MEMORANDUM

TO: Norm Young
WATER District FILE

FROM: TIM LUKE TL

DATE: December 9, 1993

RE: Curran Tunnel Status Report

==========

On September 8, 1993, the Department installed a water level measurement device in the Curran Tunnel. Specifically, the device is a sensor which uses ultrasonic waves to measure distance between the sensor and a target surface, which in this case is water level. The measured distance is then calculated as depth of water in the tunnel. The sensor is not able to detect changes in flow in the Rangen Hatchery pipeline.

As depicted in Attachment A, the ultrasonic sensor is mounted to the ceiling of the tunnel approximately 20 feet from the tunnel opening. A 50 ft electric cable connects the sensor to a datalogger next to the tunnel where water levels are recorded at 60 minute intervals, 24 hours per day. The sensor and datalogger are powered by a 12 volt battery which is recharged by a photovoltaic solar panel. Recorded data in the datalogger is periodically downloaded to a lap top personal computer at the site by IDWR staff. The downloaded file is an ASCII file which contains the date, time and raw water level measurement from the sensor to the water level surface.

During the first six weeks of data collection some of the raw measurements were logged at over eight feet. These logged measurements were obviously incorrect as the diameter of the tunnel is only six feet. Only a few of these bad data points were logged during September but the problem increased over the first three weeks of October. This problem seems to have been corrected by installing additional hardware on the sensor. The hardware upgrade was made on October 29.

Attached to this memo are several graphs which show water levels as recorded by IDWR's ultrasonic sensor and datalogger. The graphs show all hourly measurements taken between September 8 and December 1, 1993. The known inaccurate measurements referenced above have been replaced with estimated values using linear interpolation (i.e.; values estimated as a function between two known surrounding values).

The attached graph shown as Attachment B shows the raw water level readings (including interpolated values), or the distance between the sensor and the water level surface logged from the ultrasonic sensor. This graph shows several dramatic water level changes.

The most obvious and dramatic change is the one occurring just prior to October 27. This and several smaller data shifts on the graph appear to be the result of instrument error and have been corrected based on actual on-site measurements and instrument calibration. The second graph, given as Attachment C, shows the corrected raw water level readings. The third graph, Attachment D, shows corrected water levels as depth of water from the bottom of the tunnel.

As shown on Attachment D, water depth in the tunnel increased steadily from September 8 through about October 31, then leveled out for about eight days before entering a gradual decline to the most recent levels on December 1. The large fluctuations recorded between September 29 and October 7 appears to be an anomaly as compared to the rest of the data. I am unaware of an explanation at this time as to why there are large and frequent fluctuations in the data during this specific time period.

Actual discharge of water in the tunnel as measured with a current meter on miscellaneous dates increased from 10.8 cfs on September 8 to 20.1 cfs on November 4. Attachment E is a graph of tunnel discharge (excluding flow of Rangen pipeline) as estimated by current meter measurements at different dates between July 7 and December 1, 1993. Attachment F is a plot of water level or stage vs. measured discharge (also excludes Rangen pipeline). Water levels in this latter graph are based on staff gage observations taken during individual current meter measurements. A rating table and/or rating curve will be developed after obtaining additional tunnel discharge and stage measurements. A rating table or curve can be available prior to the next irrigation season.

In addition to installing the water level equipment and making periodic discharge measurements at the tunnel, IDWR has distributed ground water pump cards to owners of wells which are located on the Snake Plain Aquifer within a three mile radius of the Curran Tunnel. The purpose of distributing the cards is to potentially compare water level changes in Curran Tunnel with nearby pumping activity. Well owners or operators in the area have been asked to voluntarily complete and return the cards to IDWR. There are nearly 30 separate irrigation wells in this area operated or owned by 19 different parties. A pump card was sent for each well and month of operation. The cards allow the operator to record dates and number of hours each well was pumped. An example of the cards is provided as Attachment G.

As of December 1, 1993, IDWR has received only three pump cards involving two separate wells. This is not sufficient to allow a correlation of pumping events to changes in tunnel flow. Since distributing the cards, IDWR has called most of the well owners or operators to further discuss the study and encourage users to return the cards. Some of the users have expressed concern about participating in this project for fear that IDWR would use the

information to physically curtail their ground water pumping. Also, many of the users had indicated that pumping for the year had been curtailed before receiving the cards.

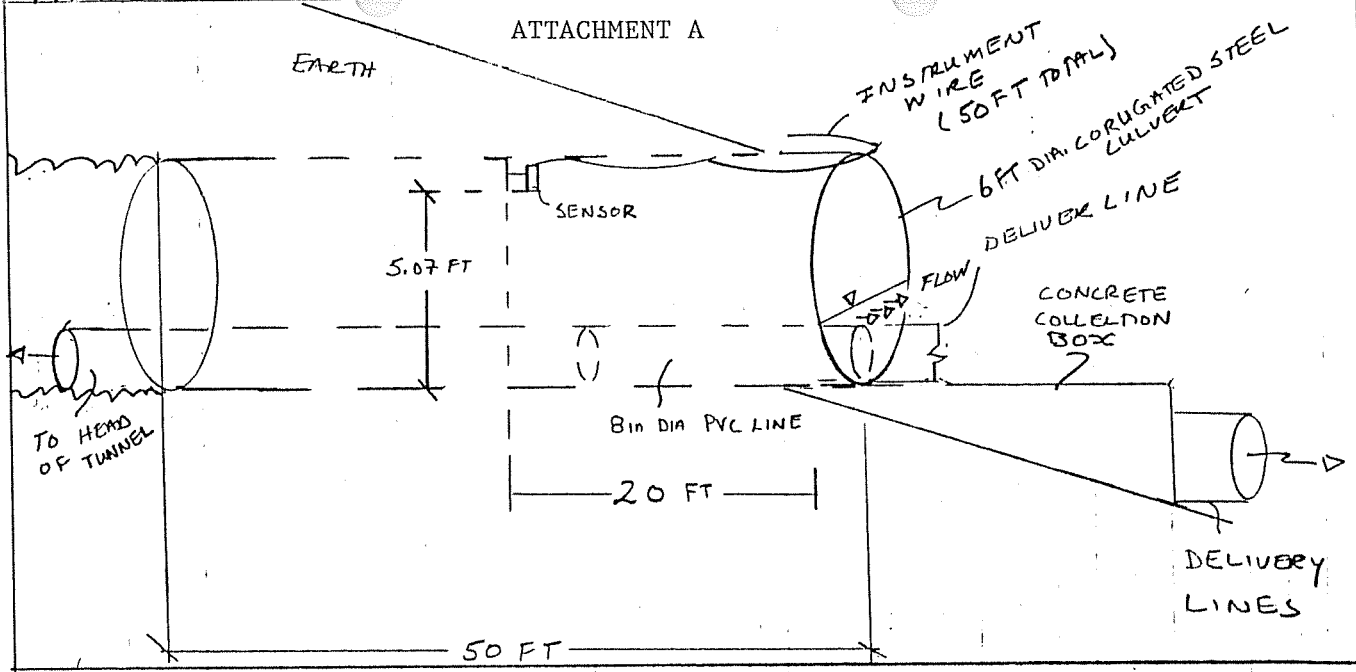
Continuous Monitoring:

IDWR will continue to log water level data at Curran Tunnel through the following irrigation season and perhaps longer. IDWR staff will also continue to measure discharge at the site with an objective to develop a stage-discharge rating table for the tunnel. Obtaining an accurate rating table however may be hampered due to the operation of the Rangen pipeline which diverts water in the tunnel and upstream of the measuring site. Prior to the ensuing irrigation season, IDWR should consider requesting Rangen to install a flow meter for the pipeline diversion in the tunnel. IDWR has also asked the Rangen Hatchery manager to document significant diversion changes.

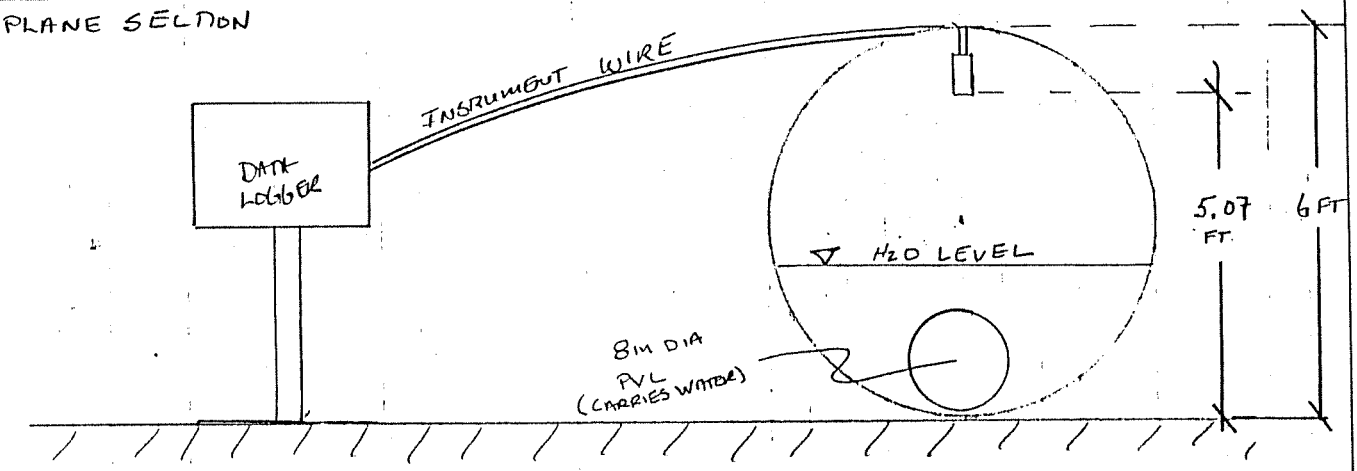
IDWR staff is currently looking at the possibility of installing one or two additional water level recorders at nearby springs. Additional recorders would likely be mechanical type recorders and installed by the ensuing irrigation season. Ideal sites would include good access to a location upstream or above diversions and near an existing measuring device such as a weir.

PROFILE SECTION | CURRAN TUNNEL SITE DRAWINGS | 11/16/93 GEH

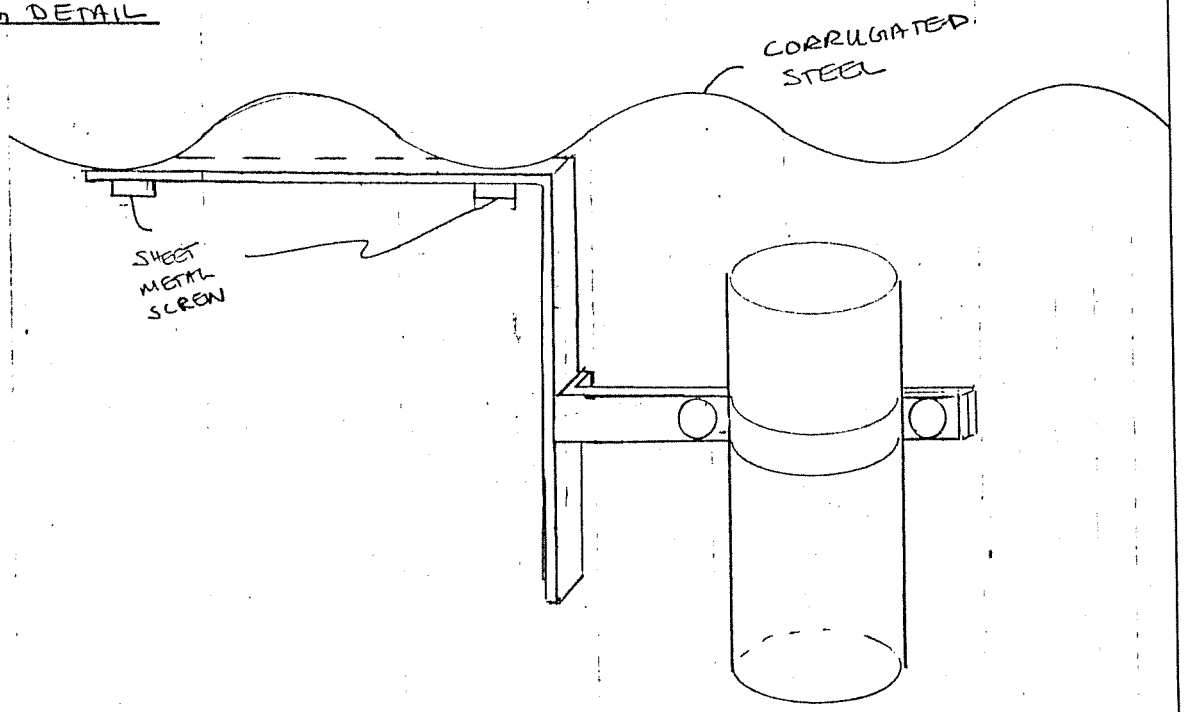
ATTACHMENT A



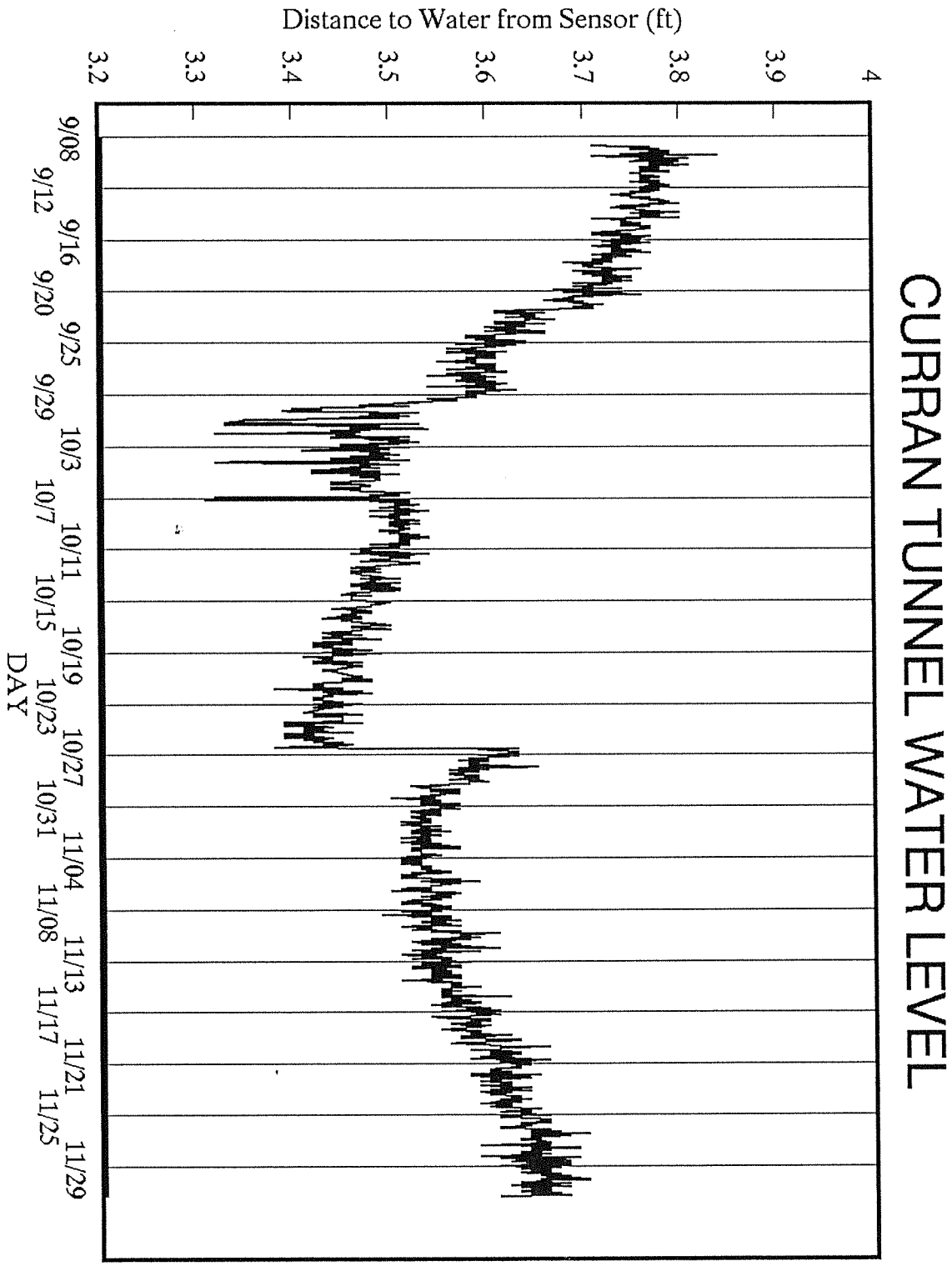
PLANE SECTION



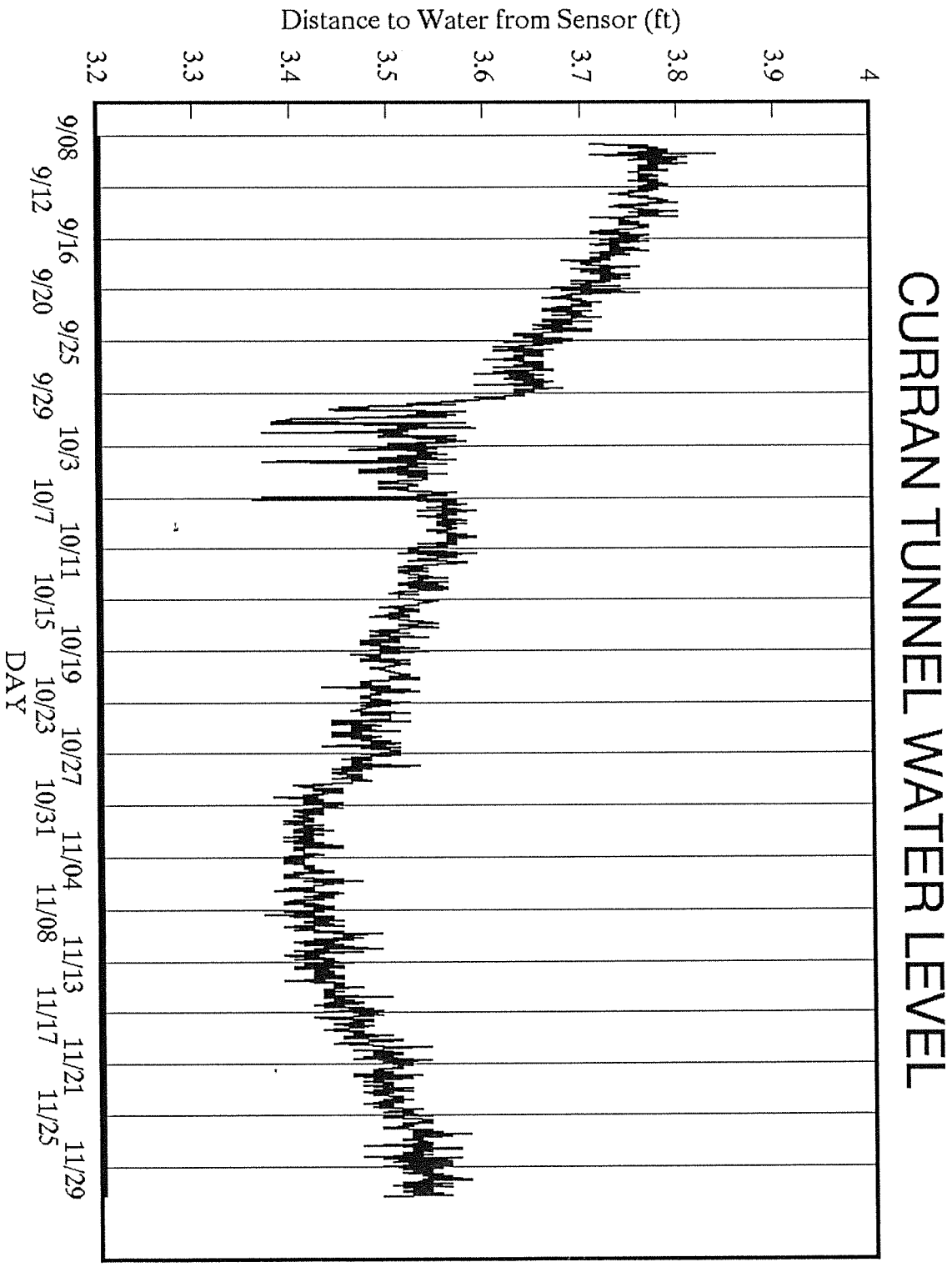
MOUNTING DETAIL



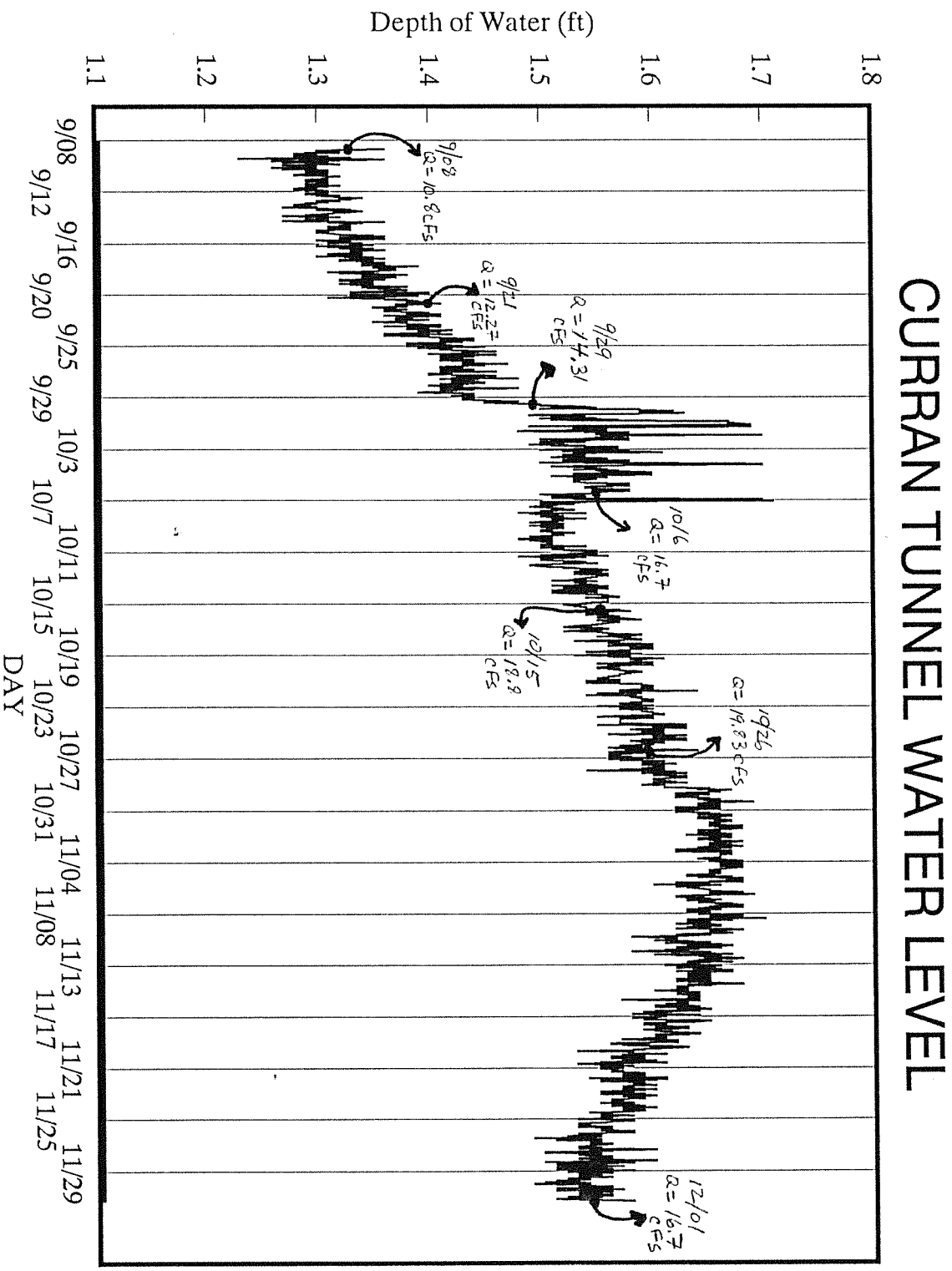
ATTACHMENT B



ATTACHMENT C



ATTACHMENT D

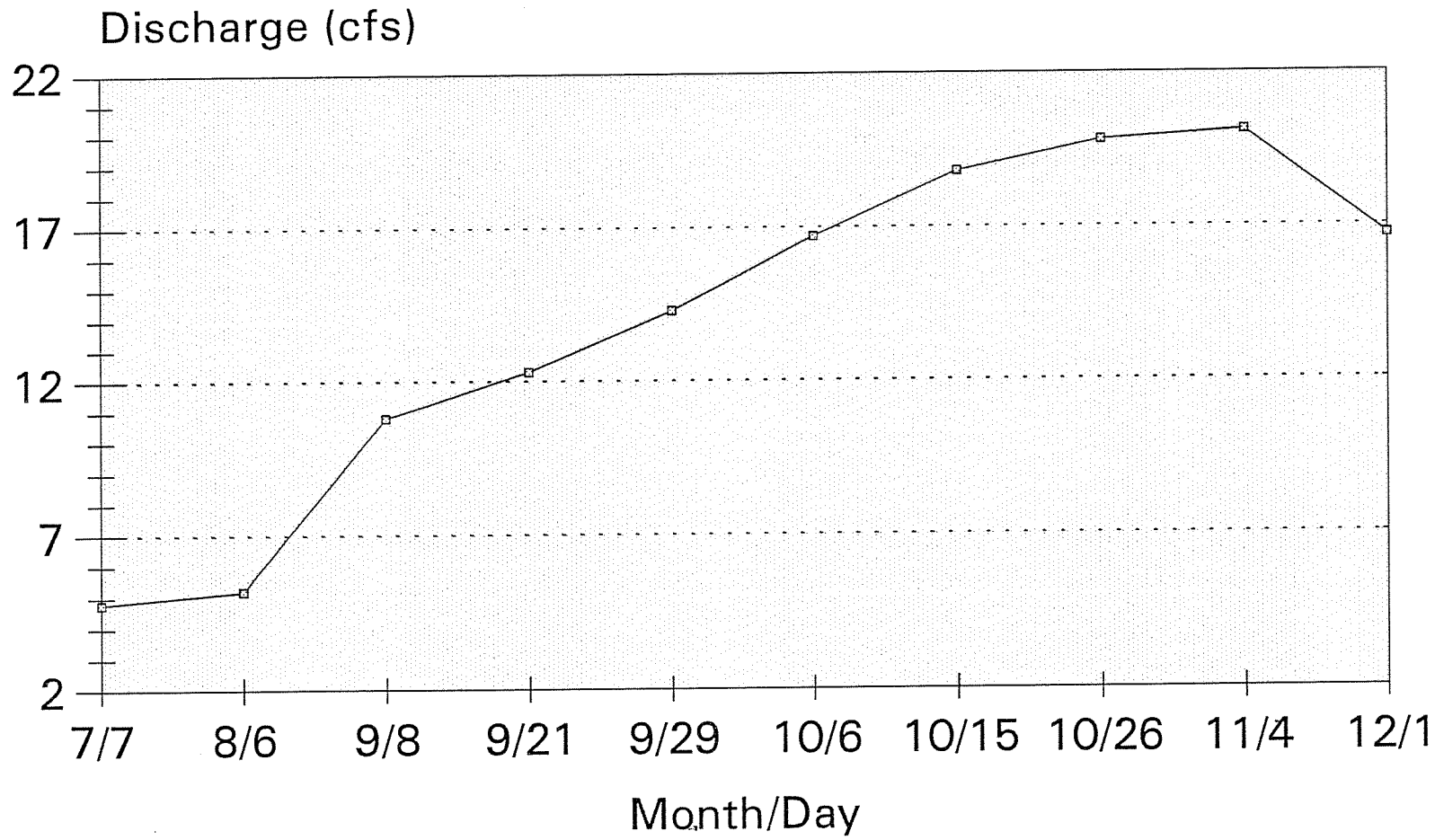


Curran Tunnel Discharge

Measured Discharge on Miscellaneous Dates

7/07 - 12/01, 1993

ATTACHMENT E

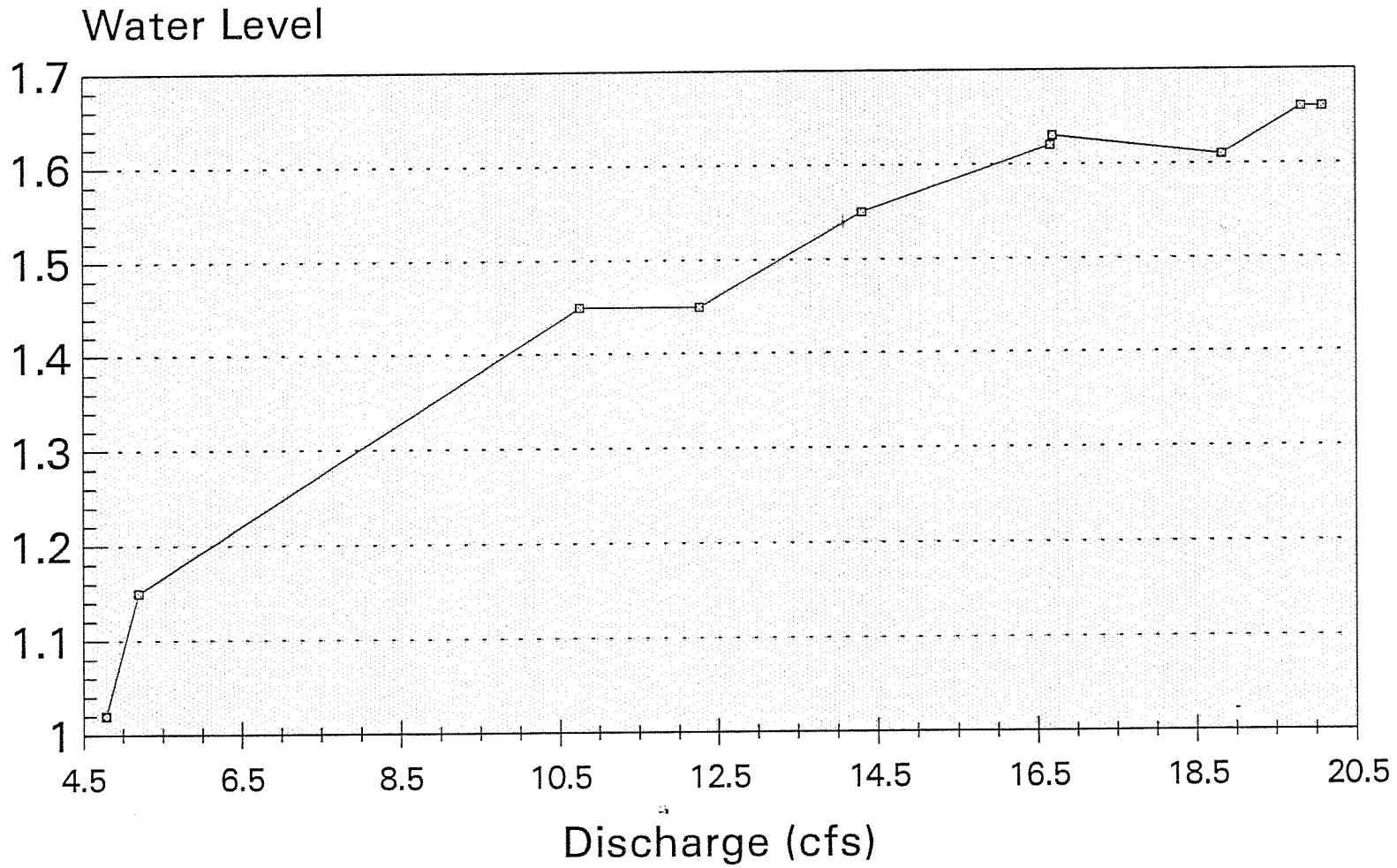


Discharge measured 20 ft. upstream from opening
Discharge does not include flow of Rangen pipeline

Curran Tunnel Stage-Discharge Relation

Miscellaneous Measurements

July 7 thru December 1, 1993



ATTACHMENT F

Stage = staff gage observations from current meter measurements

ATTACHMENT G

IDAHO DEPARTMENT OF WATER RESOURCES
GROUND WATER USE INFORMATION
(Example Form)

1. Month/Year: SEPTEMBER, 1993
2. Water User Name: Idaho Farm Corp.
3. Water Right Number(s): 36-02001
4. Diversion Name and/or Number: IDAHO FARM WELL No. 2 NR. HAGERMAN
5. Diversion Location: T.7S, R.14E, Sec. 32, SESESE
6. Flow Meter Reading at Begining of Month: 862 Acre-Feet
7. Method of Calculating or Estimating Flow Rate: Two 1/4-mile wheel lines, 1 HAND LINE, TOTAL OF 84 NOZZLES @ ≈ 5gpm EACH.
8. Comments: PUMP TURNED OFF FOR SEASON ON 9/15/1993

9. Daily Pump Use:

Day	Hours Pumped	Time Pumped From	Time Pumped To	Flow Rate	Day	Hours Pumped	Time Pumped From	Time Pumped To	Flow Rate
1	OFF				16				
2	"				17				
3	11	1:00 pm	–	420 gpm	18				
4	24	–	–	" "	19				
5	24	–	–	" "	20				
6	10		10 AM	" "	21				
7	OFF				22				
8	"				23				
9	"				24				
10	4	8:00 pm	–	420 gpm	25				
11	18	–	–	" "	26				
12	12	–	NOON	" "	27				
13	OFF				28				
14	10	7:00 AM	5:00 pm	320 gpm	29				
15	11	7:00 AM	6:00 p.m.	" " → 64 nozzles	30				
					31				