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Planning Department
Hernando County, Florida

UTILITY SYSTEM ANALYSIS REPORT

FOR

Pulte Sterling

Project No. 21094

October 2021

Prepared by

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Construction Management

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1. General Information

The Pulte Sterling Development will consist of 254+-/ acres to be developed as 840 residential lots. This Utility System Analysis report will make an initial assessment of the impacts to the County's water and sewer system and determine if any upgrades may be required. It is not intended for permitting any improvements to the existing systems or the proposed site. Additionally, any modifications recommended may be further modified during final design.

2. Water/Sewer Use Data

The project site is currently undeveloped and unpopulated. Upon completion, the project will consist of 840 single family residential lots.

Water and Sewer Flows are based on HCUD minimum design requirements.
Water = 390 gpd/ERU
Sewer = 200 gpd/ERU

Fire flow is assumed to be 1,000 gpm at a minimum pressure of 20 psi. See Exhibit 1 for estimated water and sewer flow calculations.

3. Potable Water Flow Analysis

Hydraulic Analysis
The County's WaterCAD model was used to determine the impacts to the existing water system. See Exhibit 2 for information related to the modeling of this scenario.

Three connections with the existing system are proposed. One to the 12" water main on Sterling Hills Blvd. The second to the 8" water main on Opportunity Ave. And the third to the 4" on Foothill St. Five representative nodes were then created to represent the total system. They were located at high points and at remote points in the system. Total demands and minimum fire flow requirements were set at these nodes. The existing elevation at each node, as determined from lidar, is used for the node elevation.

Results
The preliminary analysis shows that the existing water system should be capable of providing adequate flow to the site for domestic and fire demands. Although it should be noted that further analysis using the site layout and proposed elevations, once determined, along with fire hydrant testing to calibrate the model for this area will be required as part of the final design.

4. Sanitary Sewer Analysis

Hydraulic Analysis
The County's Sewer model developed as part of the County's wastewater masterplan update was used to analyze the proposed development's impact to the system. The model revision used is HCUD Model (West)April 2021.

The Concept plan calls for three pump stations. For this preliminary analysis the total flow for the development is equally split among the three proposed stations. A 4-inch

force main is extended from the first pump station. When the second station connects the force main is upsized to a 6-inch. Then when the third station connects an 8-inch force main is extended down Sterling Hills Blvd to the 8-inch force main that discharges from Pump Station AP-LS23. Which is a master pump station that receives flow from two pump stations located to the south along Sterling Hills Blvd.

Springside Grove (formally known as Village Van Gogh Phase 2) is a 230 lot single family subdivision currently in the permitting stage. This development is located north of Elgin Boulevard and for modeling purposed is assumed to be developed with the initial scenario. Refer to the Preliminary Analysis Report dated 5/21/2020 for information on this development.

In addition, Hernando County is currently in the design phase to provide upgrades to the force main and pump station known as "The Hut". The current Elgin Boulevard force main ultimately connects to a 12-inch force main on Barclay which currently discharges to a 15-inch gravity sewer. The connection of the 12-inch force main to the gravity sewer is causing surcharging of the lines and an extension along Barclay Avenue to bypass the gravity sewer is part the of Hut upgrade project. This extension will need to be in place before any development from the Pulte Sterling development can come online. The current County schedule for implementation will have the upgrades completed in 2023. An acceleration of the 12-inch force main extension by the developer will be required to connect prior to the HCUD project completion date.

The following assumptions were used for the proposed pump station:

- Ground elevation of the pump station is based an assumed low elevation of 50 NGVD for the pump station site
- Invert into pump station is assumed to be 10' below grade
- Assumed pump height of 4'

The pump station design worksheet was used to calculate the values needed for SewerCAD.See Exhibit 3 for parameters and assumptions used in the analysis. Please note that on-site gravity mains and manholes were not included in this analysis.

The model shows no significant impacts to the existing system. See Exhibit 4 for model results.

5. Conclusion

In conclusion, the preliminary water modeling shows that the existing water system should be adequate to provide service to the proposed development. The existing sewer system is also capable of providing service to the proposed development assuming the 12-inch force main extension along Barclay Avenue has been constructed and placed into service.

Estimated Wastewater and Water Demand Worksheet

Date: 10/19/2021

Project Name: _____ Project No. 21094

Flows estimates were made for the proposed development of 400 residential units.

Flow Demand Estimate:
Commercial
Wastewater 0.12 gpd/ft2
Water 0.18 gpd/ft2
Residential
Wastewater 200 gpd/ERU
Water 390 gpd/ERU

Name	Per Unit	total # of units	Wastewater Flow per unit (gpd)	Average Wastewater flow (gpd)	Water Flow per unit (gpd)	Average Water flow (gpd)
Single Family Residen	ERU	840	200	168000	390	327600

Estimated Wastewater Demand (Max Buildout)

Wastewater Total Average Daily Flow = **168,000** **gpd avg**
0.168 mgd avg
116.67 gpm avg

Peaking Factor = 3

Wastewater Total MaxAverage Daily Flow = **504,000** **gpd peak**
0.504 mgd peak
350.00 gpm peak

Estimated Water Demand (Max Buildout)

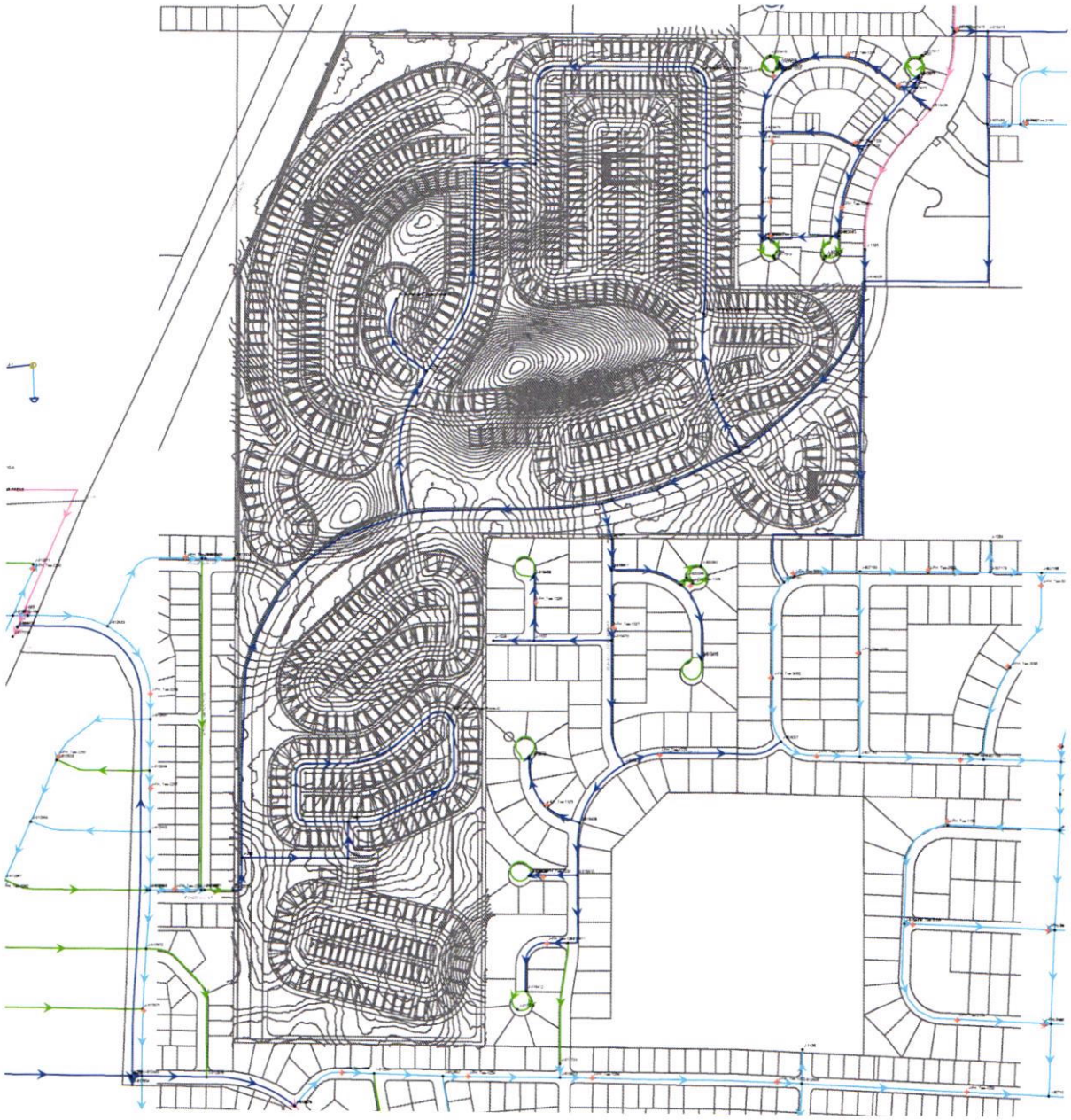
Water Total Average Daily Flow = **327,600** **gpd avg**
0.3276 mgd avg
227.50 gpm avg

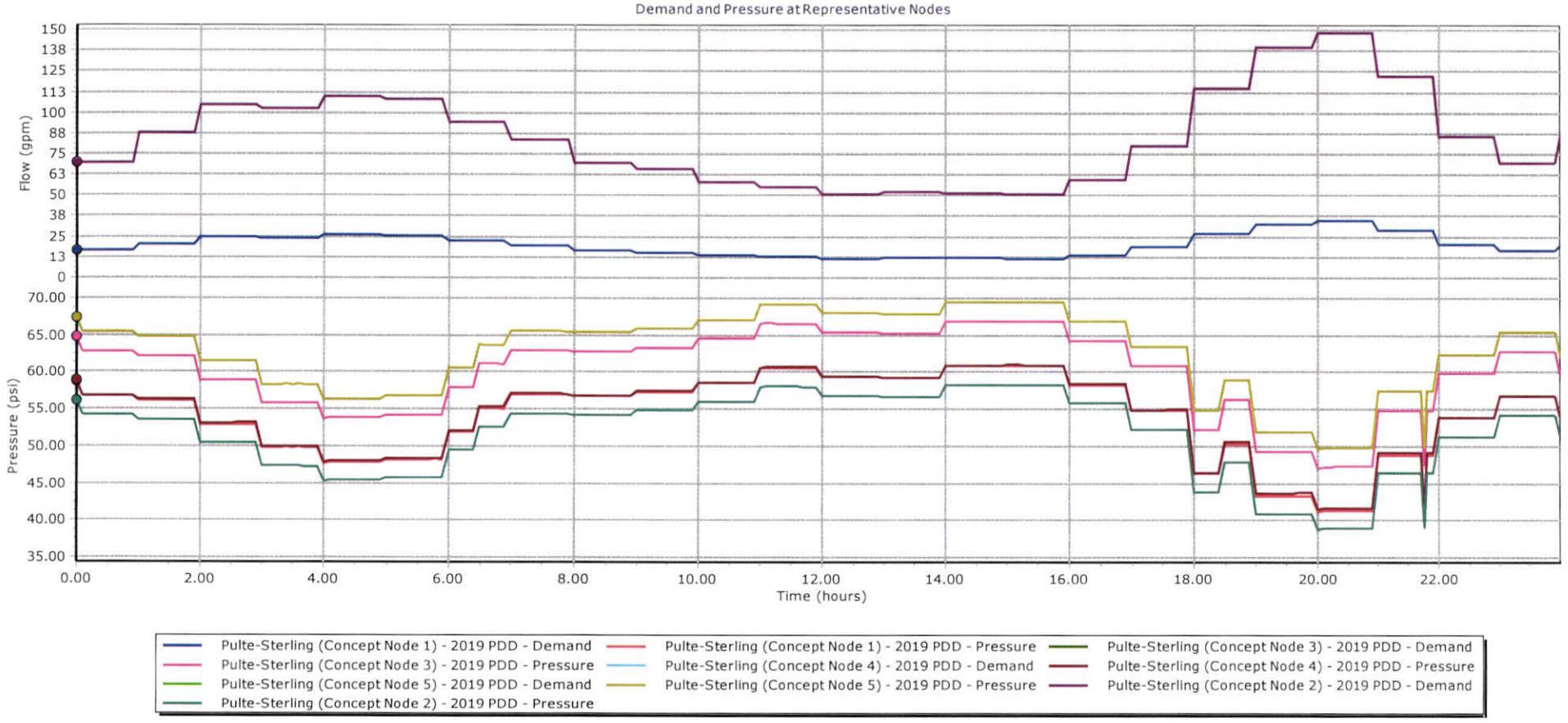
Residential Peaking Factor = 2

Water Total Max Average Daily Flow = **655,200** **gpd avg**
0.6552 mgd peak
455.00 gpm peak

2021-10-11_Concept-UTIL-Plan.dwg

Scenario: 2019 PDD




Demand and Pressure at Representative Nodes
Flow (gpm)
150
138
125
113
100
88
75
63
50
38
25
13
0
Pressure (psi)
70.00
65.00
60.00
55.00
50.00
45.00
40.00
35.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
Time (hours)
Pulte-Sterling (Concept Node 1) - 2019 PDD - Demand
Pulte-Sterling (Concept Node 1) - 2019 PDD - Pressure
Pulte-Sterling (Concept Node 3) - 2019 PDD - Demand
Pulte-Sterling (Concept Node 3) - 2019 PDD - Pressure
Pulte-Sterling (Concept Node 4) - 2019 PDD - Demand
Pulte-Sterling (Concept Node 4) - 2019 PDD - Pressure
Pulte-Sterling (Concept Node 5) - 2019 PDD - Demand
Pulte-Sterling (Concept Node 5) - 2019 PDD - Pressure
Pulte-Sterling (Concept Node 2) - 2019 PDD - Demand
Pulte-Sterling (Concept Node 2) - 2019 PDD - Pressure

PROJECT:
Pulte Sterling

WETWELL SIZING & FORCEMAIN CALCULATIONS

A. DETERMINATION OF FLOW:

	56,000	GPD	Total flow is divided by 3 to get estimate for preliminary analysis
PROPOSED LIFT STATION FLOW =	0.056000	MGD	
	2,333	GPH	
	38.89	GPM	

NOTES: {{Describe/Justify where this flow comes from}}
Flow estimate based on 400 Residential units, see worksheet

B. PUMP OUT RATE:

PEAK HOUR FACTOR = 3

NOTES: {{Describe/Justify where this PF comes from}}
Hernando County uses a PF of 3

Calculate Peak Flow Rate 116.67 GPM

Input Desired PUMPOUT FLOW RATE (q) 120 GPM
0.3 CFS

Size Wetwell

Input Desired WETWELL DIAMETER =		6.00	FEET
WETWELL SURFACE AREA =		28.27	SQ. FT.
Input Desired Max time between pump starts at average flows (t)		30	min
determine design volume based on V=tq/4		292	gal
Input Desired WETWELL OPER. DEPTH =		3.00	FEET
WETWELL OPER VOLUME =		634	GALS
WETWELL FILL TIME (@ PEAK) =		5.4	MINUTES
WETWELL FILL TIME (@ AVE) =		16.3	MINUTES

C. DETERMINATION OF FORCEMAIN CROSS-SECTIONAL AREA:

Input minimum Design FORCEMAIN VELOCITY (MIN) =		2.00	FPS
Input Maximum Design FORCEMAIN VELOCITY (MIN) =		4.00	FPS
CALCULATED AREA (MIN) = Q/V	A =	0.134	SQ. FT.
F.M. INTERNAL DIAMETER (MAX)	ID =	4.95	INCHES
CALCULATED AREA (MAX) = Q/V	A =	0.067	SQ. FT.
F.M. INTERNAL DIAMETER (MIN)	ID =	3.50	INCHES

D. DETERMINATION OF FORCEMAIN VELOCITY:

Input Desired Nominal Pipe Diameter 4

ACTUAL FORCEMAIN OUT. DIA.	OD =	4.80	INCHES	PVC, CL 150 (SDR 18), 4" TO 12" PVC, CL 150 (SDR 25), 14" TO 24"
ACTUAL FORCEMAIN INT. DIA.	ID =	4.266	INCHES	
ACTUAL FORCEMAIN WALL THICKNESS	T =	0.267	INCHES	
FORCEMAIN VELOCITY	V =	2.69	FPS	

Pipe Diameter Acceptable!

2.0 - FORCEMAIN FRICTION LOSS

A. STATIC HEAD

HIGHEST FORCEMAIN DISCHARGE ELEV. (H2)	H2 =		FEET	VERIFY ELEVATION
WETWELL PUMP OFF FLOAT ELEV. (H1)	H2 =		FEET	ground elev-depth to invert-oper depth=

STATIC HEAD = 0.00 FEET

B. FORCEMAIN PIPE HEAD LOSS (HAZEN-WILLIAMS FORMULA)

FRICTION FACTOR (C) C = 120

LENGTH OF FORCEMAIN (L) L = 5,000 FEET

FORCEMAIN FRICTION LOSS (FP) = 0.2083(L/100)(100/C)^1.85(Q^1.85/D^4.87

FP = 45.34 FEET

C. FORCEMAIN FITTINGS MINOR HEAD LOSS (HAZEN-WILLIAMS FORMULA)

EQUIVALENT LENGTHS OF FITTINGS (See Equivalent Length Worksheet)

		Friction Loss
4" Fittings equivalent length	66.48	0.60
6" Fittings equivalent length	0	
8" Fittings equivalent length	0	
10" Fittings equivalent length	0	
12" Fittings equivalent length	0	

Forcemain friction loss due to fittings= 0.60

Added pressure equivalent for existing forcemain 35 feet (15 psi ASSUMED VALUE NEEDS TO BE VERIFIED)

D. FORCEMAIN TOTAL DESIGN HEAD LOSS (HAZEN-WILLIAMS FORMULA)

TOTAL DESIGN HEAD (TDH)M = SH+FP+FM TDH = 80.94 FEET

MIN. PUMP DISCHARGE PRESSURE (P) = TDH*0.4335 P = 35.09 PSI

PUMP CHARACTERISTICS: **120 GPM @ 80.94 TDH**

ACTUAL PUMP OUT TIME (@PEAK): 5 MINUTES

PUMP STARTS PER HOUR 5.6

Calculate Pump Control Levels

Top of Wetwell Elevation *{Elevation (Ground) (ft) for SewerCAD}* 50 ELEV

Top of wetwell thickness 8 inches

Inside top of Wetwell Elevation 49.3333333 ELEV

Input Influent Invert Elevation 40 ELEV.

Elevation (Maximum) (ft) (for SewerCAD Only) *39.6*

Alarm Signal On Elevation **39.5** ELEV.

Second Pump On Elevation **39** ELEV.

First Pump On Elevation **38.5** ELEV.

Elevation (Initial) (ft) (for SewerCAD Only) *38.4*

Pumps Off Elevation **35.50** ELEV.

Elevation (Minimum) (ft) (for SewerCAD Only) *35.40*

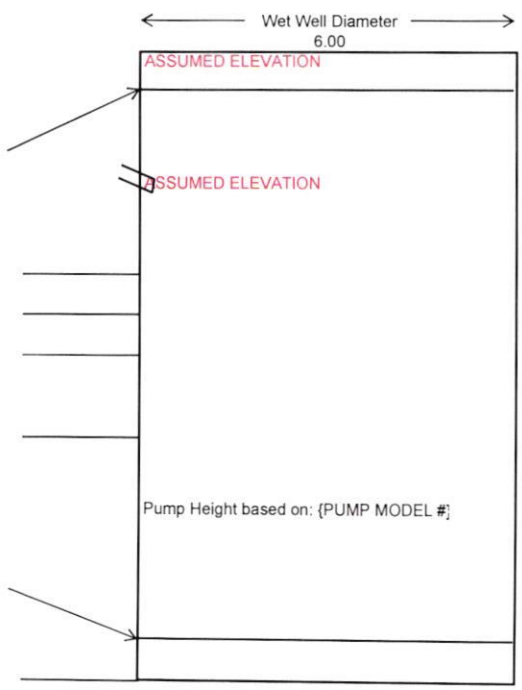
Pump Height (in feet) (Required for Design but not for SewerCAD) 4 ft

PUMP Elevation (Invert) (ft) (for SewerCAD Only) *32.25*

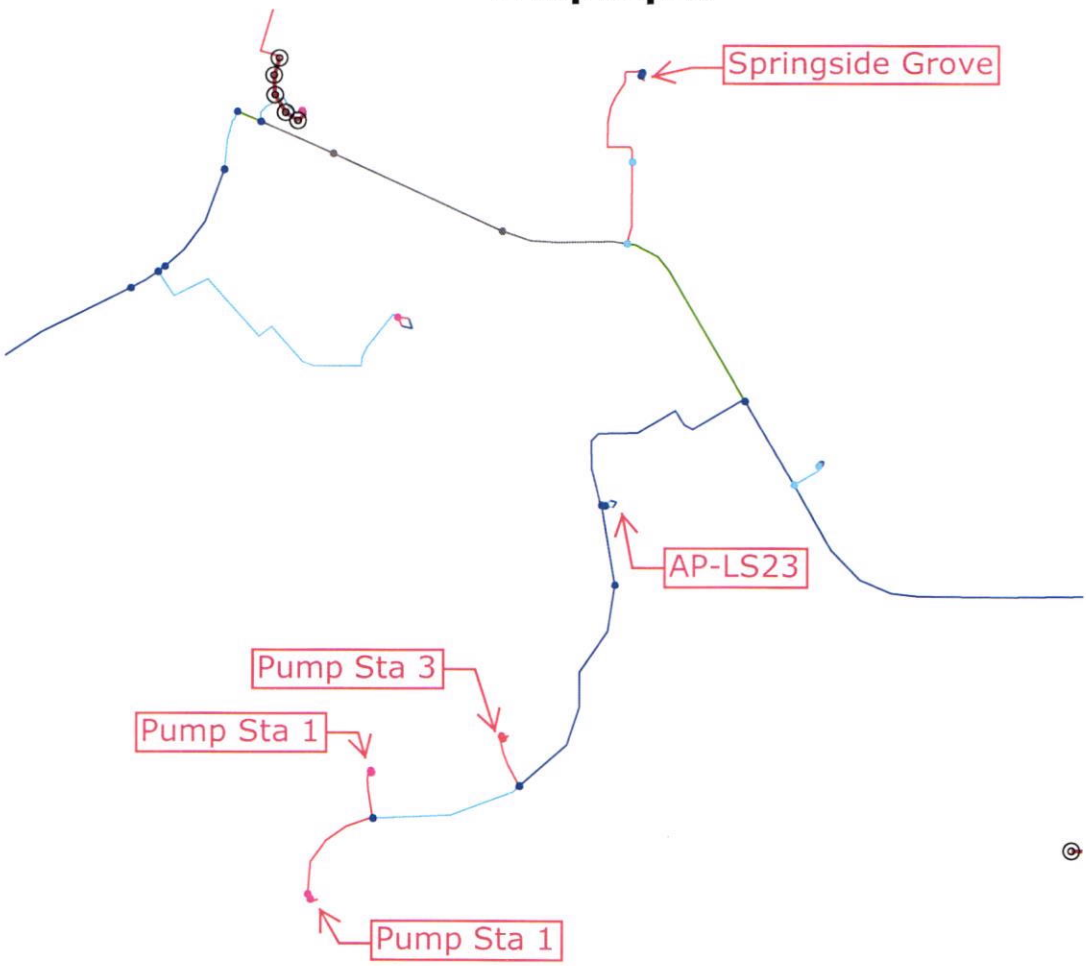
Top of Slab Elevation *{Elevation (Base) (ft) for SewerCAD}* **31.25** ELEV.

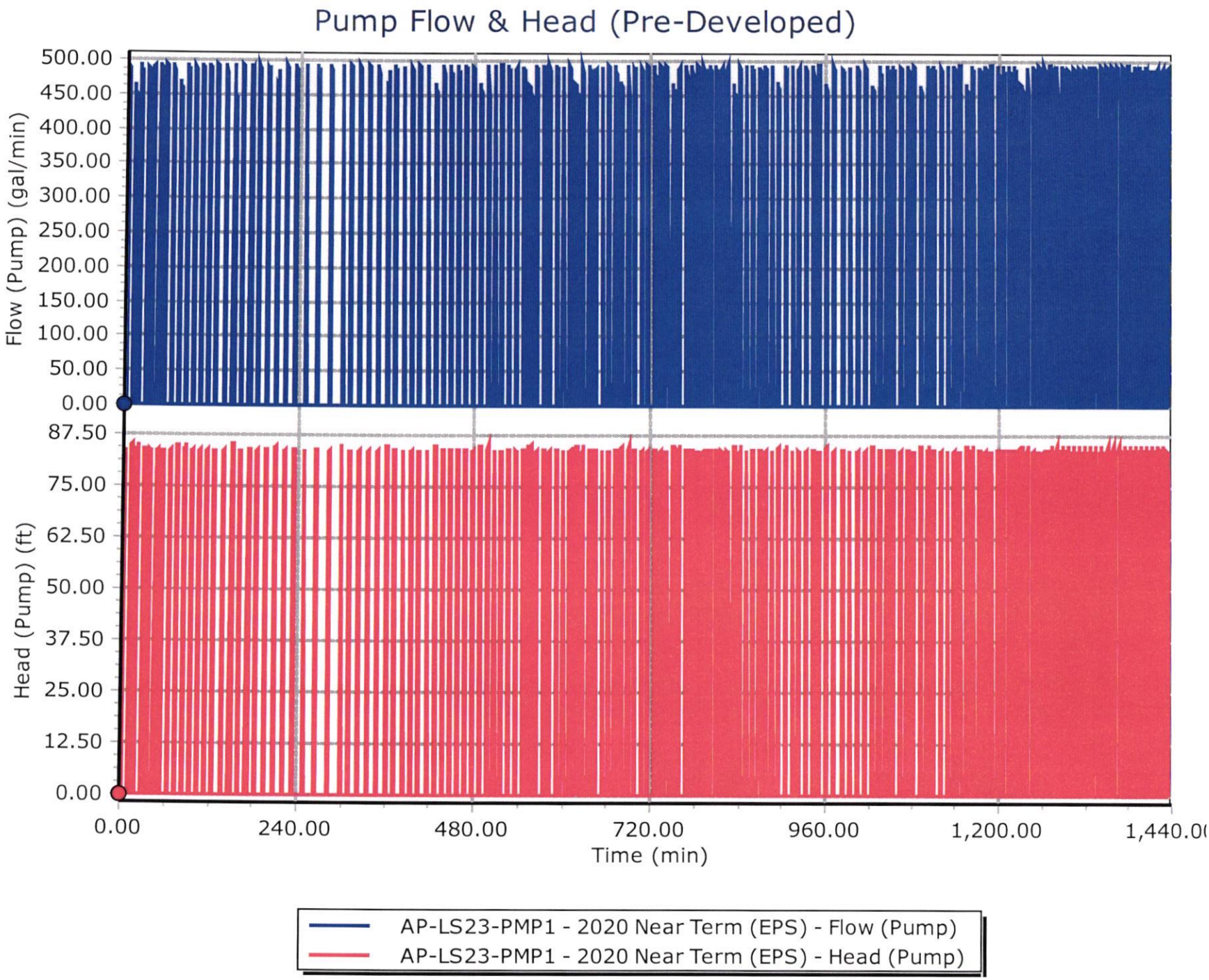
Slab Thickness (inches) 10 inches

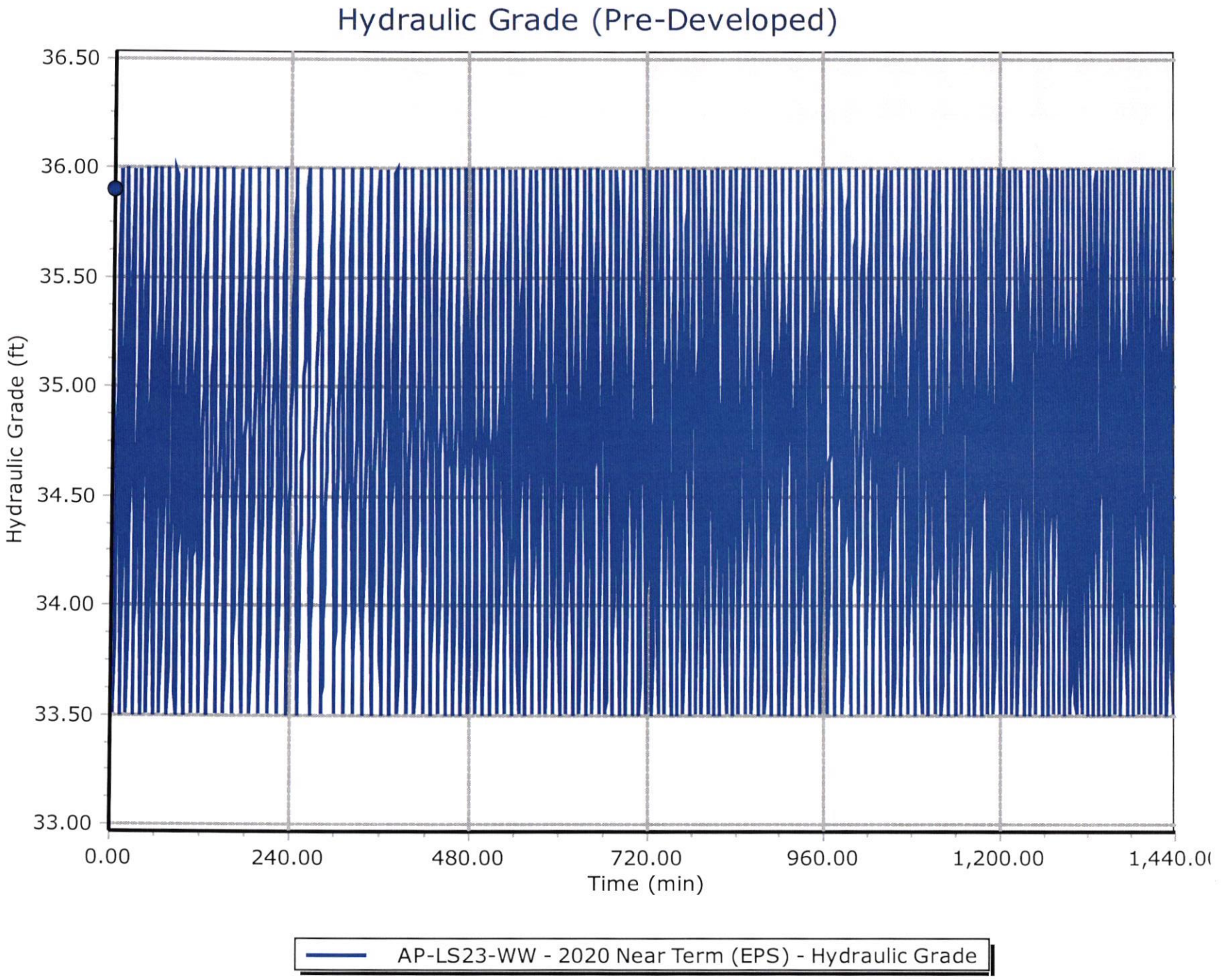
Bottom of Slab Elevation 30.42 ELEV

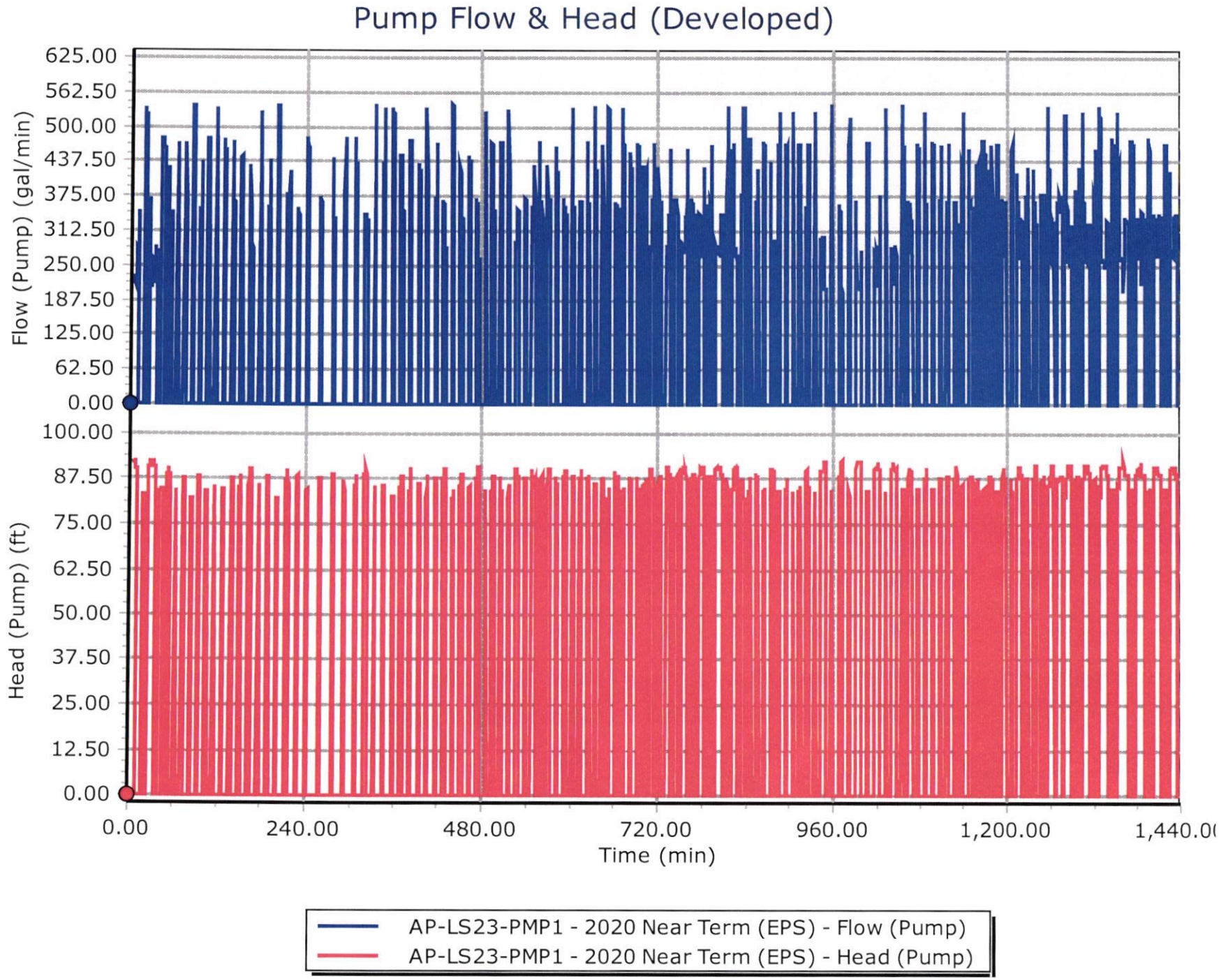


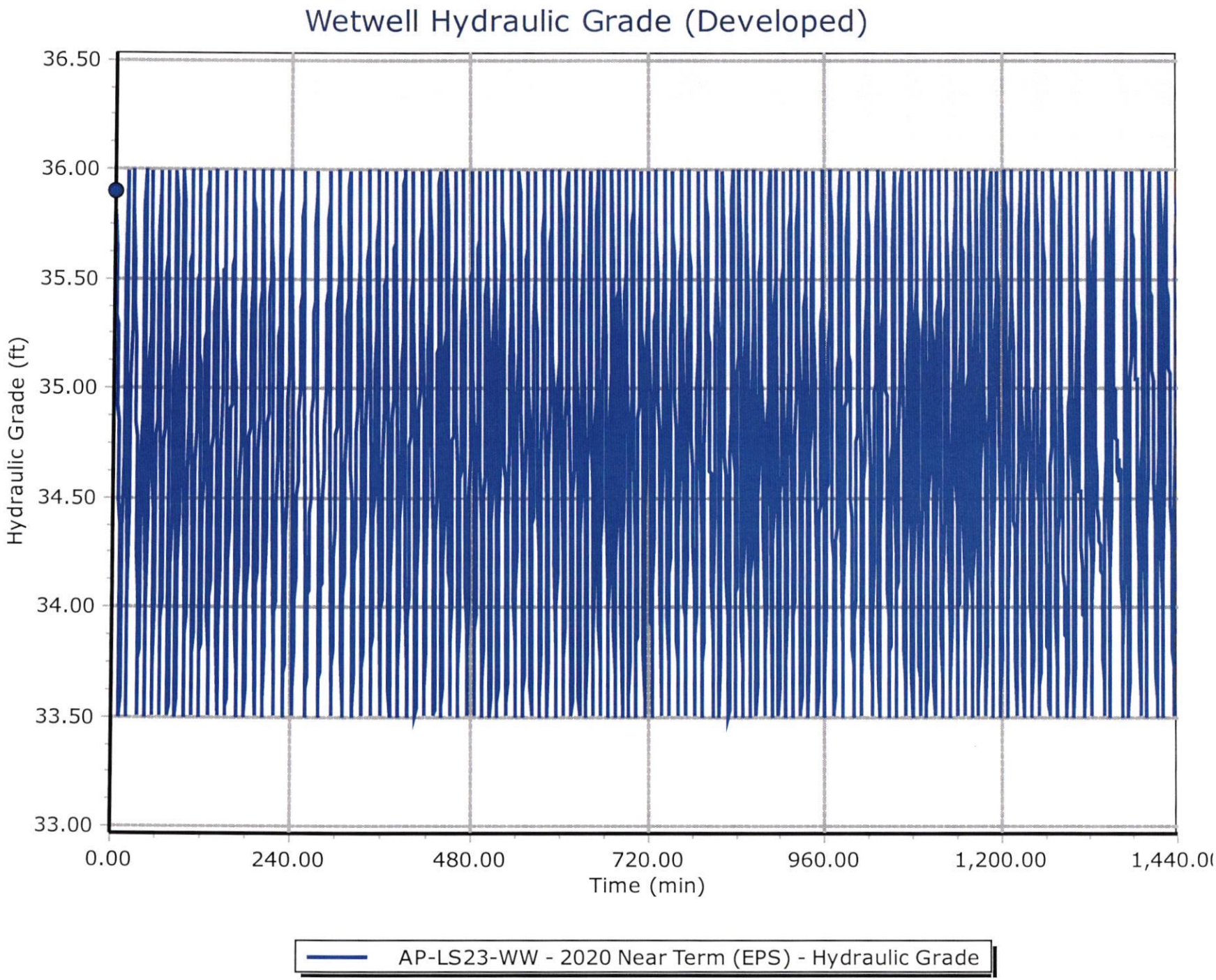
Title: Scenario: 2020 Near Term (EPS)
Pump Report

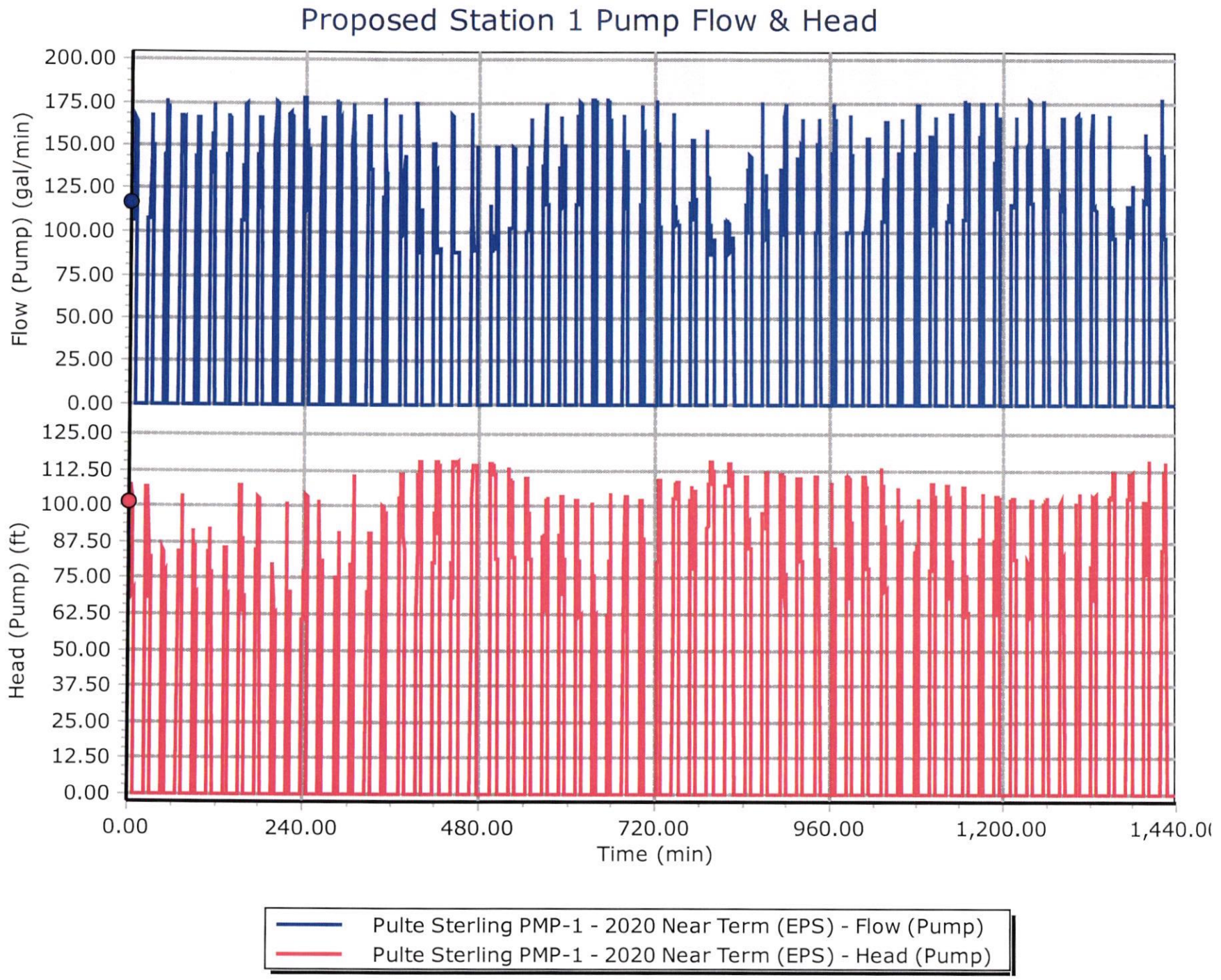


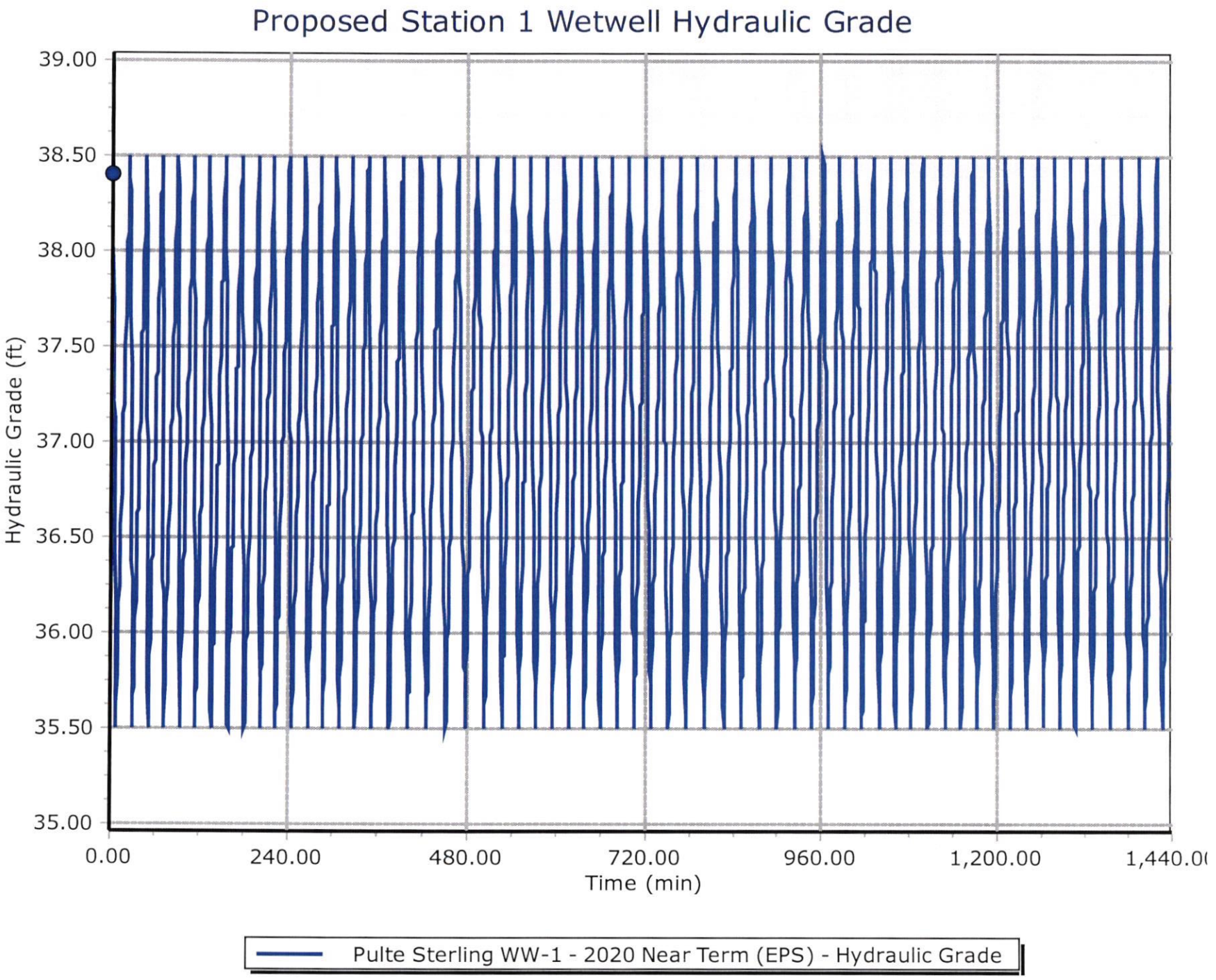

Pump Flow & Head (Pre-Developed)
Flow (Pump) (gal/min)
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Head (Pump) (ft)
87.50
75.00
62.50
50.00
37.50
25.00
12.50
0.00
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.0(
Time (min)
AP-LS23-PMP1 - 2020 Near Term (EPS) - Flow (Pump)
AP-LS23-PMP1 - 2020 Near Term (EPS) - Head (Pump)

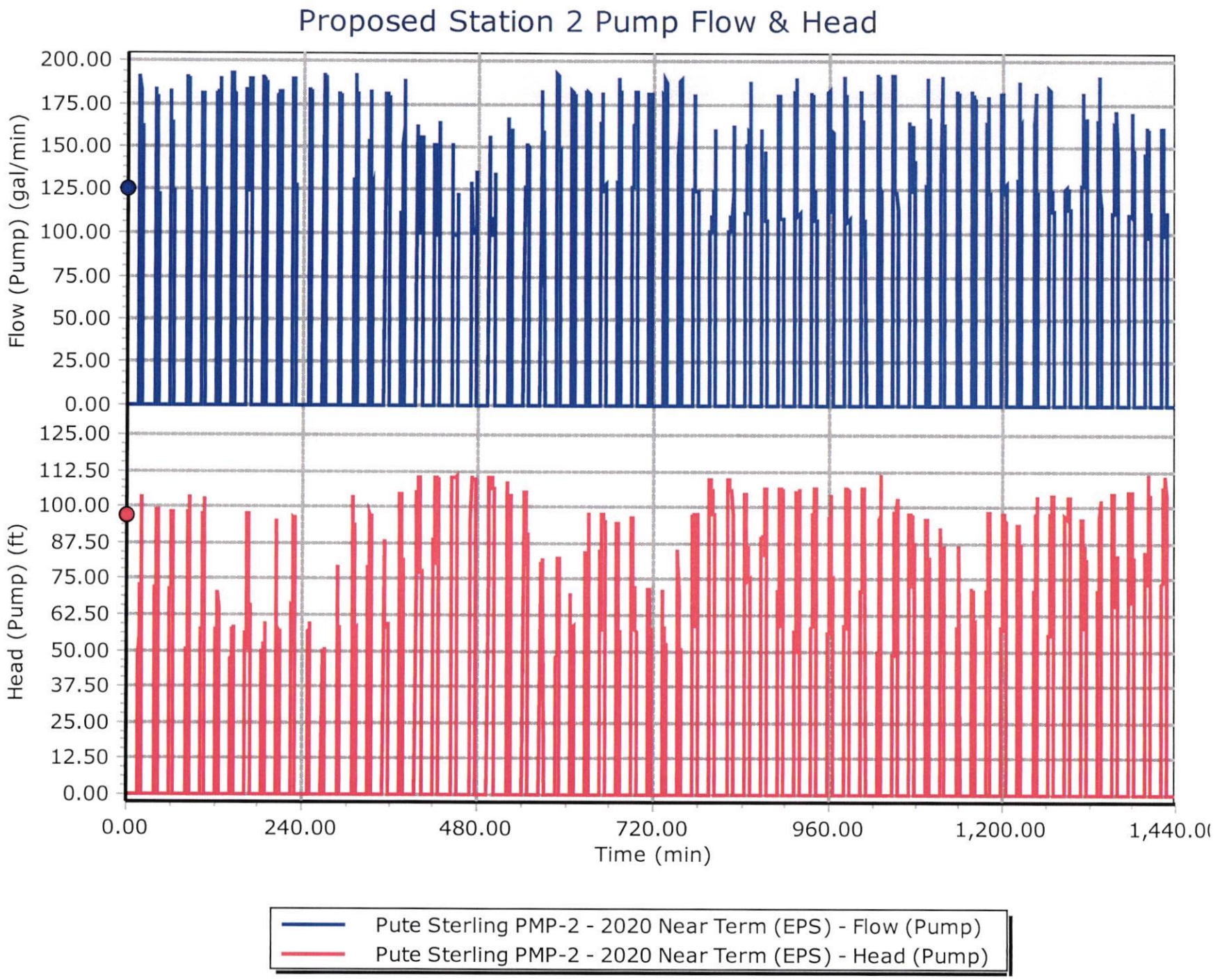

Hydraulic Grade (Pre-Developed)
36.50
36.00
35.50
35.00
34.50
34.00
33.50
33.00
Hydraulic Grade (ft)
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.00
Time (min)
AP-LS23-WW - 2020 Near Term (EPS) - Hydraulic Grade

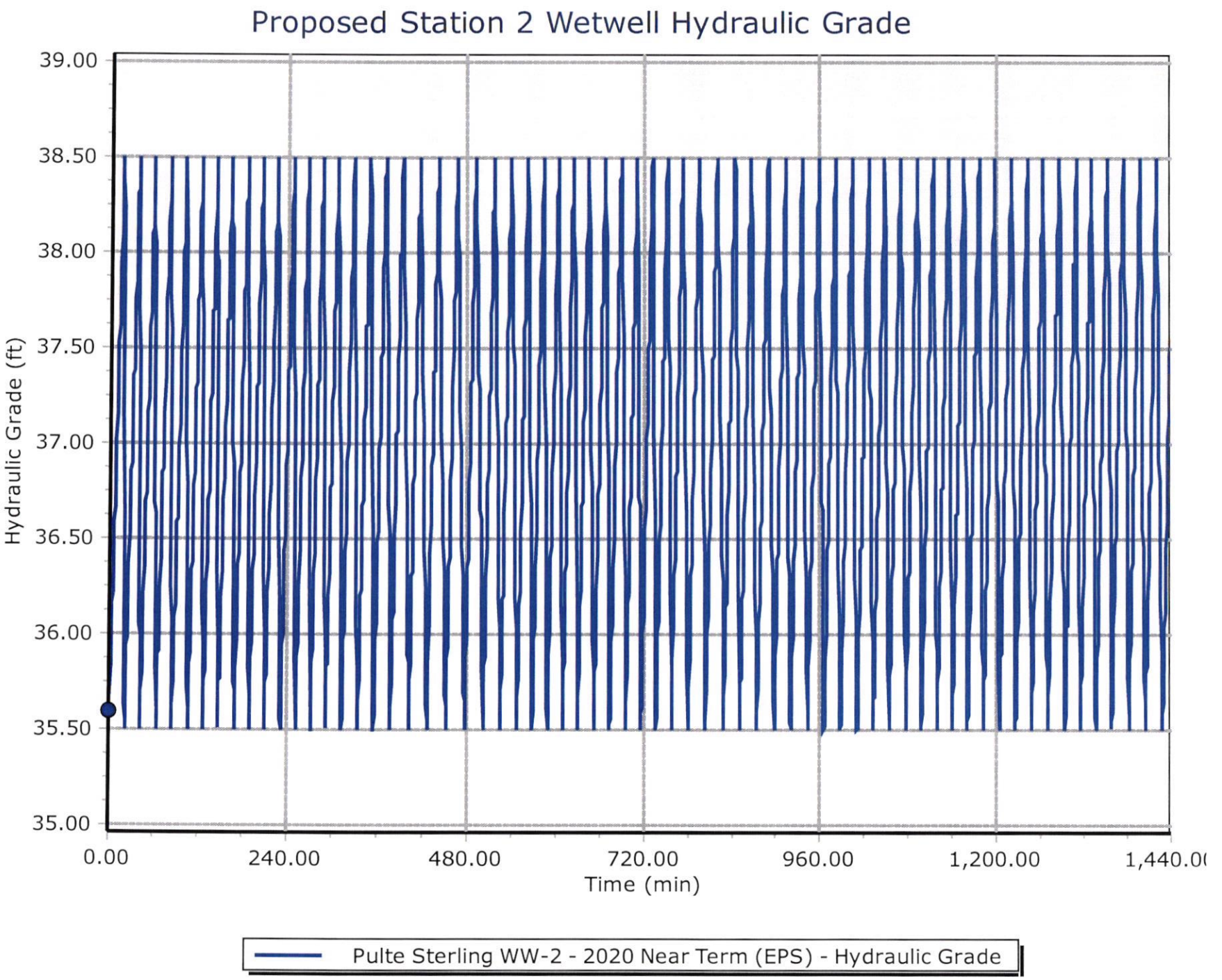

Pump Flow & Head (Developed)
Flow (Pump) (gal/min)
625.00
562.50
500.00
437.50
375.00
312.50
250.00
187.50
125.00
62.50
0.00
Head (Pump) (ft)
100.00
87.50
75.00
62.50
50.00
37.50
25.00
12.50
0.00
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.0(
Time (min)
AP-LS23-PMP1 - 2020 Near Term (EPS) - Flow (Pump)
AP-LS23-PMP1 - 2020 Near Term (EPS) - Head (Pump)

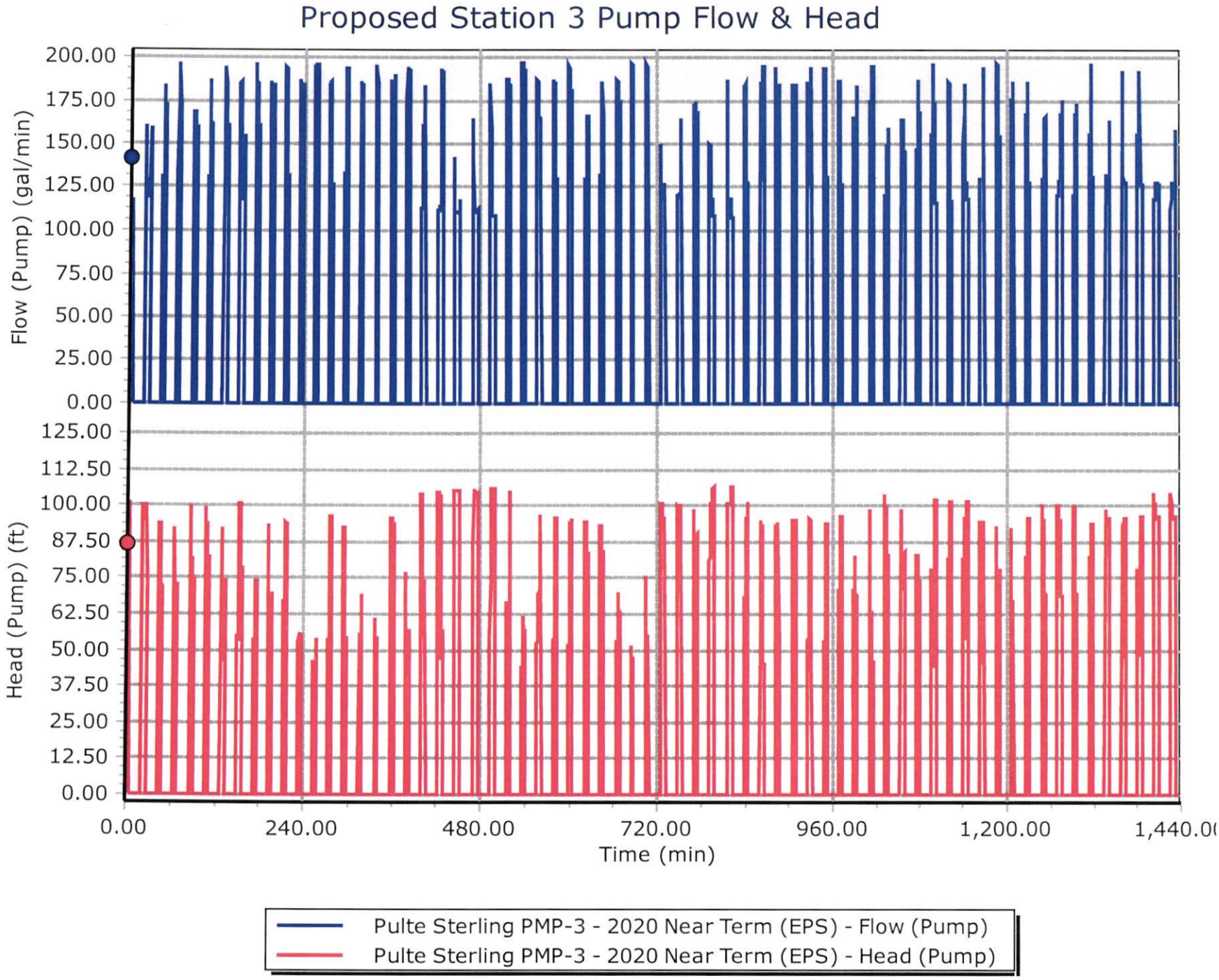

Wetwell Hydraulic Grade (Developed)
36.50
36.00
35.50
35.00
34.50
34.00
33.50
33.00
Hydraulic Grade (ft)
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.0(
Time (min)
AP-LS23-WW - 2020 Near Term (EPS) - Hydraulic Grade

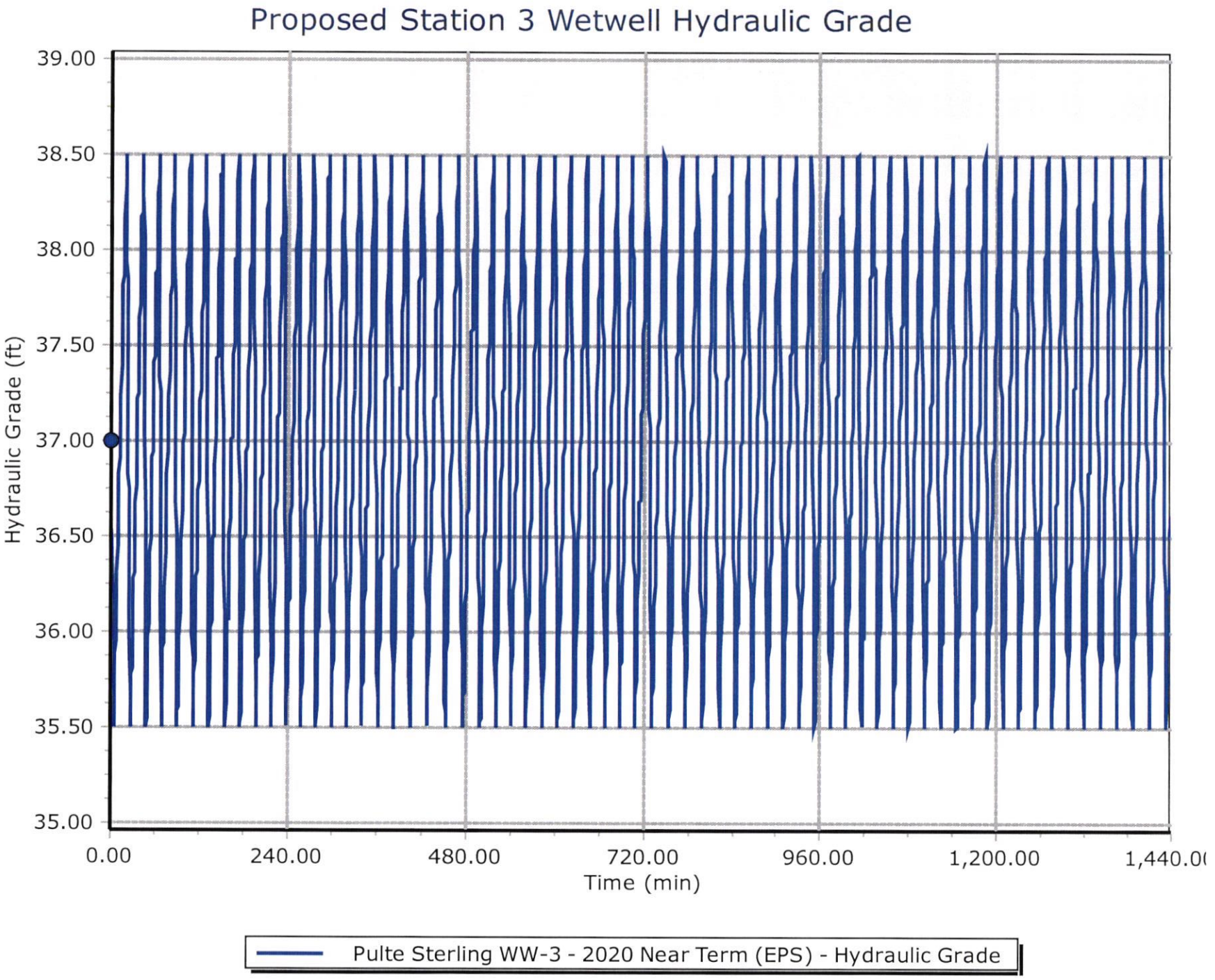

Proposed Station 1 Pump Flow & Head
Flow (Pump) (gal/min)
200.00
175.00
150.00
125.00
100.00
75.00
50.00
25.00
0.00
Head (Pump) (ft)
125.00
112.50
100.00
87.50
75.00
62.50
50.00
37.50
25.00
12.50
0.00
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.0(
Time (min)
Pulte Sterling PMP-1 - 2020 Near Term (EPS) - Flow (Pump)
Pulte Sterling PMP-1 - 2020 Near Term (EPS) - Head (Pump)

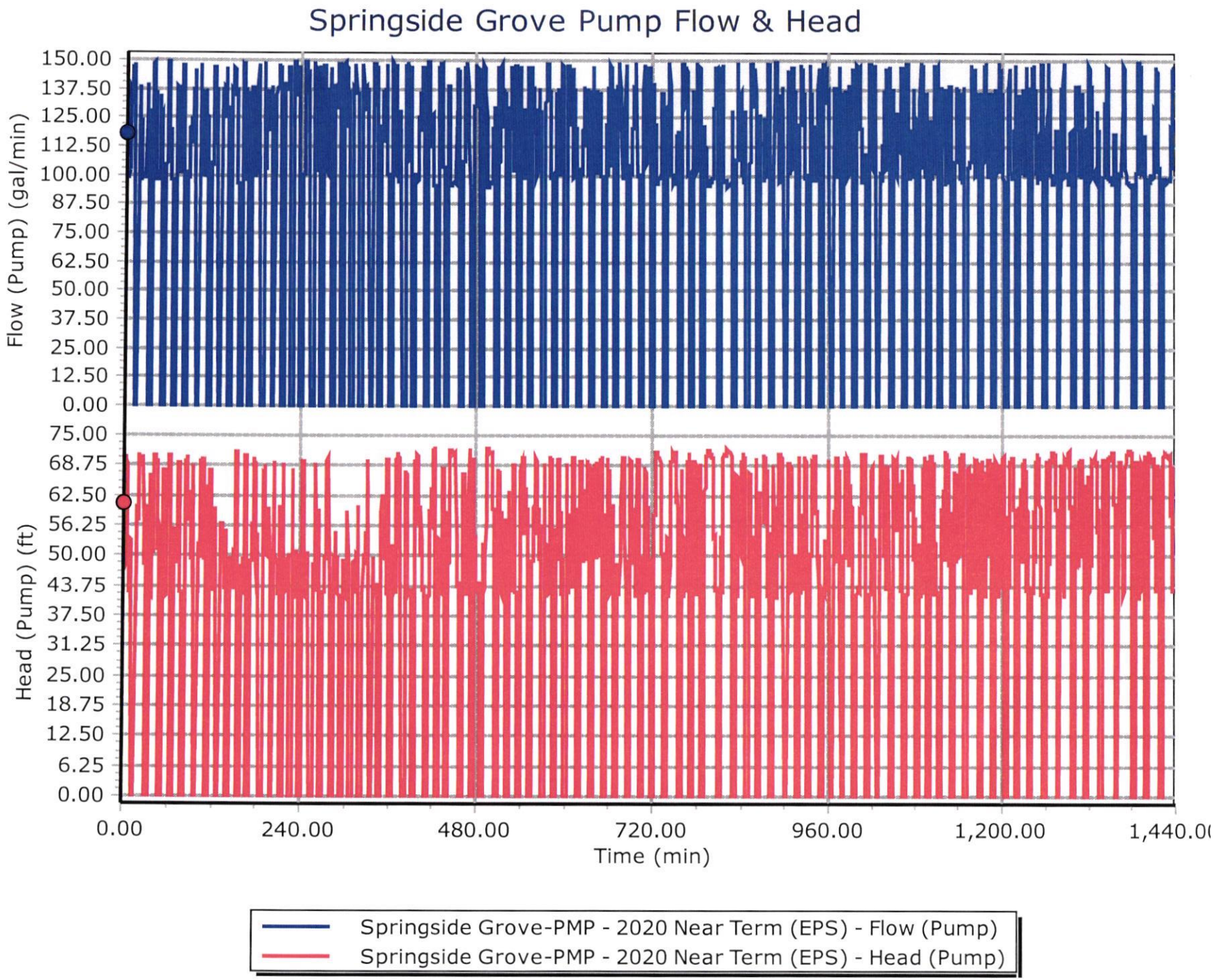

Proposed Station 1 Wetwell Hydraulic Grade
39.00
38.50
38.00
37.50
37.00
36.50
36.00
35.50
35.00
Hydraulic Grade (ft)
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.00
Time (min)
Pulte Sterling WW-1 - 2020 Near Term (EPS) - Hydraulic Grade

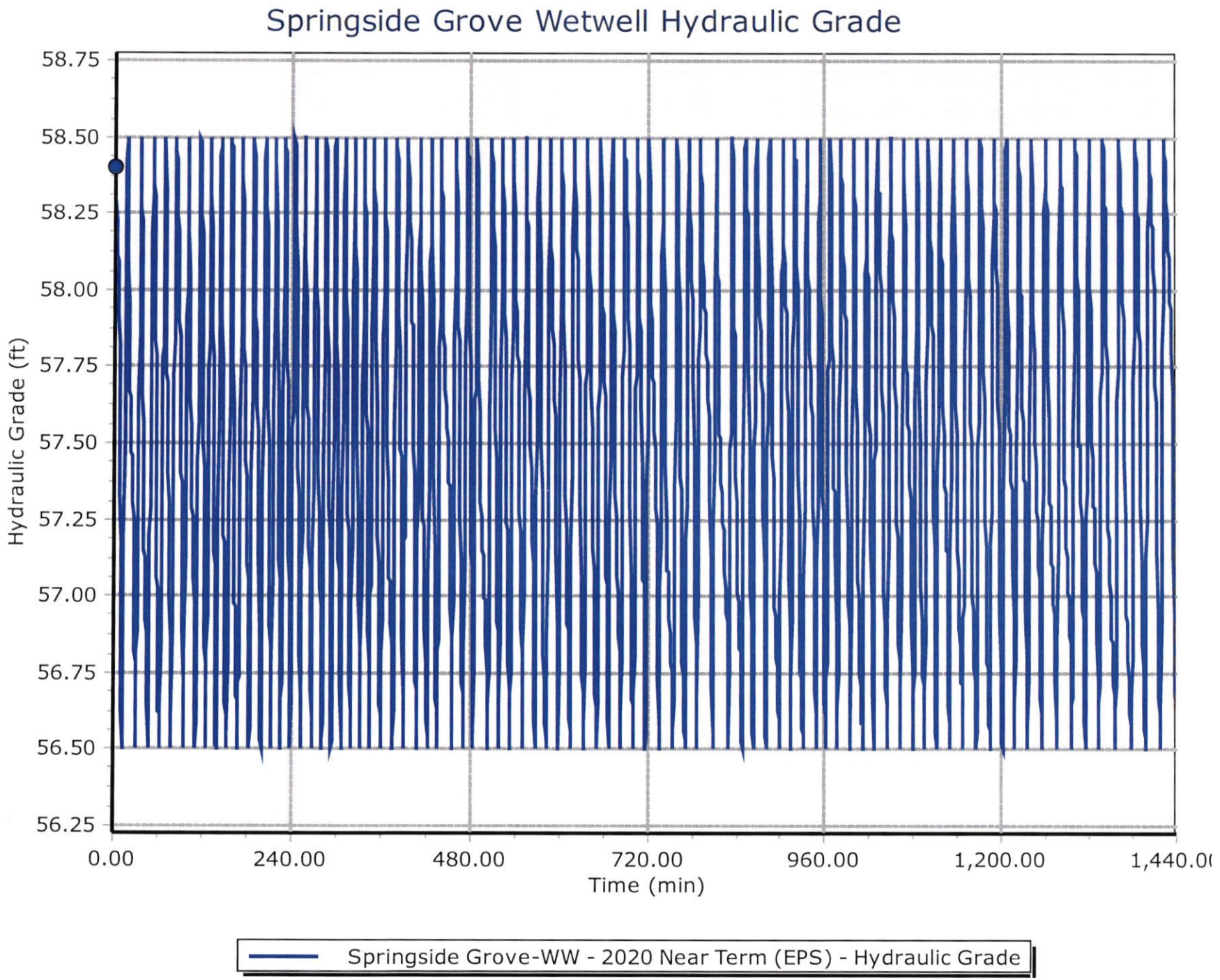

Proposed Station 2 Pump Flow & Head
Flow (Pump) (gal/min)
200.00
175.00
150.00
125.00
100.00
75.00
50.00
25.00
0.00
Head (Pump) (ft)
125.00
112.50
100.00
87.50
75.00
62.50
50.00
37.50
25.00
12.50
0.00
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.0(
Time (min)
Pute Sterling PMP-2 - 2020 Near Term (EPS) - Flow (Pump)
Pute Sterling PMP-2 - 2020 Near Term (EPS) - Head (Pump)


Proposed Station 2 Wetwell Hydraulic Grade
39.00
38.50
38.00
37.50
37.00
36.50
36.00
35.50
35.00
Hydraulic Grade (ft)
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.00
Time (min)
Pulte Sterling WW-2 - 2020 Near Term (EPS) - Hydraulic Grade


Proposed Station 3 Pump Flow & Head
Flow (Pump) (gal/min)
200.00
175.00
150.00
125.00
100.00
75.00
50.00
25.00
0.00
Head (Pump) (ft)
125.00
112.50
100.00
87.50
75.00
62.50
50.00
37.50
25.00
12.50
0.00
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.0(
Time (min)
Pulte Sterling PMP-3 - 2020 Near Term (EPS) - Flow (Pump)
Pulte Sterling PMP-3 - 2020 Near Term (EPS) - Head (Pump)


Proposed Station 3 Wetwell Hydraulic Grade
39.00
38.50
38.00
37.50
37.00
36.50
36.00
35.50
35.00
Hydraulic Grade (ft)
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.0(
Time (min)
Pulte Sterling WW-3 - 2020 Near Term (EPS) - Hydraulic Grade


Springside Grove Pump Flow & Head
Flow (Pump) (gal/min)
150.00
137.50
125.00
112.50
100.00
87.50
75.00
62.50
50.00
37.50
25.00
12.50
0.00
Head (Pump) (ft)
75.00
68.75
62.50
56.25
50.00
43.75
37.50
31.25
25.00
18.75
12.50
6.25
0.00
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.0(
Time (min)
Springside Grove-PMP - 2020 Near Term (EPS) - Flow (Pump)
Springside Grove-PMP - 2020 Near Term (EPS) - Head (Pump)


Springside Grove Wetwell Hydraulic Grade
58.75
58.50
58.25
58.00
57.75
57.50
57.25
57.00
56.75
56.50
56.25
Hydraulic Grade (ft)
0.00
240.00
480.00
720.00
960.00
1,200.00
1,440.00
Time (min)
Springside Grove-WW - 2020 Near Term (EPS) - Hydraulic Grade