

WATER MANAGEMENT

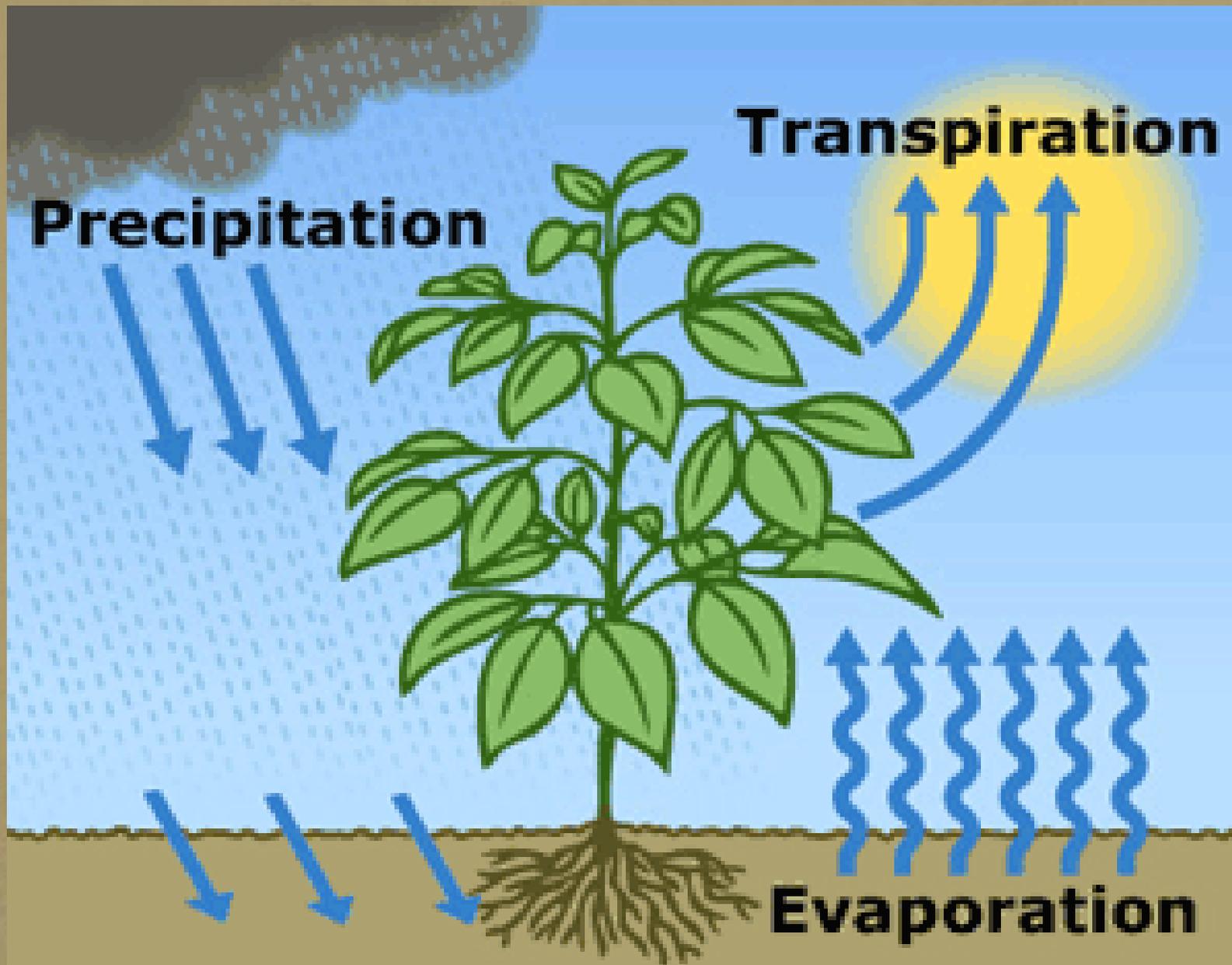
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- ▣ Water leaves the farm in two main ways
 - ▣ Pumping
 - ▣ Evaporation/Transpiration

- ▣ Water comes to the farm three main ways
 - ▣ Rainfall
 - ▣ Irrigation
 - ▣ Seepage

It is our place to manage these factors across time to protect the crop while minimizing pumped discharges

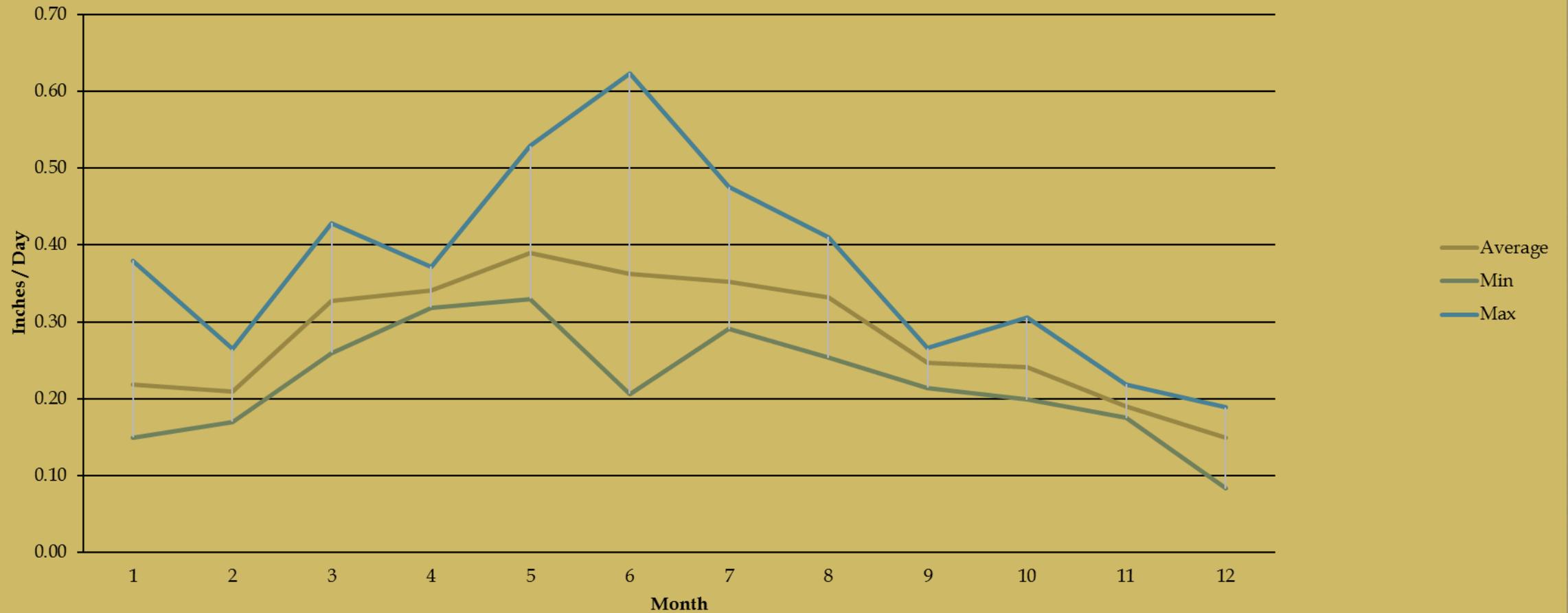


Seepage?

- ▣ Soil water storage can be 1/2 inch or more of rainfall which requires no pumping. Some BMP permit requirements use delayed pumping which takes advantage of evaporation.
- ▣ Delayed pumping can reduce pumping by at least 0.2 inches per day.
- ▣ Pumping at reduced rates can stretch the discharge cycle a time allowing evaporation to be of larger effect.

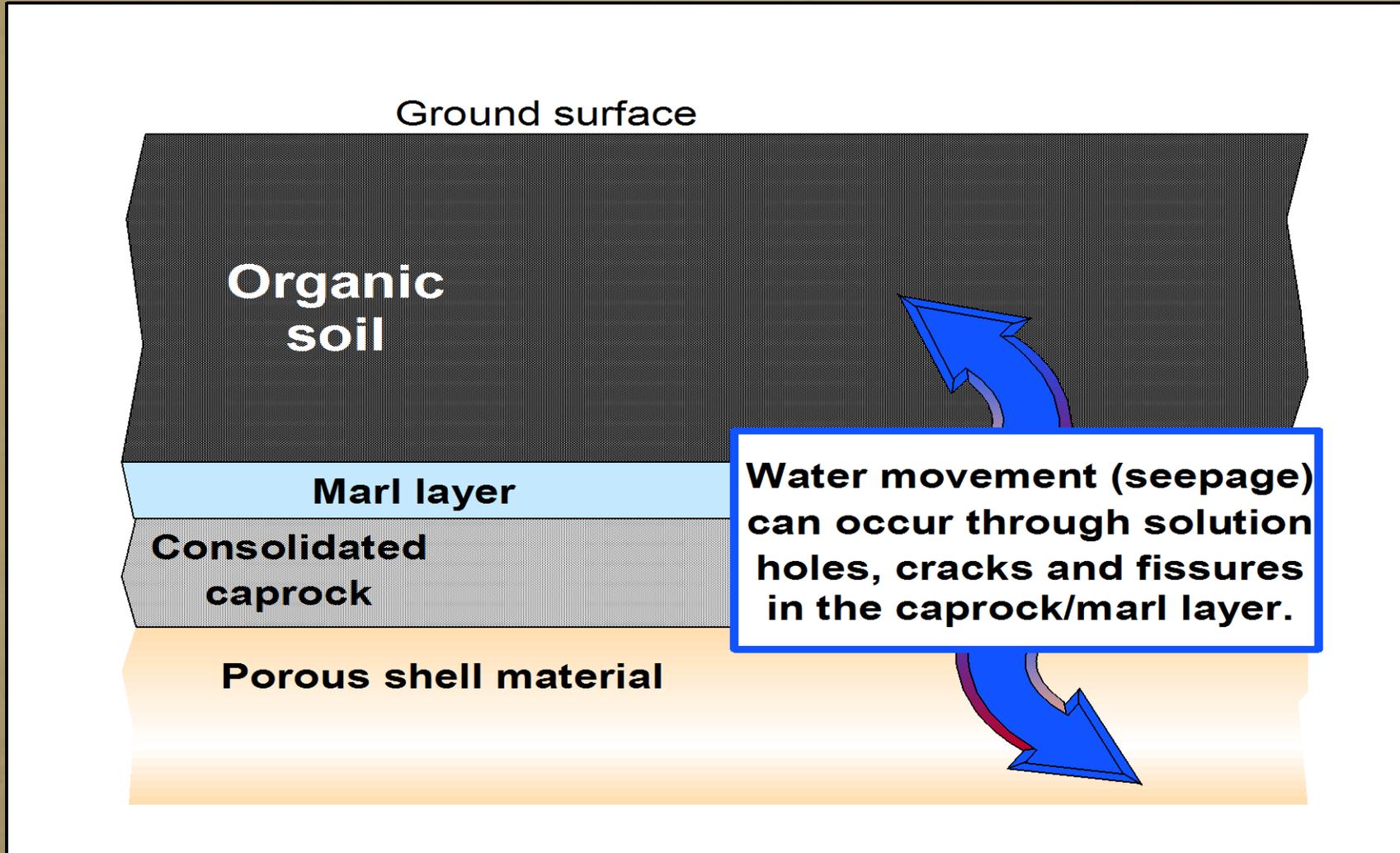
Daily Evaporation

Evaporation at S-7



- ▣ Each Farm is Hydraulically unique.
- ▣ Pumping decision makers must know how field water level responds to main canal elevation versus time.
- ▣ Once the desired field water level is reached and held, the pumps have accomplished their intended task.
- ▣ The field will still be wet but further pumping will have little or no effect.
- ▣ This water is absorbed and adsorbed in and on the soil and will only leave by evaporation/transpiration.

- Deeper Histosoil and Porous Substrate



- ▣ Internal pumping can be used to lower water tables prior to and during harvest so that only part of the farm is drained into the remainder
- ▣ Use of culverts and risers can segregate which part of the farm is being drained so that a smaller part of the farm is drained through the discharge pump station

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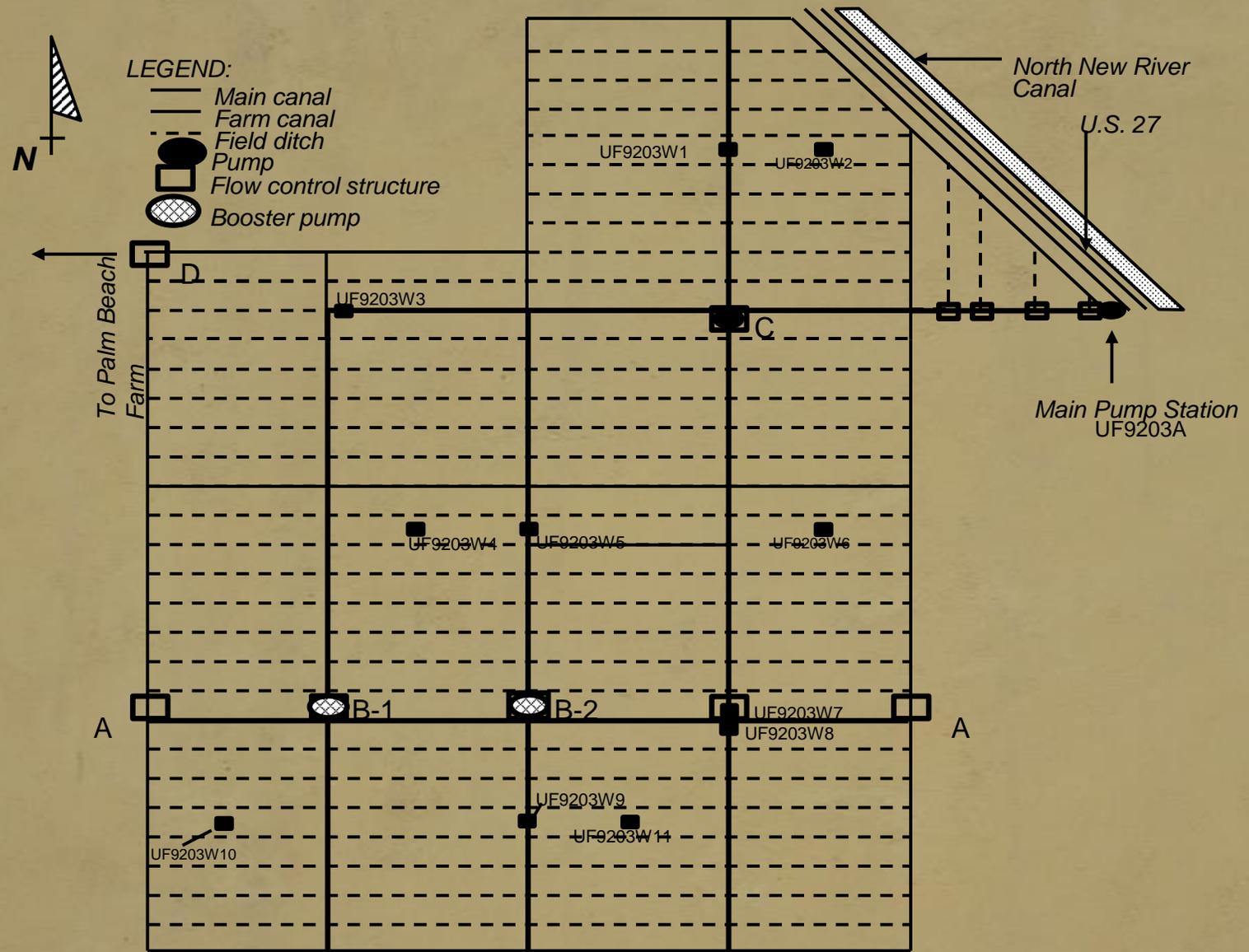


Figure 3A-BMP: UF9203A hydraulic system and farm layout.

- ▣ It may be possible to Increase the duration of a major pumping event which will lower velocities and allow water loss though evaporation.
- ▣ This will also allow better control of seepage while the SFWMD canals drop to normal levels.
- ▣ Learn the response of your farm to pumping, canal water levels, time and, evaporation.
- ▣ The result will be less fuel used, less water discharged and less sediment and other detritus in the sampler. All of this results in a lower P load from the farm

Water Discharge BMPs	PTS	Usual Method
Water Management (0.5 Inch)	5	Delayed Pumping
Water Management (1.0 Inch)	10	Delayed Pumping and Soil Storage
Water Management (1.5 Inches)	15	Delayed Pumping and Soil Storage
Water Management (>1.5 Inches)	15	Onsite Detention/Retention
Improved Infrastructure	5	Typically, Use Of Interior Devices
No Direct Discharge	15	Retention
Reduced Flow through Water Table Management	5	Water Table Guidelines

SFWMD Basin	WOD Site	Farm Name	Acres	Normal Pump On El (ft)	Normal Pump Off El (ft)	Normal Target El (ft)	Harvest Pump On El (ft)	Harvest Pump Off El (ft)	Harvest Target El (ft)
50-067-70	MC1	PB	MANY	9.0	7.0	8.5	7.7	5.7	7.2
	MC2			8.8	7.0	8.3	7.5	5.7	7.0
	MC3			7.6	6.0	7.1	6.3	4.7	5.8
	MC4			8.8	6.7	8.3	7.5	5.4	7.0
	MC5			8.5	7.0	8.0	7.2	5.7	6.7
	MC6			8.8	6.8	8.3	7.5	5.5	7.0
	MC7			8.8	7.6	8.3	7.5	6.3	7.0
	MC8			8.9	7.9	8.4	7.6	6.6	7.1
	MC9			8.5	7.6	8.0	7.2	6.3	6.7
	MC10			8.5	6.8	8.0	7.2	5.5	6.7
	MC11			8.6	6.5	8.1	7.3	5.2	6.8
	MC12			7.6	6.0	7.1	6.3	4.7	5.8
	MC13			7.5	6.0	7.0	6.2	4.7	5.7
	MC14			8.2	7.0	7.7	6.9	5.7	6.4
	MC15			8.2	7.0	7.7	6.9	5.7	6.4
	MC16			8.2	7.0	7.7	6.9	5.7	6.4
	MC17			8.8	6.7	8.3	7.5	5.4	7.0
	MC18			9.2	7.0	8.7	7.9	5.7	7.4
	MC19			10.4	8.4	9.9	9.1	7.1	8.6
	MC20			11.1	9.2	10.6	9.8	7.9	9.3
	MC21			10.5	9.0	10.0	9.2	7.7	8.7
	MC22			8.2	6.2	7.7	6.9	4.9	6.4
	MC23			9.6	6.8	9.1	8.3	5.5	7.8

- After major rain events where the soil is saturated or flooded and the pump canal is moving toward the shut off elevation. You will still have to wait a week while water evaporates before you can reenter the field
- The water adsorbed and absorbed in the top ~10 inches of the field will only leave by evaporation regardless of the field water table
- For sandy soils the time will be less but there is still no advantage in pumping below target water levels

Detention: temporarily holding water until conditions for release are met; object is to control discharge rates to reduce impact on downstream receiving systems.

Retention: preventing water from discharging into receiving surface waters; water is held until it is lost to percolation, evapotranspiration or evaporation.

EAA Detention BMP is a hybrid of Detention and Retention

- ▣ If the ditches and soil are shallow and, the farm canals are not well developed and, the underlying rock is consolidated the farm will drain like a sponge over a parking lot. Once surface water is pumped away only evaporation will remove water from the soil.
- ▣ Only flooding will irrigate unless overhead irrigation is available.



Notes

- ▣ $\text{In/Day} \times \text{Acres} \times 18.8574 = \text{GPM}$
- ▣ $1 \text{ Acre Inch} = 27154.285 \text{ Gallons}$
- ▣ $1 \text{ Acre Foot} = 325851.42 \text{ Gallons}$
- ▣ $\text{Acres} \times \text{Rain (Water) Inches} \times 27154.285 / \text{GPM} = \text{Minutes of Pumping}$

Pump Nominal Diameter Inches	Pump Actual ID Diameter Inches	10 FPS GPM	8 FPS GPM
10	10.000	2,448	1,958
12	12.000	3,525	2,820
14	13.250	4,298	3,438
16	15.250	5,693	4,554
18	17.250	7,284	5,827
20	19.250	9,071	7,257
24	23.250	13,233	10,586
28	27.250	18,178	14,542
30	29.250	20,944	16,755
36	35.250	30,418	24,334
42	41.250	41,654	33,323
48	47.250	54,653	43,722
54	53.250	69,414	55,532
60	59.000	85,215	68,172

Project: Test 24

PIPE AND PUMP OD	24	IN
PIPE AND PUMP GUAGE	0.375	IN
PIPE AND PUMP ID	23.25	IN
PROPELLER HUB DIAMETER	11.239	IN
PROPELLER DIAMETER	20.969	IN
GALLONS PER MINUTE	13233	GPM
STATIC HEAD	6	FT
SYSTEM HEAD	8.160	FT
SYSTEM HP	39.83	HP
DISCH PIPE / PUMP CASING	50	FT
DRIVER RPM	1725	RPM
PUMP RPM	748	RPM
DRIVE RATIO	2.306	5V
SPECIFIC SPEED (NS)	17822	NS
CUBIC FEET PER SECOND	29.483	CFS
SUCTION UMBRELLA	49.75	IN
SUCTION END CLEARANCE	15.26	IN

	Entrance Angle Deg	Exit Angle Deg
Propeller OD	14.147	15.043
Propeller Meridian	17.442	19.863
Propeller Hub	25.186	31.406

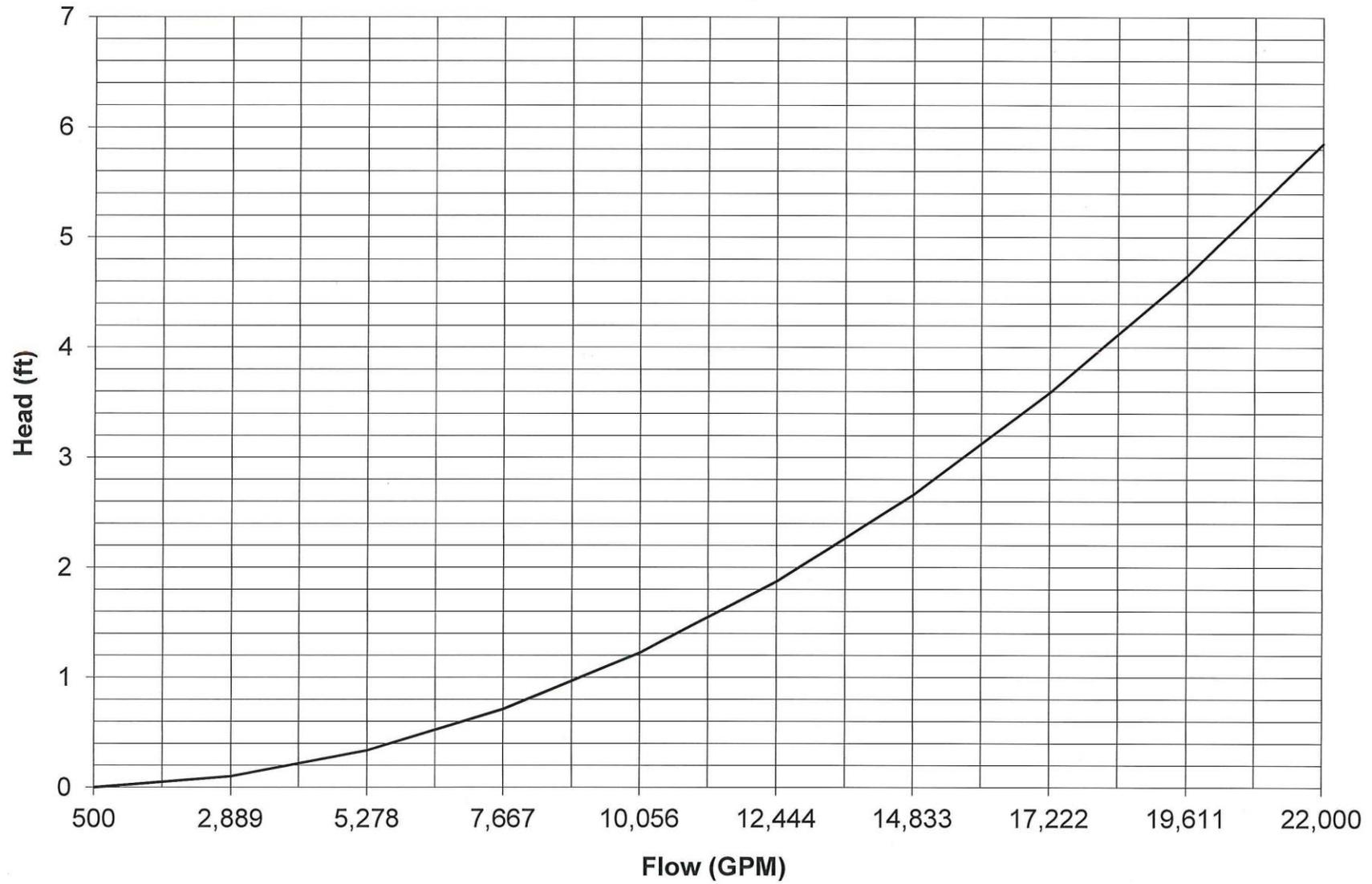
Preferred Limits of Design For Low Head Axial Flow Pumps

- ▣ No additional head by design or layout
- ▣ Propeller hub is at least $.536 \times$ the propeller diameter
- ▣ Velocity through the propeller is limited to 17.25 fps
- ▣ Velocity through the pump casing is limited to 10 fps

These suggestions will limit cavitation and enhance power conservation.

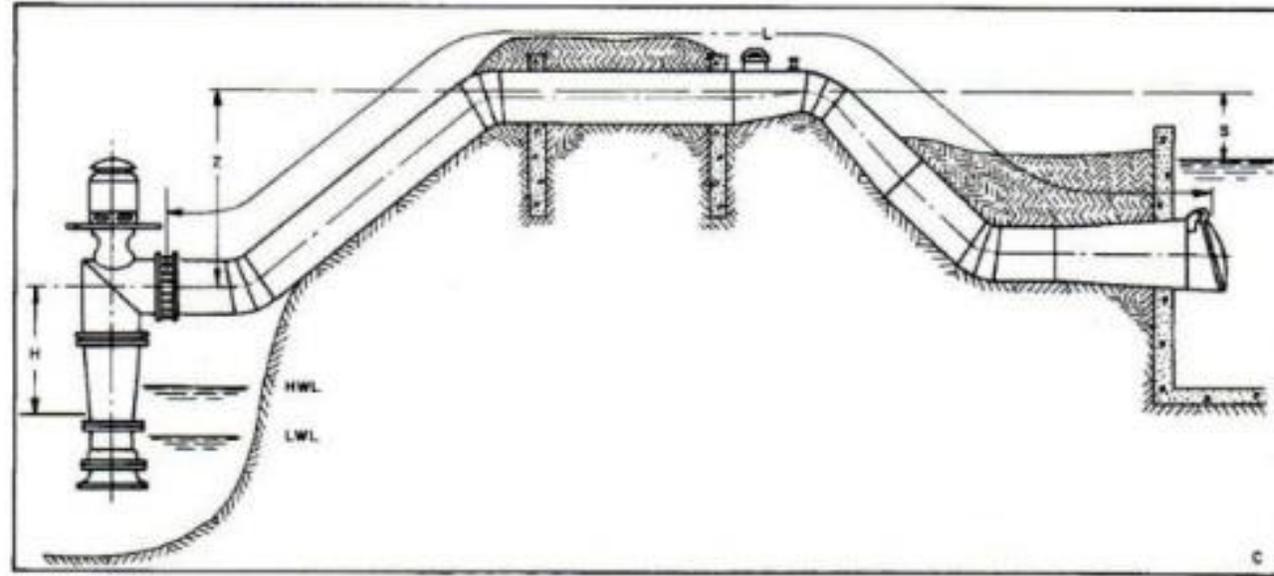
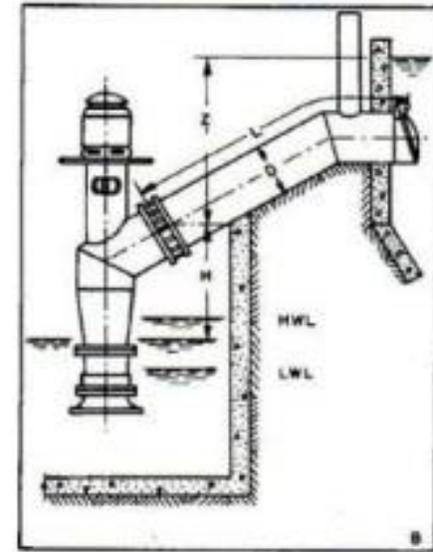
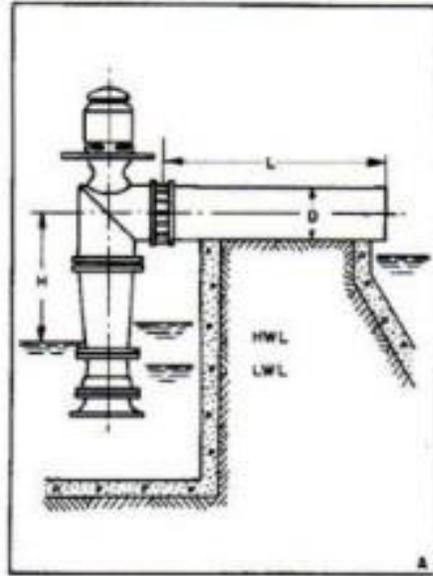
Total Head	
Pipe Dia (ins):	24
Pipe ID	23.25
Schedule:	30
Water Temp (DegF):	75
Pipe Length (ft):	50
Equivalent Length (ft):	50
Flow Rate (gpm)	Head (ft)
500	0
2,889	0.10
5,278	0.34
7,667	0.71
10,056	1.22
12,444	1.87
14,833	2.66
17,222	3.59
19,611	4.65
22,000	5.85

System Curve

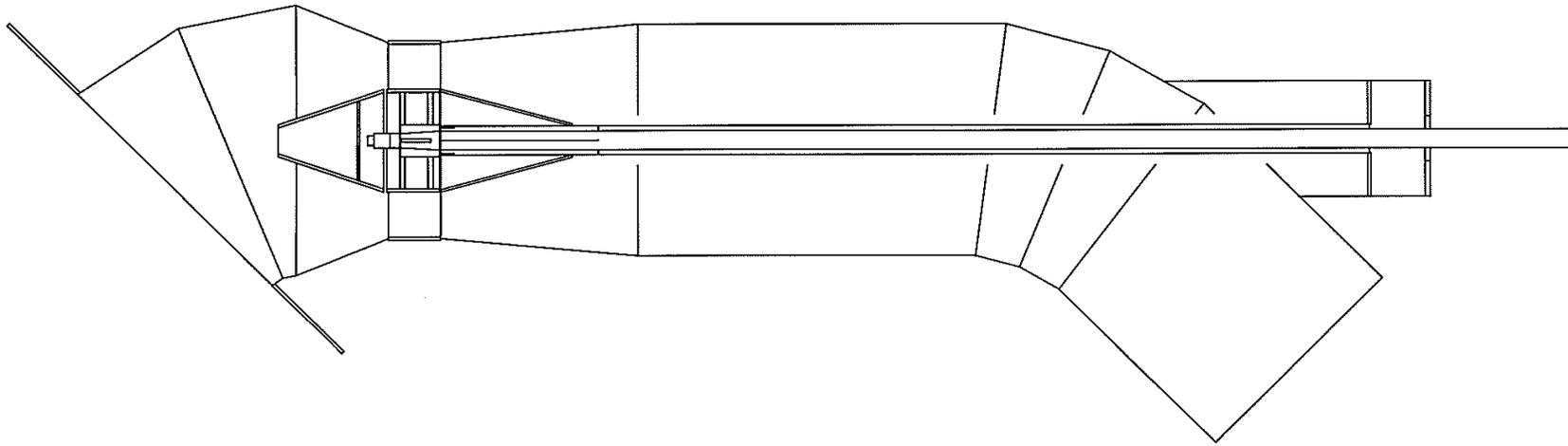


6Ft Static Lift

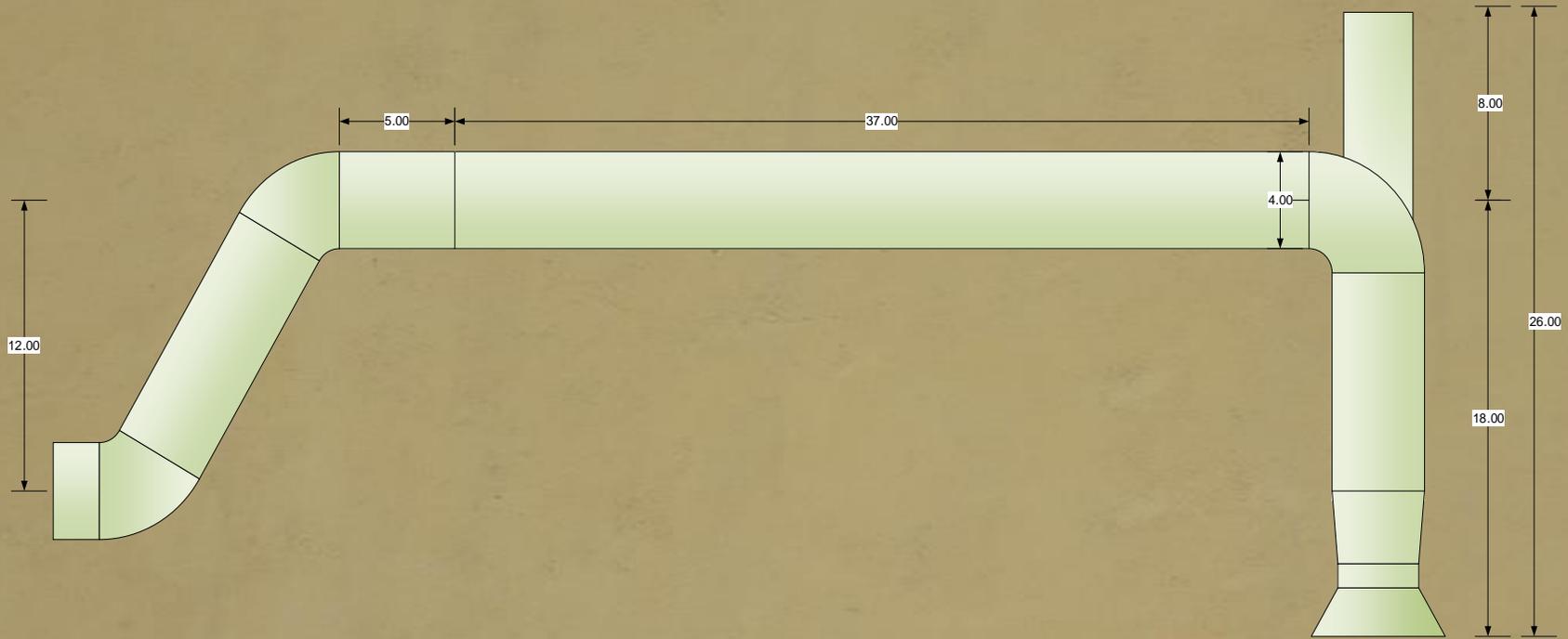
24" Pipe GPM	Added Head Ft	Total Head Ft	Increase Fuel/Gal W %	80% EFF HP
10056	1.22	7.22	0.00%	24.59
12444	1.87	7.87	8.26%	33.18
14833	2.66	8.66	16.63%	43.51
17222	3.59	9.59	24.71%	55.95
19611	4.65	10.65	32.21%	70.75
22000	5.85	11.85	39.07%	88.31



NPSHA must
be 2 feet more
than the
NPSHR







S2 Pump Station Daily Record

