

DEQ EXHIBIT 21

TRAPEZOIDAL CHANNEL FLOW
MANNING EQUATION

3/3

Project: Drying Beds
Client: Anchor Environmental
Location: Natrona County

User: CLC
Checked: _____
Job No. 15203-CE

Date: 1/9/12
Date: _____

INPUT DATA: (use ? for the unknown value)

Flowrate (Q)	308 cfs
Manning "n"	0.014
Bottom Width (b)	? ft
Side Slope Ratio (z)	0 Horz:1Vert
Uniform Depth (y)	3 ft
Longitudinal Slope (S)	0.01 ft/ft

CALCULATED RESULTS:

Flowrate (Q)	308.00 cfs
Flow Velocity (V)	14.63 ft/sec
Manning "n"	0.014
Bottom Width (b)	7.02 ft
Side Slope Ratio (z)	0.00 Horz:1Vert
Uniform Depth (y)	3.00 ft
Top Width (W)	7.02 ft
Area (A)	21.06 ft ²
Wetted Perimeter (P)	13.02 ft
Hydraulic Radius (R)	1.62 ft
Longitudinal Slope (S)	0.0100 ft/ft
Specific Energy (E)	6.32 ft
Momentum Function (M)	171.49 ft ³
Froude Number	1.49
Critical Values:	
Critical Slope	0.0049 ft/ft
Critical Depth	3.91 ft
Critical Velocity	11.22 ft/sec

DEQ Exhibit 21

EQC No. 13-5802

SUBJECT Drainage Analysis PROJECT NO. 15203-RE PAGE

CLIENT Anchor Environmental DATE 12/12/11 BY CLL

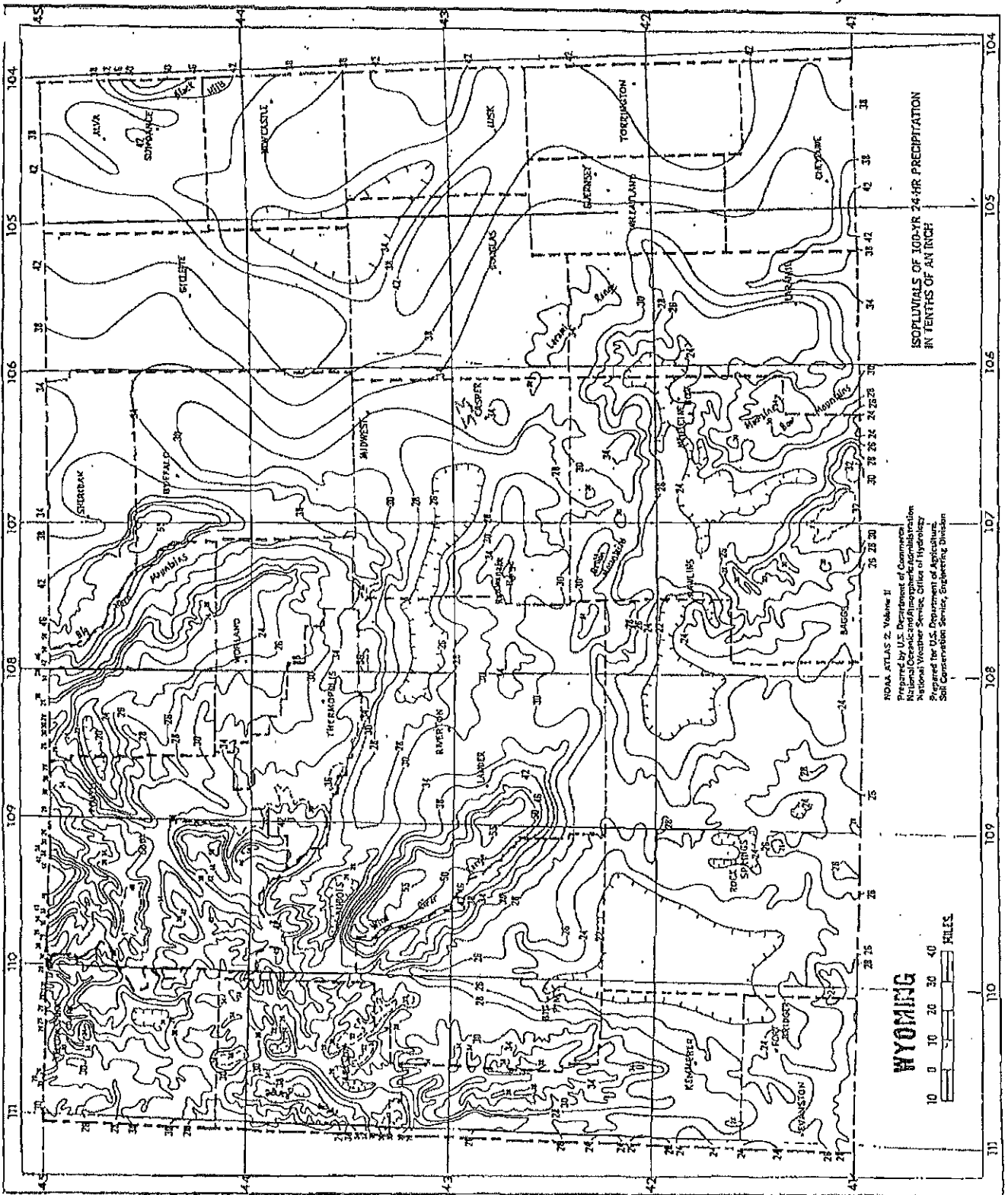
PROJECT Drying Beds CHECKED BY

IR-55

$$\text{area of hillside} = \frac{(680 \times 380)}{2} = 129,200 \text{ ft}^2$$
$$= 2,9690$$

CR# for Sage brush with grass understory
and a soil with very little permeability
and high runoff - group D = 70

Length = 240 feet



ISOPLETHS OF 100-YR 24-HR PRECIPITATION
IN TENTHS OF AN INCH

NOAA ATLAS 2, Volume II
Prepared by U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service, Office of Hydrology
Prepared for U.S. Department of Agriculture,
Soil Conservation Service, Engineering Division

WYOMING

10 0 10 20 30 40 MILES

Table 2-2d.—Runoff curve numbers for arid and semiarid rangelands¹

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition ²	A ³	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	98
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		76	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	56
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

¹Average runoff condition, and $I_a = 0.2S$. For range in humid regions, use table 2-2c.

²Poor: <30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: >70% ground cover.

³Curve numbers for group A have been developed only for desert shrub.

STORM RUNOFF ANALYSIS
 U.S. SOIL CONSERVATION SERVICE
TR-55 GRAPHICAL PEAK DISCHARGE METHOD

Project: Anchor Environmental
 Location: Mill, Wyoming

User: CLC
 Checked: _____

Date: 12-12-11
 Date: _____

Runoff Data:

Drainage Area: 2.96 acres
 Runoff Curve Number: 70
 Rainfall Distribution Type: II

Calculated Potential
 Maximum Retention: 4.29 inches

Time of Concentration Data:
 Hydraulic Length: 240 feet
 Average watershed slope: 50 %

Calculate Time of Concentration
 by the Modified Curve No. Method: 0.10 hours
 (not less than 0.10 hours)

Return Period (yrs)	2	5	10	25	50	100
24-Hr Rainfall (in)						3.30
Ia/P Ratio						0.26
Runoff (in)						0.89
Runoff (acre-ft)						0.2
Unit Peak Discharge (cfs/acre/in)						1.485
Pond and Swamp Factor (1 = no pond or swamp)			1.00	1.00	1.00	1.00
Peak Discharge (cfs)						3.9

TRAPEZOIDAL CHANNEL FLOW
MANNING EQUATION

Project: Anchor Environmental Drying Beds
Client: Anchor Environmental
Location: Hillside

User: CLC
Checked: _____
Job No. 15203.CE

Date: 12-12-11
Date: _____

INPUT DATA: (use ? for the unknown value)

Flowrate (Q)	3.9 cfs
Manning "n"	0.03
Bottom Width (b)	0 ft
Side Slope Ratio (z)	2 Horz:1Vert
Uniform Depth (y)	? ft
Longitudinal Slope (S)	0.02 ft/ft

CALCULATED RESULTS:

Flowrate (Q)	3.90 cfs
Flow Velocity (V)	3.40 ft/sec
Manning "n"	0.030
Bottom Width (b)	0.00 ft
Side Slope Ratio (z)	2.00 Horz:1Vert
Uniform Depth (y)	0.76 ft
Top Width (W)	3.03 ft
Area (A)	1.15 ft ²
Wetted Perimeter (P)	3.39 ft
Hydraulic Radius (R)	0.34 ft
Longitudinal Slope (S)	0.0200 ft/ft
Specific Energy (E)	0.94 ft
Momentum Function (M)	0.70 ft ³
Froude Number	0.97
Critical Values:	
Critical Slope	0.0211 ft/ft
Critical Depth	0.75 ft
Critical Velocity	3.47 ft/sec

new pump
WS = wastewater submersible
WS503203 = order number
WS5003 = series #
for Gould

388803 - model # with
new
Inverter system

Goulds Pumps

MODEL WS503203

HP 5 RPM

1725

231

THREE PHASE MOTOR OVERLOAD PROTECTION
CHECK BY THE INSTALLER. SEE INSTRUCTIONS

US
B0664121



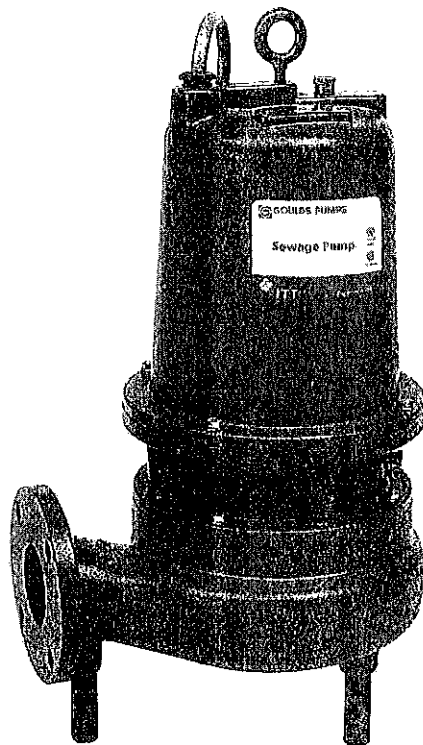
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Wastewater

Goulds Pumps

WS_D3 Series Model 3888D3

Submersible Sewage Pump



FEATURES

- **Impeller:** Cast iron, ASTM A48, Class 30, two vane semi-open, non-clog design with pump out vanes for mechanical seal protection. Balanced for smooth operation. Silicon bronze impeller is an option.
- **Casing:** Heavy duty gray cast iron, ASTM A48, Class 30. Volute type casing with 3", 125#, ANSI flanged, horizontal discharge. Compatible with A10-30 cast iron or A10-30B cast iron and brass (non-sparking) guide rail assembly.
- **Dual Mechanical Seals:** Silicon carbide vs. silicon carbide outer seal and ceramic vs. carbon inner seal, stainless steel metal parts, Buna-N elastomers. Upper and lower shaft seals are positioned independently and are separated by an oil-filled chamber.
- **Shaft:** 300 series stainless steel keyed design.
- **Fasteners:** 300 series stainless steel.
- Capable of running dry temporarily without damage to seals or motor.



Goulds Pumps is a brand of ITT Water Technology, Inc.
- a subsidiary of ITT Industries, Inc.

www.goulds.com

Engineered for life



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GOULDS PUMPS Wastewater

APPLICATIONS

Used in a variety of residential, commercial and industrial applications such as:

- Sewage systems, Flood and Pollution Control, Dewatering/Effluent, Farms, Hospitals, Trailer Courts, Motels

SPECIFICATIONS

Pump:

- Maximum solid size: 2.5"
- Discharge size: 3", 125 # ANSI flange
- Maximum capacity: 470 GPM
- Maximum total head: 65 feet
- 300 Series stainless steel fasteners
- 20' Power cord
- Standard silicon carbide/silicon carbide outer seal

Motor:

- Maximum ambient temperature: 104° F (40° C) continuous duty, 140° F (60° C) intermittent duty
- Rated for continuous duty when fully submerged
- Insulation: Class F
- 60 Hertz
- Single row ball bearings
- 300 Series stainless steel keyed shaft

Single Phase:

- 1.5 - 5 HP; 208 and 230 volts
- Built-in thermal overloads with automatic reset
- Built-in capacitors

Three Phase:

- 1.5 - 5 HP; 200, 230, 460 and 575 volts
- Class 10 overload protection must be provided in control panel

MOTORS

- Fully submerged in oil-filled chamber. High grade turbine oil surrounds motor for more efficient heat dissipation, permanent lubrication of bearings and mechanical seal for complete protection against outside environment.
- Class F insulation.
- Designed for Continuous Operation: Pump ratings are within the motor manufacturer's recommended working limits and can be operated continuously without damage when fully submerged.
- Bearings: Upper and lower heavy duty ball bearing construction for precision positioning of parts and to carry thrust loads.
- Power Cable: Severe duty rated, oil and water resistant. Epoxy seal on motor end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking. 20 foot standard with optional lengths available.
- O-ring: Assures positive sealing against contaminants and oil leakage.

AGENCY LISTINGS



Tested to UL 778 and CSA 22.2 108 Standards
By Canadian Standards Association File #LR38549

US: Goulds Pumps is ISO 9001 Registered.

MODEL AND MOTOR INFORMATION

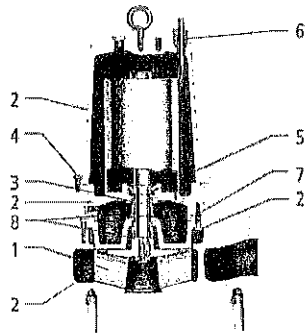
Order No.	HP	Phase	Volts	RPM	Impeller Dia. (In.)	Maximum Amps	L.R. Amps	KVA Code	Power Cable	F.L. Motor Efficiency %	Resistance		Wt. (lbs.)		
											Start	Line-Line			
WS1518D3M	1.5	1	208	1750	5.25	15.0	50.8	B	14/3	80	1.1	0.9	192		
WS1512D3M			230			12.5	29.5	E		70	1.4	1.8			
WS1538D3M		3	200			11.5	40.9	H		14/4	81	NA		1.7	190
WS1532D3M			230			10.0	40.0	F			83			2.3	
WS1534D3M			460			5.0	20.0	F			83			9.3	
WS1537D3M			575			4.0	14.4	H			74			14.8	
WS1518D3	1.5	1	208	1750	6.50	15.0	50.8	B	14/3	80	1.1	0.9	192		
WS1512D3			230			12.5	29.5	E		70	1.4	1.8			
WS1538D3		3	200			11.5	40.9	H		14/4	81	NA		1.7	190
WS1532D3			230			10.0	40.0	F			83			2.3	
WS1534D3			460			5.0	20.0	F			83			9.3	
WS1537D3			575			4.0	14.4	H			74			14.8	
WS2018D3	2	1	208	1750	7.00	19.0	50.8	B	14/3	80	1.1	0.9	196		
WS2012D3			230			16.0	36.9	D		75	1.4	1.5			
WS2038D3		3	200			11.5	40.9	H		14/4	81	NA		1.7	194
WS2032D3			230			10.0	40.0	F			83			2.3	
WS2034D3			460			5.0	20.0	F			83			9.3	
WS2037D3			575			4.0	14.4	H			74			14.8	
WS3018D3	3	1	208	1750	7.25	23.5	50.8	B	10/3	80	1.1	0.9	205		
WS3012D3			230			21.5	46.4	C		79	1.0	1.0			
WS3038D3		3	200			13.2	53.8	G		14/4	85	NA		1.3	200
WS3032D3			230			12.0	49.5	H			83			1.9	
WS3034D3			460			6.0	24.8	H			83			7.5	
WS3037D3			575			4.8	17.3	G			78			11.6	
WS5012D3	5	1	230	1750	8.00	26.5	57.7	A	10/3	80	1.0	0.8	210		
WS5038D3			200			18.8	73.9	F		84	0.9				
WS5032D3		3	230			16.4	63.6	E		14/4	85	NA		1.2	205
WS5034D3			460			8.2	31.8	E			85			4.8	
WS5037D3			575			6.8	22.8	E			80			7.4	



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GOULDS PUMPS Wastewater

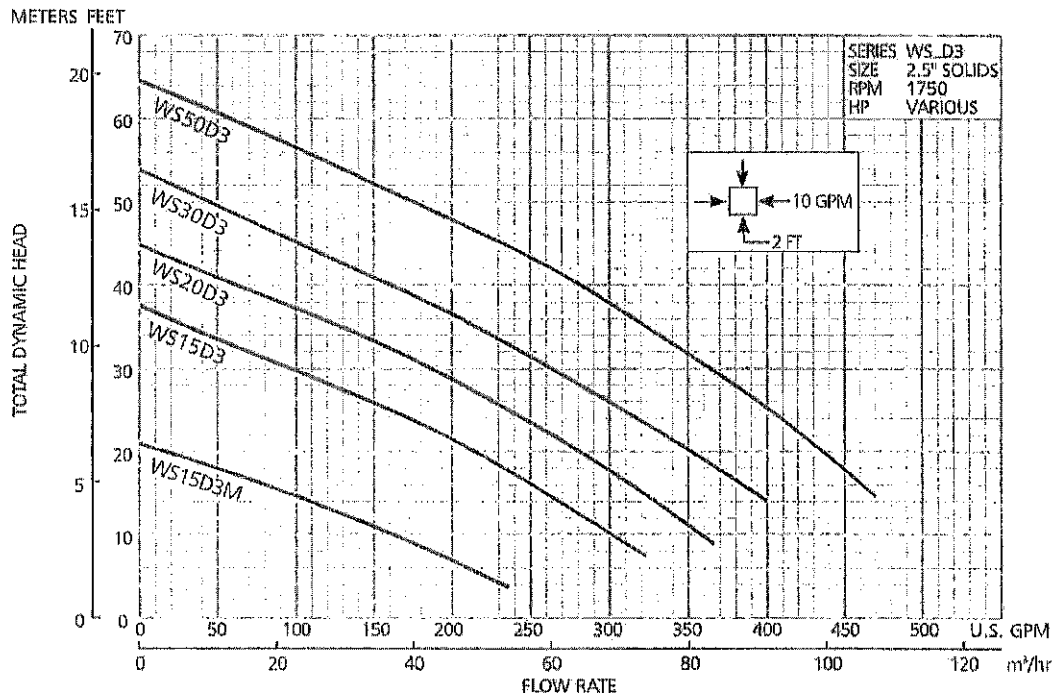
MATERIALS OF CONSTRUCTION



Item No.	Part Name	Material				
		Standard	Optional			
1	Impeller, non-clog	1003	1179			
2	Castings	1003				
3	Shaft-keyed	300 Series SS				
4	Fasteners	300 Series SS				
5	Ball bearings	Steel				
6	Power cable	STOW, 20 feet	Additional lengths			
7	O-ring	BUNA-N				
8	Outer Mech. Seal	Service	Rotary	Stationary	Elastomers	Metal Parts
	OPT	Heavy duty	Silicon Carbide	Tungsten Carbide	BUNA-N	300 Series SS
	STD	Mild abrasives	Silicon carbide		BUNA-N	300 Series SS
Material Code		Engineering Standard				
1003		Cast iron — ASTM A48 Class 30				
1179		Silicon bronze — ASTM C87600				

PERFORMANCE RATINGS (Gallons Per Minute)

Series No.	WS15D3M	WS15D3	WS20D3	WS30D3	WS50D3	
HP	1 1/2	1 1/2	2	3	5	
RPM	1750					
Total Head Feet of Water	10	160	300			
	15	90	260	320		
	20		210	280	350	
	25		160	235	310	
	30		100	185	265	
	35			130	210	
	40			60	160	
	45				100	
	50					170
	55					115
	60					60





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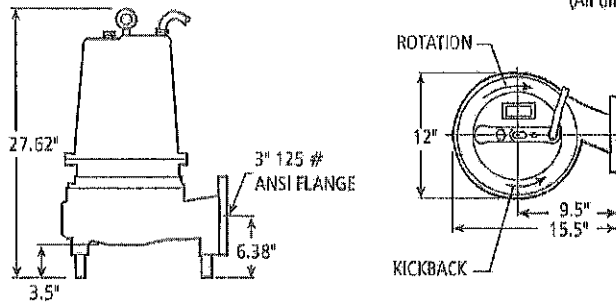
Wastewater

APPLICATION DATA AND CONSTRUCTION DETAILS

Maximum Solid Size	2.5"
Minimum Casing Thickness	3/8"
Casing Corrosion Allowance	1/8"
Maximum Working Pressure	30 PSI
Maximum Submergence	50 feet
Minimum Submergence	Fully submerged for continuous operation 6" below top of motor for intermittent operation
Maximum Environmental Temperature	40° C (104° F) continuous operation, 60° C (140° F) intermittent operation
Power Cable -- Type (See Motor Information for AWG data/size.)	Type SJTOW: single phase, 1½ and 2 HP Type STOW: single phase, 1½ – 3 HP and 5 HP, 460 V Type STOW: single phase, 3 and 5 HP; three phase 5 HP, 230 V
Motor Cover, Bearing Housing, Seal Housing, Casing	Gray Cast Iron -- ASTM A48, Class 30
Impeller -- Standard, Optional	Gray Cast Iron -- ASTM A48 or Cast Bronze -- ASTM B584 C87600
Motor Shaft	AISI 300 Series Stainless Steel
Motor Design	NEMA 56 Frame, oil filled with Class F Insulation
Motor Overload Protection	Single phase: on winding thermal overload protection auto reset Three phase: requires Class 10 overloads in control panel
External Hardware	300 Series Stainless Steel
Impeller Type	Semi-open with pump out vanes on back shroud
Oil Capacity -- Seal Chamber	1.5 quarts
Oil Capacity -- Motor Chamber	1½-5 HP single and three phase: 7 quarts
Mechanical Seals -- Standard	Upper Carbon/Ceramic; Type 21 Lower Silicon Carbide/Silicon Carbide; Type 31
Mechanical Seals -- Optional Lower	Silicon Carbide/tungsten Carbide; Type 31

DIMENSIONS

(All dimensions are in inches. Do not use for construction purposes.)



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SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

B3888D3 March, 2006

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SPECIFICATIONS

MATERIALS

A. GEOSYNTHETICS

1. Secondary liner shall be a 30 mil polyvinyl chloride (PVC) liner.
2. Ballasts shall be UV-resistant sand bags with a UVI rating of at least 1600 hours.

B. DRAIN PIPE

1. All drain pipe shall be PVC pipe conforming to the requirements of AWWA Specification C-900, "Polyvinyl Chloride Pressure Pipe", made to ductile iron O.D.'s for "Push-On" joints. Pipe joints shall be with an elastomeric gasket or joint. Pipe class shall be Class 165.
2. All drain pipe fittings shall be ductile iron with mechanical joints. (AWWA C-153: Ductile-Iron Compact Fittings for Water Service) Ductile iron fittings used for drain pipe shall be Class 250 conforming to AWWA C-110, Gray-Iron and Ductile Irons Fittings for Water and Other Liquids or "AWWA C-153, Ductile-Iron Compact Fittings for Water Service. The interior of the fitting shall have a cement mortar lining conforming to AWWA C-104. The outside surface of the fitting shall receive a bituminous coating approximately one (1) mil thick.
3. Resilient Seated Gate Valves
 - a. Resilient Seated Gate Valves shall be iron body, with non-rising stems with design, construction, and pressure rating conforming to AWWA C-509, standard for Resilient Seated Gate Valves with modifications specified herein.
 - b. Waterway shall be smooth and shall have no depressions or cavities in seat area where foreign material can lodge and prevent closure or sealing.
 - c. Stem seals shall be double "O" ring seals designed so that the seal above the stem collar can be replaced with the valve under pressure in full open position.
 - d. Resilient Seated Gate Valves for underground installation shall have two-inch (50 mm) square wrench nut for key operation. All valves shall open counterclockwise unless indicated otherwise in the special provisions.
 - e. The Resilient Seated Gate Valves' interior parts and surfaces shall be coated in accordance with AWWA C-550.
4. Manholes shall be constructed of precast concrete rings with frames and covers and steps in accordance with details shown on Wyoming Public Works Standard Specification, 2001 Edition, Standard Drawings No. 02700-01 and 02. All manholes shall be designed to withstand AASHTO HS-20 (MS 18) loading.
6. Trace wire shall be No. 10 AWG solid copper, plastic coated.
7. Anti-seep collars shall be a 3-foot by 3-foot, Agri Drain anti-seep collar, or approved equal.

C. LEAK COLLECTION SYSTEM

1. Perforated pipe shall be PVC conforming to ASTM D-2729.
2. Pipe shall be 6-inch Schedule 40 PVC.
3. Sump shall be 15-inch PVC pipe. Pipe shall conform to ASTM D-3034, "Standard Specification for Polyvinyl Chloride Sewer Pipe and Fittings". PVC pipe shall have a minimum Standard Dimension Ratio (SDR) of 35.
4. Pea gravel shall conform to Wyoming Department of Transportation Standard Specifications for Road and Bridge Construction, 2003 Edition, Gravel for Drains, Grading C.

CONSTRUCTION

- A. Construction of the evaporation pond shall conform with the Wyoming Department of Environmental Quality regulations, and Wyoming Occupational Health and Safety Administration regulations.
- B. Topsoil shall be removed to a depth of 6 inches and stockpiled prior to construction.
- C. Embankment material shall be placed in uniform approximate horizontal layers not exceeding eight inches in loose thickness, for the entire width of the embankment. Each layer of embankment shall be completed, leveled and compacted before the succeeding layer is placed.
- D. The CONTRACTOR shall provide watering and rolling as required to obtain the density of 95% of maximum dry density as determined by AASHTO T-99 (Standard Proctor) for all embankment placed. Water content shall be within plus or minus two percentage points of optimum moisture content.
- E. All geosynthetics, anchors, penetrations, and welds shall be installed per manufacturer's recommendations and instructions. All welds shall be tested by non-destructive means to assure 100% seal in accordance with the manufacturer's recommendations. The drainage layer shall be installed on the sides and bottoms of all cells in accordance with the manufacturer's recommendations.