

3. Why is dissolved gaseous chlorine commonly used for disinfection of drinking water rather than methods such as ozonation or UV-treatment as commonly used for disinfection of wastewater? (5 points)

4. Knowing that you have taken this class, your boss assigns you to develop a water quality model for a client water utility. You ask for any previous work done to determine an applicable chlorine decay coefficient. Your boss replies, "Oh, just look up a value from your course notes." What is your response? (5 points)

5. A colleague is designing a high-service pump station for a water utility, and you are assigned to check his work. The pumps will be physically located near a ground-level storage tank such that the pump elevation will always be below the suction-side water level. You note that your colleague has not completed NPSH calculations, and he replies that such calculations are never needed when the pump is below the starting water elevation. Is this statement correct? Why or why not? (5 points)

CVEN 458 – Hydraulic Engineering of WDS
Spring Semester 2013
Dr. Kelly Brumbelow, Texas A&M University

Exam #2 – Part B

Open-book, Open-notes (2 questions); Time allowed: 55 minutes

All work for Part B must be written on separate pages with your name written on each page.

1. A large pump station and water transmission pipeline will have the following characteristics:

Pipeline: 118,000 ft long, 48 in diameter, concrete ($\epsilon = 0.005$ ft), no significant minor losses

Pump station: 3 pumps in parallel (2 pumps are Goulds model 3420, size 16x18-30, impellor diam. 26 inches, 1190 rpm; 1 pump is Goulds model 3420, size 18x20-24, impellor diam. 24 inches, 1190 rpm); Technical data attached at end of exam

Starting reservoir elevation = 735.2 ft

Ending reservoir elevation = 769.9 ft

When all 3 pumps are operating, what will be (a) the flowrate in the pipeline (gpm), and (b) the total shaft power consumption (kW) of the pump station?

A sheet of graph paper is attached for your convenience.

(45 points)

1 cfs = 448.83 gpm

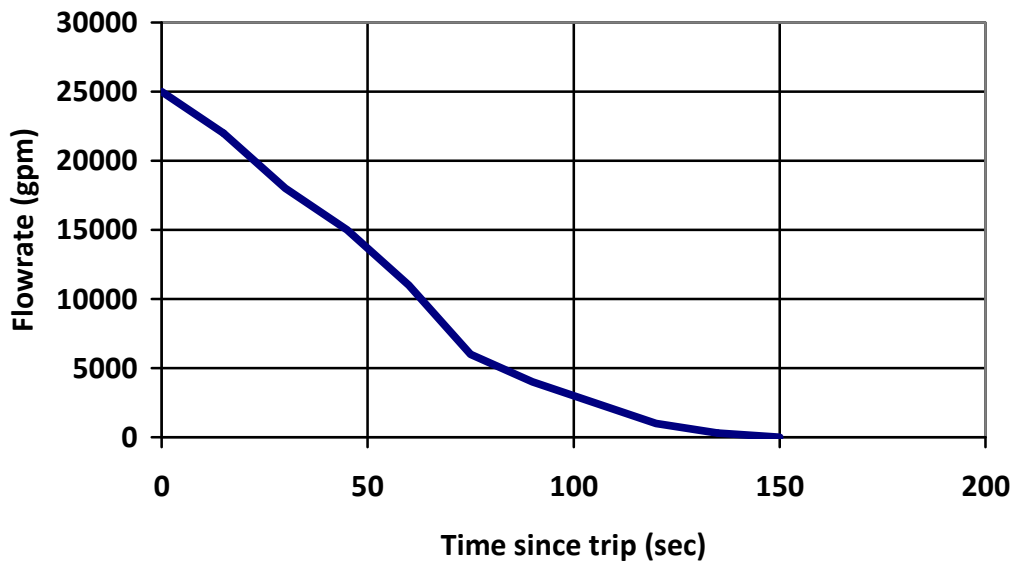
1 kW = 737.56 ft-lb/sec

2. A “pump trip” occurs when a pump’s power is suddenly lost and it slows impellor rotation to zero over “short” (but not instantaneous) period of time. Such an event generates a hydraulic transient, and analysis of the transient scenario is standard in pipeline engineering.

For the pipeline and expected time-behavior of a pump trip event described below, *determine the magnitude of the expected transient (ft of water head) generated in the first characteristic time of the pipeline.*

Pipeline: 65,000 ft long, steel ($E = 29 \times 10^6$ lb/ft²), actual inner diameter 35.74 inches, wall thickness 0.18 inches

Pump trip time behavior (pump is located at beginning of the pipeline):

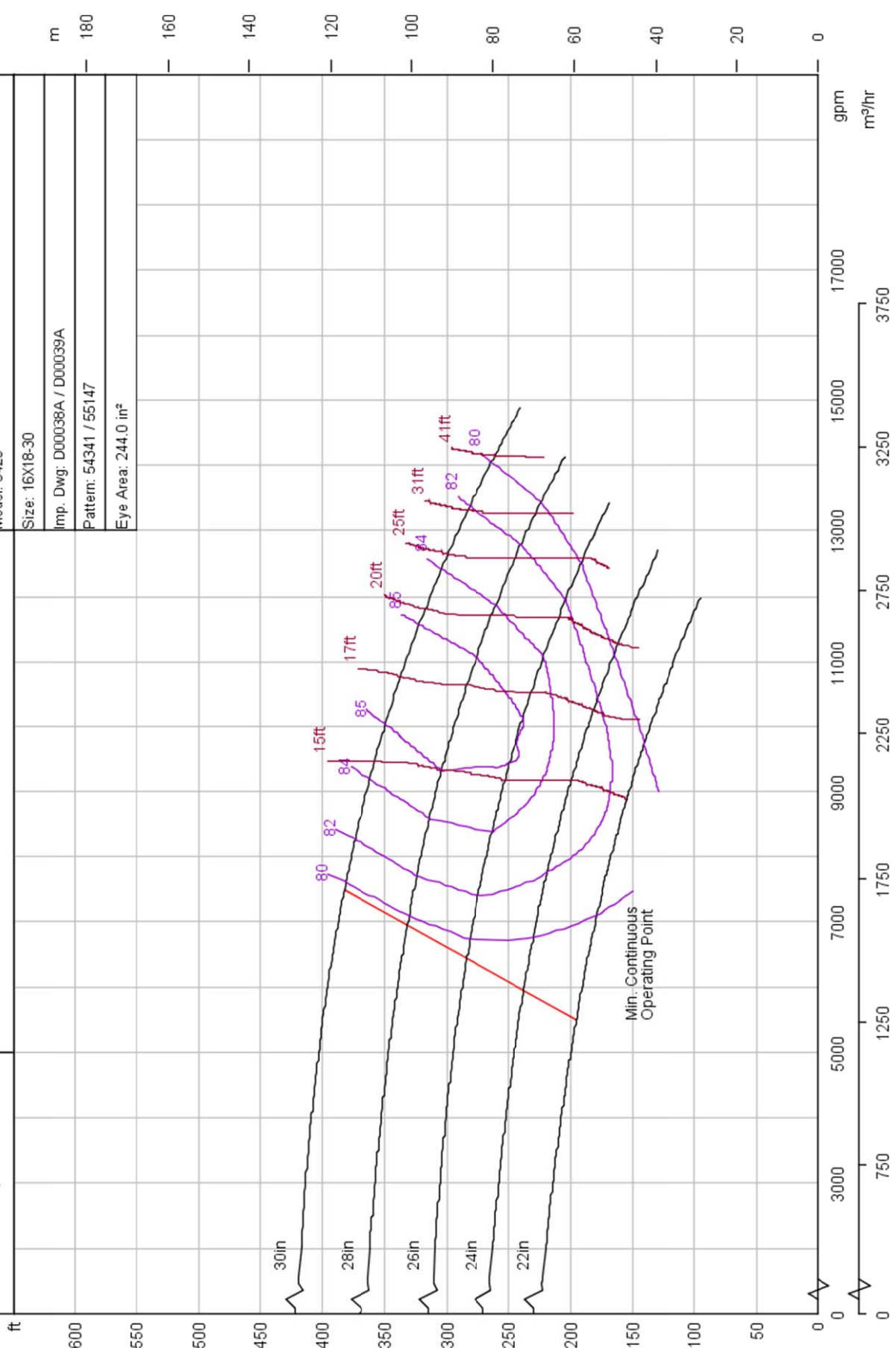


(30 points)

GOULDS PUMPS
ITT Corporation

CENTRIFUGAL PUMP CHARACTERISTICS

CDS No.: 2539 - 1
Speed: 1190 rpm
Model: 3420
Size: 16X18-30
Imp. Dwg: D00038A / D00039A
Pattern: 54341 / 55147
Eye Area: 244.0 in ²



GOULDS PUMPS

ITT Corporation

CENTRIFUGAL PUMP CHARACTERISTICS

CDS No.: 3145 - 2

Speed: 1190 rpm

Model: 3420

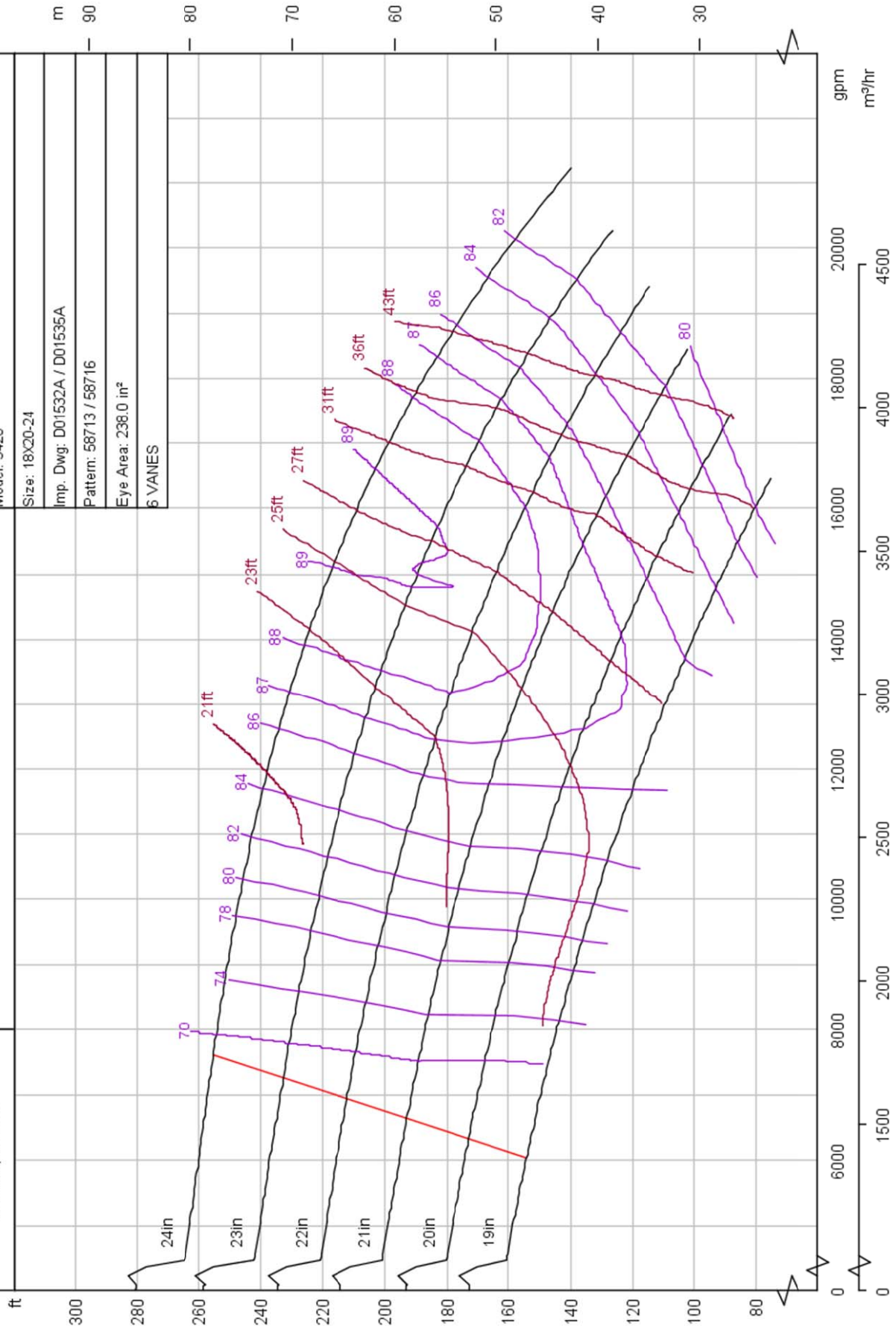
Size: 18X20-24

Imp. Dwg: D01532A / D01535A

Pattern: 58713 / 58716

Eye Area: 238.0 in²

6 VANES



m

90

80

70

60

50

40

30

gpm

m³/hr

20000

18000

16000

14000

12000

10000

8000

6000

0

4500

4000

3500

3000

2500

2000

1500

0

