Appendix I

Preliminary Water Supply and Distribution System Engineering Report for Raleigh and Heiden Properties Development Project

GLENN L. SMITH, P.E.
Consulting Engineer, P.C.
Licensed in New York, New Jersey and Pennsylvania

533 Broadway / P.O. Box 156
Monticello, New York 12701
Telephone: (845) 796-2216
Fax: (845) 796-2716

PRELIMINARY
WATER SUPPLY AND DISTRIBUTION SYSTEM
ENGINEERING REPORT
FOR
RALEIGH AND HEIDEN PROPERTIES
DEVELOPMENT PROJECT

Heiden Road and Park House Road
Town of Fallsburg
Sullivan County * New York

Date: May 31, 2011
Rev:

Table of Contents

ATTACHMENTS

FIGURES

1. Introduction

The following evaluates and summarizes water supply plans for the proposed Raleigh and Heiden Hotel Properties development located on Heiden Road (County Road No. 161) in the Town of Fallsburg, Sullivan County, New York. The project will consist of the proposed construction of 236 single-family housing units in four (4) separate clusters, varying from 47 to 68 homes per cluster. In addition, the existing 230 room Raleigh Hotel will continue to operate on a year-round basis utilizing existing sources including two (2) on-site wells; and interconnection with the Town of Fallsburg municipal watermain installed along Heiden Road.

This report has been prepared for submittal to the New York State Department of Health in regard to water system improvements and groundwater taking associated with the project. These improvements will include the installation and development of at least five (5) new drilled wells, a distribution piping system, water storage and pumping facilities and disinfection..

The project development upon full buildout will consist of the following components:

Cluster #1: 55 Dwelling Units in 13 singles and 21 duplex homes.
Cluster #2: 47 Dwelling Units in 19 singles and 14 duplex homes
Cluster #3: 66 Dwelling Units in 16 singles and 25 duplex homes
Cluster #4: 68 Dwelling Units in 8 singles and 30 duplex homes

Existing Raleigh Hotel to remain at 230 rooms

2. Project Description

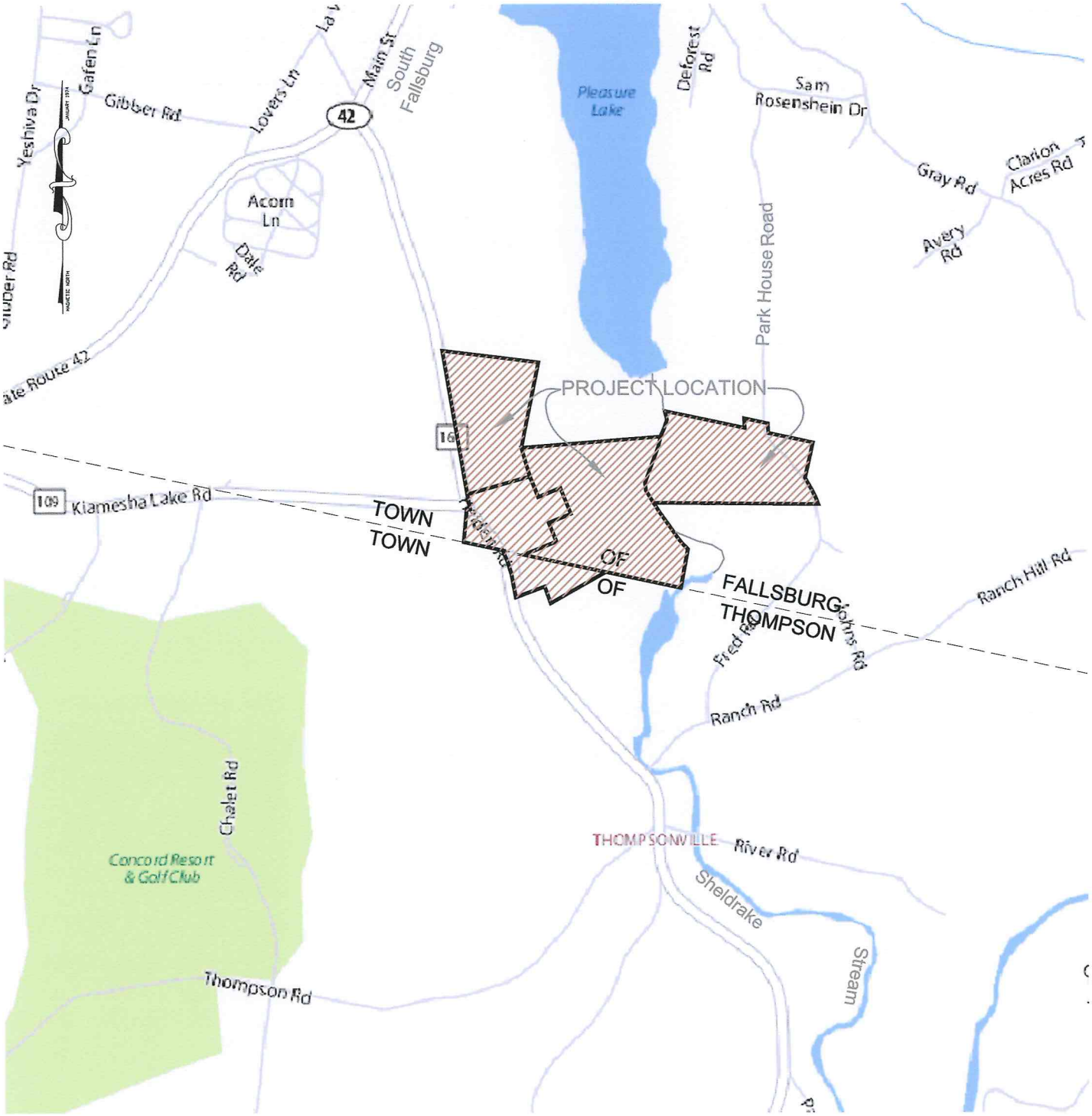
The project is situated on the Raleigh Hotel and former Heiden Hotel properties lying along the easterly side of Heiden Road (a.k.a. Thompsonville Road and County Road No. 161), and bounded along the easterly side by Park House Road (Town Road No. 62) in the Town of Fallsburg. The total tract comprises 226.33 acres in Fallsburg, with a 11.22 acre parcel situated in the adjacent Town of Thompson containing the current hotel entrance drive and portion of proposed access road to housing clusters #2 and 3. (Refer to Figures 2-1, 2-2 and 2-3)

Access to the project will be provided at multiple points, including the above-noted Raleigh Hotel entrance drive that will be shared by the hotel and clusters #2 & 3; two (2) additional entrances off Heiden Road located approximately 1,500' and 2,400' north, respectively, of the Raleigh entrance to serve housing clusters #1 and 2; and a primary and emergency/secondary drive off Park House Road to serve cluster #4. (Refer to Figure 2-4)

The current project site consists of a mixture of existing Raleigh Hotel facilities, including numerous structures, swimming pool, recreation courts, parking lots and drives;

former Heiden Hotel ancillary bungalows, outbuildings, pools and courts (that hotel burned down several years ago), and wooded, undeveloped areas. Pleasure Lake, with an area of approximately 220 acres, is located immediately north of the project site with its outlet stream (Sheldrake Stream) flowing in a southerly direction through the property, physically separating the westerly side project (clusters #1, 2 & 3 plus hotel) from the easterly side project (cluster #4). Sheldrake Stream (Water Index No. D-1-38) is tributary to the Neversink River.

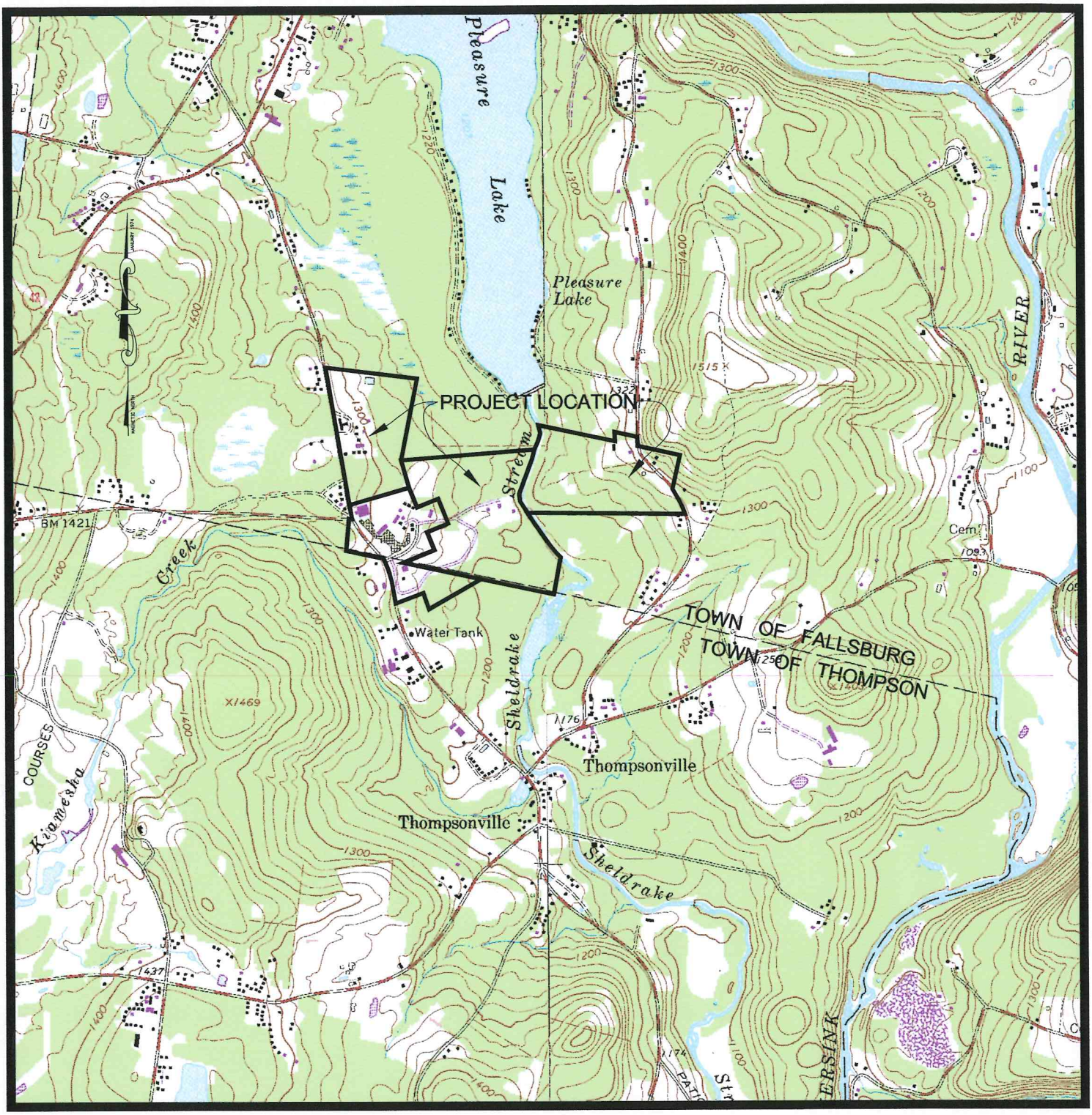
The portion of project property lying adjacent to Heiden Road is currently within the Town of Fallsburg Consolidated Water District, thereby providing access to the existing 8" dia. watermain installed along that road to the Raleigh Hotel. The hotel is currently interconnected to that main as a supplemental supply to two (2) existing drilled wells also utilized by the hotel. Proposed housing Cluster #1 also lies primarily within the water district bounds such that the project intent is to serve those 55 homes by the municipal system connection with a master water meter and backflow preventor valve in a pit at the point of connection. All other homes in Clusters #2, 3 and 4 will be served by the proposed on-site community water system.



SCALE: 1" = 2000 FT

RALEIGH HOTEL - HEIDEN ROAD PROPERTIES
(T) FALLSBURG - (T) THOMPSON
SULLIVAN COUNTY NEW YORK

FIGURE 2-1
LOCATION MAP
MAY 2011



SCALE: 1" = 2000 FT

RALEIGH HOTEL - HEIDEN ROAD PROPERTIES

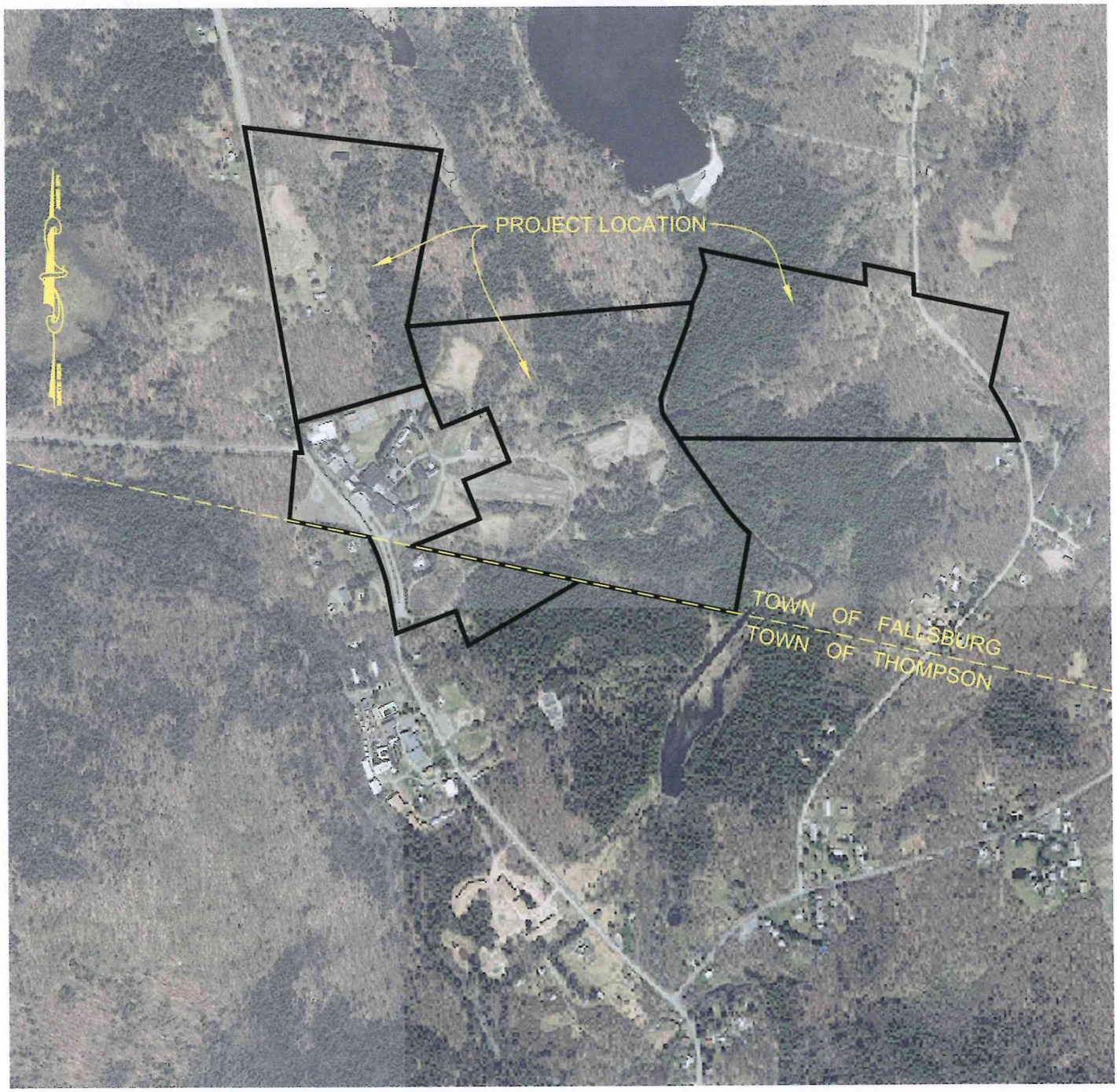
(T) FALLSBURG - (T) THOMPSON

SULLIVAN COUNTY NEW YORK

FIGURE 2-2

USGS VICINITY MAP

MAY 2011



SCALE: 1" = 1000 FT

RALEIGH HOTEL - HEIDEN ROAD PROPERTIES

(T) FALLSBURG - (T) THOMPSON

SULLIVAN COUNTY NEW YORK

FIGURE 2-3

AERIAL PHOTO

MAY 2011

FIGURE 2-4

REV.	DR.	CK.	DATE	DESCRIPTION

GLENN L. SMITH
CONSULTING ENGINEER, P.C.
P.O. BOX 156 - MONTICELLO - NEW YORK - 12701
PH. (845) 796-2216

SITE PLAN

RALEIGH AND HEIDEN PROPERTIES
HEIDEN ROAD AND PARK HOUSE ROAD
(T)FALLSBURG • SULLIVAN COUNTY • NEW YORK

DATE	FEBRUARY 10, 2011
REVISION	
SCALE	1" = 200'-0
DRAWN	GLB
CHECKED	GLS
JOB NO.	11-0

SHEET NO. 1 OF SHEETS

SEAL

3. Water Supply Needs

3.1 The following section summarizes the specific requirements of the water supply, storage and distribution system with respect to quantity and quality characteristics

3.1a **System Design Flow – Town of Fallsburg Water District**

Raleigh Hotel (existing)	40,000 gpd
Cluster #1 (proposed)	22,000 gpd
Total	62,000 gpd

3.1b **System Design Flow – On-site Water System**

Clusters #2 + 3 + 4	72,000 gpd
Average Daily Demand (A.D.D.)	50 gpm
Maximum Daily Demand (M.D.D.) (1 ½ times A.D.D.)	75 gpm

Required Wells Capacity

Number of Wells Constructed	5
Minimum Combined Capacity	Need 75 gpm with best well out of service

Required Storage

Gravity Storage Tanks	Use approximately 70% of Average Daily Demand of 72,000 gpd = 50,400 gals
Dimensions	Use 5 vertical polyethylene storage tanks, each 12' dia. x 13'-9" high = 10,000 gals each = 50,000 gals. total

Booster Pumps System

Number of Pumps	Two (duplex) centrifugal pumps
Type	Skid-mounted end-suction centrifugal pumps, 15 HP each, continuous run
Capacity	200 gpm (4 x A.D.D. of 50 gpm)
System Pressure	Maintain 35 psi at highest elevation (Unit #68 in Cluster #4)
Total Dynamic Head (TDH)	Elev. Head 38'
	35 psi pressure head 81'
	friction loss head 4'
Total TDH	123'
Booster Pump Design Requirement	200 gpm at 123' TDH

Disinfection System	
Minimum Chlorine Contact Time	30 mins at peak flow
Hourly Peaking Factor	4 times A.D.D.
Peak Hourly Flow Rate	200 gpm
Minimum Detention Storage Volume	6,480 gals
No. of Metering Pumps	1 each
Metering Pump Type	Positive displacement
Model	Liquid Metronics
Pump Capacity	48 gpd maximum
Chlorine Solution Storage	2 – 5,000 gal. poly. crocks
Pump Activation	Interlocked with well pumps
Water Flow Metering	
Meter Size	2" Neptune
Meter Type	Disc., Direct Read
Meter Units	Gallons

4. **Water Treatment**

No treatment of the groundwater supply serving the residential clusters #2, 3 and 4 is anticipated other than for chlorine disinfection purposes.

5. **Operation and Maintenance**

The proposed water system serving the residential clusters will be constructed, operated, and maintained by the Homeowners Association. It is the owner's intention to execute a technical services agreement with an individual that will serve as the certified water system operator. This agreement will be fully executed prior to project and startup.

6. **Water Supply Sources Provided (On-Site System)**

Five (5) wells were drilled on the project site in 2009 by Fulton & Son Well Drilling, under the direction of the project developer, with well data summarized as follows:

No.	Date Drilled	Depth	Static W.L.	Casing	72-Hour Test Yield	Notes
Well 1	5/28/09	400'	40'	50'	15 gpm	
Well 2	6/2/09	600'	40'	42'	15 gpm	
Well 3	6/15/09	375'/600'	15'	40'	30 gpm	Well deepened to 600'
Well 4	8/7/09	500'	60'	42'	35 gpm	
Well 4a	9/1/09	625'	60'	50'	15 gpm	
				TOTAL	110 gpm	

As indicated in Section 3.1b (above) the Maximum Daily Demand (M.D.D.) of 75 gpm shall be provided by on-site wells, with the best producing well out-of-service.

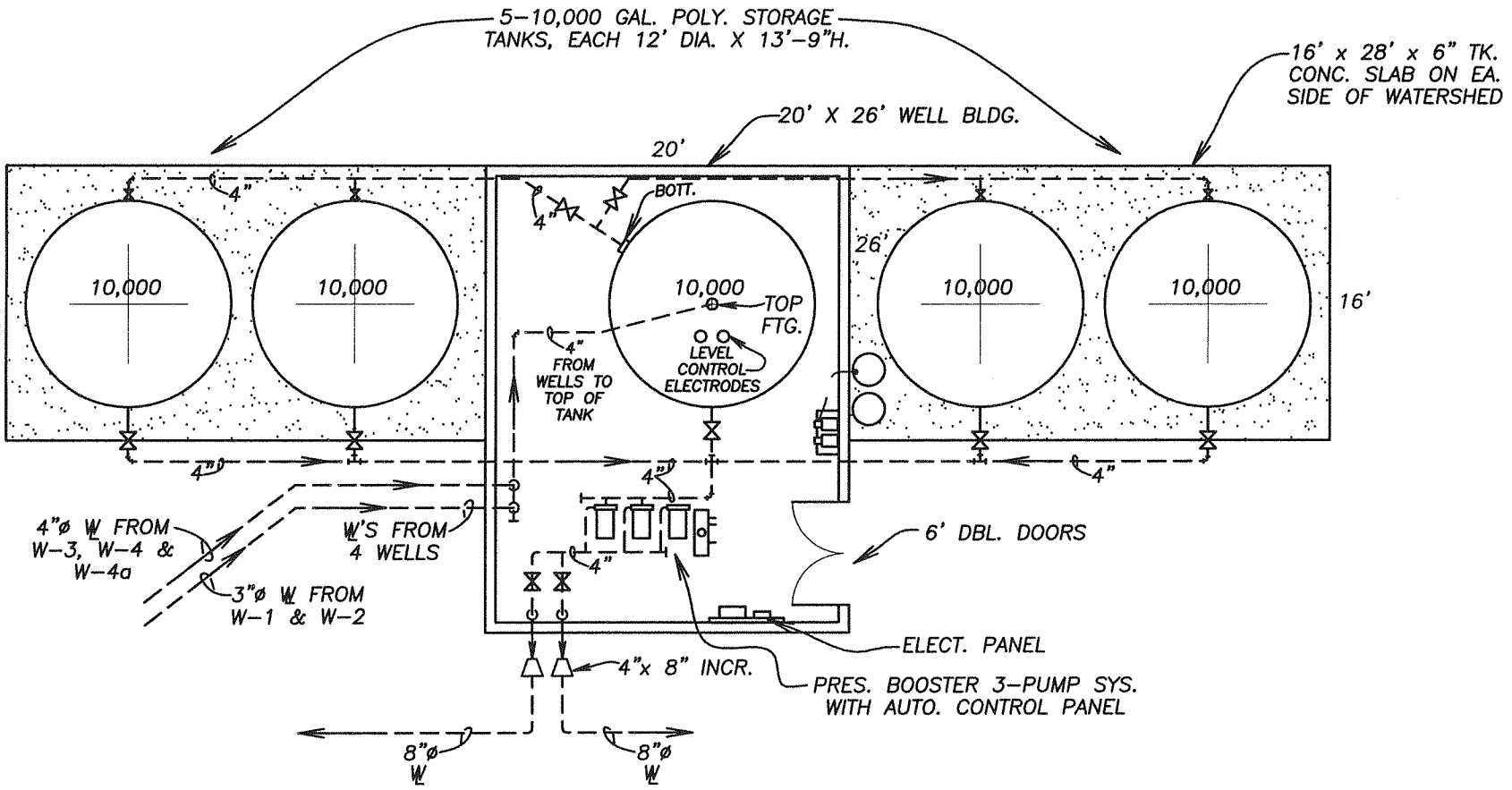
With Well #4 identified as the "best" well at 35 gpm, remaining wells #1, 2, 3 and 4a yields total 75 gpm which is equivalent to M.D.D., so satisfactory.

Respectfully submitted,

_____

Glenn L. Smith, P.E.

GLS/js



WATERWORKS SYSTEM PLAN 1/3

SCALE: 1" = 10'–0

Figure 3-1

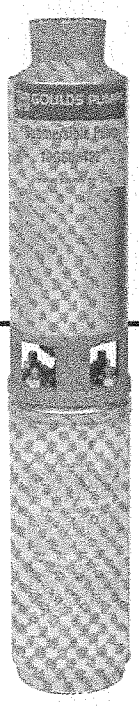
GOULDS PUMPS

60 Hz Standard Capacity 4" Submersible Pumps

MODEL GS

5GS, 7GS, 10GS, 13GS, 18GS, 25GS

WELL #1



SPECIFICATIONS

Model	Flow Range GPM	Horsepower Range	Best Eff. GPM	Discharge Connection	Minimum Well Size	Rotation①
5GS	1.2 – 7.5	½ – 2	5	1¼	4"	CCW
7GS	1.5 – 10	½ – 3	7	1¼	4"	CCW
10GS	3 – 16	½ – 5	10	1¼	4"	CCW
13GS	4 – 20	½ – 3	13	1¼	4"	CCW
18GS	6 – 28	¾ – 5	18	1¼	4"	CCW
25GS	8 – 33	1 – 5	25	1¼	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	BUNA, FDA compliant
Check Valve Seat	AISI 304 SS
Check Valve Retaining Ring	AISI 302 SS
Bearing Spider – Upper	Glass Filled Engineered Composite
Bearing	Urethane, FDA compliant
Klipring	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 Used on pumps over 24 stages.
② Used on models with 27 stages or larger.

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:** High profile 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.

■ **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 2 HP, stainless steel casing with nickel plated gray iron end bells on motors over 2 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.

■ **Agency Listings:** All complete pump/motor assemblies are UL778 and CSA listed and complies with ANSI/NSF std. 61. All 4" Franklin Electric Motors are UL778 recognized.

ORDER NUMBER CODE

5 GS 05 4 1 2 (R)

- GPM at Best Efficiency — 5, 7, 10, 13, 18, 25
- GS Pump Series
- Horsepower Code: 05 = ½, 07 = ¾, 10 = 1, 15 = 1½, 20 = 2, 30 = 3, 50 = 5
- 4 = 4" Franklin Motor
- Phase: 1 = 1 Phase 3 Wire, 2 = 1 Phase 2 Wire, 3 = 3 Phase 3 Wire
- Voltage: 1 = 115 V, 2 = 230 V, 3 = 380 V, 4 = 460 V, 7 = 575 V
- Reduced Stage ½ HP Water End ("R" model replaces the ⅓ HP model.)

AGENCY LISTINGS

Canadian Standards Association

Underwriters Laboratories

Classified ANSI/NSF 61-1992

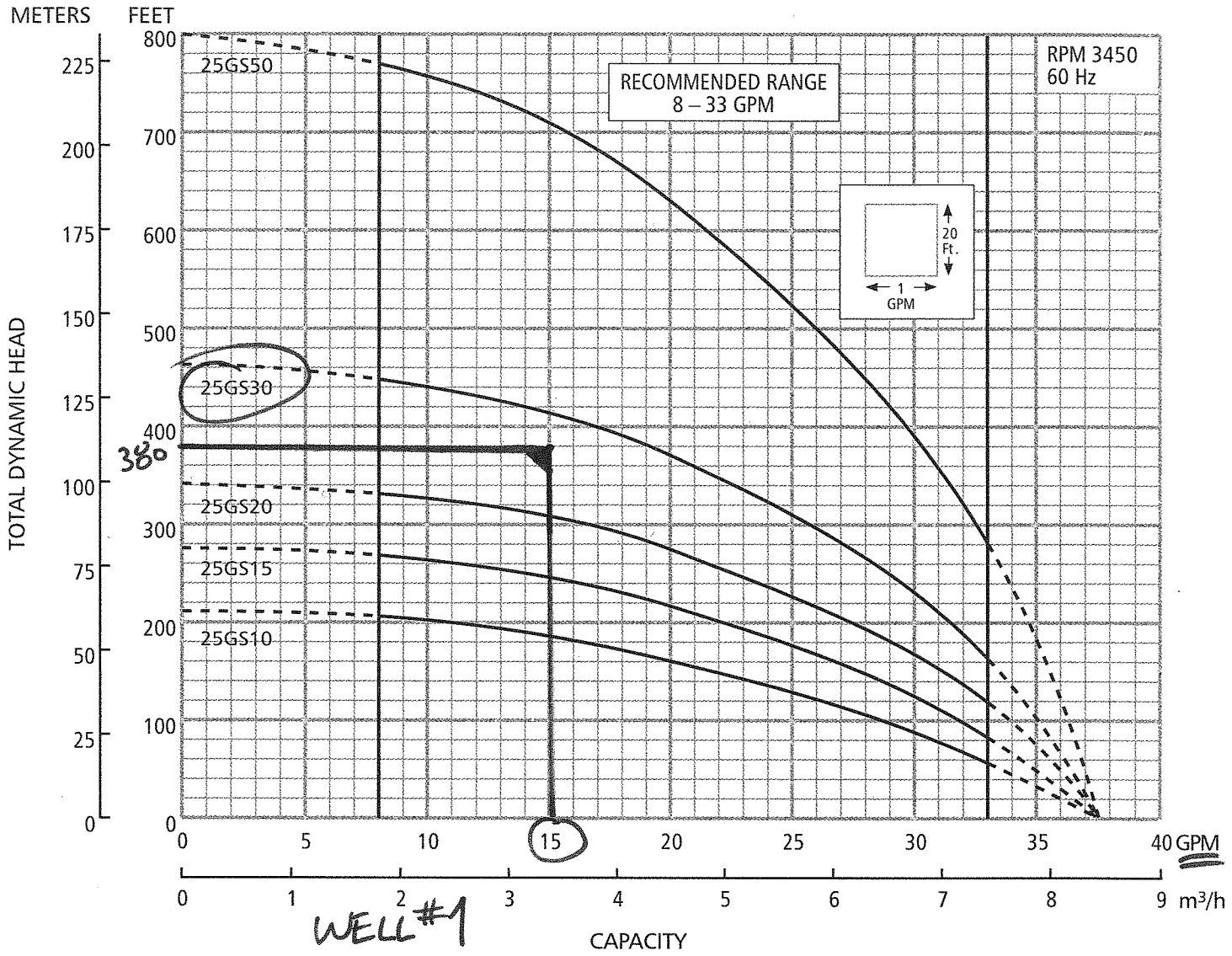
Goulds Pumps is ISO 9001 Registered.

Goulds Pumps

ITT Industries

Model 25GS

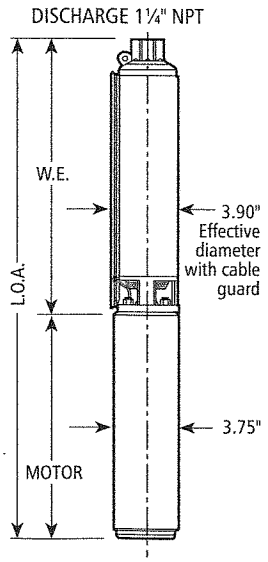
GOULDS PUMPS



DIMENSIONS AND WEIGHTS

Model	HP	Phase	Stages	Length (inches)			Weight (lbs.)		
				W.E.②	Motor	L.O.A.③	W.E.	Motor	Total
25GS10412,22	1	1	7	12.7	11.8	24.5	7	24	31
25GS15412	1½	1	9	14.6	13.6	28.2	8	28	36
25GS15422	1½	1	9	14.6	15.1	29.7	8	31	39
25GS15432,34	1½	3	9	14.6	11.8	26.4	8	24	32
25GS20412	2	1	11	16.5	15.1	31.6	9	33	42
25GS20432,34	2	3	11	16.5	13.6	30.1	9	28	37
25GS30412	3	1	15	20.2	19.1	39.3	11	41	52
25GS30432,34	3	3	15	20.2	16.1	36.3	11	35	46
25GS50412	5	1	26	31.8	28.2	60.0	17	70	87
25GS50432,34	5	3	26	31.8	22.2	54.0	17	55	72

② W.E. = water end or pump without motor.
③ L.O.A. = length of assembly – complete pump – water end and motor.

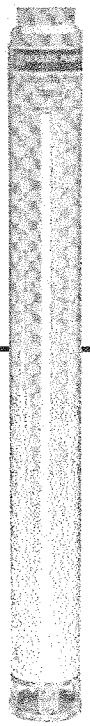


GOULDS PUMPS

60 Hz High Capacity 4" Submersible Pumps

WELLS # 2, 3, 4 & 4a → 33GS 40GS, 55GS, 60GS, 75GS, 80GS

MODEL GS



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.

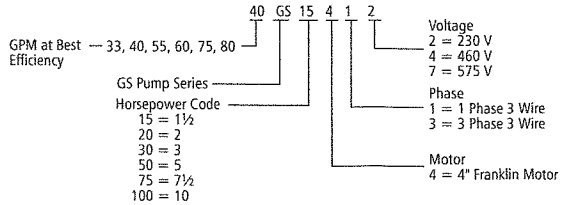
■ **Agency Listings:** All pump assemblies are UL778 and CSA listed and complies with ANSI/NSF std. 61. All 4" Franklin Electric Motors are UL778 recognized.

AGENCY LISTINGS

Canadian Standards Association
Classified ANSI/NSF 61-1992

Goulds Pumps is ISO 9001 Registered.

ORDER NUMBER CODE

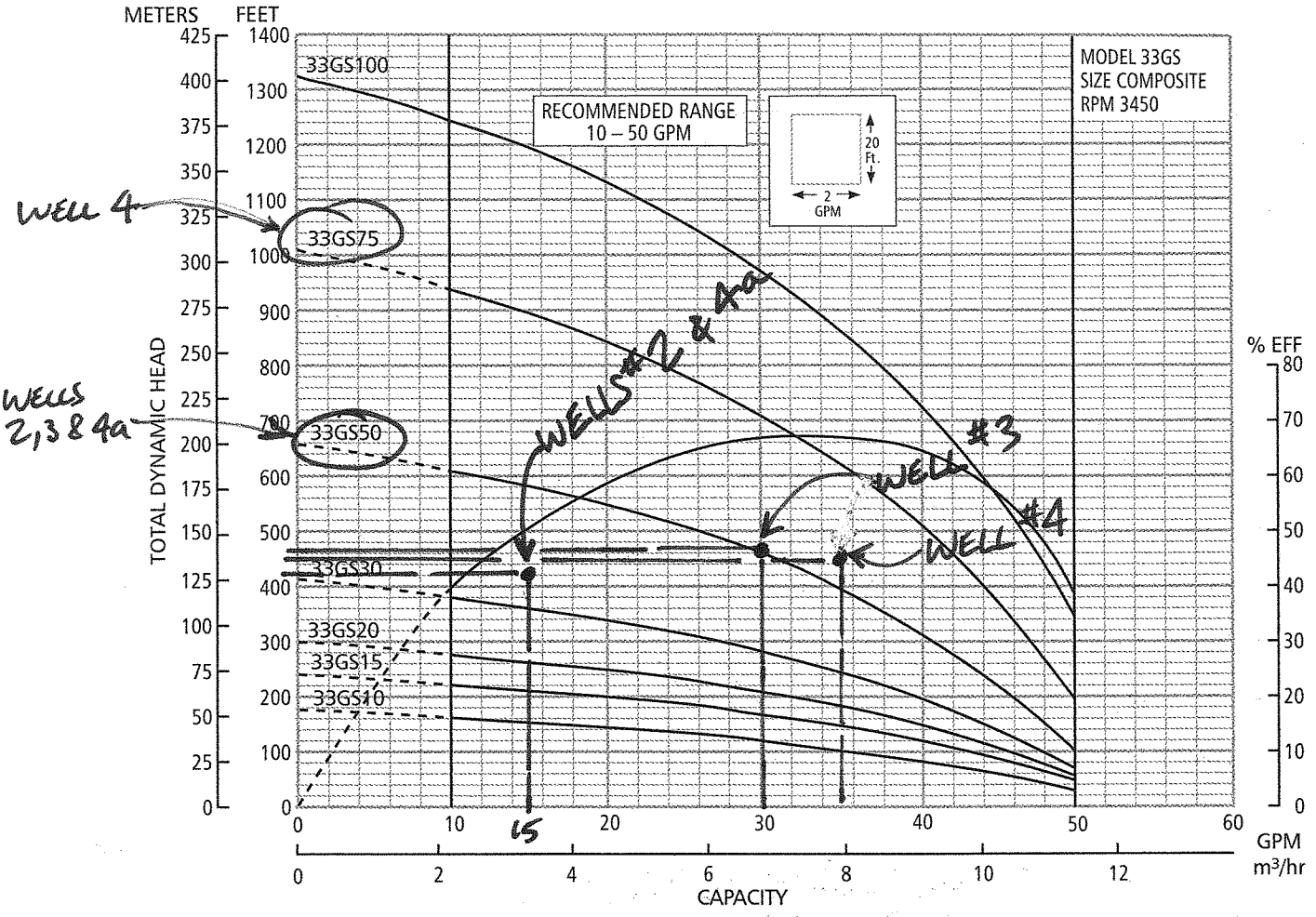


Goulds Pumps

ITT Industries

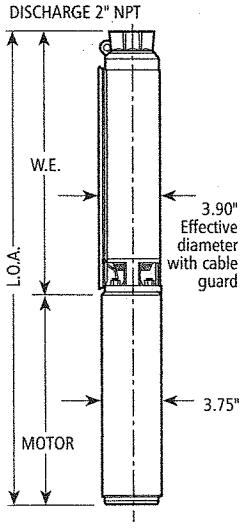
Model 33GS

GOULDS PUMPS



DIMENSIONS AND WEIGHTS

HP	Stages	W.E. Order No.	Motor Order No.	PH	Motor Volts	W.E.① Length	Motor Length	L.O.A.②	W.E. Weight	Motor Weight	Total Weight
X	6	33GS10	S06940	1	230	14.2	11.8	26.0	8	24	32
			S06978	3	200	14.2	11.8	26	8	24	32
			S06970		230						
			S06975		460						
			S06979		575						
1½	8	33GS15	S07940	1	230	16.6	13.6	30.2	9	28	37
			S07978	3	200	16.6	11.8	28.4	9	24	33
			S07970		230						
			S07975		460						
			S07979		575						
X	10	33GS20	S08940	1	230	19.1	15.1	34.2	10	33	43
			S08978	3	200	19.1	13.6	32.7	10	28	38
			S08970		230						
			S08975		460						
			S08979		575						
X	14	33GS30	S09940	1	230	24	19.1	43.1	13	41	54
			S09978	3	200	24	16.1	40.1	13	35	48
			S09970		230						
			S09975		460						
			S09979		575						
5	22	33GS50	S10940	1	230	35.2	28.2	63.4	19	70	89
			S10978	3	200	35.2	22.2	57.4	19	55	74
			S10970		230						
			S10975		460						
			S10979		575						
7½	34	33GS75	S119784	3	200	49.6	28.2	77.8	26	70	96
			S119704		230						
			S119754		460						
			S119794		575						
X	44	33GS100	S129724	3	460	61.8	30.4	92.2	32	75	107
			S129794		575						



NOTES:
For complete pump, order water end and motor.
① W.E. = water end or pump without motor.
② L.O.A. = length of assembly – complete pump – water end and motor.

ATTACHMENT 1
WATER SUPPLY SYSTEM DESIGN COMPUTATIONS

1a) Source: Town of Fallsburg Water District

The existing Raleigh Hotel complex will remain in the municipal water district and served by the 8" dia. watermain installed along Heiden Road to the hotel to supplement existing hotel wells. The following summarizes maximum hotel facilities demand on the town supply with both hotel wells out of service:

Estimated Demand:	
230 guest rooms x 120 gpd/room =	27,600 gpd
Banquet Facility: 460 guests (2/room) x 20 gpcd =	9,200 gpd
Swimming Pool: Estimate 20% of 460 guests	
= 92 persons x 10 gpcd =	920 gpd
Estimated Demand =	37,720 gpd
Say	**40,000 gpd**

Cluster #1

Since the majority of Housing Cluster #1 is situated within the municipal water district (i.e. – 47 homes of 55 units in cluster), this cluster will be served by the town's consolidated water district, in conjunction with extending the district bounds to incorporate the 8 "out-of-district" units, subject to Fallsburg Town Board approval.

Estimated Demand:	
55 dwelling units x 4 bedrooms/unit = 220 bedrooms x	
95 gpd/br* =	20,900 gpd

*(Note: Use design flow rate of 475 gpd/4 br. home
less 20% for water saving fixtures =
380 gpd ÷ 4 br. = 95 gpd/br.)

Additional Cluster #1 Water Demand

Swimming Pools – 2 pools will serve Cluster #1,
estimate 20% of project population utilize pools on daily basis.

55 homes x 4 br./home x average 2 persons/br. = 440 persons	
x 20% using pool = 88 persons	
Estimate 4 gpcd additional demand x 88 persons =	352 gpd

Day Camp – Estimate average 2 children/dwelling unit x
55 units = 110 children. Use average daily demand of

3 gpd/child x 110 children =	330 gpd
Cluster #1 Subtotal	21,582 gpd

Total Estimated Water Demand from (T) Fallsburg Consolidated Water District = 40,000 gpd (existing hotel) + 21,582 gpd (Cluster #1) = 61,582 gpd, **Say 62,000 gpd**

1b) On-Site Community Water Supply to be Developed

The three (3) remaining residential clusters #2, 3 and 4 will be served by an on-site water supply system including drilled wells, storage tanks, pumping equipment and distribution system.

Compute Design Demand:

Cluster #2 -	47 dwelling units x 4 br./unit x 95 gpd/br =		17,860 gpd
Cluster #3 -	66 dwelling units x 4 br./unit x 95 gpd/br =		25,080 gpd
Cluster #4 -	68 dwelling units x 4 br./unit x 95 gpd/br =		25,840 gpd
		Subtotal	68,780 gpd

Additional Clusters Water Demands (Although following activities will be utilized primarily by residents of project, with water demand factored into dwelling unit figures, additional demand figures have been included to account for guests, miscellaneous uses, etc.)

Swimming Pools – 2 pools will serve Clusters #2 & 3 and 2 pools will serve Cluster #4, estimate 20% of project population utilize swimming pools on daily basis.

181 homes in Clusters #2 + 3 + 4 at 4 br./home x average 2 persons/br. = 1,448 persons x 20% = 290 persons using pools

Estimate 4 gpcd additional water demand x 290 persons = 1,160 gpd

Day Camps – Estimate average 2 children per dwelling unit in Clusters #2, 3 and 4 utilize day camps x 181 units = 362 children

Use average demand of 3 gpd/child x 362 children = 1,086 gpd

Total Estimated On-Site Demand = 71,026 gpd
Say 72,000 gpd

Average Daily Demand (A.D.D.) = 72,000 gpd ÷ 1,440 mins/day = 50 gpm
Maximum Daily Demand (M.D.D.) = 1 ½ times the A.D.D. = 50 gpm x 1 ½ = 75 gpm

Required Wells Capacity
The minimum available combined well yields shall equal or exceed the Maximum Daily Demand (M.D.D.) of 75 gpm, with the largest producing well out of service.

Therefore, at least two (2) or three (3) wells are necessary with adequate capacity such that with the most productive of these wells out of service, the remaining wells must have a combined safe yield of at least 75 gpm.

Provided Wells Capacity

Well #1 (400' depth) = 15 gpm[1]
Well #2 (600' depth) = 15 gpm
Well #3 (600' depth) = 30 gpm
Well #4 (500' depth) = 35 gpm
Well #4a (625' depth) = 15 gpm
Total 110 gpm[2]

[1]Wells yields based on 72-hour pumping tests performed in September 2009
[2]With best well #4 out of service, remaining capacity = 75 gpm

Required Storage Volume
Gravity storage capacity equivalent to at least one (1) days average daily demand under full occupancy conditions is recommended, or 72,000 gals.

Provided Storage Volume
In consideration of five (5) new wells constructed for this project with good yields determined by 72-hour pumping tests that, when combined, equal or exceed the Maximum Daily Demand with the best well out of service, it is proposed to reduce total storage volume to approximately 70% of 72,000 gals = 50,000 gals. Install five (5) – 10,000 gal. capacity vertical polyethylene tanks at grade, each 12'-0" diameter x 13'-9" high.

Size Distribution System Booster Pumps
Install Constant Speed On-Demand Booster Pumps skid-mount system in waterworks building with three (3) - ±200 gal. ASME bladder (pressure) tanks.

Each pump discharge rate shall be equivalent to peak hourly rate of four (4) times Average Daily Demand of 50 gpm, or 200 gpm.

Total Dynamic Head (TDH) computations for sizing booster pumps shall be based upon a minimum system operating pressure of 35 psi at the highest elevation in the distribution system, which is 1,288' in Unit #68 in Cluster #4 near Park House Road.

Highest Building Elevation	1,288'	
- Elevation at Waterworks Building	1,250'	
Elevation Head =		38'
+ Pressure Head Equivalent to 35 psi=		81'
+ Piping, Valves/Fittings Friction Losses =		4'
T.D.H		123'

Then, size booster pumps for maximum 200 gpm @ 123' T.D.H.

Use 2 – "Goulds" end-suction centrifugal pumps, each 3656/3756 S-Group, 2 ½ x 3-7, 15 HP, 3,500 RPM, 3' suction, 2 ½" discharge with capacity of 260 gpm at 123' T.D.H.

Size Water Disinfection System

A minimum chlorine contract period of 30 minutes is required for all potable water flows based on the peak hourly flowrate. Using a peak flow factor (PFF) of four (4), then 50 gpm x 4.0 = 200 gpm peak flow rate.

Minimum detention tank volume required for 30 minute contact period at 200 gpm = 30 mins x 200 gpm = 6,000 gals. required.

Under full occupancy total storage capacity provided = five (5) – 10,000 gal. tanks = 50,000 gals. Since storage volume will not be permitted to drop below ½ of 50,000 gal. volume, or 25,000 gals, at any time, the actual chlorine contact period will be 25,000 gals ÷ 200 gpm = 125 mins. vs. 30 mins. required, so OK.

Size Well Pumps

Well #1 (400' deep, 15 gpm yield)

Estimate maximum 15 gpm flow rate from submersible pump, set pump at 350' depth.

Piping: 2" dia. g.s. drop pipe into well, 350'
2" dia. PVC pipe to water building, 500'

a) Piping Headloss,	H_L = 0.6'/100 x 3.50 =	2.1'	
	H_L = 0.6'/100 x 5.0 =	3.0'	
	Piping Friction Loss =	5.1'	
b) Valves & fittings Loss, Estimate		2.2'	
c) Elevation Head			
Top of storage tank = 1,248' + 14' =			1,262'
Estimate Low Level in well = 1,216 grd. el. – 325' drawdown =			891'
	Elev. Head		371'

Total Dynamic Head (TDH) = 5.1' + 2.2' + 371' = 378.3', say 380'

Size well pump for 15 gpm at 280' TDH

Install "Goulds" Model 25GS30, 3 phase, 3.0 HP, 230 V, 3,450 RPM, 1 ¼" discharge, 4" dia. submersible pump rated 19 gpm at 280' TDH.

Well #2 (600' deep, 15 gpm yield)
Estimate maximum 15 gpm flow rate from submersible pump, set pump at 400' depth.

Piping: 2" dia. g.s. drop pipe into well, 400'
2" dia. PVC pipe to water building, 800'

a) Piping Headloss, H_L = 0.6'/100 x 4.0 = 2.4'
H_L = 0.6'/100 x 8.0 = 4.8'
Piping Friction Loss = 7.2'

b) Valves & fittings Loss, Estimate 2.2'
c) Elevation Head
Top of storage tank = 638' + 14' = 1,262'
Estimate Low Level in well = 1,210 grd. el. – 350' drawdown = 860'

Elev. Head 402'

Total Dynamic Head (TDH) = 7.2' + 2.2' + 402' = 411.4', say 412'

Size well pump for 15 gpm at 412' TDH

Install "Goulds" Model 33GS50, 3 phase, 5.0 HP, 230 V, 3,450 RPM, 2" discharge, 4" dia. submersible pump rated 32 gpm at 412' TDH.

Well #3 (600' deep, 30 gpm yield)
Estimate maximum 30 gpm flow rate from submersible pump, set pump at 400' depth.

Piping: 2" dia. g.s. drop pipe into well, 400'
2" dia. PVC pipe to water building, 1,750'

a) Piping Headloss, H_L = 1.85'/100 x 4.0 = 7.4'
H_L = 1.85'/100 x 17.50 = 32.5'
Piping Friction Loss = 39.9'

b) Valves & fittings Loss, Estimate 2.2'
c) Elevation Head
Top of storage tank = 1,248' + 14' = 1,262'
Estimate Low Level in well = 1,187 grd. el. – 350' drawdown = 837'

Elev. Head 425'

Total Dynamic Head (TDH) = 39.9' + 2.2' + 425' = 467.1', say 468'

Size well pump for 30 gpm at 468' TDH

Install "Goulds" Model 33GS50, 3 phase, 5.0 HP, 230 V, 3,450 RPM, 2" discharge, 4" dia. submersible pump rated 29 gpm at 468' TDH; or 35 gpm at 400' TDH

Well #4 (500' deep, 35 gpm yield)
Estimate maximum 35 gpm flow rate from submersible pump, set pump at 400' depth.

Piping: 2" dia. g.s. drop pipe into well, 400'
2" dia. PVC pipe to water building, 900'

a) Piping Headloss, H_L = 2.48'/100 x 4.0 = 9.9'
H_L = 2.48'/100 x 9.0 = 22.3'
Piping Friction Loss = 32.2'

b) Valves & fittings Loss, Estimate 2.2'
c) Elevation Head
Top of storage tank = 1,248' + 14' = 1,262'
Estimate Low Level in well = 1,202 grd. el. – 350' drawdown = 852'

Elev. Head 410'

Total Dynamic Head (TDH) = 32.2' + 2.2' + 410' = 444.4', say 445'

Size well pump for 35 gpm at 445' TDH

Install "Goulds" Model 33GS75, 3 phase, 7 ½ HP, 230 V, 3,450 RPM, 2" discharge, 4" dia. submersible pump rated 43 gpm at 445' TDH.

Well #4a (625' deep, 15 gpm yield)
Estimate maximum 15 gpm flow rate from submersible pump, set pump at 400' depth.

Piping: 2" dia. g.s. drop pipe into well, 400'
2" dia. PVC pipe to water building, 800'

d) Piping Headloss, H_L = 0.6'/100 x 4.0 = 2.4'
H_L = 0.6'/100 x 8.0 = 4.8'
Piping Friction Loss = 7.2'

e) Valves & fittings Loss, Estimate 2.2'
f) Elevation Head
Top of storage tank = 1,248' + 14' = 1,262'
Estimate Low Level in well = 1,207 grd. el. – 350' drawdown = 857'

Elev. Head 405'

Total Dynamic Head (TDH) = 7.2' + 2.2' + 405' = 414.4', say 415'

Size well pump for 15 gpm at 415' TDH

Install "Goulds" Model 33GS50, 3 phase, 5.0 HP, 230 V, 3,450 RPM, 2" discharge, 4" dia. submersible pump rated 33 gpm at 415' TDH.