the emergency stand-by generator system that includes automatic start-up and transfer if a power outage occurs.

Since the static head will vary by 7', the pumps are sized to deliver more than the design delivery rate of 63.5 gpm to a flow splitter box where flows in excess of 63.5 gpm are returned to the equalization tank. The pumps' capacity is also greater then that necessary to maintain a minimum velocity of 2 fps in the 4" force main.

The system head plotted on the pump curve is shown on Exhibit B. The pump will discharge about 132 gpm when level in the equalization tank is maximum and about 92 gpm when the pump is about to turn off at the low water level. The corresponding velocities in the 4" force main are 3.35 and 2.35 fps.

Flow Splitter

The discharge from the equalization pump will discharge to a flow splitter box within the process/control building.

The flow splitter consists of a 45 degree vee notch weir and a vertical 6" diameter overflow. Exhibit C provides the flow characteristics of a 45 degree weir and shows that at the desired flow rate of 63.5 gpm to the primary clarifier, the inflow can be varied by about 8 gpm by varying the depth of flow by about ¼".

The flow depth is varied to set the desired flow rate by adjusting the threaded 6" overflow by as much as 1" from the theoretical elevation. The numerical flow rate can be calibrated by using the effluent flow meter.

There will be a tendency for solids to accumulate within the splitter box; removal of the solids can be accomplished by a daily stirring of the compartment.

Primary Clarification

A single primary clarifier with a net surface area of 128 sq. ft. is provided to remove the easily settleable solids and floatable fats and greases. At a design inflow rate of 63.5 gpm (91,440 gpd) the overflow rate will be 91,440/128 = 714 gpd/sf.

The double sided effluent trough provides about 15.8 lf of weir and limits the weir overflow rate to 91,440/15.8 = 5,787 gpd/lf.

Two sludge hoppers with side slopes of 1.75:1 and a bottom plan area of 2' square are provided. A submersible pump in each sump is controlled by time clocks to remove the accumulated sludge as necessary. The clock controls operate on an hourly cycle and enable the Operator to set the frequency and duration of pumping as required. The sludge is transferred to the aerobic sludge digester.

A surface skimmer will continuously remove floatables with the skimmings returned to the equalization tank via the drain line provided.

Rotating Biological Contactor

A Rotating Biological Contactor (RBC) and clarifier are designed as the means of secondary treatment. Although the effluent limits of 30 mg/l BOD_5 must be met after the rapid sand filters, the RBC selection is intended to meet that limit during routine operation.

The designed RBC provides 23.75 ksf in each of the first two stages utilizing low density media and a minimum of 29.5 ksf of media area in the third and fourth stages, utilizing medium or high density media. The design is conservatively based on manufacturer's current criteria and at lower than expected wastewater temperatures.

Temperature – The design of the RBC process is based on a very conservative temperature of no less than 45° F. Due to the relatively short collection system and the lack of commercial or industrial wastewater, the temperature of the wastewaters entering the flow equalization tank should be 60° F or greater. Use of diffused aeration for oxygenation and mixing within the equalization tank will not significantly reduce the wastewater temperature whereas use of a floating mechanical aerator could reduce the temperature by 2 to 4 degrees. Placement of the equalization tank within a building further reduces any potential loss in heat energy and lowering of wastewater temperature.

RBC Influent – A primary clarifier will reduce the influent BOD_5 by up to 35%; primary clarifier removal efficiency is assumed to be 30%.

BOD_5 to primary clarifier at 63.5 gpm and 300 mg/l = 228.8 lb/day

BOD_5 to RBC = 0.70 (228.8) = 160.15 lb./day = 210 mg/l

RBC Sizing @ 55° F

First Stage Loading:

Recommended limit = 8 lbs BOD_5 /ksf
Minimum first stage = 160.12/9 = 20.0 ksf
First stage BOD_5 removal = 40%
First stage effluent BOD_5 = 0.6 (210) = 126 mg/l

Balance of media required for BOD_5 removal to 30 mg/l:

$$\text{Additional removal} = \frac{120-30}{120} \times 100 = 75\%$$

Application rate = 3.2 ± gpd/sf
Remaining area required for BOD_5 removal = 91,440/3.2 = 28.6 ksf

Total minimum RBC are at 55° F = 20.0 + 28.6 = 48.6 ksf

RBC Sizing @ 45°

Temperature Correction Factors:

1.4 for BOD @ 45° F

Total minimum area required at 45° F = 1.4 (48.6) = 68.04 ksf

Minimum area provided by design – 2 (23.75) + 2 (29.5) = 106.5 ksf

First stage loading = 160.15/23.75 = 6.74 lbs BOD_5/ksf

Although the first stage loading is within the parameters recommended by manufacturers, provisions are made in the design to routinely add dissolved oxygen to the first stage and to step feed a portion of the influent directly to the second stage if desired.

Secondary Clarification

A single secondary clarifier follows the RBC process to separate the settleable solids from the treated wastewater.

The clarifier surface area of 128 sf provides an overflow rate at the 63.5 gpm (91,440 gpd) design flow rate of:

91,440/128 = 714 gpd/sf

The double sided effluent weir length is about 15.8 lf, providing an overflow rate at the 63.5 gpm design flow rate of:

91,440/15.8 = 5787 gpd/lf

Without taking credit for any volume provided by the hoppers, the detention volume is 5,984 gallons, providing a detention at the 63.5 gpm design flow rate:

$$\frac{5{,}984(1440)}{91{,}440} = 94.2 \text{ minutes}$$

Two sludge hoppers with side slopes of 1.75:1 and a bottom plan area of 2" square are provided. A submersible pump in each sump is controlled by time clocks to remove the accumulated sludge as necessary. The clock controls operate on an hourly cycle and enable the Operator to set the frequency and duration of pumping as required within each hour. The sludge is transferred to the aerobic sludge digester.

Although not required, a surface skimmer is provided to remove any floatables.

Rapid Sand Filtration

The secondary clarifier effluent will flow to a prepackaged rapid sand filter system to further reduce the suspended solids and $CBOD_5$. The design features of the rapid sand filter will also raise the dissolved oxygen by 1 to 3 mg/l.

The rapid sand filter is completely automatic in daily operation, only requiring operator attention for a periodic chemical cleaning cycle with sodium hypochlorite and detergent about every 2 weeks. The unit designed incorporates several proprietary designs and features to enhance operation and to reduce backwash frequencies and volumes.

The system consists of 2 filter cells, each providing 19.5 sf of filtering area. At the design inflow rate of 63.5 gpm, the overall filtering rate is 1.65 gpm/sf and with only one filter bed in use, the filtering rate is 3.3 gpm/sf.

The unit utilizes a special feature that automatically "bumps" the filtering media at predetermined head losses during operation, breaking up the solids mat at the sand interface and permitting the solids to penetrate into the sand bed. In addition, air is introduced to the wastewater above the filter bed surface, creating a roll within the wastewater that keeps suspended solids in suspension above the filter bed rather than being impinged on the waste/bed interface. These features permit extended filter runs before backwashing and reduce the percentage of filtrate used for backwashing. The combination of the low filtration rate and these features should require backwashing (automatic) about once every two days.

The proven design of the system includes an air scour in combination with a clear water backwash rate of 12 gpm/sf for a 3.5 minute duration. Each filter bed is automatically backwashed one at a time when a predetermined head loss is reached, with the second filter still filtering during the first filter's backwashing operation.

The total volume of filtrate necessary to backwash both filter beds is:

$$2\ (19.5)\ (12)\ (3.5) = 1{,}617 \text{ gallons}$$

Without even considering the constant inflow of filtrate to the clearwell during backwashing, the clearwell provides a volume of about 1,645 gallons, suitable for backwashing both filters one after the other if necessary.

The backwash wastewaters will flow by gravity to the flow equalization tank. Any residual chlorine from the periodic chemical cleaning cycle will be absorbed/reacted by the raw wastewaters in the equalization tank.

Disinfection

Disinfection by chlorination will provide an economical, simply controlled and effective disinfection process. A relatively large contact chamber for the nearly constant inflow rate of 62.5 gpm will provide the necessary disinfection by chlorination and permit economical effective dechlorination to limit the residual chlorine in the final effluent.

Detention

The total length of the contact chamber, including the flow measurement portion is 13.67', the width is 3' and liquid depth (at full flow) is 6.45' for a total volume of 1,980 gallons.

Detention at full flow = 1,980/62.5 = 31.7 minutes

If it is ever necessary to temporarily bypass the equalization tank, chlorine can be temporarily introduced into the tertiary filter's clear well, providing an additional volume of 1,645 gallons for a total volume of 3,625 gallons and a detention of 15.4 minutes at the expected peak hourly flow of about 235 gpm.

Chlorine Dosage

Although a dosage of only about 3-5 mg/l is anticipated as necessary to provide a 0.5 mg/l residual at the outflow from the contact chamber, provisions to dosing at least to mg/l are to be provided.

For a 10 mg/l dose:

lb/day = 10 (0.09) (8.34) = 7.5 of chlorine

Using a full strength 14% sodium hypochlorite solution providing about 1.25 lbs of chlorine per gallon:

Feed rate = 7.5/1.25 = 6 ± gpd for a 10 mg/l dose

Feed rate = 3 ± gpd for a 5 mg/l dose

A chemical feed pump with an adjustable feed rate of 0-24 gpd and a 30 gallon (min.) solution crock is provided.

Dechlorination

The maximum effluent chlorine residual permitted by the SPDES Permit is 0.15 mg/l.

However, due to the length of the outfall and continued reduction in chlorine residual during the flow from the treatment facilities to the Van Anden Kill, it is likely that a residual of greater than 0.15 mg/l can be maintained as the effluent leaves the treatment facilities without exceeding the 0.15 mg/l chlorine residual limit at the actual discharge. The Operator should try to maintain a high residual in the effluent as it leaves the treatment facilities as a means to prevent Coliform regrowth within the outfall piping, as long as the final chlorine residual is 0.15 mg/l or less at the Van Anden Kill.

Provisions to add sodium metabisulfite to the chlorine contact chamber effluent are included. The reaction between sodium metabisulfite and chlorine is measured in

seconds with 1.775 parts of sodium metabisulfite required to remove each part of chlorine.

With a chlorine residual of 0.5 mg/l at the outlet of the contact chamber and limit of 0.15 mg/l at final discharge, 0.35 mg/l of chlorine must be removed.

Chlorine to be removed = 0.35 (.09)(8.34) = 0.253 lbs/day

Sodium metabisulfite required = 1.775 (0.263) = 0.466 lbs/day

The solubility of sodium metabisulfite at 32° F is about 14 lbs per 100 lbs of water or about 14 lbs per 12 gallons.
Using a solution of ½ lbs of sodium metabisulfite per 5 gallons of water will require a dosage of about 5 gpd. A chemical feed pump with an adjustable feed rate of 0-24 gpd and a 30 gallon crock (minimum) are provided.

Flow Measurement and Recording

The final effluent will pass over a 45° vee notch weir prior to discharge. Exhibit "C" provides the head versus flow rate relationship for the weir and shows that the depth of flow will be about 5-3/8" at the 62.5 gpm (90,000 gpd) permitted discharge rate.

The flow monitoring/measurement equipment provided will continuously measure, indicate and record the instantaneous and total flow rates.

The discharge rate from the final flow meter should be used to fine adjust the flow rates in the primary clarifier inlet flow splitter box.

Sludge Treatment and Disposal

Sludge from the primary and secondary clarifiers will be combined and aerobically digested and thickened. The digested and thickened sludge must be removed from the facilities periodically by a NYDEC certified scavenger for ultimate off site disposal in accordance with NYDEC regulations.

Primary Sludge:

It is assumed that the primary clarifiers will remove about 60% of the estimated 300 mg/l suspended solids in the raw wastewater and that the sludge will be pumped at 3 to 4% solids.

Raw sludge = 0.6 (0.09) (300) (8.34) = 135.1 lbs/day

Secondary Sludge:

There are two methods of calculating sludge from secondary clarifiers that follow the RBC process:

a. Typical unsettled RBC effluent = 125 mg/l SS
   Typical settled RBC effluent = 20 mg/l SS or less

   Secondary sludge = (0.09) (125-20) (8.34) = 78.8 lbs/day

b. 0.55 lbs sludge produced /lb of BOD_5 removed
   30% BOD_5 removal in primary clarifier
   BOD_5 to RBC = .7(300) = 210 mg/l
   RBC effluent BOD_5 =30 mg/l or less
   BOD_5 removed = 0.09 (210-30) (8.34) = 135.1 lbs/day

   Secondary sludge = 0.55 (135.1) = 74.3 lbs/day

   Use the more conservative 78.8 lbs/day at 2-3% solids

Total Sludge:

The total daily sludge production is taken as 135.1 lb/day (pri.) plus 78.8 lbs/day (sec.) for a total of 213.9 lbs/day.

It is assumed that the sludge will be about 70% VSS, or the volatile sludge will be about 150 lbs/day.

Sludge Age:

For 40% reduction of the VSS, 474 degree days are needed. At a temperature of 7.22° C (45° F), a minimum detention of 65.7 days is required. During the digestion process, 40% of the VSS (60 lbs/day) are destroyed.

Digestion Sizing:

Influent solids = 214 lb/day therefore, use conservatively assume 2% solids
Sludge wet weight = 214/.02 = 10,700 lb/day
Sludge wet volume = 10,700/8.34 = 1,259 gallons/day
Assume sludge thickened to at least 4%
With 40% VSS destroyed /day, net sludge/day = 214 -60 – 154 lb/day
Net weight sludge/day at 4% solids = 3,850 lb/day
Net volume sludge/day = 453 gallons/day

Minimum digester volume = 66 (453) = 29,898 gallons = 3,997 cubic feet
Digester volume provided = 4,281.75 cf = 32,027 gallons
Detention provided – 32,027/453 = 70.7 days

Sludge Thickener:

Volume of each hopper = $3.5/3\ (4^2 + 36^2 + 4x36)^{.5}$
= 44.52 cf = 333 gallons
Total hopper volume = 666 gallons
Upper portion volume = 6(12) (4.75) (7.48) = 2,558 gallons
Total thickener volume = 666 + 2,558 = 3,224 gallons

Aeration Requirements

Required air = 30 cfm/1,000 cf of tankage
Volume of aerated section = 4282 cf
Minimum air supply required = 4.282 (30) – 128.5 cfm

Digester/Thickener Operation

The thickener is designed to be operated primarily as continuous process, but could be operated as a batch process if the Operator utilizes a portable pump to remove the supernatant.

Batch process:

If the empty thickener is filled from the digester by gravity, the digester can then accept 2831 gallons or over 3 days of digested sludge displaced by fresh incoming sludge.

If the sludge is permitted to remain in the digestor for 24 hours, the surface overflow rate is: 2831/62 = 39.3 gpd/sf.

After 24 hours of quiescence, the supernatant could be pumped to the equalization tank by using a portable pump. After the supernatant is removed, the sludge pumps would be lowered to the bottom of the hoppers and the thickened sludge returned to the digester for additional treatment.

Continuous Treatment

With the thickener always full, sludge being discharges to the digester will displace an equal volume to the thickener. With the raw sludge added to the digester at a rate of 899 gpd (and an equal volume displaced to the thickener), a surface area of 62 sf and a weir length of 11.8 lf, the surface overflow rate will be 14.5 gpd/sf and the weir overflow rate will be 76.2 gpd/lf.

Each sludge hopper has its own air lift for sludge removal. The 2" air lift will pump about 15 gpm at the design air supply of 3 cfm and can be increased to about 25 gpm by increasing the sir flow to 25 gpm. The air will continuously return thickened sludge to the inlet end of the aerobic digester.

During periods when fresh sludge is not added to the digester, there will be no supernatant overflowing the thickener weirs but there will be a continuous return of thickened sludge to the digester. As fresh sludge is discharged into the digester, it displaces an equal volume of digested sludge to the thickener which causes supernatant to flow over the weir. The supernatant will have a low BOD_5 and ammonia concentration due to the extended (>70 days) aeration period in the thickener and is returned to the equalization tank where it is mixed with and will dilute the raw wastewater.

Aeration

Low pressure air is to be supplied for five processes at the following minimum rates and maximum pressures:

Equalization tank	- >1.251 cfm/1000 gal. with water depth varying up to 7.25'
Aerobic digestion	- 128.5 cfm with water depth of 7.25'
Sludge airlifts	- 6 cfm with water depth of 6.75'
Sand filter	- 14 cfm at 2 psi (4.62' w.d)
RBC	- 20 ± cfm with water depth of 4.5'

Three identical blowers are to be provided. One blower will provide air to the equalization tank, one blower will provide air to the digester, sludge air filters, rapid sand filter and RBC and one blower will serve as a standby for either of the other two blowers. The blowers will be interconnected with piping but separated by appropriate shutoff and check valves.

The Operator should routinely change one of the two blowers in use with the idle blower in order to promote even wear and tear on all blowers.

<u>Operating Pressure</u>

The maximum water depth over the diffusers in the equalization or digester tank is 7.25'.

Piping loss = allow 6" w.g. loss to either equalization tank digester, or air lift.
Diffuser loss = 1" w.g. for 10 cfm/diffuser therefore, use 6" w.g.
Filter / silencers = <0.2" w.g.
Total calculated loss = 8.25' = 3.57 psi
Design for 4 psi to allow for misc. losses
Check for 4.25 psi

The selected blowers each have a capacity of 175 cfm at 4 psi (4150 rpm – 8.4 BHP) or 4.25 psi (5250 rpm – 9.2 BHP).

The 175 cfm is greater than either the minimum required for the equalization tank and will assure proper mixing and aerobic conditions within that process. The 175 cfm is greater than the 168.5 cfm minimum required for the other four processes; any excess air can be used in either the digester of RBC process. 132 cfm at 4.25 psi.

Any one of the three blowers can then serve either air requirement or as the back up for either air requirement.

Operator's Convenience

The facility serves a small service area owned and operated by a single entity; operation and maintenance will be performed by either full-time Sewage Works Corporation employees and/or by outside professional operators. Sanitary facilities and potable water are available within the Operator's room.

Water for washdown of tankage and floors is available and will be identified with a permanent sign.

A NYSDOH approved reduced zone pressure backflow preventer is located between the potable water system and service lines to the washdown hydrants.
Heat will be provided only for the small operator's room both for the convenience of personnel and to protect the exposed portions of the water system.

Operation of Facilities

Proper operation of the wastewater treatment facilities will require daily attention, testing and maintenance. All operations are to be performed or supervised by a NYDEC certified Wastewater Treatment Plant Operator.

In order to permit proper operations, laboratory equipment (for onsite testing for pH, temperature, chlorine residual and settleable solids), small hand tools, hoses, etc. shall be supplied. Other tests, such as for Coliform bacteria, BOD_5 and SS are to be performed by a NYDEC approved laboratory.

Site Improvements

Access to and parking at the treatment building is provided. All treatment units are enclosed within a building.

Performance Sampling

The SPDES permit for this facility requires monitoring of the effluent being discharged to the receiving waterway. All effluent samples can be readily obtained from the effluent pumping well within the process/control building. Composite samples may be obtained manually or by use of portable sampling equipment.

Order Control

Odor is best controlled by prevention through proper design and operation rather than by treatment. Odor prevention by design includes the selection of the RBC process and provisions for building ventilation, excess air in the aerobic digester and flow equalization processes and automatic transfer of power for the blowers to the standby generator during a power outage.

The raw wastewater entering the equalization tank is fresh and will be kept under proper aeration until delivered to the primary clarifier. However, even under these conditions, there will be a slight but distinct odor around the primary clarifier. The RBC effluent

will have a slight and different odor in the secondary clarifier. Under normal operating conditions, neither odor is anticipated to be objectionable inside of let alone outside of the treatment buildings.

The treatment buildings will be continuously ventilated to dilute any slight odors from normal operation and to remove excess moisture in the building environment. The continuous dilution of building air with fresh air will reduce operator sensitivity to the normal odors and maintain a normal relative humidity within the buildings.

The only potential cause of significant odors is from an extended period of lack of aeration in the equalization tank or digester. Standby emergency generation and a back up blower is provided.

The air system provides to fresh air to enter the process/control building, flow through the separate RBC room and flow to the equalization /sludge building where an additional 315 ±of air is added from the aeration processes.

A separate odor treatment system is provided in the equalization sludge building with a 1400 ± exhaust fan. This fan will operate continuously, drawing about 1185 cfm from the process/control building. The odor control system includes a high pressure chemical feed pump that injects proprietary chemicals into the air duct. A contact chamber with demister is provided. The discharge of all air through the building roof, located to maximize the separation to off property residences.

External Pump Station Power

It is desirous to provide emergency stand-by power to a pumping station situated within the sewage collection system from the emergency generator that is to be provided for the wastewater treatment facilities. Since both control and power cables must be provided between the treatment facilities site and the external pumping station, power to the external pumping station shall be routed through the wastewater treatment facilities.

Emergency Stand-by Power

The normal operation of the wastewater treatment facility depends on pumping to transfer wastewater from the equalization tank to the primary clarifier.

Prevention of odor is accomplished by proper aeration. Although effluent disinfection during power outages is not essential, it is desirable.

Emergency standby power is provided to start and operate the entire treatment facilities and external pumping station under normal conditions. The standby power system will include an automatic transfer switch that will sense a power outage, start the standby generator and transfer the load from the supplied power supply to the generator power supply.

Building Design

Although the process plans, specifications and this report do not provide the structural, architectural and electrical design for the buildings, it is noted that the buildings must be constructed of materials suitable for service in areas of high humidity.

Furthermore, it is noted that the Owner's intent is to provide an exterior design so that the two buildings will blend into a residential neighborhood. In addition to materials selected and architectural design, the areas around the buildings will be landscaped with lawn, "foundation" plantings, bushes and/or trees.

Section 5.0

Stormwater Pollution Prevention Plan (SWPPP)

Section 6.0

NYSDEC Wetland Mapping

Section 7.0

Endangered
and
Threatened Species
Report

Chazen Companies

April 10, 2006

Section 8.0

Phase II Bog Turtle Survey

Ecological Solutions
August 1, 2006

Phase II Bog Turtle Survey

Summit Woods Property
Route 52
Town of East Fishkill,
Dutchess County, NY

August 1, 2006

Prepared by:

Michael Nowicki
Ecological Solutions, LLC
1248 Southford Road
Southbury, CT 06488
(203) 910-4716

1.0 INTRODUCTION/METHODS

In March 2002 Ecological Solutions, LLC identified potential Bog Turtle (*Glyptemys muhlenberghi*) habitat on the 325.22 acres Summit Woods property located on Route 52 in the Town of East Fishkill, Dutchess County, NY (Figure 1.0-1). The Bog Turtle is listed as a New York State endangered species[1] and is listed as a threatened species by the US Fish and Wildlife Service.

As part of the continuing environmental review for the project, the Applicant ABD Fishkill, LLC contracted with Ecological Solutions, LLC in April 2006 to undertake a Phase II Bog Turtle survey within a total of 3.55 acres (Area 1: 0.83 ac.; Area 2: 2.72 ac.) of potential habitat (limestone fen) identified on the site (Figure 1.0-2). Two additional areas of herbaceous wetland with fen indicator species totaling 18.67 acres [Area 3: 11.97 ac.; Area 4: 6.70 ac. (Figure 1.0-2)] were also evaluated but were determined to be unsuitable based upon the absence of consistent groundwater-driven hydrology. This report provides the results of the Phase II Bog Turtle survey within the 3.55 acres of high quality limestone fen habitats on this site during May and June 2006.

The Phase II survey was completed in accordance with the protocols outlined by the Fish and Wildlife Service (2001)[2]. A bog turtle survey is an attempt to determine presence or probable absence of the species. Following the Phase II Bog Turtle Survey guidelines helps to maximize the potential for detection of bog turtles at previously undocumented sites at a minimum acceptable level of effort. Although the detection of bog turtles confirms their presence, failure to detect them does not absolutely confirm their absence (likewise, bog turtles do not occur in all appropriate habitats and many seemingly suitable sites are devoid of the species).

Three investigators (Jason Tesauro, Randy Stechert, and Michael Nowicki) surveyed the two identified limestone fen areas (Areas 1 and 2) on four days (May 25, June 1, June 8, and June 15, 2006) for the presence of Bog Turtles. Survey times lasted the required three (3) to six (6) person-hours per acre of wetland per visit. All surveys were performed generally between 9:00am and 3:00pm under optimal weather conditions with air temperatures between 70-85 degrees Fahrenheit during the surveys.

Visual surveys were executed using a combination of transect-based and random opportunistic search methods. During each survey rivulets, small open water zones, and other potential turtle refugia were probed with wooden sticks for subsurface turtles. Basking areas, including open-canopy hummocks, matted vegetation and shallow waterways were also thoroughly examined—especially in early June when gravid females spend a significant time in the sun for egg gestation. Open tussocky areas were also combed for nests or eggshell fragments from hatched/predated nests of previous years. Areas 1 and 2 were surveyed four times for a total of 72 man-hours. As part of habitat evaluation/monitoring efforts, Areas 3 and 4 were also surveyed on the first and last day of the survey for a total of 12 man-hours.

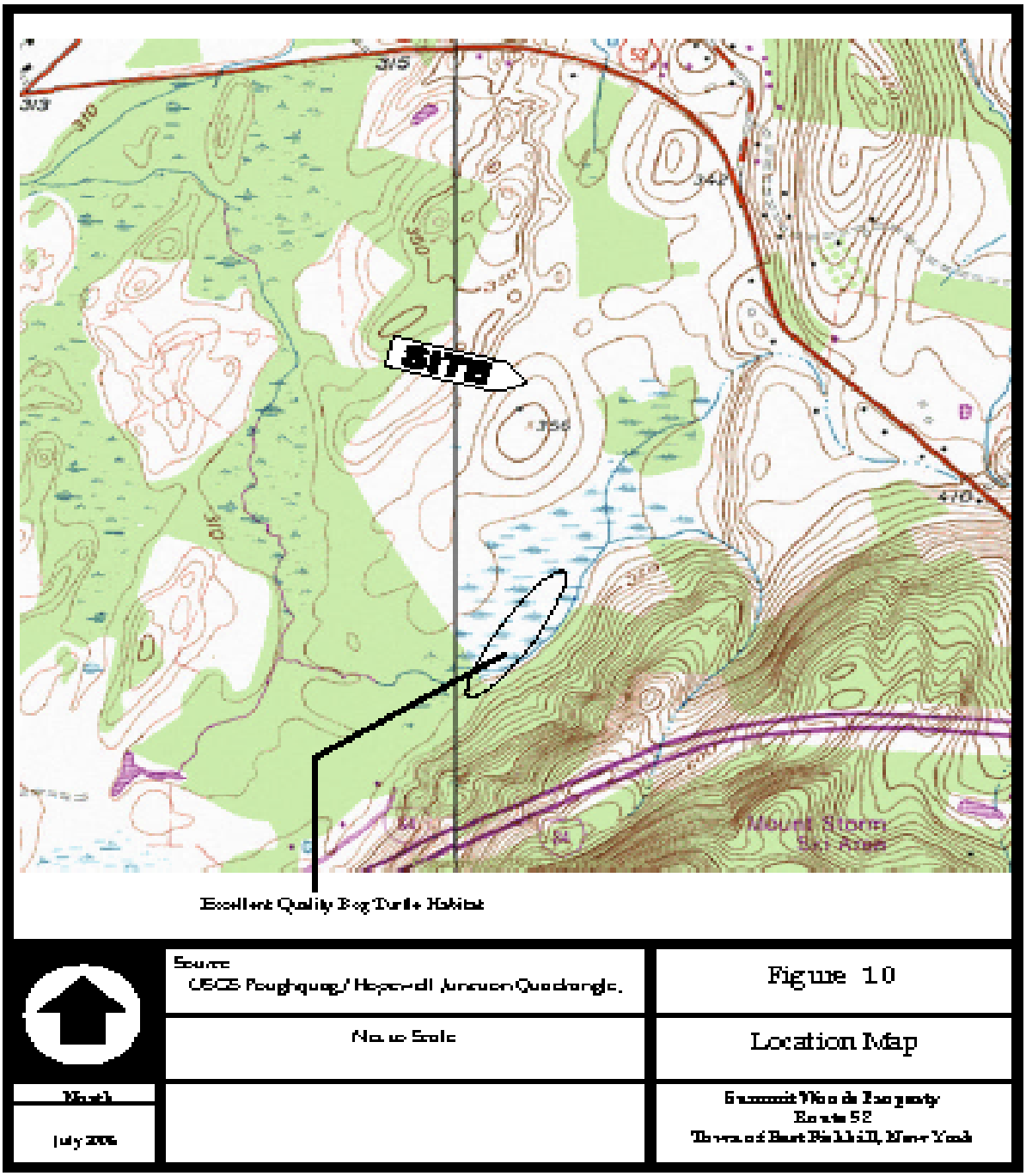
---

[1] New York State DEC Web Site Endangered Species Home Page Bog Turtle Fact Sheet

[2] US Fish and Wildlife Service 2001 Bog Turtle (Clemmys muhlenbergii) Northern Population, Recovery Plan Hadley, Massachusetts

In addition to visual searches, six un-baited funnel (i.e. commercial eel traps) and twelve box traps were set by Tesauro along potential travel corridors within Area 1. Traps were checked daily for a total of 14 days or 252 trap nights (18 traps x 14 days). Note that trapping was done only to complement survey efforts and was not done in any kind of "official" sense. A genuine trapping study, known as a "Phase III Survey," has very rigid federal protocols and is employed when a definitive sense of bog turtle presence/absence is required.

Figure 1.0-1
Location Map



2.0 LITERATURE REVIEW

Bog Turtle Habitat - According to the federal recovery plan (USFWS, 2001), Bog Turtle habitat includes shallow, spring-fed fens, sphagnum bogs, swamps, marshy wet meadows with soft, muddy, organic bottoms, slow moving water, and open canopies bordered by shrub and red maple swamps. Plant species found in association with bog turtles include shrubby cinquefoil (*Potentilla fruticosa*), sedges (*Carex* spp., especially *Carex stricta),* sphagnum moss (*Sphagnum spp.),* and skunk cabbage (*Symplocarpus foetidus)*. The turtles frequently lay eggs atop tussock sedges in areas with open canopies and sparse shrub vegetation that would not shade the nests.

According to NYSDEC and the Natural Heritage Program (2003)[3], optimal habitat (in New York) has the following attributes:

- <25% canopy cover
- Headwater or spring head water sources
- Muddy substrate
- Shallow, uneroded rivulets
- Shrubby cinquefoil, sedges, rushes, sphagnum moss
- No obvious threats or evidence of negative impacts to wetland in the past.

2.1 Species Description

Bog Turtle - The secretive bog turtles are now in the Genus *Glyptemys,* and have a maximum length not exceeding 4.5 inches. The carapace is domed and from light brown to ebony, with scutes often having lighter-colored centers in a starburst pattern. The distinguishing feature is a large, conspicuous, bright orange or yellowish blotch on each side of the head. This blotch is present from birth in both sexes.

[3] *Personal conversations between Jesse Jaycox (Natural Heritage Program) and Mike Clancy (NYSDEC, with Mike Nowicki, 2003.*

3.0 HABITAT ASSESSMENT/RESULTS

The 325.22 acres Summit Woods property contains approximately 75 acres of wetland. The majority of the wetland onsite is comprised of a core red maple hardwood swamp in the center with wet meadow and fen wetland types located on the outer fringe area. A watercourse (Van Anden Creek) drains the wetland system toward the south and several tributaries and rivulets are located entering and flowing through the system from the large area of steep slopes and areas near Route 52.

Four discrete patches of emergent wetland were evaluated for bog turtle habitat suitability: Area 1 (0.83 ac.), Area 2 (2.72 ac.), Area 3 (6.7 ac.), and Area 4 (11.97 ac.) Figure 3.0-1.

Figure 3.0-1
Potential Bog Turtle Habitat
Summit Woods Property

Areas 1 and 2 were determined to contain suitable bog turtle habitat and were the focus of the Phase II survey. The hydrology at each of these habitats is maintained by copious springs that create a diverse array of rivulets, shallow pools, and flowages. Substrates are quaggy and contain a mixture of organic matter (deposits up to several feet deep) and mineral material. Dominant plant species include Poison Sumac (*Rhus vernix*), Sundew (*Drosera* sp.), Tussock Sedge (*Carex stricta*), sapling red maples, various ferns, thick mounds of sphagnum moss, and Skunk Cabbage (*Symplocarpus foetidus*). Almost no invasive/non-native plants exist in the high quality fen areas, and signs of past disturbance were non-existent (very rare for wetlands in Hudson Valley).

Wetland Area 3 meets all the criteria of suitable bog turtle habitat with the exception of hydrology. A few ephemeral seepages were identified in Area 3, but these seeps did not contain the appropriate volume nor had the consistency to create soft, mucky conditions that are well suited for turtle burrowing. The vegetation in Area 3 contained fen species but was dominated by dense stands of the tall-growing sedge, *Carex lacustris*, Purple Loosestrife (*Lythrum salicaria*), and Gray Dogwood (*Cornus racemosa*).

Area 4 consists of a dry, mineral soil fen surrounding a poorly drained, marshy basin that had been ditched for agricultural use (presumably for hay). The hydrology in the basin is primarily standing water 6”-12” deep and appears to be maintained primarily by precipitation and run-off. The vegetation is composed of submergent and emergent species. Overall, the basin portion of wetland appears to function more like a vernal pool then a fen, despite the patchy occurrences of Shrubby Cinquefoil (*Pentaphylloides floribunda*), Grass-of-Parnassus (*Pamassia glauca*), Cotton Grass (*Eriophorum angustifolium*), and other bog turtle/fen ‘indicator’ species. The frequent observations of spotted turtles at Area 4 are potential testament to its vernal character.

The visual surveys and complementary trapping efforts yielded no bog turtles or sign of their presence. Other turtle species encountered during the Phase II survey were Spotted Turtle (*Clemmys gutatta*), Eastern Box Turtle (*Terrapene carolinensis*) and Snapping Turtle (*Chelydra serpentina*). In addition, Ribbon Snake (*Thamnophis sauritus*), DeKay Snake (*Storeria dekayi*), Milk Snake (*Lampropeltis triangulum*) and Garter Snakes (*Thamnophis sirtalis*) were also identified as well as several common amphibians including Pickerel Frog (*Rana palustris*) and Green Frog (*Rana clamitans melanota*) (Tables 3.0-1 and 3.0-2).

Table 3.0-1 Reptilian Species Observed			
DATE	**COMMON NAME**	**SCIENTIFIC NAME**	**NUMBER CAPTURED**
5/25,6/1,6/15	Spotted Turtle	Clemmys guttata	5
6/8,6/15	Eastern Box Turtle	Terrapene carolinensis	2
6/15	Snapping Turtle	Chelydra serpentina	1
6/15	Milk Snake	Lampropeltis triangulum	1
5/25/6/8	Dekay's Snake	Storeria dekayi	2
5/25,6/1	Ribbon Snake	Thamnophis sauritus	2
6/15	Garter Snake	Thamnophis sirtalis	4

Table 3.0-2 Amphibian Species Observed			
DATE	**COMMON NAME**	**SCIENTIFIC NAME**	**NUMBER OBSERVED**
5/25,6/1,6/15	Green Frog	Rana clamitans melanota	5
6/8,6/15	Pickerel Frog	Rana palustris	5

4.0 CONCLUSIONS

The visual surveys and complementary trapping efforts yielded no bog turtles or signs of their presence. As noted in Section 1.0, a bog turtle survey is an attempt to determine presence or probable absence of the species. The work in this Report documents the results of the visual surveys and complementary trapping efforts and leads to the conclusion that bog turtles are probably absent from the site. It is acknowledged that the failure to find bog turtles does not absolutely confirm their absence.

5.0 REFERENCES

U.S. Fish and Wildlife Service. 2001. Bog Turtle (Clemmys muhlenbergii), Northern Population Recovery Plan. Hadley, Massachusetts. 103 pp.

Section 9.0

Construction Details

Section 10.0

Subdivision Plans