

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 65-13382
Exam Date: 8/19/2016

1. Current Owner:
BOGUS BASIN RECREATIONAL ASSN INC
C/O BRAD WILSON 2600 BOGUS BASIN RD
BOISE ID 83702
(208)332-5131
2. Accompanied by: Chris Bromley (Attorney), Brad Wilson (GM) & Bogus Basin staff.
Phone No: 208-332-5131
Address: 2600 Bogus Basin Rd, Boise ID 83702
Relationship to Permit Holder:

3. SOURCE:
BOGUS CREEK

TRIBUTARY:
SHAFFER CREEK

B. OVERLAP REVIEW

1. Other water rights with the same place of use: None.
2. Other water rights with the same point-of-diversion: 65-4015B, 65-4036, 65-9408 & 65-9409

C. DIVERSION AND DELIVERY SYSTEM**1. LOCATION OF POINT(S) OF DIVERSION:**

BOGUS CREEK SE¼SE¼ Sec. 16, Twp 05N, Rge 03E, B.M. BOISE County

Method of Determination: Aerial imagery compared with digital PLSS mapping. Location visited and verified during exam.

2.

PLACE OF USE: COMMERCIAL

Twp	Rge	Sec	NE				NW				SW				SE				Totals
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
05N	03E	16			X									X		X	X	X	
05N	03E	21		X			X												

Method of Determination: Hydrants observed during field exam. Map submitted by permit owner identified location of all hydrants. Digital PLSS maps used to confirm legal descriptions of commercial POU.

3.
 - ☒ Delivery System Diagram Attached (required). Indicate all major components and distances between components.
 - ☒ Indicate weir size/pipe as applicable.
 - ☒ Map Attached Showing Location(s) of point(s) of diversion and place(s) of use (required). Scale must be 1:24,000 or greater.
 - ☒ Aerial Photo Attached (required for irrigation of 10+ acres).
 - ☒ Photo of Diversion and System Attached

4.

Well or Diversion ID No.*	Motor Make	Hp	Motor Serial No.	Pump Make	Pump Serial No. or Discharge Size
Pump House	General Electric	15	DKJ410251		6" CS pipe to 225k gal storage tank

*Code to correspond with No. on map and aerial photo

D. FLOW MEASUREMENTS

1.

Measurement Equipment	Type	Make	Model No.	Serial No.	Size	Calib. Date

2. Measurements: System is not built to provide a measuring location.**E. FLOW CALCULATIONS**☒ Additional Computation Sheets Attached

Measured Method: Theoretical

$$Q = \frac{8.8 * (\text{Efficiency}) * \text{hp}}{\text{depth to water} + 2.31 * (\text{psi}) + \text{friction}}$$

Efficiency = 0.70

Depth to water = 6840' - 6240' = 600'

psi = 247

hp = 15

See attached theoretical sheet.

Theoretical at Pump House to storage facility = 0.08 cfs or 35.9 gpm.

Information collected from user suggests a diversion of 50 – 300 gpm or 0.11 – 0.67 cfs.

SMI Polecat operating & Parts Manual and flyers suggest a rate of 15 - 150+ gpm or 0.03 – 0.33 cfs.

5 systems running at one time could produce **0.15 – 1.65 cfs**

Permit	0.34 cfs combined use limit
B.U. Standard Allowance	No Limit
B. U. Proof Fee	\$100 → 0.21 to 1.00 cfs
Estimated system @ max diversion	1.65 cfs
License Recommendation	0.34 cfs

F. VOLUME CALCULATIONS**1. Volume Calculations for Irrigation:**

$$V_{I.R.} = (\text{Acres Irrigated}) \times (\text{Irrigation Requirement}) =$$

$$V_{D.R.} = [\text{Diversion Rate (cfs)}] \times (\text{Days in Irrigation season}) \times 1.9835 =$$

$$V = \text{Smaller of } V_{I.R.} \text{ and } V_{D.R.} =$$

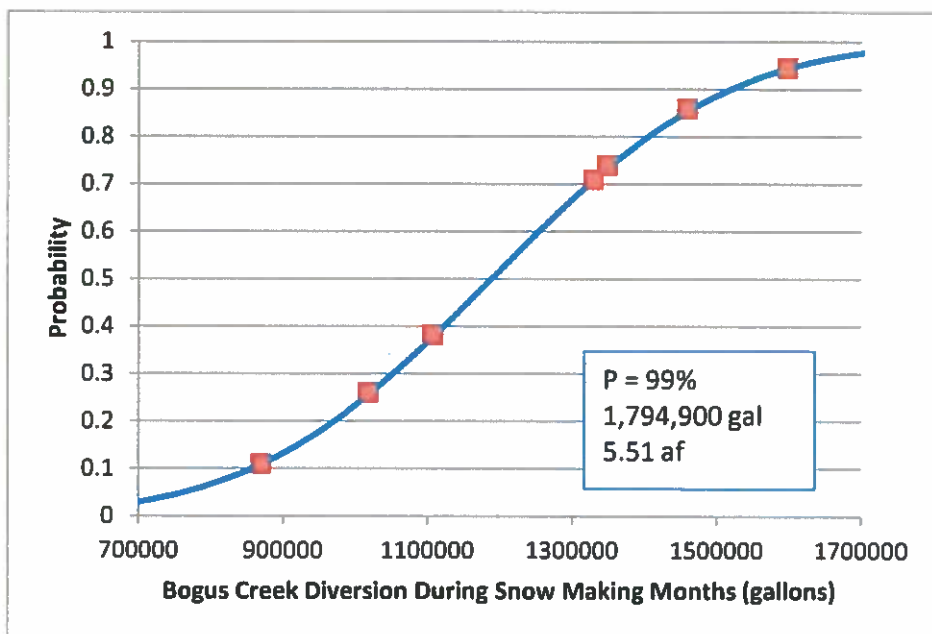
2. Volume Calculations for Other Uses: Commercial, Commercial Storage & Commercial from Storage

Annual Bogus Creek Diversion*			Peak Season Use on Record*		
	Gallons	AF		Gallons	AF
2010	2,207,070	6.8			
2011	2,001,400	6.1	Nov-12	191,340	0.6
2012	3,373,245	10.4	Dec-12	395,220	1.2
2013	2,515,140	7.7	Jan-13	508,140	1.6
2014	2,087,930	6.4	Feb-13	275,700	0.8
2015	2,528,400	7.8	Mar-13	226,560	0.7
Average	2,452,198	7.5	Sum	1,596,960	4.9

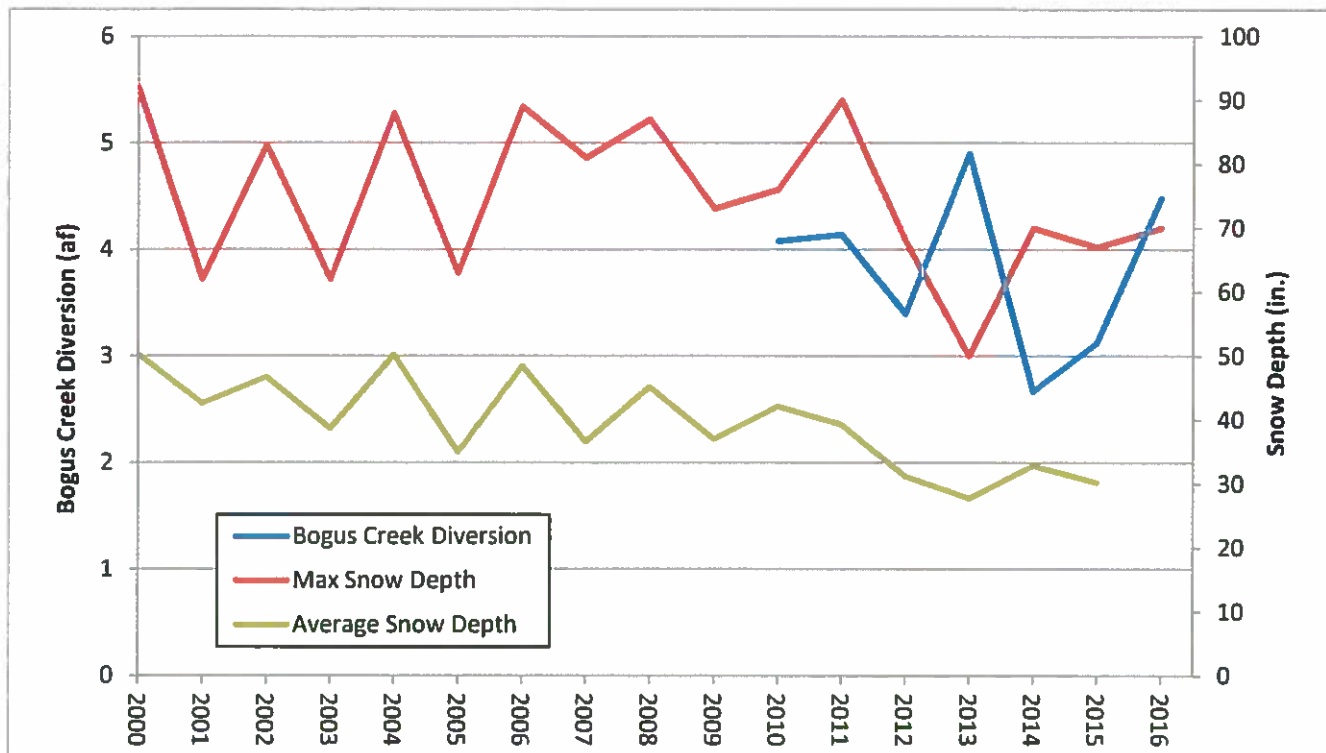
* See user pump records from 2009 – 2016 attached to this report for detailed diversion volumes.

$$\text{Max diversion volume} = [\text{Diversion Rate (cfs)}] \times (\text{Days in commercial season}) \times 1.9835 = 0.34 \times 151 \times 1.9835 = 101.8 \text{ af}$$

Beneficial Use Examination
Rule 35.01.j:
... Annual diversion
volumes for heating and
cooling uses may be
adjusted to account for
documented weather
conditions during any
single heating or
cooling season from
among the fifty (50)
years immediately prior
to submitting proof of
beneficial use for the
permit...



The graph above shows probabilities curve using a 3rd degree standard deviation to calculate the 1% (100 year) event based on the sample size collected during the 2009 to 2016 seasons.



(n.d.). Retrieved October 3, 2016, from <http://wcc.sc.egov.usda.gov/nwcc/site?sitenum=978>

The graph above represents Bogus Creek diversion volumes during the ski season submitted by Bogus Basin (blue) and NRCS SNOTEL Site data which represents max and average snow depth during the same season (red and green). An effort was made to find a correlation between low snow depth and peak diversion volumes; however results are inconsistent.

SNOTEL Site: Bogus Basin	Permit	32.0 af (combined use limit)
State: Idaho	B.U. Standard Allowance	No Limit
Site Number: 978	Estimated system @ max diversion (0.34 cfs)	101.8 af
County: Boise	1994-1995 Snow Making Log	2.4 af
Latitude: 43 deg; 46 min N	Peak season use on record	4.9 af
Longitude: 116 deg; 6 min W	1% Probabilities event	5.5 af
Elevation: 6340 feet	License Recommendation	5.5 af
Reporting since: 1999-09-22		

G. NARRATIVE/REMARKS/COMMENTS

The field exam was conducted on August 19, 2016 by agents Patrick Kelly and Rachel Sommer. They were escorted on the property by Chris Bromley, Brad Wilson and Bogus Basin staff members. A field exam was conducted on the same visit for permit 65-13381. Permits 65-13381, 65-13382 and 65-13466 are being licensed concurrently.

Permit 63-13382 is in the name of Bogus Basin Recreational Assn Inc C/O Scott L Campbell at PO BOX 1539 BOISE ID 83701. Brad Wilson is the current acting general manager to the resort and issued a change of address with his business card during the field exam. ID SOS records for Bogus Basin Recreational Assn Inc (No. C21014) matches the new address given at 2600 BOGUS BASIN RD BOISE ID 83702. Mr. Wilson is represented as the registered agent for the company. No further action is required to address current ownership.

POD on Bogus Creek was confirmed in the SESE QQ. Surface water collection begins as water enters a small collection pond just above the sand filter. Water then passes through the filter and enters a 7,000 gallon "clear well" at the pump house location. From the pump house, water can be moved up to the 250,000 gallon storage facility at the top of Chair #2, or water can enter a headgate on Bogus Creek outside the pump house and enter the commercial system directly.

The pump house has a 15 hp GE motor that pushes water up to the storage facility. Topographic maps and aerial imagery was used to estimate a total lift of 600'. Pressure gauges on the system indicate 247 psi at the pump. The system is not constructed to place transducer measuring equipment on the system. A theoretical of 0.08 cfs calculates a diversion to the storage facility. There are a number of small storages before the pump house including a still well and settling pond. Both of these storages are small enough to consider the 24 hour rule. The diversion from the pump house to the 250,000 storage tank is the only true diversion to storage occurring. A diversion to storage component should be added to the license limiting such to 0.08 cfs.

Most of the resort's water needs are served from the 250,000 gallon storage facility. This facility creates a high pressure which is desirable for quality snow making. Also, the flow required to run the 5 snow machines at one time may not be available directly from the Bogus Creek source when temperatures are 20° F or less. Snow making systems operate at peak performance between 100 to 500 psi. To reflect actual beneficial use, a 'commercial from storage' component should be added to the license. To serve the 'from storage' use, 'commercial storage' would also be added. At only 0.7 af, a significant amount of refill should be considered to fulfill the commercial use for snow making at peak performance.

The department received a water use log for snow making purposes on September 26, 1995. This report identifies the day and hour's equipment was used to make snow. This diversion from 11/6/1994 to 3/7/1995 totals 795,600 gallons or 2.4 af.

A request for additional information was made to the resort to quantify a volume limit associated with the use. Diversion records were provided for the past seven years going back to October of 2009. This data is outside the consideration for beneficial use, but for purposes of system use the information provided can be considered useful.

Identifying a limit based on the Bogus Creek diversion limits the license to 4.9 af recorded during the 2012-2013 season. Water records provided require a few assumptions. First, there is no measurement of water use directly for snow making purposes. The records provided show a total diversion from the source. However, this water is comingled with ground water and overlapping domestic rights that enter a storage facility for all of the resorts water needs. For purposes of the license, a 4.9 af limit suggests that all of the water diverted from Bogus Creek between 11/1 to 3/31 is used for snow making purposes. This gives the resort the benefit of doubt regarding use, but ignores diversions under the domestic rights. Water records indicate a diversion from the same source and system year round with substantial amounts in summer months. These summer months sometimes exceed the snow making season, further complicating the data.

The water right analysis conducted for 35-8575A was reviewed during this process. This is a commercial right for snow making purposes for Sun Valley Ski Resort. Beneficial Use Rule 35.01.j for heating and cooling was used in this case and allowed a term review of 50 years 'worst case' scenario. Determining a volume to account for such an event has proved to be very difficult given the limited amount of data presented. A probabilities curve was generated using a 3rd degree standard deviation. This quantifies the 1% chance (1 in 100) event the system would require a 5.51 af volume. This is larger than the highest diversion on record, however may be limited considering only seven data points were used in the analysis.

NRCS data was compiled to reflect annual snow depths. This data was compared to seasonal Bogus Creek diversions. The data was not sufficient to suggest a correlation between the two data sets.

Overlap review finds four domestic water rights owned by Bogus Basin (65-4015B, 65-4036, 65-9408 and 65-9409). These rights carry a total volume of 103.94 af for use in the Bogus Basin Recreation Area. This is a substantial amount of water for rights that are not being fully used and further impedes the ability to measure what is actually being diverted for snow making purposes.

Ultimately, to gain a 32.0 af volume with a 0.34 cfs diversion limit, the resort would have to utilize the snow making machines for an average of 7.5 hours per day for the entire 151 day season. This seems exceedingly high, given ambient conditions may not allow for such a high diversion for the entire season. The 32.0 af limit associated with the permits originally comes from a large storage facility that was planned to be developed when the applications were made in 1992. The construction of such a large facility never occurred. When we consider the 2.4 af '94-'95 report and records that comingle ground water and domestic uses, it is extremely difficult to make a recommendation any higher than 5.5 af without further information to support such a need.

Have conditions of permit approval been met? ☒ Yes ☐ No

H. RECOMMENDATIONS

1. Recommended Amounts

<u>BENEFICIAL USE</u>	<u>PERIOD OF USE</u>	<u>DIVERSION RATE</u>	<u>ANNUAL VOLUME</u>
COMMERCIAL	11/01 to 3/31	0.34 CFS	5.5 AF
COMMERCIAL STORAGE	11/01 to 3/31		5.5 AF
COMMERCIAL FROM STORAGE	11/01 to 3/31		5.5 AF
DIVERSION TO STORAGE	11/01 to 3/31	0.08 CFS	
	<u>Totals:</u>	0.34 CFS	5.5 AF

2. Recommended Amendments

☐ Change P.D. as reflected above ☐ Add P.D. as reflected above ☐ None
☒ Change P.U. as reflected above ☐ Add P.U. as reflected above ☒ Other: Nature of Use

I. AUTHENTICATION

Field Examiner's Name Patrick Kelly Date 10-4-2016

Reviewer _____ Date _____



BOGUS BASIN
MOUNTAIN RECREATION AREA

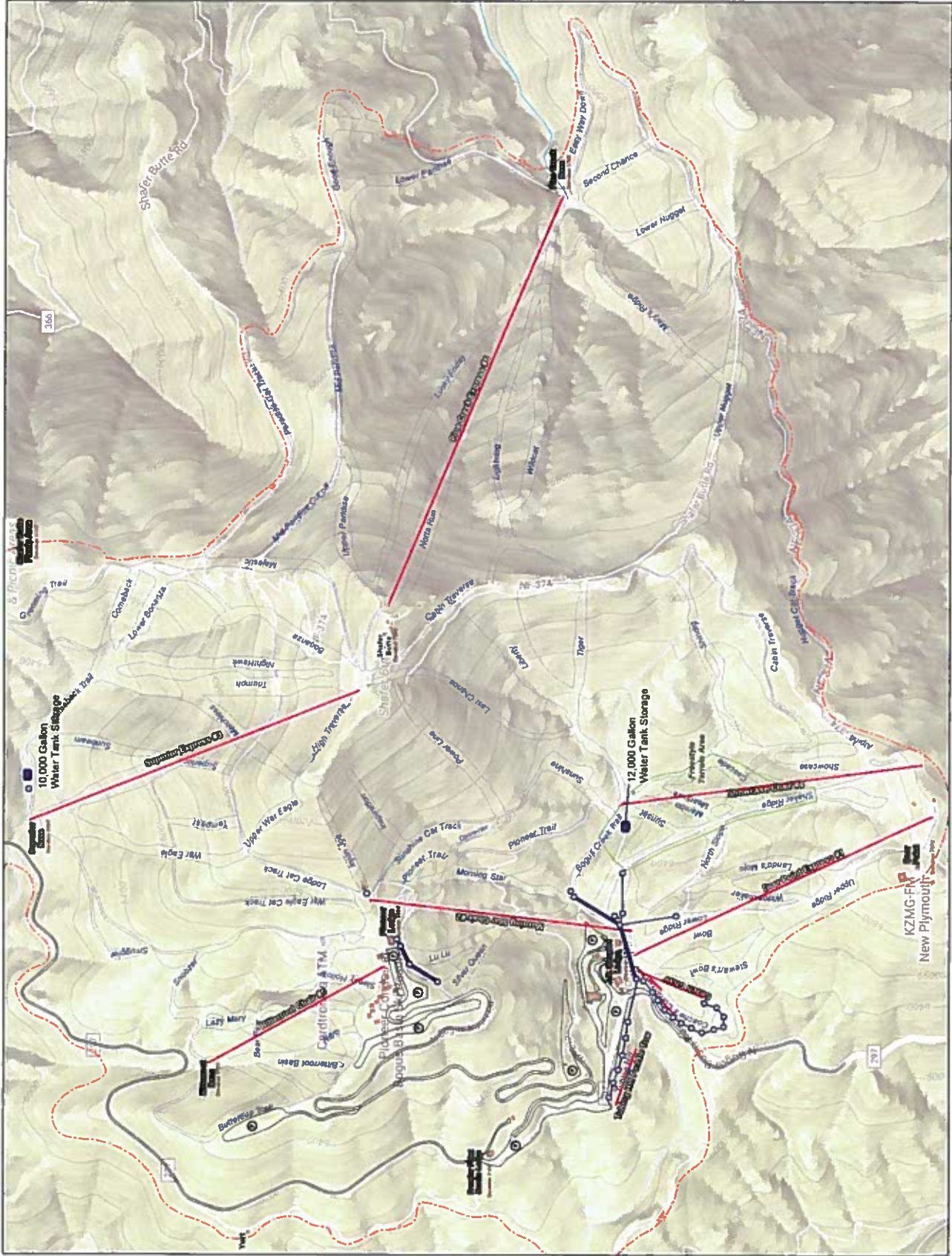
Legend

- Snowmaking Hydrant
- Water Tank Storage
- 1 1/2 in. Water Line
- 5 in. Water Line
- ⊙ Parking Lot
- Ski Area Boundary
- Nordic Trails
- Section Line
- Lifts
- Stream
- Buildings
- Freestyle Terrain Area
- Runs
- Road
- Lagoon

1:12,000

1 inch = 1,000 feet

(Page size 11" x 17")



	2009		2010		2011		2012		2013	
	surface	ground	surface	ground	surface	ground	surface	ground	surface	ground
Jan.			329,700	264,600	513,240	252,360	208,680	169,320	508,140	113,760
Feb.			312,840	213,360	196,920	281,280	290,490	221,040	275,700	169,200
March			194,840	152,160	191,640	197,760	261,780	187,920	226,560	105,840
April			99,520	153,480	139,500	36,600	121,200	318,960	106,080	118,320
May			67,060	45,840	61,500	125,520	145,740	144,360	139,020	178,080
June			22,120	161,280	28,560	300,600	52,560	291,240	263,400	94,200
July			216,780	294,120	126,300	440,400	483,900	327,600	321,900	182,400
Aug.			253,200	245,400	250,300	564,000	683,160	316,440	206,280	526,920
Sept.			245,220	242,880	92,520	410,280	229,155	230,160	48,120	216,480
Oct.	124,240	56,760	18,960	152,640	55,380	199,920	310,020	11,280	85,740	135,360
Nov.	159,420	186,840	168,000	187,320	38,940	84,960	191,340	14,160	81,600	139,200
Dec.	332,080	250,920	278,830	200,540	306,600	225,000	395,220	34,680	252,600	244,200
	615,740	494,520	2,207,070	2,313,620	2,001,400	3,118,680	3,373,245	2,267,160	2,515,140	2,223,960

1,110,260

4,520,690

5,120,080

5,640,405

4,739,100

	2014		2015		2016	
	surface	ground	surface	ground	surface	ground
Jan.	199,560	222,240	205,020	260,280	140,640	261,960
Feb.	175,200	139,200	310,800	235,800	142,500	190,800
March	159,660	194,040	174,420	226,680	233,200	140,400
April	6,720	284,880	53,280	105,120	129,900	148,200
May	59,820	174,480	88,200	112,800	167,280	106,320
June	127,860	317,640	205,380	304,320	50,340	347,010
July	491,760	89,640	143,640	466,560	40,000	420,960
Aug.	249,450	149,450	202,560	347,640		
Sept.	107,000	187,000	73,020	328,080		
Oct.	184,500	128,160	129,900	155,400		
Nov.	105,180	245,520	570,660	480,240		
Dec.	221,220	288,480	371,520	328,080		
	2,087,930	2,420,730	2,528,400	3,351,000	903,860	1,615,650

4,508,660

5,879,400

2,519,510

MEMORANDUM

TO: Water Right File – 65-13382
FROM: Patrick Kelly – Water Resource Agent
DATE: September 1, 2016
SUBJECT: Additional information request

The following e-mail was sent to SMI's support via their website support:

Hello, I am working with Bogus Basin Ski Resort to license their water use for snow making purposes. I am interested in finding out a diversion rate for your Super Polecat machines. I understand that there are likely some significant variables depending on use. But any information you can provide to estimate a diversion rate in say, gallons per minute, I would greatly appreciate it. Thank you!

A response was promised in 3-5 business days.

- <http://www.snowmakers.com/ask-snowmaking-expert.html>

Kelly, Patrick

From: Chris Bromley [cbromley@mchughbromley.com]
Sent: Tuesday, September 20, 2016 10:07 AM
To: Kelly, Patrick
Subject: RE: Snowmaking Guns

Patrick,

Bogus has 5 Polecat guns, three of which are the "Standard" model and two of which are the "Super" model. The Standards use around 50 gpm, while the Supers use around 100 gpm, depending on water pressure and temperature. Snow is typically made around 20 degrees Fahrenheit, with around 200 gpm on each type of gun. When it gets below 15 degrees Fahrenheit, the use can be up to 300 gallons per minute. Pressure is typically close to 200 psi.

Chris

From: Chris Bromley [mailto:cbromley@mchughbromley.com]
Sent: Monday, September 19, 2016 1:38 PM
To: 'Kelly, Patrick' <Patrick.Kelly@idwr.idaho.gov>
Subject: RE: Snowmaking Guns

Patrick,

I have the information from the manufacturer and am verifying with Bogus. Once I close that loop, I'll get it to you.

Chris

From: Kelly, Patrick [mailto:Patrick.Kelly@idwr.idaho.gov]
Sent: Thursday, August 25, 2016 10:02 AM
To: Chris Bromley <cbromley@mchughbromley.com>
Subject: RE: Snowmaking Guns

Awesome. Thank you Chris.

From: Chris Bromley [mailto:cbromley@mchughbromley.com]
Sent: Wednesday, August 24, 2016 9:37 AM
To: Kelly, Patrick
Subject: Snowmaking Guns

Patrick,

Responding to your question about Bogus' snowmaking guns. Bogus has 2 guns that meet the specs in the attachment. Bogus has 3 guns that meet the specs for the guns in the backfile.

Let me know if you need anything else on this topic.

Thanks,

Chris

380 South 4th Street, Suite 103
Boise, Idaho 83702
(208) 287-0991
cbromley@mchughbromley.com
<http://www.mchughbromley.com>

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OPERATING & PARTS

MANUAL

POLECAT SNOWMAKER

March 2002

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INTRODUCTION

Your PoleCat Snowmaker is one of the most technically advanced snowmaking machines in existence. PoleCat Snowmakers differ from air/water and other fan snowmakers in several ways.

One PoleCat difference is quality snow -- large quantities of quality snow -- at very significant energy savings over other snowmaking systems. Other important features are simplicity of design, operation and maintenance. As you become more familiar with this machine and its great versatility, you will appreciate the difference your PoleCat can make.

Literally thousands of hours of research, testing and actual use have gone into the design and improvements to the PoleCat Snowmaker. At hundreds of ski areas around the world, PoleCat Snowmakers are operating successfully under widely varying conditions. The PoleCat has been continually improved over its lifetime.

Snow Machines, Incorporated is dedicated to providing our customers with superior quality products for optimum trouble-free operation.

It is important that you have a full understanding of the contents of this manual. It contains information which will help you operate your PoleCat Snowmaker in a safe manner and obtain optimum performance from the system.

GENERAL DESCRIPTION

The PoleCat Snowmaker utilizes a ducted fan with an efficient articulating nucleator and bulk water distribution system. The nucleator, or seeder, is a specialized air/water snowmaker which is heated to virtually eliminate freeze-ups.

The best snow quality is attained by using maximum water pressure (up to 500 PSI) and the proper selection of bulk water nozzles for the prevailing weather conditions.

The bulk water system consists of a main water manifold with 18 nozzles divided into six sections. Three sets of two nozzles are always on, these are located in the 12 o'clock, 4 o'clock and 8 o'clock positions. The first bank of nozzles to turn on with the self-draining 3-way ball valves would be the four nozzles in the 6 o'clock position. The second bank of nozzles to turn on is the four nozzles in the 10 o'clock position. The final bank of four nozzles are in the 2 o'clock position. This arrangement facilitates adjustments, depending on prevailing conditions, to get optimum snow quantity and quality.

Note that snowmaking capacity is relatively independent of air consumption, due in part to the fact that air flow through the nucleator (seeder) is approximately 35 CFM (with 10 HP compressor) or 20 CFM (with 5 HP compressor) at all times. The air consumption will remain in this range whether the PoleCat Snowmaker is converting 15 GPM or 150 GPM.

Nucleation is an important factor in the efficient conversion of water into snow. The nucleator (seeder) on your PoleCat Snowmaker is equipped with a fixed position nucleator. The nucleator air/water ratio remains at a constant air/water ratio independent of water pressure.

The valve manifold on your PoleCat Snowmaker is equipped with an inline filter to remove contaminants in the water. The inline filter needs to be cleaned routinely to prevent nozzle clogging that can cause nozzle freezing and reduced snow quality and production. Additionally, removal of contaminants from the water minimizes wear to the nozzles, which can lead to an inconsistent spray pattern and reduced nozzle efficiency.

The PoleCat is a high production easy to use SMI product. If you have any questions on the operation of the equipment after reviewing this manual, please contact your local representative or SMI directly at 1-800-248-6600.

OPERATING REQUIREMENTS

SERVICES FOR POLECAT SNOWMAKER

Standard Electrical Service

460 volt - 60 Hertz - 3 phase - operating at 14 amp minimum to 29 amp maximum depending on selection of compressors and optional electric heaters.

The motors have been designed with a 1.3 service factor capable of operating at $\pm 10\%$ of design voltage.

Options available: 220 volt - 3 phase - 60 Hertz

380 volt - 3 phase - 50 Hertz
(Europe, Northern Japan, Latin America)

400 volt - 3 phase - 50 Hertz
(Japan, Korea, New Zealand and Australia)

575 volt - 3 phase - 60 Hertz
(Eastern Canada)

Other motor options available upon request.

Water

15 - 150+ GPM / 150 PSI (minimum) 500 PSI (maximum)

Compressed Air

20 CFM at 85 PSI - supply of 5 HP compressor
-OR-

40 CFM at 85 PSI - supply of 10 HP compressor
-OR-

60 CFM at 85 PSI - supply of 15 HP compressor
-OR-

Hill air supply between 20 CFM and 100 CFM

TECHNICAL SPECIFICATIONS

Capacity	13 – 114 GPM (50 – 432 LPM) depending on nozzle configuration Minimum 100 psi (7 Bar) water pressure required
Throw	20 – 150 feet (7 – 46 meters)
Fan Motor	10 or 15 HP (7.5 or 11 Kw)
Compressor	5 HP (4 Kw) or 10 HP (7.5 Kw)
Nucleator Heat (on-board compressed)	185 Watt
Nucleator Heat (hill air)	785 Watt
Spray Manifold Heat (optional)	1.3 Kw
Search Light	150 Watt
Water Connection	1 ½" or 2"
Electric Connection	Customer Choice of Plug 150 feet (carriage) or 40 feet (tower) of Electrical Cord Included

Operating Specifics (cont)

6. WATER SYSTEM

The PoleCat water system is designed for maximum flexibility and ultimate snow production. The PoleCat will produce snow at water pressures below 100 psi (7 Bar), but minimum suggested water pressure is 150 psi (10 Bar). The maximum water pressure is 500 psi (35 Bar).

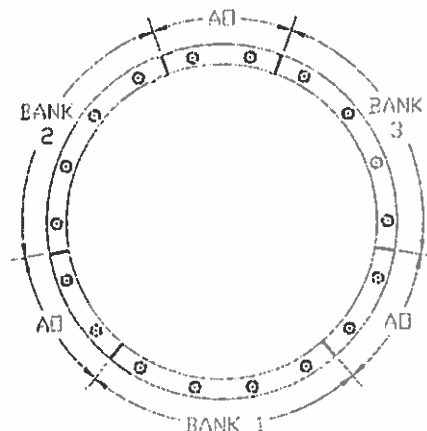
Water enters the machine via a camlock fitting and then into the stainless steel valve manifold. The valve manifold is equipped with a 30 mesh inline filter that should be checked and cleaned regularly to prevent water pressure loss and decreased snow production.

To clean the inline filter you first unscrew the valve manifold cap and hang it in an appropriate place on the machine. The filter is removed by carefully (like a surgeon) pulling it from the valve manifold being sure not to drag the inside surface of the filter on the threaded rod. The filter is best cleaned using a power washer but a round plastic bristle brush and flushing with tap water can be used as an alternate method. Before inserting the clean filter it is best to lightly flush out the valve manifold to remove any particulate that was deposited upon removal of the inline filter. Inspect the O-rings at each end of the inline filter and filter cap for damage and replace if necessary. Place the clean filter in the valve manifold and replace the cap. The cap only needs to be fingers tight to properly seal.

Note: To simplify filter cleaning it is recommended that dirty filters are cleaned immediately or allowed to soak in water to prevent the deposits from drying making the filter very difficult to clean later.

The PoleCat spray manifold has six banks containing 18 nozzles with three of the banks always on (AO) when water is supplied to the valve manifold. The always on banks contain six Maxipass 078 nozzles for both tower and carriage mount that flow between 13.2 gpm (49.8 lpm) and 21.0 (79.5 lpm).

The banks marked valve 1, 2 and 3 can be turned on/off by the three heated 3-way ball valves on the valve manifold. Heat is automatically supplied to the ball valves when the control panel switch is on. Allow the heat to the valve to thaw them prior to operating to avoid damaging the plastic seats. The 3-way ball valves will drain upon shutdown with the valve handle in the down position. Position the angle of the fan barrel so that the water is able to drain from the spray manifold down through the valve manifold via gravity out the valve.



Operating Specifics (cont)

Water System (cont)

The bank marked as valve 1 is the next to be turned on as temperatures permit. This bank contains four Maxipass 092 nozzles for both tower and carriage mount that flow between 15.6 gpm (59.2 lpm) and 24.4 gpm (92.3 lpm).

The bank marked as valve 2 is the next to be turned on as temperatures permit. This bank contains two Maxipass 092 and two Maxipass 125 nozzles for both tower and carriage mount that have a combined flow of between 18.4 gpm (69.8 lpm) and 29.0 gpm (109.7 lpm).

The bank marked as valve 3 is the last to be turned on. This bank for a carriage contains two Maxipass 092 and two Maxipass 125 nozzles that flow at the same rate as valve 2 bank. The tower mount on the other hand contains two Maxipass 125 and two Maxipass 140 nozzles that have a combined flow of between 25.4 gpm (96.2 lpm) and 39.8 gpm (150.6 lpm). As the temperature rises, the nozzle banks should be turned off in the opposite sequence.

Note: The minimum and maximum flow rates (in gpm) given above are at 100 psi (7 bar) and 500 psi (34 bar), respectively. The water flow rates given are taken for pressures at the nozzle tip.

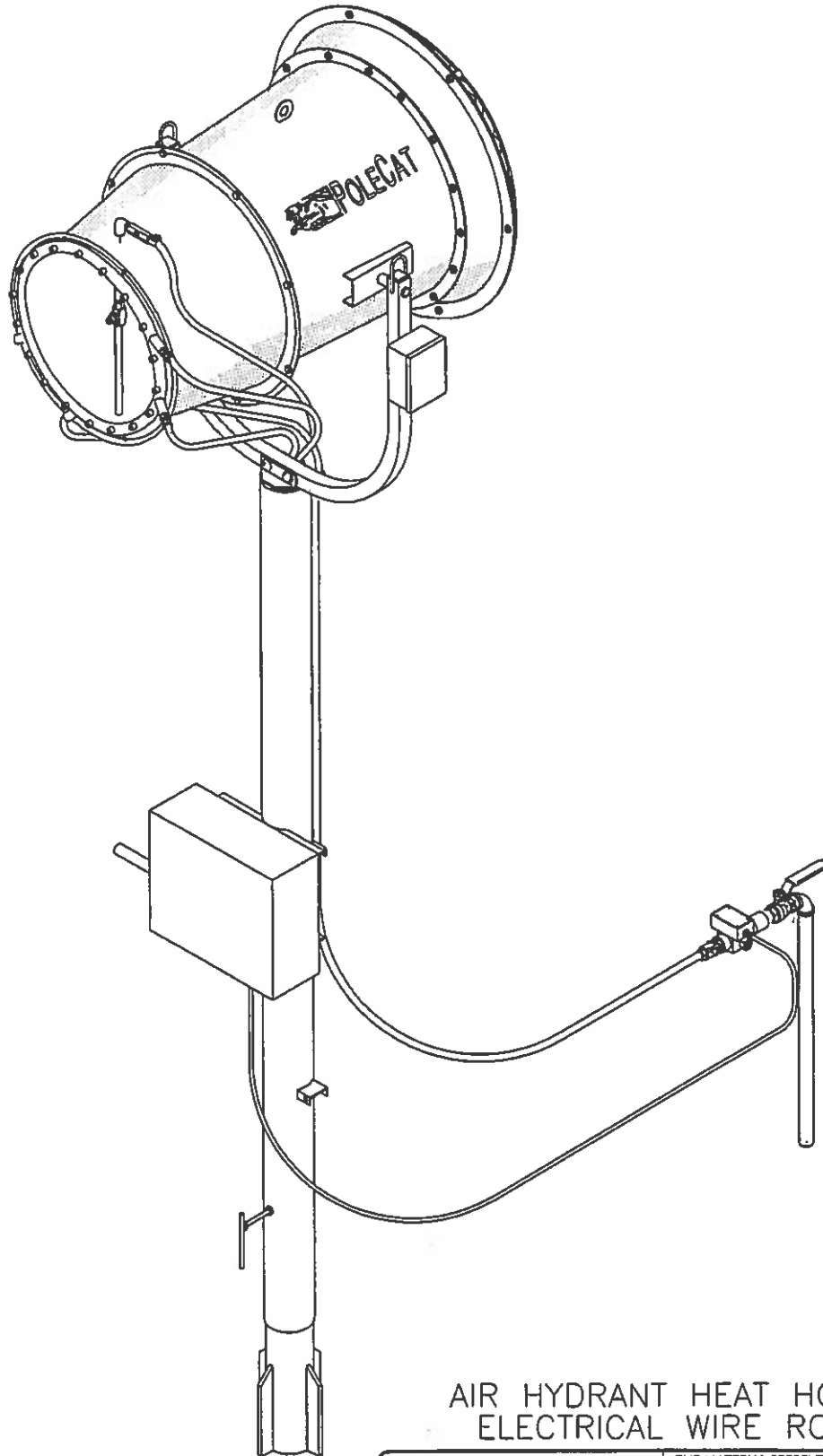
The water pressure can be regulated at the water hydrant or pump station.

Changing the water pressure can considerably impact snow quality by varying the water flow and water particle droplet size. Increasing water pressure will increase the water flow through the nozzles and decrease the water particle droplet size. Decreasing the water pressure will decrease the water flow through the nozzles and increase the water particle droplet size.

Operating Specifics (cont)

7. PROJECTED WATER FLOW RATES

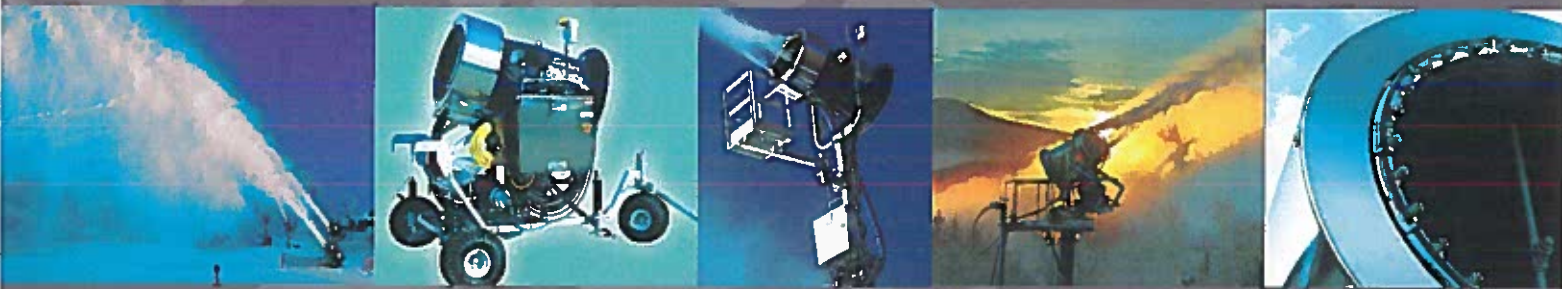
	Standard Nozzle Configuration in gallons per minute (liters per minute)				
Bank	Nozzles	200 psi (14 Bar)	300 psi (20 Bar)	400 psi (28 Bar)	500 psi (34 Bar)
Always On	6 x 078	13.2 (49.8)	16.2 (61.2)	18.6 (70.2)	21.0 (79.5)
Valve 1	4 x 092	15.6 (59.2)	19.2 (72.8)	22.0 (83.2)	24.4 (92.3)
Valve 2	2 x 092	7.8 (29.6)	9.6 (36.4)	11.0 (41.6)	12.2 (46.2)
	2 x 125	10.6 (40.2)	13.0 (49.2)	15.0 (56.8)	16.8 (63.5)
Valve 3 (carriage)	2 x 092	7.8 (29.6)	9.6 (36.4)	11.0 (41.6)	12.2 (46.2)
	2 x 125	10.6 (40.2)	13.0 (49.2)	15.0 (56.8)	16.8 (63.5)
Valve 3 (tower)	2 x 125	10.6 (40.2)	13.0 (49.2)	15.0 (56.8)	16.8 (63.5)
	2 x 140	14.8 (56.0)	18.2 (68.8)	20.6 (78.0)	23.0 (87.1)
Total Carriage		65.6 (248.6)	80.6 (305.2)	92.6 (350.2)	103.4 (391.2)
Total Tower		72.6 (275.0)	89.2 (337.6)	102.2 (386.6)	114.2 (432.1)



POLECAT

AIR HYDRANT HEAT HOSE AND ELECTRICAL WIRE ROUTING

 Snow Makers SMI covers the world		THE MATERIAL PRESENTED HEREON IS PROPRIETARY AND THE EXCLUSIVE PROPERTY OF SMI	
SNOW MACHINE 1812 N. Rockwell Dr. Midland, MI 48642		DATE	DATE
		DATE	DATE



TECHNICAL SPECIFICATIONS

SUPER POLECAT FLEXIBILITY AND PERFORMANCE

The Super PoleCat is a high performance big throw snow machine with many flexible automation options including remote control and full automatic modes of operation for either individual standalone machines or when connected to a complete network.



SMI's SmartSnow™ Automation & Control software is flexible and customizable and offers proven communication options, accurate weather measurement, supporting equipment and instrumentation, integrated auxiliary equipment, and service that is second to none.



Snow Machines, Inc.
1512 North Rockwell Dr.
Midland, MI 48642
Tel: +1-989-631-6091
Toll Free +1-800-248-6600
snowmakers.com

- Mount: 10.5' (3.2 m) or 15.5' (4.7 m) tower or 3 wheel painted A-frame carriage or 3 wheel galvanized steel carriage with Snowcat lifting brackets
- Electrical: Three phase
- Fan: 20 HP (15 kW):
1760 rpm (1760 U/m) at 480V/60Hz
1450 rpm (1450 U/m) at 400V/50Hz
Fan: 25 HP (18 kW):
1760 rpm (1760 U/m) at 480V/60Hz
1450 rpm (1450 U/m) at 400V/50Hz
Propeller: SMI 7 blade aluminum
Screen: stainless steel
- Compressor:
5.5 HP (4.8 kW) Atlas Copco, 21.4 cfm at 100 psi (10.1 l/s at 7 bar)
or 5 HP (3.7 kW) Hydrovane, 22 cfm at 100 psi (10.4 l/s at 7 bar)
or 10 HP (7.5 kW) Hydrovane, 43.3 cfm at 100 psi (20.5 l/s at 7 bar)
or hill air, 60-100cfm at 80psi
- Heating: 300 W
Optional spray manifold heater 1300 W
900 W additional if hill air
- Water Pressure: 100 – 750 psi (7 – 50 bar)
- Water Connection: Customer's choice
- Valves: 4 self-draining heated 3-way valves
- Nozzles: Always on banks: 10 nozzles
Valve 1: 6 nozzles
Valve 2: 4 nozzles
Valve 3: 5 nozzles
Valve 4: 5 nozzles
Total: 30 nozzles
- Nucleators: Central nozzle with six jets
- Filtration System: Stainless steel filter with washable 30 mesh (595µm) screen
- Electrical Cord: Tower: 40' (12 m), Carriage: 100' (30 m)
- Rotation: 360° horizontal rotation – 10° to 60° elevation adjustment
- Oscillator: optional for tower and galvanized carriage, 70° arc of rotation

SMI SUPER POLECAT

The SMI Super PoleCat Snowmaker and Snowtower are SMI's big throw simple nozzle fan snowmaking products that excel in all temperature conditions. The Super PoleCat is offered with a piston or vane compressor or hill air feed, in manual or automatic, and in a variety of custom tower and carriage mounts.

The Super PoleCat uses a 20HP (15 kW) or 25HP (18 kW) fan for a big throw and 30 nozzles that you can customize to achieve water flows specific to your climate. These 30 nozzles are nucleated with a single central six jet nucleator nozzle. Water adjustment is easy with four heated self draining valves.

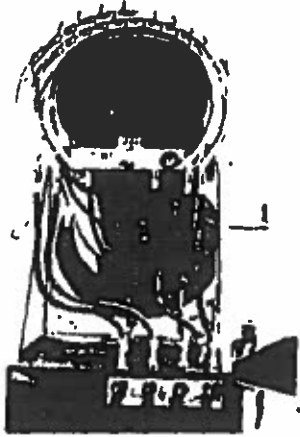
The PoleCat is simple to operate and maintain and an excellent all around performer for all conditions. Another great snowmaking value from SMI.

Call SMI or your local representative today for more information or visit us at snowmakers.com.



Breakthrough from SMI!

SILENTSTORM SNOWMAKER



SMI's SilentStorm introduces many technical advances that result in significantly increased snow production, reduced noise levels, greater throw, flexibility and reduced operating costs. Silent because it's QUIET! Storm because its snow production equals or exceeds any snowmaker on the market today.

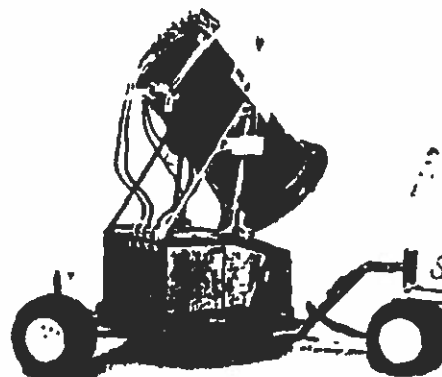
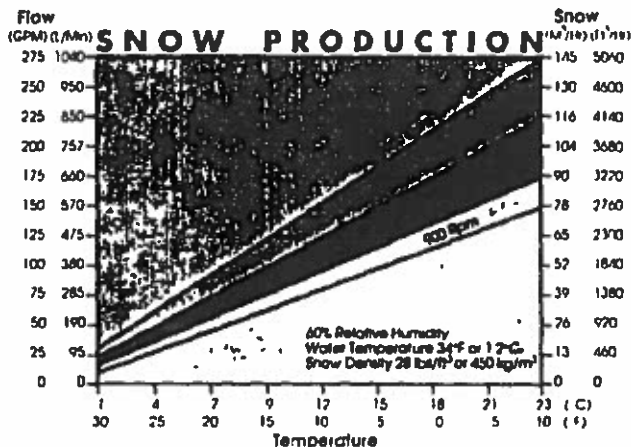
The revolutionary design concepts include a new high efficiency propeller and a variable frequency drive on the fan. The propeller with its skewed leading edge is specially designed to produce more air to increase efficiency over 45%.

The Variable Frequency Drive allows ultimate flexibility. The VFD lets you 'dial in' the fan speed from 900 RPM to 1900 RPM. Low speed (900 RPM) is very quiet and can be used on narrow trails or windy nights to limit throw. High speed can be used in open areas for maximum snow production. You can 'dial in' the proper throw and noise level for the different locations on your mountains. Trail width, chairlift lines, and condominium locations are conditions that can be easily accommodated. The machine can now be used in various locations and conditions.

The SilentStorm has a special air intake, a long barrel, multiple nucleators and over 35,000 CFM (1000CMM). The manifold design advances the patented Boyne and Highland snowmaking concepts to increase snow production significantly in all temperature/humidity conditions. The SilentStorm uses one to twelve nucleators and offers a simplified step valving system for easy use. A customized heating system is included. Flood and trouble lights are standard.

The machine is well packaged on a 360° turntable that is easy to use. A triangular-shaped four wheel carriage allows easy mobility and quick set up and shutdown.

The SilentStorm is high production, energy efficient, portable, flexible and quiet. It is one of the world's quietest snowmakers. The combination of low capital cost, low operating cost, variable throw, and low noise makes the SilentStorm the most flexible snowmaker and the best investment in snowmaking you will ever make.



SMI Snow Makers

Snow Machines, Inc.
1512 N. Rockwell Drive
Midland, MI 48640
(517) 631-6091
Toll-free North America
1-800-248-6600
FAX 517-631-3152

SEP 21 1992



Bogus Creek enters small pool through large culvert above sand filter (shown in distance).



Sand Filter House



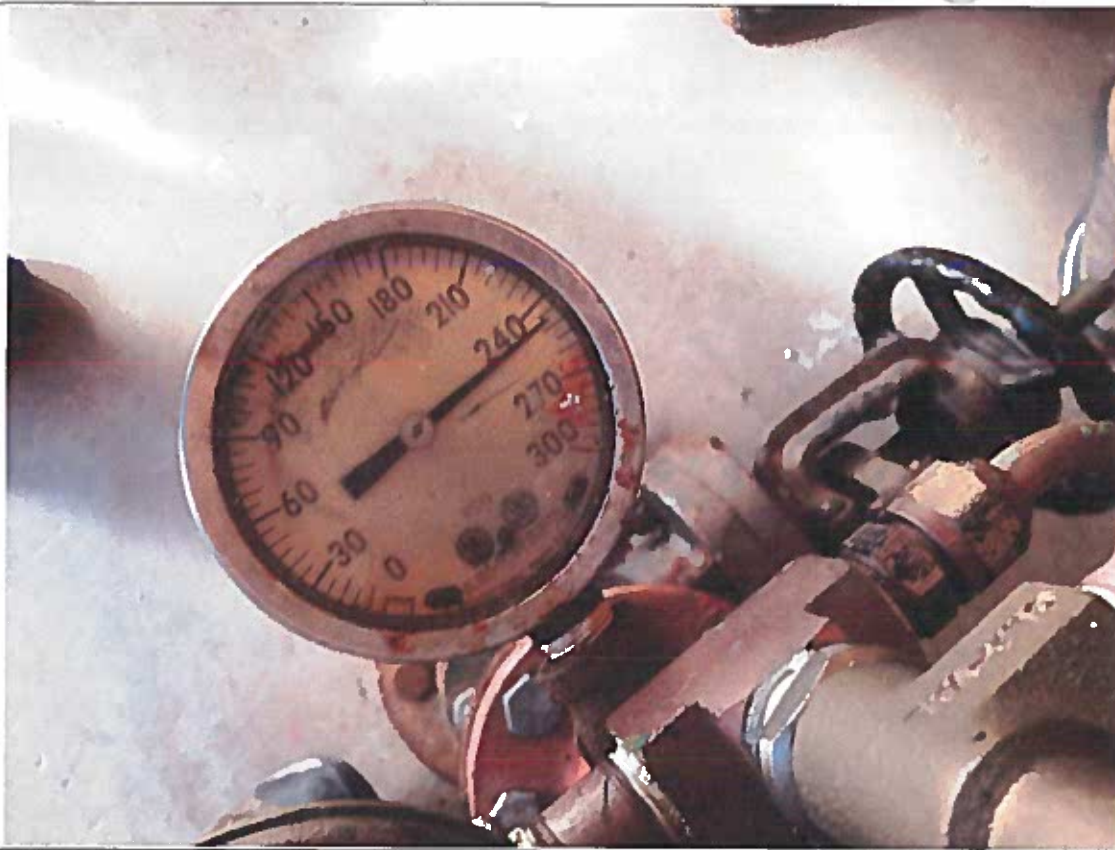
Bogus Creek at Pump House location.

Water can enter a 7,000 gallon clear well under Pump House or can continue through creek.



Inside Pump House.

Blue Pump & Motor on red casing shown against back wall. Water can be diverted up to storage facility or can be pumped directly to snow making hydrants at this location.



247 psi shown on system from storage facility (Gravity pressure).



GE Motor.

15 hp

Model:
5K6227XH48A

SN:
DKJ410251

Phase:
3



Storage Facility

Located at top of
Chair #2.

225,000 gallons
0.7 af



Water line connects
to a series of
hydrants. These
hydrants provide
water access to
snow making
machines.