

8.21.08 White Arrow Ranch / Hot Springs (cy)

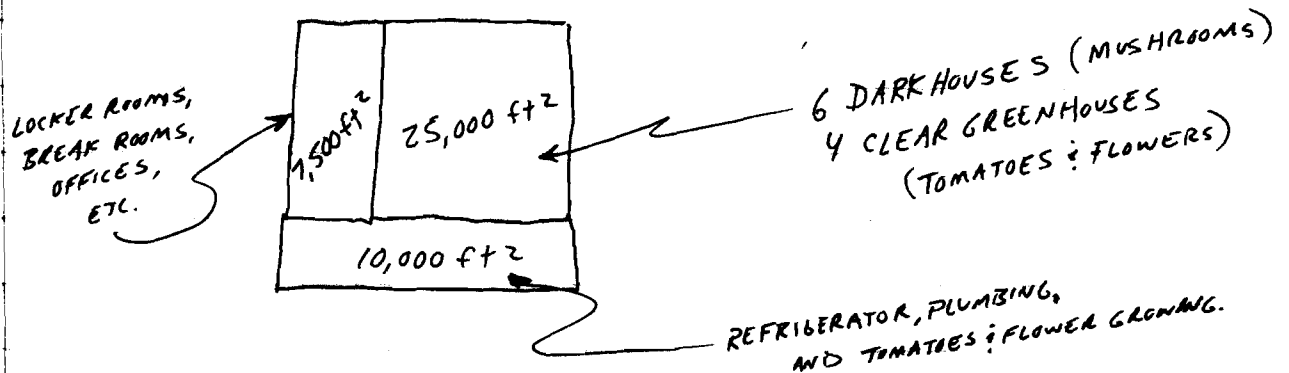
meas #2

W. Pipe 11:37 start 4686 gal
468.6 gpm

Speed = 5095
Signal = 3

37-8165 COMMERCIAL USE IN GREENHOUSE
BUILDING CALCULATIONS BY C. SKINNER 8/26/2008

GREENHOUSE BUILDING IS $\approx 42,500 \text{ ft}^2$ (per Arcmap)
and CONFIGURED AS FOLLOWS...



TOTAL AREA FOR GREENHOUSE (NON DARKHOUSE/MUSHROOM)

$$\frac{4}{10} (25,000 \text{ ft}^2) + 10,000 \text{ ft}^2 = 20,000 \text{ ft}^2 \text{ or } 0.46 \text{ acre}$$

PER BIG BEND SENTINEL ~~THE~~ NEWSPAPER ARTICLE...

"VILLAGE FARMS TOMATO GROWERS HAS TWO 40-ACRE GREENHOUSES IN MARFA AND ONE IN FORT DAVIS. VILLAGE FARMS VICE PRESIDENT MIKE BLEDSOE SAID EACH GREENHOUSE USES AN AVERAGE OF 80 MILLION GALLONS PER YEAR" ($80,000,000 \div 40 \text{ acres} = 2,000,000 \text{ gallons per acre}$)

$$0.46 \text{ acres} * 2,000,000 \text{ gallons/acre per year} = 920,000 \text{ gallons/year}$$

$$\text{or } \approx 2.8 \text{ acre-feet/year}$$

WATER USE IN
GREENHOUSE SECTIONS

37-8165 COMMERCIAL USE ANALYSIS 8/26/2008

TOTAL AREA FOR DARKHOUSE/MUSHROOM SECTION

$$6/10 * 25,000 \text{ ft}^2 = 15,000 \text{ ft}^2 * 5 = 75,000 \text{ ft}^2$$

(RACKS STACKED 5 HIGH)

PER PENNSYLVANIA STATE UNIVERSITY ARTICLE ON MUSHROOM FARMING...

* 1980 NATIONAL AVERAGE WAS 3.12 ~~lb~~ lbs/ft² ~~(15 week production)~~

* 90% OF MUSHROOM IS WATER

* 15 WEEK PRODUCTION CYCLE

$$75,000 \text{ ft}^2 (3.12 \text{ lbs}) = 234,000 \text{ lbs} (.9) = 210,600 \text{ lbs}$$

$$210,600 \text{ lbs} \div 8.3 \text{ lbs/gallon} = 25,373 \text{ gallons}$$

$$25,373 \left(\frac{52}{15} \right) = 87,961 \text{ gallons/year or } 0.27 \text{ acre-feet per year}$$

cycles per year

amount of water in mushroom harvest per year

5 Hp pump observed as part of the hot water plumbing in building hooked to 3 timers to different rooms with timers set for total of 11.5 minutes per hour.

* Assume pressure of 50 psi, 10 feet of lift (floor to ceiling); 70% eff.

$$Q = \frac{8.8 \times \text{Hp} \times \text{eff}}{1.44 + [(2.31)(\text{pressure})]} = \frac{8.8 \times 5 \times .70}{10 + [(2.31)(50)]} = 0.25 \text{ cfs}$$

$$(0.25 \text{ cfs}) \left(\frac{448.83 \text{ gpm}}{\text{cfs}} \right) \left(\frac{11.5 \text{ min}}{\text{hour}} \right) \left(\frac{24 \text{ hour}}{\text{day}} \right) \left(\frac{365 \text{ days}}{\text{year}} \right) \left(\frac{1 \text{ acre-foot}}{325,950 \text{ gallons}} \right) = 34 \text{ acre-ft}$$

$$34 \text{ acre-ft} (3 \text{ timers}) = 102 \text{ acre-feet}$$

WATER USE
IN
DARKHOUSE/
MUSHROOM
SECTION

37-8615 COMMERCIAL USE ANALYSIS

8/26/08

* ASSUME 40 WORKERS (BASED ON 40 LOCKERS IN FACILITY)

* ASSUME 40 HOUR WORK WEEK PER WORKER

$$40 \text{ workers} * 40 \text{ hour work week} = 1600 \text{ worker hours/week}$$

* ASSUME WORKERS @ FACILITY 24 HOURS PER DAY, 7 DAYS PER WEEK

$$(24 \text{ hours})(7 \text{ days}) = 168 \text{ working hours/week}$$

* ASSUME WORKERS EVENLY DISTRIBUTED PER SHIFT & WORK WEEK

$$1600 \frac{\text{worker hours}}{\text{week}} \div 168 \frac{\text{working hours}}{\text{week}} = 9.5 \text{ workers/work week}$$

* ASSUME 8-hour shifts

$$168 \frac{\text{working hours}}{\text{week}} \div 8 \text{ hour shift} = 21 \text{ shifts/week}$$

PER FIELD EXAMINERS HANDBOOK

WORKERS PER PERSON PER SHIFT REQUIRE 15 GALLONS

$$\left(\frac{9.5 \text{ workers}}{\text{shift}} \right) \left(\frac{15 \text{ gallons}}{\text{worker}} \right) \left(\frac{21 \text{ shifts}}{\text{week}} \right) \left(\frac{52 \text{ weeks}}{\text{year}} \right) = \frac{155,610 \text{ gallons}}{\text{year}} \approx 0.5 \text{ ac-ft/year}$$

WATER USE AT SHOWER FACILITIES

ASSUME TWO SHOWERS PER SHIFT (COMING & GOING) PER WORKER @ 15 gallons/shower

$$\left(\frac{9.5 \text{ workers}}{\text{shift}} \right) \left(\frac{15 \text{ gallons}}{\text{worker shower}} \right) \left(\frac{2 \text{ worker showers}}{\text{shift}} \right) \left(\frac{21 \text{ shifts}}{\text{week}} \right) \left(\frac{52 \text{ weeks}}{\text{year}} \right) = \frac{311,220 \text{ gallons}}{\text{year}} \approx 0.96 \text{ ac-ft/year}$$

TOTAL COMMERCIAL WATER USEUSE 0.25 cfs for FLOW RATE

TOTAL VOLUME = GREENHOUSE WATER USE + MUSHROOM/DARKHOUSE WATER USE

$$+ \text{WORKER WATER USE} = 2.8 \text{ afa} + 102 \text{ afa} + 1.5 \text{ afa} = \underline{\underline{106.3 \text{ afa}}}$$

WATER
USE
FOR
WORKERS

37-8165 RATE OF FLOW FOR HEATING USE ANALYSIS BY C SKINNER 8/25/2008 (BASED ON APPLICATION PROCESSING MEMO #23 (AMENDED))

PER GEORGE PANAGIOTOU OF BLISS VALLEY PROPERTIES...

MAIN HOUSE $\approx 7500 \text{ ft}^2$ footprint, multiple levels with total area $\approx 10,000 \text{ ft}^2$

HOUSE BY MOAT $\approx 800 \text{ ft}^2$ footprint, single level

GUEST HOUSE $\approx 900 \text{ ft}^2$ footprint, 2-levels (not counting basement) 1800 ft^2 (heated)

GREENHOUSE BUILDING $\approx 40,000 \text{ ft}^2$ (actually $42,500 \text{ ft}^2$)
per aremap

FIND BTU'S

main house $E = [.67 \cdot 66^\circ] 10,000$

$E = 442,200 \text{ BTU/hour}$

moat house $E = [.67 \cdot 66^\circ] 800$

$E = 35,376 \text{ BTU/hour}$

guest house $E = [.67 \cdot 66^\circ] 1800 \times 0.8$

$E = 63,676.8 \text{ BTU/hour}$

greenhouse building

$E = [.67 \cdot 66^\circ] 40,000$

$E = 1,768,800 \text{ BTU/hour}$

$1,879,350 \text{ BTU/hour}$

$E = [e \cdot \Delta T] \times \text{Area}$

$e = .67$ (average residence)

$e = 1.11$ (poor energy efficiency)

$\Delta T = (t_i - t_o) = (70^\circ - 4^\circ) = 66^\circ$

Boise

multiply by 0.8
for 2-story

main house

2 other homes
greenhouse building

P.S.

FIND TEMPERATURE DROP ACROSS SYSTEM

$\Delta T_s = 0.3(s - t)$

where s = source temp (141.8°F measured near home during exam)

$\Delta T_s = 0.3(141.8 - 70)$

t = inside temp (use 70°F)

$\Delta T_s = 21.54^\circ\text{F}$

FIND FLOW RATE37-8165 HEATING USE
ANALYSIS 8/25/08

$$\text{RATE} = \frac{E}{500 (\Delta T_s)} \quad (\text{in gpm})$$

$$\text{FOR MAIN HOUSE} = \frac{E}{500 (\Delta T_s)} = \frac{442,200}{500 (21.54^\circ)} = 41.06 \text{ gpm}$$

$$\boxed{= 0.09 \text{ cfs}} \leftarrow$$

$$\text{FOR MORT HOUSE} = \frac{E}{500 (\Delta T_s)} = \frac{35,376}{500 (21.54^\circ)} = 3.28 \text{ gpm}$$

$$\boxed{\text{round to } 0.01 \text{ cfs}} \leftarrow$$

$$\text{FOR GUEST HOUSE} = \frac{E}{500 (\Delta T_s)} = \frac{63,676.8}{500 (21.54^\circ)} = 5.91 \text{ gpm}$$

$$\boxed{= 0.01 \text{ cfs}} \leftarrow$$

$$\text{FOR GREENHOUSE BUILDING} = \frac{E}{500 (\Delta T_s)} = \frac{1,879,350}{500 (21.54^\circ)} = 174.50 \text{ gpm P.S.}$$

$$\boxed{= 0.37 \text{ cfs}} \leftarrow$$

$$0.39 \text{ cfs}$$

$$\boxed{\text{TOTAL FLOW RATE} = 0.50 \text{ cfs P.S.}}$$

$$\boxed{0.48 \text{ cfs}} \leftarrow$$

37-8165 HEATING VOLUME ANALYSIS

BY C. SKINNER 8/25/2008

$$VOLUME = \frac{H_L * DD * 24 * C_D}{\Delta t_1 * K * C * \Delta t_2}$$

where Δt_1 = inside minus outside temp = $70^\circ - (-3^\circ) = 73^\circ F$

H_L = Peak heat load required = from graph in BTU/hour per ft²

(for main home $H_L = 32$, for other homes & building $H_L = 46$)

DD = annual heating degree days = 5970 (BLISS)

C_D = .62 for homes, .8 for greenhouse building (weighted average of greenhouse space @ .85 vs non greenhouse space @ 0.62)

$K = .90$

$C = 2.72 \times 10^6$ (unit conversion to give V in acre-ft)

Δt_2 = temp drop across system (use $\Delta T_s = 21.54^\circ$)

$$\text{Volume for Main home} = \frac{(32)(10,000)(5970)(24)(.62)}{(73)(.90)(2.72 \times 10^6)(21.54)} = 7.38 \text{ ac-ft}$$

$$\text{Volume for Mont house} = \frac{(46)(800)(5970)(24)(.62)}{(73)(.9)(2.72 \times 10^6)(21.54)} = 0.85 \text{ ac-ft}$$

$$\text{Volume for guest house} = \frac{(46)(1800)(5970)(24)(.62)}{(73)(.90)(2.72 \times 10^6)(21.54)} = 1.91 \text{ ac-ft}$$

$$\text{Volume for green house building} = \frac{(46)(\overset{42,500}{\cancel{40,000}})(5970)(24)(.8)}{(73)(.9)(2.72 \times 10^6)(21.54)} = \overset{58.22}{\cancel{54.79}} \text{ ac-ft} \quad (.5)$$

$$\text{TOTAL VOLUME} = \overset{68.36}{\cancel{64.93}} \text{ ac-ft} \quad (.5) \leftarrow$$

8/21/2008

37-8165

FIELD
NOTES

157° @ source

double
pane
windows
well insulated
Oakley stone
floors

main house 10,000 ft² 3 levels
no garage
foundation 7000-8000 ft²

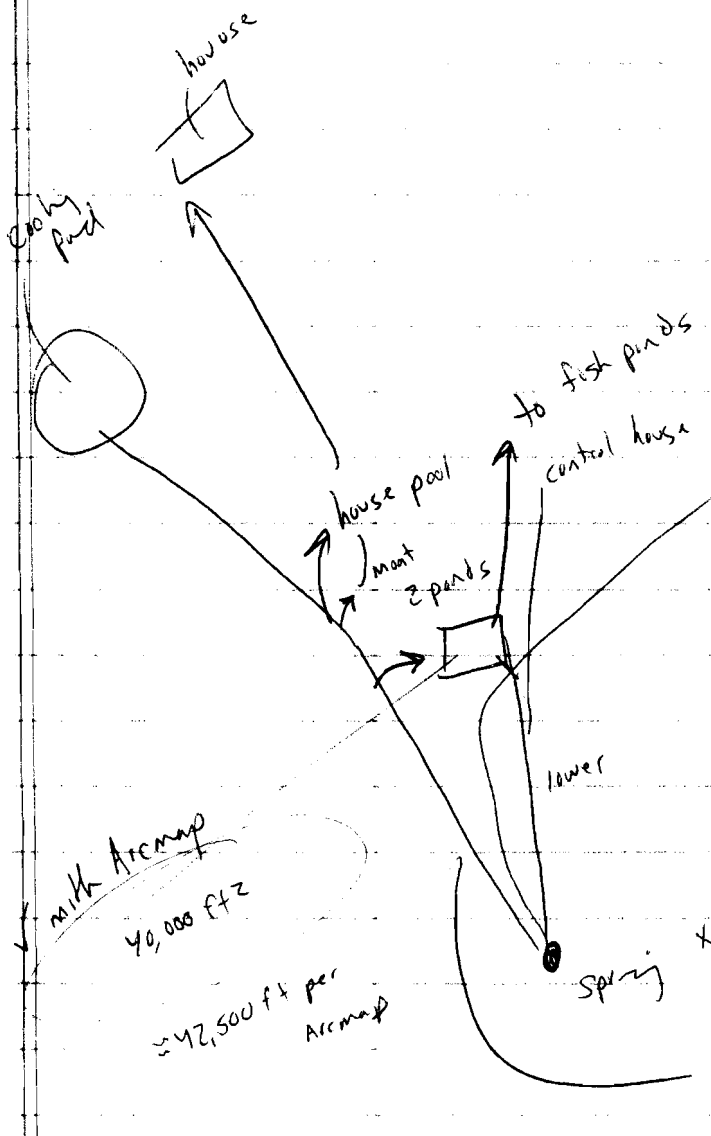
driveway: sidewalks heated

wood floors 800 ft² house by moat

guest house ~~1000 ft²~~ 900 ft² (three story)
no garage basement

Not
as well constructed as
main houses

building radiant
heat
cooling of mushrooms



lower pipe
to greenhouses & fishpond
and irrigation

upper pipe
2 homes
moat
irrigation
2 ponds

8/21/2008

37-8165 FIELD NOTES

Spring site tag

→ A0000472 - Allens

→ A0015220 - south side

temp
63°C

61° @ ditch

East line

upper pipe 8.78" diameter

thickness .27

spacing = 6.46 on FLD 12

sound speed @ 140°F 5086

inst. sound speed 5059

total
volume
1474 gallons
10 minutes

47.4 gpm

logger
file
name

WA east

start time 10:54

overflow

6 seconds

6 seconds

≈ .12 cfs

overflow

15.5 seconds

≈ .05 cfs

1.2' tall

.94' diameter
.84'

.89'

≈ .75 f13

on stream
panel

Bliss Valley
Grows

West line

diameter 11.13

thickness .625

spacing 8.38

tanks
tipped
sides of hay
in under
real
high
misters
fans

468 gpm

8/21/2008

~~37-8165~~
FIELD NOTES

Baldor industrial
hot water mister
5 hp

11.5 minutes

5 mushroom
racks

12 rooms

locker rooms

Six fish raceways

first pond on stream
A0015222

try on pump room
SW of greenhouse
A0015221

8/21/2008

37-8165 FIELD NOTES

POD

1.93 cfs spring

1.84 cfs captured @ spring

1.04

33

~ 39 cfs
not
captured
from creek

Commercial
employees
time cards

28 employees

24 time cards

Showers

shower
controversy

mold and contaminants

powder mold

40 lockers

in locker
rooms

assume
40 hour
shifts

POI

return flows

→ tomatoes - winter
→ and mushrooms - year round
→ ~~prinsettas~~ prinsettas → seasonal
→ irises → seasonal

tomatoes & flowers

Creek dammed up (actual diversion fed 37-810 & 37-811)

onstream

2 ponds

onstream
ponds

Rediversion

(on stream storage)
fish propagation
ditch wildlife

33-acre surface area ~ 3 ft deep

1.93 cfs
rediversion of cfs for fish propagation