Appendix E

Pump Testing and Packer Testing Results

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Technical Memorandum

To	Brianne Hastings	Page 1
CC	Shannon Gleason	
Subject	Summary of Well Development, Packer Testing, and Hydraulic Monitoring Results for wells 114-MW61D, 114-MW66D, 114-M72D, 114-MW73D, and 114-MW76D Bedrock Groundwater Remedial Investigation Garfield Avenue Group Sites, City of Jersey City, Hudson County, New Jersey	
From	Frederik Schuele, Elizabeth Perry	
Date	January 17, 2025	

Introduction

This Technical Memorandum presents the results of well development, packer testing, and hydraulic monitoring conducted at wells 114-MW61D, 114-MW66D, 114-M72D, 114-MW73D, and 114-MW76D as part of the bedrock groundwater Remedial Investigation (RI) at the Garfield Avenue (GA) Group Sites in Jersey City, New Jersey (the Site).

Background

Bedrock groundwater investigation activities have been conducted at the Site since 2006 to support completion of the RI as prescribed in the New Jersey Department of Environmental Protection (NJDEP) Technical Requirements for Site Remediation (NJDEP, 2018) and associated NJDEP technical guidance. Four bedrock wells (114-MW4D, 114-MW6D, 114-MW7D, and 114-MW16B) were installed during RI activities conducted in 2006 and 2007 and four bedrock wells (114-MW52D, 114-MW57D, 114-MW61D, and 114-MW66D) were installed during RI activities conducted in 2020 and 2021. More recently (later in 2021 and in 2022), two additional bedrock wells were installed (114-MW71D and 114-MW72D) and existing bedrock wells 114-MW4D, 114-MW-61D, and 114-MW66D were deepened. Additional activities conducted included well development, borehole geophysical logging, groundwater elevation gauging, groundwater sampling, hydraulic testing, and installation of multi-port water FLUTe systems at open borehole bedrock wells 114-MW4D, 114-MW52D, 114-MW57D, 114-MW66D, and 114-MW72D. A summary of well details is provided in **Table 1** and well locations are shown on **Figure 1**.

Results, findings, and conclusions pertaining to the bedrock groundwater investigation are presented in the *Addendum to Groundwater Remedial Investigation Report and Groundwater Remedial Action Work Plan for Bedrock Water-Bearing Zone* (AECOM, 2023). Comments provided by the NJDEP on this document indicated that to complete the remedial investigation for the bedrock water-bearing zone, the direction of groundwater flow in the Lockatong Formation must be determined from potentiometric heads collected at three wells completed in the Lockatong Formation and shown to be hydraulically connected. In addition, the Department indicated that a new bedrock well must be installed south of existing well 114-MW72D to complete the delineation of the chromium plume in the bedrock water-bearing zone.

The comments provided by NJDEP were further discussed during a technical meeting held on October 19, 2023. During the meeting, it was agreed that hydraulic monitoring to determine the direction of groundwater flow in the Lockatong Formation would focus on the area around well 114-MW66D. Two additional bedrock wells would be installed near 114-MW66D, one to the south along bedding strike and one to the west down bedding dip. A combination of packer testing and hydraulic monitoring would be used to evaluate for hydraulic connection between the wells. If a hydraulic connection between the three wells were to be established, then the direction of groundwater flow in the Lockatong formation could be determined from potentiometric heads collected at these wells. An additional technical meeting to discuss delineation of the chromium plume within the bedrock water-bearing zone was held on April 4, 2024. During this meeting, it was agreed that a new well would be installed south of existing well 114-MW72D and that pump testing would be conducted at the new well to evaluate hydraulic connection with 114-MW72D.

This technical memorandum describes the field work and data collection activities that were completed pursuant to the scopes of work agreed upon during the October 19, 2023 and April 4, 2024 technical meetings. In addition, the collected data are presented and discussed, and findings and conclusions based on the data are presented.

Field Activities

Field activities related to the packer testing and hydraulic monitoring programs are presented below.

Bedrock Well Installation

Two open borehole bedrock wells (114-MW73D, 114-MW74D) were completed in the Lockatong Formation from December 26, 2023 to January 10, 2024. An additional well, 114-MW76D, was competed in the same formation on June 18, 2024 in an effort to delineate chromium in groundwater south of well 114-MW72D. Well details are presented in **Table 1** and well locations are shown on **Figure 1**. Drilling and well installation activities were performed in accordance with N.J.A.C. 7:9D by a New Jersey (NJ)-licensed driller. At each bedrock well location, continuous soil logging from the ground surface to the top of bedrock was completed using sonic drilling. Upon reaching the top of bedrock, cores of the rock were collected using sonic drilling. Boring logs with well construction details are presented in Appendix B of the *Addendum to Groundwater Remedial Investigation Report and Groundwater Remedial Action Work Plan for Bedrock Water-Bearing Zone* (AECOM, 2025).

Well Development and Hydraulic Monitoring at 114-MW66D and 114-MW72D

Upon completion of installation, wells 114-MW73D, 114-MW74D, and 114-MW76D were developed in accordance with the FSP-QAPP (AECOM, 2010). Well development activities at wells 114-MW73D, 114-MW74D were conducted on January 11 and 12, 2024, and at well 114-MW76D on June 19, 2024.

Groundwater elevation data collected from the FLUTe ports at 114-MW66D during well development at 114-MW73D and 114-MW74D were used to evaluate for potential hydraulic connection between 114-MW66D and 114-MW73D, and between 114-MW66D and 114-MW74D, respectively. Groundwater elevation data collected from the FLUTe ports at 114-MW72D during well development at 114-MW76D were used to evaluate for potential hydraulic connection between 114-MW76D and 114-MW72D. Continuous water level response data were collected from each FLUTe port at 114-MW66D and 114-MW72D using Air Coupled Transducers (ACTs). The ACTs were installed at 114-MW66D and 114-MW72D by FLUTe and were programmed to collect readings at 1-

minute intervals. Upon completion of field activities, the ACTs were removed from the wells and shipped to FLUTE for data downloading and processing. The final datasets provided to AECOM by FLUTe were used to develop graphs of the water level response for each sample port at 114-MW66D and 114-MW72D during the well development periods.

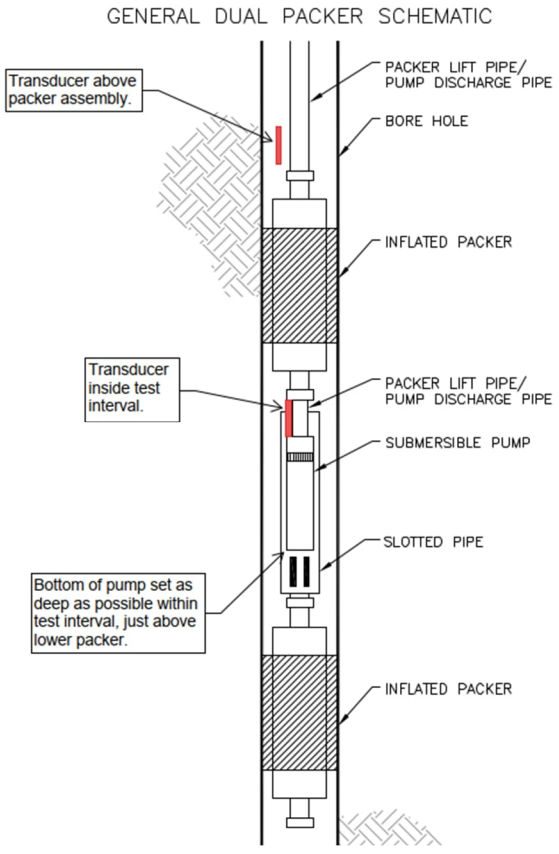
Packer Testing and Hydraulic Monitoring

Packer testing was performed from January 16 to 24, 2024 at wells 114-MW73D and 114-MW74D to:

- evaluate potential hydraulic connection between 114-MW73D and wells 114-MW61D, 114-MW66D, and 114-MW74D, and
- evaluate potential hydraulic connection between 114-MW74D and wells 114-MW61D, 114-MW66D, and 114-MW73D.

A dual packer assembly was used to isolate 5-foot intervals within the open boreholes at 114-MW73D and 114-MW74D for testing, as illustrated in the schematic below. The packer assembly allowed for deployment of a pump within the test interval. The first test interval at each well started at the top of the open borehole, just below the bottom of the steel casing. The following intervals were tested at each well (in feet below ground surface):

- 114-MW73D: 88-93, 93-98, 98-103, 103-108, 108-113, and 113-118
- 114-MW74D: 97-102, 102-107, 107-112, 112-117, 117-122, 122-127, and 127-132



For each test, the packers were inflated to isolate the test interval and the pump was activated to remove water from the test interval and induce drawdown within the isolated portion of the borehole. Observations noted during testing included pumping rates, packer pressure, depth to water readings, color of the purge water, and volume of water pumped from the well. Tests were terminated when drawdown in the isolated portion of the borehole stabilized or approached stabilization. Water generated from the packer testing program was containerized at the point of generation and disposed of at the groundwater treatment plant on Site 114. Field forms completed during each test are included in **Attachment 1**.

During packer testing, vented Level Troll 700 pressure transducers, provided by In-Situ, Inc. of Fort Collins, CO, were used to collect continuous water level data at wells 114-MW61D, 114-MW73D, and 114-MW74D. A transducer was deployed at 114-MW61D on January 15, 2024 and programmed to collect readings at 30-second intervals. The transducer was removed from 114-MW61D on January 16, 2024. During packer testing at 114-MW73D, a transducer was deployed at 114-MW74D and programmed to collect readings at 30-second intervals. During packer testing at 114-MW74D, a transducer was deployed at 114-MW73D and programmed to collect readings at 30-second intervals. The ACTs installed in the FLUTe ports at 114-MW66D were used to monitor response at 114-MW66D to packer testing at 114-MW73D and 114-MW74D.

During packer testing at 114-MW73D and at 114-MW74D, a transducer was deployed within the packer assembly to monitor changes in water level in the test interval and a transducer was deployed above the packer assembly to monitor changes in water level above the test interval (see schematic above). Continuous water level readings within and above the packer assembly were collected at 15-second intervals.

Groundwater Elevation Gauging

A synoptic round of depth to groundwater readings was collected at wells 114-MW66D, 114-MW73D, and 114-MW74D on February 15, 2024. The depth to groundwater readings were used to calculate potentiometric heads for each well.

Results

Results of the well development, packer testing, hydraulic monitoring, and groundwater elevation gauging programs are presented below.

Well Development and Hydraulic Monitoring at 114-MW66D and 114-MW72D

A graph depicting continuous water level data collected at 114-MW66D during development at wells 114-MW73D and 114-MW74D is included in **Attachment 2**. A graph depicting continuous water level data collected at 114-MW72D during development at well 114-MW76D is included in **Attachment 5**. These graphs were used to evaluate whether, or not, a hydraulic connection exists between the wells. Results of the data evaluation are presented in **Tables 2 and 3**.

Packer Testing

Graphs depicting continuous water level data collected at wells 114-MW61D, 114-MW66D, 114-MW74D, and for each test interval during packer testing at 114-MW73D are included in **Attachment 3**. Graphs depicting continuous water level data collected at wells 114-MW61D, 114-MW66D, 114-MW73D, and for each test interval during packer testing at 114-MW74D are included in **Attachment 4**. These graphs were used to evaluate whether, or not, a hydraulic connection

exists between the wells. Results of the data evaluation for the packer testing at 114-MW73D and 114-MW74D are presented on **Table 4** and **Table 5**, respectively. Pumping rates and volumes pumped during the packer testing at 114-MW73D and 114-MW74D are presented on **Table 6** and **Table 7**, respectively.

Groundwater Elevation Gauging

Depth to groundwater readings and calculated potentiometric heads for wells 114-MW73D and 114-MW74D, and the FLUTe ports at well 114-MW66D are presented on **Table 8**.

Findings and Conclusions

The following findings and conclusion are based on the results of the well development, packer testing, hydraulic monitoring, and groundwater elevation gauging programs described above:

- Based on hydraulic monitoring data collected at 114-MW66D during development of wells 114-MW73D and 114-MW74D:
    - 114-MW73D and 114-MW74D are hydraulically connected to FLUTe ports 1 and 2 at 114-MW66D.
    - 114-MW73D and 114-MW74D are not hydraulically connected to FLUTe ports 3, 4, and 5 at 114-MW66D.
- Based on hydraulic monitoring data collected at 114-MW72D during development of well 114-MW76D:
    - 114-MW76D is not hydraulically connected to FLUTe ports 1, 2, 3 and 4 at 114-MW72D.
- Based on packer testing at 114-MW73D:
    - 114-MW73D is hydraulically connected to FLUTe ports 1 and 2 at 114-MW66D, and to 114-MW74D.
    - 114-MW73D is not hydraulically connected to FLUTe ports 3, 4, and 5 at 114-MW66D.
    - 114-MW73D is not hydraulically connected to 114-MW61D.
- Based on packer testing at 114-MW74D:
    - 114-MW74D is hydraulically connected to FLUTe ports 1 and 2 at 114-MW66D, and to 114-MW61D and 114-MW73D.
    - 114-MW74D is not hydraulically connected to FLUTe ports 3, 4, and 5 at 114-MW66D.

Based on these findings, the potentiometric heads calculated for 114-MW73D and 114-MW74D, and the average potentiometric head calculated for ports 1 and 2 at 114-MW66D, were used to interpolate the direction of groundwater flow within the Lockatong Formation (**Figure 2**). Based on these data and based on the understanding that groundwater flow in the Lockatong Formation occurs primarily along bedding plane fractures (i.e., bedding plane strike and dip) (Herman, 2001), the prevailing directions of groundwater flow within the Lockatong Formation are to the south/southwest along bedding strike and to the west down bedding dip due to the anisotropy in the bedrock.

References

AECOM, 2010. *Updated Field Sampling Plan-Quality Assurance Field Sampling Plan / Quality Assurance Project Plan Non-Residential Chromium Sites, Hudson County, New Jersey.* June 2010.

AECOM, 2023. *Addendum to Groundwater Remedial Investigation Report and Groundwater Remedial Action Work Plan for Bedrock Water-Bearing Zone.* PPG Garfield Avenue Group, Hudson County Chromium Sites, Jersey City, New Jersey. March 2023.

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Herman, Gregory C., 2001. *Hydrogeological Framework of Bedrock Aquifers in the Newark Basin, New Jersey*. New Jersey Geological Service, Geology in Service to Public Health, 18th Annual Meeting of the Geological Association of New Jersey, South Brunswick, New Jersey, p. 6-45.

NJDEP, 2018. *N.J.A.C., 7.26E: Technical Requirements for Site Remediation.* August 6, 2018.

Tables

Table 1
Construction Details for Bedrock Monitoring Wells
Bedrock Groundwater Remedial Investigation
Garfield Avenue Group Sites
PPG, Jersey City, New Jersey

Well ID	Water-Bearing Zone	Total Depth (ft bgs)	Open Borehole/ Screened Interval/ FLUTe Port Intervals[4]	Ground Surface Elevation (ft NAVD88)	Top of Inner Casing Elevation (ft NAVD88)	Inner Casing Material	Inner Casing Diameter (inches)
114-MW4D	Bedrock (Open Borehole)[1,2] - Diabase, Lockatong	125	90-94, 98-102, 111-115, 121-125	13.1	15.77	Steel	6
114-MW6D	Bedrock (Open Borehole) - Lockatong	111	86-111	12.6	12.69	Steel	6
114-MW7D	Bedrock[3] - Indeterminate	90	85-90	12.4	11.92	PVC	6
114-MW16B	Bedrock[3] - Diabase	35.5	30.5-35.5	16.1	15.53	PVC	2
114-MW52D	Bedrock (Open Borehole)[1] - Lockatong	105	80-83, 87-90, 102-105	13.9	15.64	Steel	6
114-MW57D	Bedrock (Open Borehole)[1] - Lockatong	112.5	87.5-91.5, 96.5-100.5, 104-108, 109-113	12.7	14.70	Steel	6
114-MW61D	Bedrock[2,3] - Diabase, Lockatong	135	110-135	14.3	17.12	PVC	2
114-MW66D	Bedrock (Open Borehole)[1,2] - Lockatong	140	91-97, 107-111, 118-123, 124-129, 137-140	13.9	16.20	Steel	6
114-MW71D	Bedrock (Open Borehole) - Diabase, Lockatong	141	115-141	14.2	15.96	Steel	6
114-MW72D	Bedrock (Open Borehole)[1] - Lockatong	125	102-106, 110-114, 116-119, 123-126	12.3	14.41	Steel	6
114-MW73D	Bedrock (Open Borehole) - Lockatong	118	88-118	13.9	14.99	Steel	6
114-MW74D	Bedrock (Open Borehole) - Lockatong	132	97-132	14.2	15.23	Steel	6
114-MW76D	Bedrock (Open Borehole) - Lockatong	124	99-124	12.0	14.90	Steel	6

Notes:

[1]Open borehole converted to FLUTe multi-port system

[2]Deepening of existing borehole

[3]Open borehole completed with 2-inch PVC screen and casing

[4]FLUTe port intervals are listed in feet blow top of steel casing. Open borehole and screened intervals are listed in feet below ground surface

bgs - below ground surface

ft - feet

NAVD88 - North American Vertical Datum of 1988

Table 2
Hydraulic Monitoring Results at 114-MW66D During Well Development at 114-MW73D and 114-MW74D
Bedrock Groundwater Remedial Investigation
Garfield Avenue Group Sites
PPG, Jersey City, New Jersey

		Well Development	
	Well ID	**114-MW73D** (88-118)	**114-MW74D** (97-132)
Hydraulic Monitoring	**114-MW66D** (Port 1, 91-97)	X	X
	114-MW66D (Port 2, 107-111)	X	X
	114-MW66D (Port 3, 118-123)	--	--
	114-MW66D (Port 4, 124-129)	--	--
	114-MW66D (Port 5, 137-140)	--	--

Notes:
X = Test results indicate that a hydraulic connection exists between the well and FLUTe port (see Attachment 2)
-- = Test results indicate that a hydraulic connection does not exist between the well and FLUTe port
FLUTe port intervals for 114-MW66D are listed in feet blow top of steel casing
Depths listed for 114-MW73D and 114-MW74D are for the open borehole interval at each well, in feet below ground surface
Well development was performed on January 11 and 12, 2024
No rain was observed during well development

Table 3
Hydraulic Monitoring Results at 114-MW72D During Well Development at 114-MW76D
Bedrock Groundwater Remedial Investigation
Garfield Avenue Group Sites
PPG, Jersey City, New Jersey

		Well Development
	Well ID	**114-MW76D** (99-124)
Hydraulic Monitoring	**114-MW72D** (Port 1, 102-106)	--
	114-MW72D (Port 2, 110-114)	--
	114-MW72D (Port 3, 116-119)	--
	114-MW72D (Port 4, 123-126)	--

Notes:
X = Test results indicate that a hydraulic connection exists between the well and FLUTe port (see Attachment 2)
-- = Test results indicate that a hydraulic connection does not exist between the well and FLUTe port
FLUTe port intervals for 114-MW72D are listed in feet blow top of steel casing
Depth listed for 114-MW76D is for the open borehole interval, in feet below ground surface
Well development was performed on June 19, 2024
No rain was observed during well development

Table 4
Packer Test Results for Pumping at Well 114-MW73D
Bedrock Groundwater Remedial Investigation
Garfield Avenue Group Sites
PPG, Jersey City, New Jersey

		Test Interval					
	Well ID	114-MW73D (88-93)	114-MW73D (93-98)	114-MW73D (98-103)	114-MW73 (103-108)	114-MW73D (108-113)	114-MW73D (113-118)
Hydraulic Monitoring	114-MW61D (110-135)	--	--	--	--	--	--
	114-MW66D (Port 1, 91-97)	X	X	--	--	X	X
	114-MW66D (Port 2, 107-111)	X	X	X	X	X	X
	114-MW66D (Port 3, 118-123)	--	--	--	--	--	--
	114-MW66D (Port 4, 124-129)	--	--	--	--	--	--
	114-MW66D (Port 5, 137-140)	--	--	--	--	--	--
	114-MW74D (97-132)	X	X	X	X	--	--

Notes:
X = Test results indicate that a hydraulic connection exists between the noted test intervals and wells/FLUTe ports (see Attachment 3)
-- = Test results indicate that a hydraulic connection does not exist between the noted test intervals and wells/FLUTe ports
FLUTe port intervals for 114-MW66D are listed in feet blow top of steel casing
Depths listed for 114-MW61D are for the screened interval, in feet below ground surface
Depths listed for 114-MW74D are for the open borehole interval, in feet below ground surface
Packer testing was performed from January 22 to 24, 2024
Rain was observed on January 23 and 24, 2024

Table 5
Packer Test Results for Pumping at Well 114-MW74D
Bedrock Groundwater Remedial Investigation
Garfield Avenue Group Sites
PPG, Jersey City, New Jersey

		Test Interval						
	Well ID	114-MW74D (97-102)	114-MW74D (102-107)	114-MW74D (107-112)	114-MW74D (112-117)	114-MW74D (117-122)	114-MW74D (122-127)	114-MW74D (127-132)
Hydraulic Monitoring	114-MW61D (110-135)	X	--	--	--	--	--	--
	114-MW66D (Port 1, 91-97)	X	X	X	--	X	X	X
	114-MW66D (Port 2, 107-111)	X	X	X	X	X	X	X
	114-MW66D (Port 3, 118-123)	--	--	--	--	--	--	--
	114-MW66D (Port 4, 124-129)	--	--	--	--	--	--	--
	114-MW66D (Port 5, 137-140)	--	--	--	--	--	--	--
	114-MW73D (88-118)	X	X	X	X	X	X	X

Notes:
X = Test results indicate that a hydraulic connection exists between the noted test intervals and wells/FLUTe ports (see Attachment 4)
-- = Test results indicate that a hydraulic connection does not exist between the noted test intervals and wells/FLUTe ports
FLUTe port intervals for 114-MW66D are listed in feet blow top of steel casing
Depths listed for 114-MW61D are for the screened interval, in feet below ground surface
Depths listed for 114-MW73D are for the open borehole interval, in feet below ground surface
Packer testing was performed from January 16 to 19, 2024
No rain was observed during packer testing

Table 6
Pumping Rates and Volumes Pumped for Packer Testing at Well 114-MW73D
Bedrock Groundwater Remedial Investigation
Garfield Avenue Group Sites
PPG, Jersey City, New Jersey

Target Interval (ft bgs)	Test Duration (min)	Minimum Pump Rate (mL/min)	Maximum Pump Rate (mL/min)	Volume Pumped (gallons)
88-93	50	3500	6000	61.1
93-98	50	3400	5500	60.3
98-103	45	3200	6000	54
103-108	45	2500	3400	36.7
108-113	40	20	2700	9.4
113-118	40	100	4100	15.7

Notes:

bgs - below ground surface

ft - feet

min - minutes

mL - milliliters

Table 7
Pumping Rates and Volumes Pumped for Packer Testing at Well 114-MW74D
Bedrock Groundwater Remedial Investigation
Garfield Avenue Group Sites
PPG, Jersey City, New Jersey

Target Interval (ft bgs)	Test Duration (min)	Minimum Pump Rate (mL/min)	Maximum Pump Rate (mL/min)	Volume Pumped (gallons)
97-102	40	1500	3700	28
102-107	50	150	2600	10.8
107-112	73	1500	4700	35.9
112-117	37	400	2500	11.8
117-122	70	98	4500	24
122-127	65	100	4500	17.1
127-132	50	100	2500	7.85

Notes:

bgs - below ground surface

ft - feet

min - minutes

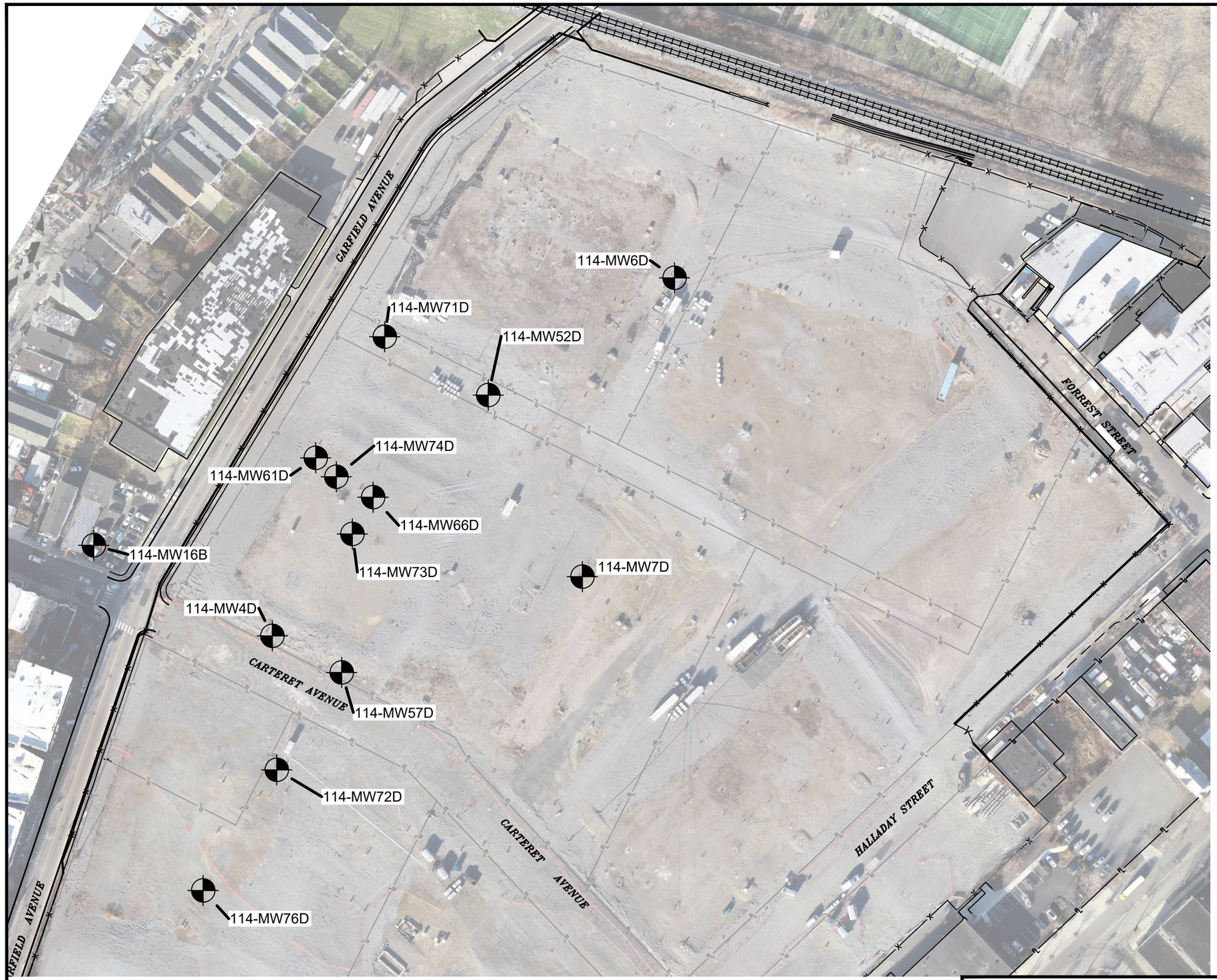
mL - milliliters

Table 8
Depth to Groundwater and Potentiometric Heads at 114-MW66D, 114-MW73D, and 114-MW74D
Bedrock Groundwater Remedial Investigation
Garfield Avenue Group Sites
PPG, Jersey City, New Jersey

Well ID	FLUTe Port (ft btsc)	Open Borehole (ft bgs)	Depth to Water (ft btsc/ft below FLUTe Port Tube)	Date of Measurement	Reference Elevation (ft NAVD88)	Potentiometric Head (ft NAVD88)	Comments
114-MW73D	--	88-118	7.85	2/16/2024	14.99	7.14	
114-MW74D	--	97-132	7.85	2/16/2024	15.23	7.38	
114-MW66D	1 (91-97)	--	8.50	2/16/2024	16.72	8.22	Average potentiometric head at 114-MW66D ports 1 and 2 = 8.22
	2 (107-111)	--	8.49	2/16/2024	16.70	8.21	
	3 (118-123)	--	8.53	2/16/2024	16.71	8.18	
	4 (124-129)	--	7.87	2/16/2024	16.72	8.85	
	5 (137-140)	--	7.70	2/16/2024	16.71	9.01	

Notes:
bgs = below ground surface
btsc = below top of steel casing
ft = feet
NAVD88 = North American Vertical Datum of 1988

Figures



LEGEND

- PROPERTY LINE
- NEW JERSEY TRANSIT LIGHT RAIL
- 114-MW72D — MONITORING WELL ID
- MONITORING WELL LOCATION

NOTES:

1. Aerial imagery dated December 20, 2021 sourced from aerial imagery provided by Borbas Surveying and Mapping, LLC.

60 0 120

GRAPHIC SCALE IN FEET

N

AECOM

PPG
GARFIELD AVENUE GROUP
JERSEY CITY, NEW JERSEY

BEDROCK MONITORING WELL LOCATIONS

DATE: 08/01/2024 | DRWN: GET | FIGURE 1

File: C:\USERS\BREEDVELDT\AECOM\PPG - GDS\910 CAD\20 SHEETS\GW\2022 GW RI\PACKER TEST MEMO FIGURE 1.DWG

LEGEND

	PROPERTY LINE
	NEW JERSEY TRANSIT LIGHT RAIL
114-MW72D	MONITORING WELL ID
	MONITORING WELL LOCATION
7.38	POTENTIOMETRIC HEAD (FT NAVD88)
7.25	INFERRED POTENTIOMETRIC SURFACE CONTOUR (FT NAVD88)
	APPARENT DIRECTION OF GROUNDWATER FLOW

NOTES:

1. Aerial imagery dated December 20, 2021 sourced from aerial imagery provided by Borbas Surveying and Mapping, LLC.
2. Potentiometric heads based on depth to groundwater readings collected on February 16, 2024.

ABBREVIATIONS:

FT - FEET
NAVD88 - NORTH AMERICAN VERTICAL DATUM OF 1988

20 0 40
GRAPHIC SCALE IN FEET

N

AECOM

PPG GARFIELD AVENUE GROUP JERSEY CITY, NEW JERSEY			APPARENT GROUNDWATER FLOW DIRECTION IN THE LOCKATONG FORMATION
DATE: 03/08/2024	DRWN: TEB		**FIGURE 2**

File: C:\USERS\FREDERIK.SCHUELE\AECOM DIRECTORY\PPG - GDS\910 CAD\20 SHEETS\GW\2022 GW RIR\PACKER TEST MEMO FIGURE 1.DWG

Attachment 1
Packer Testing Field Forms

Packer Testing Form

Location ID: 114-MW73D-88-93

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco

Date: 1/22/2024
Weather: 25 F, Sunny

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	TROLL	700	691493
Transducer 2 (Lower Unit)	TROLL	700	638195
Multiparameter Meter	NA		
Turbidity Meter	NA		
Water Level Meter	WLM	Solinst	281510, 502891

Pre-Test Data

Depth to water in open borehole (ft btc): 6.81 ft
Packer Interval top (ft btc): 88.0 ft
Packer Interval Bottom (ft btc): 93.0 ft
Pump Depth (ft btc): 93.0 ft
Depth to water at 114-MW61D (ft btc): 8.89 ft

Transducer 1 Depth (ft btc): 81.95 ft
Transducer 2 Depth (ft btc): 86.51 ft
Height of water column above Transducer 1 (ft): 75.14 ft
Height of water column above Transducer 2 (ft): 79.71 ft

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 6.5 ft
Depth to water inside packer assembly (ft btc): 5.10 ft
Height of water column above Transducer 1 (ft): Not Recorded
Height of water column above Transducer 2 (ft): Not Recorded

Upper Packer Pressure (psi): 110
Lower Packer Pressure (psi): 110

Test Data

Packer Interval Volume (gal): 7.35
Total volume pumped during test (gal): Approx. 61.1

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
8:10	6000	NA	NA	100	100	pump started	
8:15	5500	10.08	7.43	100	100		Light Yellow GW
8:20	NA	15.99	13.2	110	110	PSI increased	
8:25	5000	19.00	16.8	110	110		
8:30	4800	24.7	22.03	110	110		
8:35	4750	26.45	24.85	110	110	visual test	Light Yellow GW
8:40	4400	28.50	26.27	100	100		
8:45	4250	33.20	23.5	110	110	PSI dropped	
8:50	3800	34.10	24.3	110	110	PSI increased to 110 PSI	
8:55	3700	35.53	25.85	110	110		
9:00	3500	36.68	26.62	110	110	stopped pump and allowed to recharge	
9:05	NA	33.95	23.40	110	110		
9:10	NA	30.42	20.25	110	110		
9:15	NA	30.33	18.71	110	110		

Sample Data

Temp (^{o}C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses:
Photograph Collected (Yes/No): Visual Test Conducted

Comments

21.5 inch Stickup Coupling (distance from top of coupling to top of well PVC)

Signature J Franco Date: 1/22/2024

Packer Testing Form

Location ID: 114-MW73D-93-98

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco

Date: 1/22/2024
Weather: 25 F, Sunny

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	TROLL	700	691493
Transducer 2 (Lower Unit)	TROLL	700	638195
Multiparameter Meter	NA		
Turbidity Meter	NA		
Water Level Meter	WLM	Solinst 281510	502891

Pre-Test Data

Depth to water in open borehole (ft btc): 5.18 ft
Packer Interval top (ft btc): 93 ft
Packer Interval Bottom (ft btc): 98 ft
Pump Depth (ft btc): ~98 ft
Depth to water at 114-MW61D (ft btc): 8.75 ft

Transducer 1 Depth (ft btc): ~92.5 ft
Transducer 2 Depth (ft btc): ~95.7 ft
Height of water column above Transducer 1 (ft): 87.4 ft
Height of water column above Transducer 2 (ft): 87.34 ft

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 3.67 ft
Depth to water inside packer assembly (ft btc): 5.60 ft
Height of water column above Transducer 1 (ft): 88.98 ft
Height of water column above Transducer 2 (ft): 88.95 ft

Upper Packer Pressure (psi): 95 to 110
Lower Packer Pressure (psi): 95 to 110

Test Data

Packer Interval Volume (gal): 7.35
Total volume pumped during test (gal): Approx. 60.3

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
13:20	NA	NA	NA	95	95	Pump Started	Yellow GW
13:25	5500	9.25	6.98	95	95		Yellow GW
13:30	5500	13.7	11.2	95	95		Yellow GW
13:35	5300	18.25	15.8	110	110	PSI Increased	
13:40	4600	22.3	20.2	110	110		
13:45	4500	NA	NA	110	110		
13:50	4200	26.77	24.7	110	110	Visual Sample Collected	Yellow GW
13:55	4100	28.35	26.6	110	110		
14:00	4000	30.32	28.53	110	110		
14:05	3600	31.40	29.64	110	110		
14:10	3400	32.10	30.55	110	110	Stopped Pump and Allowed Well to Recharge	
14:15	NA	30.12	28.52	110	110	Post Test Data	
14:20	NA	28.62	27.23	110	110	Post Test Data	
14:25	NA	27.50	25.5	110	110	Post Test Data	

Sample Data

Temp (^{o}C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses:
Photograph Collected (Yes/No): Visual Test Conducted

Comments

22.5 inch Stickup Coupling (distance from top of coupling to top of well PVC)

Signature: J Franco
Date: 1/22/2024

Packer Testing Form

Location ID: 114-MW73D-98-103

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco

Date: 1/23/2024
Weather: 30 F, Overcast

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	TROLL	700	691493
Transducer 2 (Lower Unit)	TROLL	700	638195
Multiparameter Meter	NA		
Turbidity Meter	NA		
Water Level Meter	WLM	Solinst	281510, 502891

Pre-Test Data

Depth to water in open borehole (ft btc): 6.73 ft
Packer Interval top (ft btc): 98 ft
Packer Interval Bottom (ft btc): 103 ft
Pump Depth (ft btc): ~103 ft
Depth to water at 114-MW61D (ft btc): 8.84 ft

Transducer 1 Depth (ft btc): 90.26 ft
Transducer 2 Depth (ft btc): ~99.76 ft
Height of water column above Transducer 1 (ft): 83.53 ft
Height of water column above Transducer 2 (ft): 91.78 ft

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 4.2 ft
Depth to water inside packer assembly (ft btc): 6.30 ft
Height of water column above Transducer 1 (ft): 85.24 ft
Height of water column above Transducer 2 (ft): 93.52 ft

Upper Packer Pressure (psi): 110
Lower Packer Pressure (psi): 110

Test Data

Packer Interval Volume (gal): 7.35 gal
Total volume pumped during test (gal): Approx. 54

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
8:10	NA	NA	NA	NA	NA	Started Pump	
8:15	6000	12.8	10.0	110	110		
8:20	5700	14.59	11.84	110	110		
8:25	5000	18.29	15.60	110	110		
8:30	4700	21.29	18.72	110	110		
8:35	4400	24.91	22.40	110	110	Visual Test. No odors.	Yellow GW/ No Odor
8:40	4300	28.10	25.72	110	110		
8:45	4200	30.67	28.69	110	110		
8:50	3400	31.26	29.08	110	110		
8:55	3200	32.10	29.91	110	110	Stopped Pump	
9:00	NA	30.17	28.41	110	110	Post-test Data	
9:05	NA	29.08	27.21	110	110	Post-test Data	
9:10	NA	28.61	26.7	110	110	Post-test Data	

Sample Data

Temp (^{o}C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses:
Photograph Collected (Yes/No): Visual Test Only

Comments

Groundwater is observed to be more yellow than previous interval. 22.8 inch Stickup Coupling (From TOC)

Signature Joyce Franco

Date: 1/23/2024

Packer Testing Form

Location ID: 114-MW73D-103-108

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco

Date: 1/23/2024
Weather: 35 F Sunny

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	TROLL	700	691493
Transducer 2 (Lower Unit)	TROLL	700	638195
Multiparameter Meter	NA		
Turbidity Meter	NA		
Water Level Meter	WLM	Solinst	281510, 502891

Pre-Test Data

Depth to water in open borehole (ft btc): 21.7 ft
Packer Interval top (ft btc): 103 ft
Packer Interval Bottom (ft btc): 108 ft
Pump Depth (ft btc): ~ 108 ft
Depth to water at 114-MW61D (ft btc): 8.84 ft

Transducer 1 Depth (ft btc): 91.4 ft
Transducer 2 Depth (ft btc): ~105.76 ft
Height of water column above Transducer 1 (ft): 69.70 ft
Height of water column above Transducer 2 (ft): 80.52 ft

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 19.09 ft
Depth to water inside packer assembly (ft btc): 20.65 ft
Height of water column above Transducer 1 (ft): 72.85 ft
Height of water column above Transducer 2 (ft): 83.10 ft

Upper Packer Pressure (psi): 110
Lower Packer Pressure (psi): 110

Test Data

Packer Interval Volume (gal): 7.35

Total volume pumped during test (gal): Approx. 36.7

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
9:50	NA	NA	NA	110	110	Pump Started	
9:55	NA	23.68	21.32	110	110		
10:00	3400	24.96	23.80	110	110		
10:05	4500	27.43	25.72	110	110		
10:10	3600	29.88	27.90	110	110		
10:15	2700	31.57	29.48	110	110		
10:20	2400	33.02	31.0	110	110	Visual Test	
10:25	2500	33.75	31.80	110	110		
10:30	2500	34.43	32.60	110	110		
10:35	2500	35.50	33.82	110	110		
10:40	NA	34.10	32.7	110	110	Post-Test Data	
10:45	NA	32.8	31.1	110	110	Post-Test Data	
10:50	NA	31.62	30.0	110	110	Post-Test Data	

Sample Data

Temp (^{o}C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses:
Photograph Collected (Yes/No): Visual Test Only

Comments

Top of stickup coupling is 23.04" from top of well casing

Signature Joyce Franco

Date: 1/23/2024

Packer Testing Form

Location ID: 114-MW73D-108-113

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco

Date: 1/23/2024
Weather: 38 F Rain

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	TROLL	700	691493
Transducer 2 (Lower Unit)	TROLL	700	638195
Multiparameter Meter	NA		
Turbidity Meter	NA		
Water Level Meter	WLM	Solinst	281510, 502891

Pre-Test Data

Depth to water in open borehole (ft btc): 20.85 ft
Packer Interval top (ft btc): 108 ft
Packer Interval Bottom (ft btc): 113 ft
Pump Depth (ft btc): ~ 113 ft
Depth to water at 114-MW61D (ft btc): 8.84 ft

Transducer 1 Depth (ft btc): 92.94 ft
Transducer 2 Depth (ft btc): ~110.76 ft
Height of water column above Transducer 1 (ft): 72.09 ft
Height of water column above Transducer 2 (ft): 109.46 ft

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 18.39 ft
Depth to water inside packer assembly (ft btc): 16.4 ft
Height of water column above Transducer 1 (ft): 76.73 ft
Height of water column above Transducer 2 (ft): 93.10 ft

Upper Packer Pressure (psi): 110
Lower Packer Pressure (psi): 110

Test Data

Packer Interval Volume (gal): 7.35

Total volume pumped during test (gal): Approx.9.4

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
11:55	NA	NA	NA	NA	NA	Pump Started	
12:00	2700	46.25	17.46	110	110		
12:05	1600	54.95	17.40	110	110		
12:10	350	58.30	16.50	110	110		
12:15	300	59.80	15.60	110	110	Visual Test	Yellow Groundwater
12:20	150	59.5	15.50	110	110		
12:25	100	59.50	14.95	110	110		
12:30	50	59.45	14.36	110	110		
12:35	20	59.35	14.30	110	110	Stopped Pump and Allowed to Recharge	
12:40	NA	53.0	13.31	110	110	Post-Test Data	
12:45	NA	52.03	13.06	110	110	Post-Test Data	
12:50	NA	51.02	12.92	110	110	Post-Test Data	

Sample Data

Temp (^{o}C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses:
Photograph Collected (Yes/No): Visual Test Only

Comments

Top of stickup couplingis 22.9" from top of well casing

Submersible pump is 2.24 ft long

Signature: Joyce Franco

Date: 1/23/2024

Packer Testing Form

Location ID: 114-MW73D-113-118

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco

Date: 1/24/2024
Weather: 40 F Rain/Overcast

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	TROLL	700	691493
Transducer 2 (Lower Unit)	TROLL	700	638195
Multiparameter Meter	NA		
Turbidity Meter	NA		
Water Level Meter	WLM	Solinst	281510, 502891

Pre-Test Data

Depth to water in open borehole (ft btc): 6.88 ft
Packer Interval top (ft btc): 113 ft
Packer Interval Bottom (ft btc): 118 ft
Pump Depth (ft btc): ~ 118 ft
Depth to water at 114-MW61D (ft btc): 8.91 ft

Transducer 1 Depth (ft btc): 55.38 ft
Transducer 2 Depth (ft btc): 115.76 ft
Height of water column above Transducer 1 (ft): 48.51 ft
Height of water column above Transducer 2 (ft): 107.76 ft

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 5.4 ft
Depth to water inside packer assembly (ft btc): 6.63 ft
Height of water column above Transducer 1 (ft): 50.40 ft
Height of water column above Transducer 2 (ft): 108.60 ft

Upper Packer Pressure (psi): 110
Lower Packer Pressure (psi): 110

Test Data

Packer Interval Volume (gal): 7.35
Total volume pumped during test (gal): Approx. 15.7

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
8:54	NA	NA	NA	110	110	Pump Started	
8:59	4100	25.5	5.66	110	110		
9:01	2800	42.00	5.70	110	110		
9:05	1000	49.42	5.87	110	110		
9:10	800	49.40	6.00	110	110	Visual Test	Yellow Groundwater
9:15	800	48.78	6.00	110	110	Pump Rate Slowing Down	
9:20	650	48.51	6.13	110	110		
9:25	400	48.50	6.20	110	110		
9:30	100	48.40	6.31	110	110		
9:35	100	47.20	6.41	110	110	Pump Stopped	
9:40	NA	39.50	6.40	110	110	Post-Test Data	
9:45	NA	37.30	6.48	110	110	Post-Test Data	
9:50	NA	35.65	6.5	110	110	Post-Test Data	

Sample Data

Temp (^{o}C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses:
Photograph Collected (Yes/No): Visual Test Only

Comments

Top of stickup coupling is 14.5 " from top of well casing

Submersible pump is 2.24 ft long. Could not place T1 deeper into well, getting stuck.

At 0910, pump rate slowed down then went back up then continued to decrease

Signature Joyce Franco

Date: 1/24/2024

Packer Testing Form

Location ID: 114-MW74D-97-102

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco, F Schuele

Date: 1/16/2024
Weather: 29F, Fog and Snow

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	NA	NA	NA
Transducer 2 (Lower Unit)	Insitu TROLL	700	638195
Multiparameter Meter	NA		
Turbidity Meter	NA		
Water Level Meter	WLM	Solinst	281510/502891

Pre-Test Data

Depth to water in open borehole (ft btc): 4.85 ft
Packer Interval top (ft btc): 97 ft
Packer Interval Bottom (ft btc): 102 ft
Pump Depth (ft btc): ~ 102 ft
Depth to water at 114-MW61D (ft btc): 7.81 ft

Transducer 1 Depth (ft btc): NA (Not Installed)
Transducer 2 Depth (ft btc): 99.76 ft (Top of Pump)
Height of water column above Transducer 1 (ft): Not Recorded
Height of water column above Transducer 2 (ft): Not Recorded

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 4.21 ft
Depth to water inside packer assembly (ft btc): 4.20 ft
Height of water column above Transducer 1 (ft): NA
Height of water column above Transducer 2 (ft): 96.86

Upper Packer Pressure (psi): 100
Lower Packer Pressure (psi): 100

Test Data

Packer Interval Volume (gal): 7.35

Total volume pumped during test (gal): Approx. 28

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
14:55	NA	NA	NA	100	100	Pump Started	
15:00	NA	NA	NA	100	100		
15:05	3700	38.51	5.89	100	100		
15:10	3700	52.8	6.21	100	100		
15:15	3700	60.3	6.55	100	100		
15:22	1700	67.1	6.8	100	100		Clear
15:30	1300	67	7.3	100	100		
15:35	1500	66.7	7.51	100	100		
15:40	NA	NA	NA	NA	NA	Pump Stopped And Allowed to Recharge	
15:55	NA	24.3	10.4	65	65		
16:11	NA	10.45	8.89	60	60		

Sample Data

Temp (^{o}C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses: No sample collected
Photograph Collected (Yes/No): For Visual Test Only

Comments

Stickup for packer assembly 2.55 ft long. Top of stickup coupling is 19 inches above top of well casing.

Transducer 1 (above packer assembly) not installed

Signature Joyce Franco

Date: 1/16/2024

Packer Testing Form

Location ID: 114-MW74D-102-107

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco, F Schuele

Date: 1/17/2024
Weather: 12-20 F

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	Insitu TROLL Transducer	700	691493
Transducer 2 (Lower Unit)	Insitu TROLL Transducer	700	638195
Multiparameter Meter	NA		
Turbidity Meter	NA		
Water Level Meter	WLM	Solinst	281510/502891

Pre-Test Data

Depth to water in open borehole (ft btc): 6.40 ft
Packer Interval top (ft btc): 102 ft
Packer Interval Bottom (ft btc): 107 ft
Pump Depth (ft btc): 107 ft
Depth to water at 114-MW61D (ft btc): 8.11 ft

Transducer 1 Depth (ft btc): ~51.75 ft
Transducer 2 Depth (ft btc): ~ 104.8 ft
Height of water column above Transducer 1 (ft): 45.35 ft
Height of water column above Transducer 2 (ft): 106.62 ft

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 5.40 ft
Depth to water inside packer assembly (ft btc): 5.04 ft
Height of water column above Transducer 1 (ft): 46.26 ft
Height of water column above Transducer 2 (ft): 108.33 ft

Upper Packer Pressure (psi): 100
Lower Packer Pressure (psi): 100

Test Data

Packer Interval Volume (gal): 7.35

Total volume pumped during test (gal): Approx. 10.8

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
9:26	NA	NA	NA	NA	NA	Started Pump	
9:30	2600	15	5.85	100	100		
9:36	NA	39.10	6.10	100	100		
9:41	1500	45.6	6.23	100	100		
9:45	1000	49.95	6.31	100	100		
9:50	300	53.80	6.35	100	100		
9:55	200	55.94	6.40	100	100		
10:00	180	57.91	6.41	100	100	Sample Jar Collected for Visual Test	Clear, No Odors
10:05	150	58.35	6.41	100	100		
10:10	150	58.90	6.41	100	100		
10:15	150	59.21	6.41	100	100		
10:18	NA	NA	NA	100	100	Pump Stopped. Allowed to Reacharge	
10:19	NA	52.10	6.41	100	100	Post-Test Data	
10:29	NA	42.05	6.41	100	100	Post-Test Data	
10:44	NA	39.75	6.41	100	100	Post-Test Data	

Sample Data

Temp (^{o}C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses: No sample collected
Photograph Collected (Yes/No): For Visual Test Only

Comments

Packers inflated at 0914

Stickup 20 inches above well steel casing

Signature: Joyce Franco

Date: 1/17/2024

Packer Testing Form

Location ID: 114-MW74D-107-112

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco, F Schuele

Date: 1/17/2024
Weather: 16 F Sunny

Field Testing Equipment

Equipment	Make	Model	Serial Number	
Transducer 1 (Upper Unit)	Insitu TROLL transducer	700	691493	Outside
Transducer 2 (Lower Unit)	Insitu TROLL transducer	700	638195	Inside
Multiparameter Meter	NA			
Turbidity Meter	NA			
Water Level Meter	WLM	Solinst	281510/502891	

Pre-Test Data

Depth to water in open borehole (ft btc): 7.30 ft
Packer Interval top (ft btc): 107 ft
Packer Interval Bottom (ft btc): 112 ft
Pump Depth (ft btc): ~112 ft
Depth to water at 114-MW61D (ft btc): 8.11 ft

Transducer 1 Depth (ft btc): ~ 72.97 ft
Transducer 2 Depth (ft btc): ~109.75 ft
Height of water column above Transducer 1 (ft): 65.67 ft
Height of water column above Transducer 2 (ft): 110.10 ft

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 5.62 ft
Depth to water inside packer assembly (ft btc): 6.32 ft
Water level is dropping slowly
Height of water column above Transducer 1 (ft): 67.11 ft
Height of water column above Transducer 2 (ft): 112.15 ft

Upper Packer Pressure (psi): 100
Lower Packer Pressure (psi): 100

Test Data

Packer Interval Volume (gal): 7.35

Total volume pumped during test (gal): Approx. 35.9

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
11:42	NA	NA	NA	NA	NA	Pump Started. Water in tubing frozen. Need to reset test	
11:48	4700	26.52	6.81	100	100		
11:54	NA	NA	NA	NA	NA	Pump Failed	
11:58	2000	34.8	8.55	100	100	Pump Re-started	
12:05	NA	37.8	8.88	100	100		
12:10	2000	42.00	9.20	95	95		
12:15	2000	43.15	9.82	100	100		
12:20	2200	39.8	10.91	90	90	Increase Packer Pressure to 100 PSI	
12:30	1600	45.31	10.39	100	100		
12:40	1100	49.42	10.05	100	100	Visual Test Conducted	Clear/ No Odors
12:45	1500	50.0	9.90	100	100		
12:50	1500	49.7	9.91	100	100		
12:55	1500	49.05	9.95	97	97		
12:58	NA	NA	NA	NA	NA	Pump Off. Left to Recover	
13:00	NA	39.21	10.02	97	97		
13:10	NA	29.55	9.45	99	99		
13:15	NA	20.72	9.04	99	99	Stop Test	

Sample Data

Temp (^{o}C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses: No sample collected
Photograph Collected (Yes/No): For Visual Test Only

Comments

Inner Casing Stickup is 1.98 ft above well steel casing

Signature: Joyce Franco

Date: 1/17/2024

Packer Testing Form

Location ID: 114-MW74D-112-117

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco, F Schuele

Date: 1/17/2024
Weather: 18 F Sunny

Field Testing Equipment

Equipment	Make	Model	Serial Number	
Transducer 1 (Upper Unit)	TROLL	700	691493	Outside
Transducer 2 (Lower Unit)	TROLL	700	638195	Inside
Multiparameter Meter	NA			
Turbidity Meter	NA			
Water Level Meter	WLM	Solinst	281510/502891	

Pre-Test Data

Depth to water in open borehole (ft btc): 6.43 ft
Packer Interval top (ft btc): 112 ft
Packer Interval Bottom (ft btc): 117 ft
Pump Depth (ft btc): 117 ft
Depth to water at 114-MW61D (ft btc): 8.11 ft

Transducer 1 Depth (ft btc): 72.44 ft
Transducer 2 Depth (ft btc): ~114.76
Height of water column above Transducer 1 (ft): 66.01 ft
Height of water column above Transducer 2 (ft): 116.16 ft

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 6.0 ft
Depth to water inside packer assembly (ft btc): 3.9 ft
Height of water column above Transducer 1 (ft): 120.7 ft
Height of water column above Transducer 2 (ft): 80.18 ft

Upper Packer Pressure (psi): 110
Lower Packer Pressure (psi): 110

Test Data

Packer Interval Volume (gal): 7.35
Total volume pumped during test (gal): Approx. 11.8

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
14:37	NA	NA	NA	NA	NA	Pump Started	
14:42	2500	43.45	6.25	110	110		
14:47	2000	54.5	6.38	110	110		
14:52	1000	60.05	6.32	110	110	Collected Visual Test Jar	Cloudy/No Odor
14:57	750	64.36	6.32	110	110		
15:05	700	64.53	6.32	110	110		
15:10	650	65.75	6.32	110	110	Water Line Freezing	
15:15	400	66.50	6.32	110	110	Water Line Freezing	
15:20	400	67.00	6.32	110	110	Stopped Pump. Allowed to Recharge	
15:30	NA	57.5	6.32	NA	NA	Post-Test Data	

Sample Data

Temp (^{o}C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses: No sample collected
Photograph Collected (Yes/No): For Visual Test Only

Comments

21 inches Stickup Coupling(From top of casing)

Waterin tubing freezing affecting pumping rate

Signature Joyce Franco

Date: 1/17/2024

Packer Testing Form

Location ID: 114-MW74D-117-122

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco

Date: 1/18/2024
Weather: 20 F Cloudy

Field Testing Equipment

Equipment	Make	Model	Serial Number	
Transducer 1 (Upper Unit)	TROLL	700	691493	Outside
Transducer 2 (Lower Unit)	TROLL	700	638195	Inside
Multiparameter Meter	NA			
Turbidity Meter	NA			
Water Level Meter	WLM	Solinst	281510/502891	

Pre-Test Data

Depth to water in open borehole (ft btc): 6.32 ft
Packer Interval top (ft btc): 117 ft
Packer Interval Bottom (ft btc): 122 ft
Pump Depth (ft btc): ~ 122 ft
Depth to water at 114-MW61D (ft btc): 8.29 ft

Transducer 1 Depth (ft btc): ~98.1 ft
Transducer 2 Depth (ft btc): ~119.76
Height of water column above Transducer 1 (ft): 91.78 ft
Height of water column above Transducer 2 (ft): 113.20 ft

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 5.70 ft
Depth to water inside packer assembly (ft btc): 3.20 ft
Height of water column above Transducer 1 (ft): 92.20 ft
Height of water column above Transducer 2 (ft): 117.66 ft

Upper Packer Pressure (psi): 110
Lower Packer Pressure (psi): 110

Test Data

Packer Interval Volume (gal): 7.35
Total volume pumped during test (gal): Approx. 24

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
8:10	NA	NA	NA	NA	NA	Pump Started	
8:15	4500	32.9	6.03	110	110		
8:20	1200	47.0	6.20	110	110		
8:25	1100	59.8	6.32	110	110		
8:30	1000	63.5	6.40	110	110	Visual sample collected	Clear/No Odors
8:35	500	64.94	6.42	110	110		
8:40	100	65.47	6.43	110	110		
8:45	98	65.70	6.44	110	110		
8:50	2100	70.80	6.55	110	110	Flow rate changed due to ice in tubing	
8:55	1100	74.50	6.62	110	110		
9:00	1100	86.50	6.69	110	110		
9:05	500	88.10	6.69	110	110		
9:10	450	90.10	6.69	110	110		
9:15	400	91.8	6.69	110	110		
9:20	380	92.0	6.69	110	110	Pump Stopped	
9:25	NA	91.85	6.69	110	110	Post-Test Data	
9:28	NA	91.0	6.69	110	110	Post-Test Data	
9:31	NA	90.5	6.69	110	110	Post-Test Data	
9:55	NA	88.0	6.69	110	110	Post-Test Data. Slow Recharge	
10:00	NA	87.0	6.69	110	110	Post-Test Data. Slow Recharge	
10:05	NA	84.40	6.69	110	110	Post-Test Data. Slow Recharge	
10:10	NA	83.60	6.69	110	110	Post-Test Data. Slow Recharge	

Sample Data

Temp (°C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses: No sample collected
Photograph Collected (Yes/No): For Visual Test Only

Comments

21 inches stickup coupling above top of well casing

Signature Joyce Franco

Date: 1/18/2024

Packer Testing Form

Location ID: 114-MW74D-122-127

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco, F Schuele

Date: 1/18/2024
Weather: 20 F Cloudy

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	TROLL	700	691493
Transducer 2 (Lower Unit)	TROLL	700	638195
Multiparameter Meter	NA		
Turbidity Meter	NA		
Water Level Meter	WLM	Solinst	281510/502891

Pre-Test Data

Depth to water in open borehole (ft btc): 7.74 ft
Packer Interval top (ft btc): 122 ft
Packer Interval Bottom (ft btc): 127 ft
Pump Depth (ft btc): ~ 127 ft
Depth to water at 114-MW61D (ft btc): 8.38 ft

Transducer 1 Depth (ft btc): ~96.79 ft
Transducer 2 Depth (ft btc): ~124.76 ft
Height of water column above Transducer 1 (ft): 89.05 ft
Height of water column above Transducer 2 (ft): 119.34 ft

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 6.65 ft
Depth to water inside packer assembly (ft btc): 6.65 ft
Height of water column above Transducer 1 (ft): 91.36 ft
Height of water column above Transducer 2 (ft): 124.32 ft

Upper Packer Pressure (psi): 110
Lower Packer Pressure (psi): 110

Test Data

Packer Interval Volume (gal): 7.35
Total volume pumped during test (gal): Approx. 17.1

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
11:15	NA	NA	NA	110	110	Pump Started	
11:20	NA	NA	NA	110	110	Pump Failed	
11:45	NA	NA	NA	110	110	Pump Restarted	
11:50	4500	27.29	6.69	110	110	Groundwater with sediments	Cloudy
11:55	2400	53.7	6.69	110	110	Groundwater with sediments	Cloudy
12:00	700	63.21	6.69	110	110		Cloudy
12:05	500	67.3	6.69	110	110	Visual Test	Cloudy
12:10	300	69.49	6.69	110	110		Cloudy
12:15	250	69.5	6.69	110	110	Pump Failed	
12:20	NA	NA	NA	110	110		
12:30	NA	NA	NA	110	110	Pump Restarted	
12:35	300	68	6.69	110	110		
12:40	250	69.48	6.69	110	110		
12:45	250	71.17	6.69	110	110		
12:50	250	71.2	6.69	110	110		
12:55	150	71.8	6.69	110	110		
13:00	100	71.85	6.69	110	110	Pump Stopped. Allow well to recharge	
13:05	NA	66.16	6.69	110	110	Post-Test Data	
13:10	NA	63.66	6.69	110	110	Post-Test Data	
13:15	NA	62.7	6.69	110	110	Post-Test Data	

Sample Data

Temp (^{o}C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses: No sample collected
Photograph Collected (Yes/No): For Visual Test Only

Comments

50.5 inches stickup coupling (distance from top of well casing to top of coupling)

Pump failed dut to water line becoming detached from pump. Pump failed due to sediment accummulation at bottom

At 1235, pump was lifted by 10 inches from initial depth to allow water flow and restart pump

Signature Joyce Franco

Date: 1/18/2024

Packer Testing Form

Location ID: 114-MW74D-127-132

Client: PPG
Project #: 60667926
Location: Site 114
Field Staff: J Franco

Date: 1/19/2024
Weather: 21 F Cloudy

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	TROLL	700	691493
Transducer 2 (Lower Unit)	TROLL	700	638195
Multiparameter Meter	NA		
Turbidity Meter	NA		
Water Level Meter	WLM	Solinst	281510/502891

Pre-Test Data

Depth to water in open borehole (ft btc): 5.2 ft
Packer Interval top (ft btc): 127 ft
Packer Interval Bottom (ft btc): 132 ft
Pump Depth (ft btc): ~132 ft
Depth to water at 114-MW61D (ft btc): 8.46 ft

Transducer 1 Depth (ft btc): ~97.72 ft
Transducer 2 Depth (ft btc): ~119.82 ft
Height of water column above Transducer 1 (ft): 92.52 ft
Height of water column above Transducer 2 (ft): 108.98 ft

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 5.54 ft
Depth to water inside packer assembly (ft btc): 10.1 ft
Height of water column above Transducer 1 (ft): 92.19 ft
Height of water column above Transducer 2 (ft): 109.72 ft

Upper Packer Pressure (psi): 110
Lower Packer Pressure (psi): 110

Test Data

Packer Interval Volume (gal): 7.35

Total volume pumped during test (gal): Approx. 7.85

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
10:05	NA	NA	NA	NA	NA	Pump Started	
10:10	2500	32.7	5.94	110	110		
10:15	1200	52.19	6.19	110	110		
10:20	500	59.3	6.3	110	110		
10:25	300	58.15	6.35	110	110		
10:30	200	57.4	6.38	110	110		
10:35	100	56.65	6.39	110	110	Pump Slowed Down	
10:40	NA	NA	NA	NA	NA	Visual Test Collected	Cloudy/No Odors
10:45	NA	NA	NA	NA	NA	Pump Failed Due to Frozen Line	
11:05	500	52.1	6.4	110	110	Pump Restarted at a Different Depth	
11:10	450	54.8	6.41	110	110		
11:15	100	54.5	6.42	110	110	Water Line Freezing. Pump Failed Again	
11:20	NA	49.8	6.44	110	110	Post-Test Data	
11:25	NA	49.15	6.45	110	110	Post-Test Data	
11:30	NA	47.63	6.45	110	110	Post-Test Data	

Sample Data

Temp (^{o}C)	pH (s.u.)	Sp. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)
NA	NA	NA	NA	NA	NA

Sample ID: NA
Filtered (Yes/No): NA
Requested Analyses: No sample collected
Photograph Collected (Yes/No): For Visual Test Only

Comments

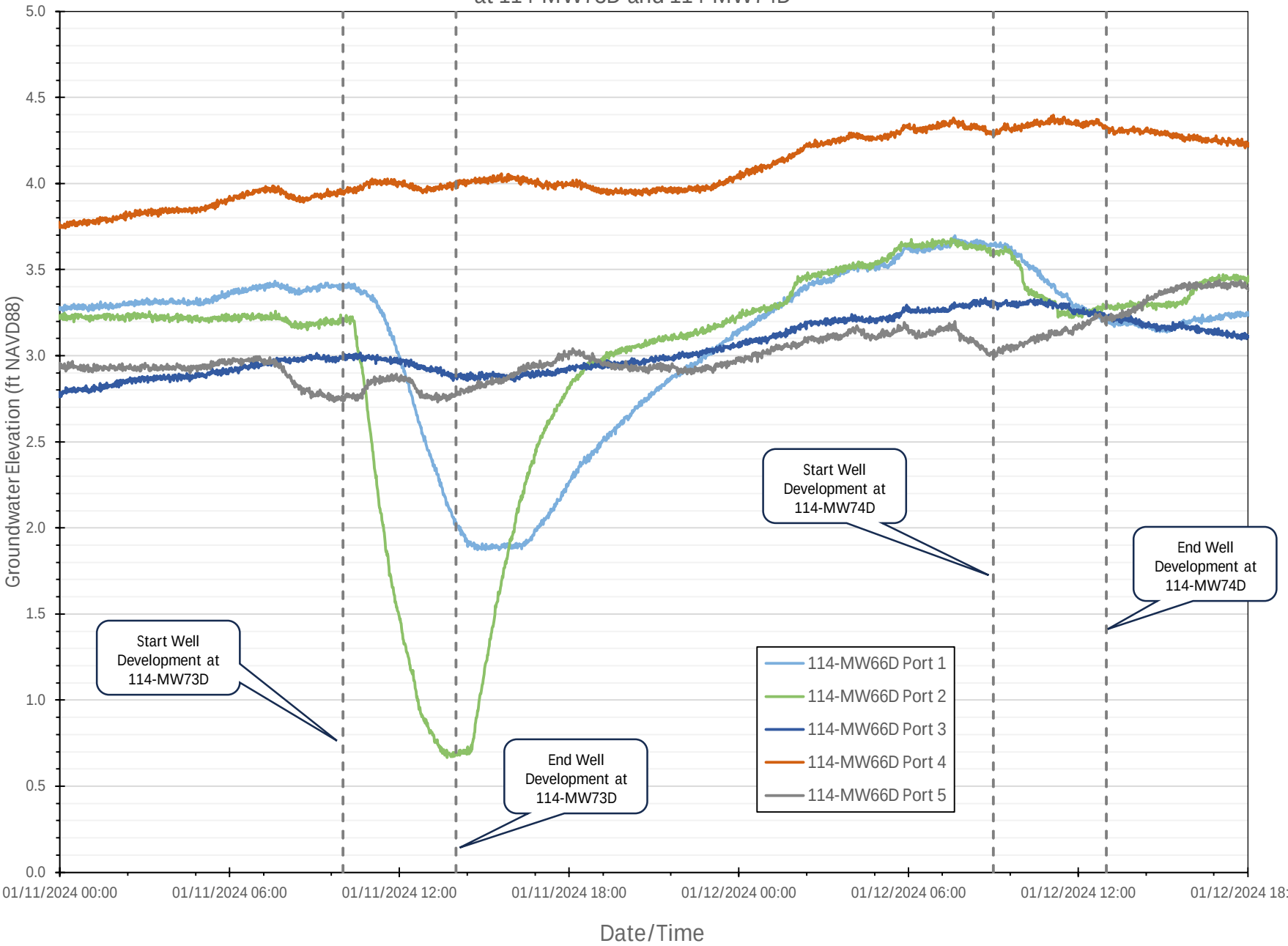
59 inches stickup coupling above well top of casing

Signature Joyce Franco

Date: 1/19/2024

Attachment 2
Hydraulic Monitoring Data at 114-MW66D During Development at 114-MW73D and 114-MW74D

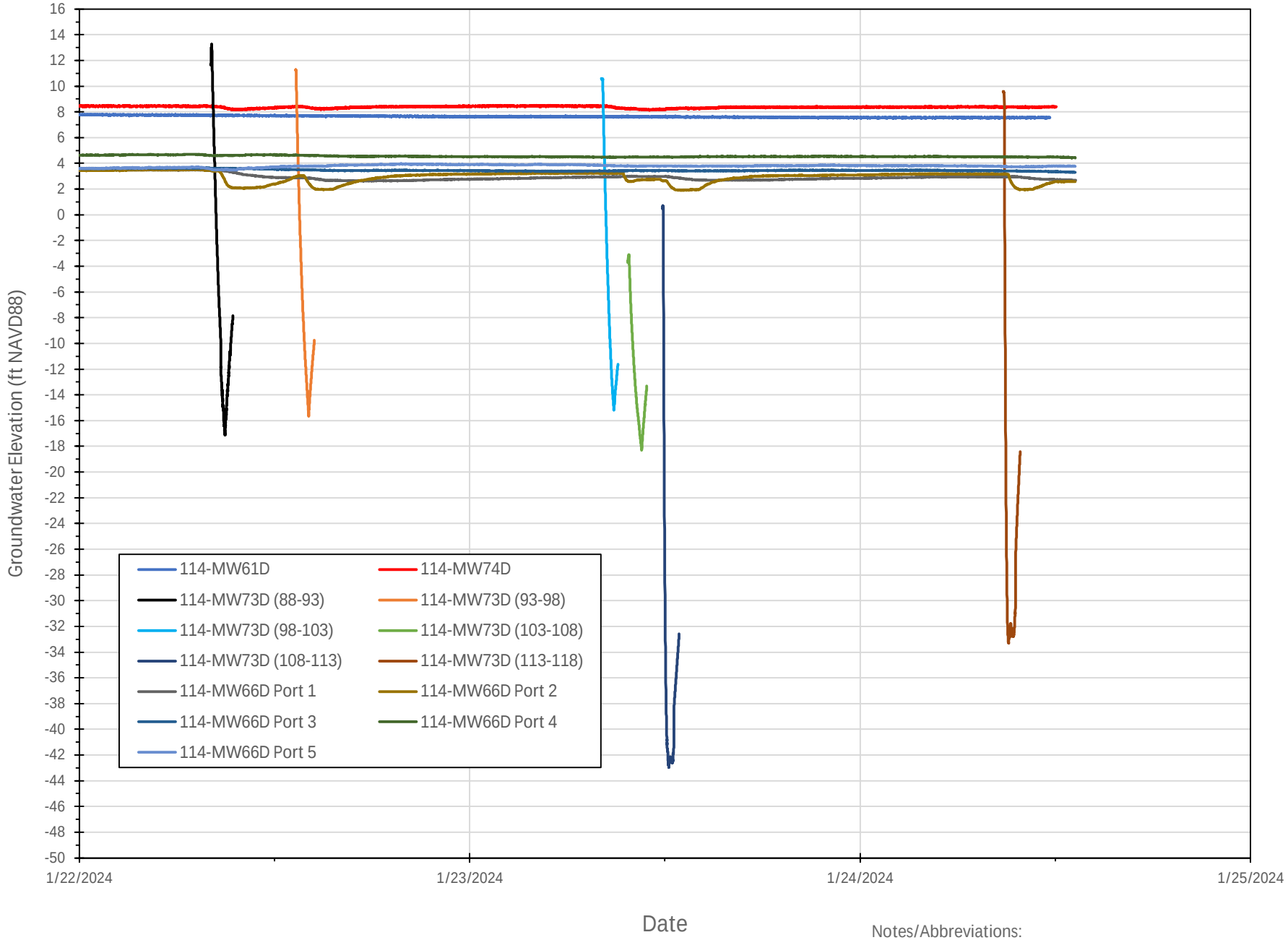
FIGURE A2-1
Groundwater Elevation Response at 114-MW66D During Well Development
at 114-MW73D and 114-MW74D



Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988

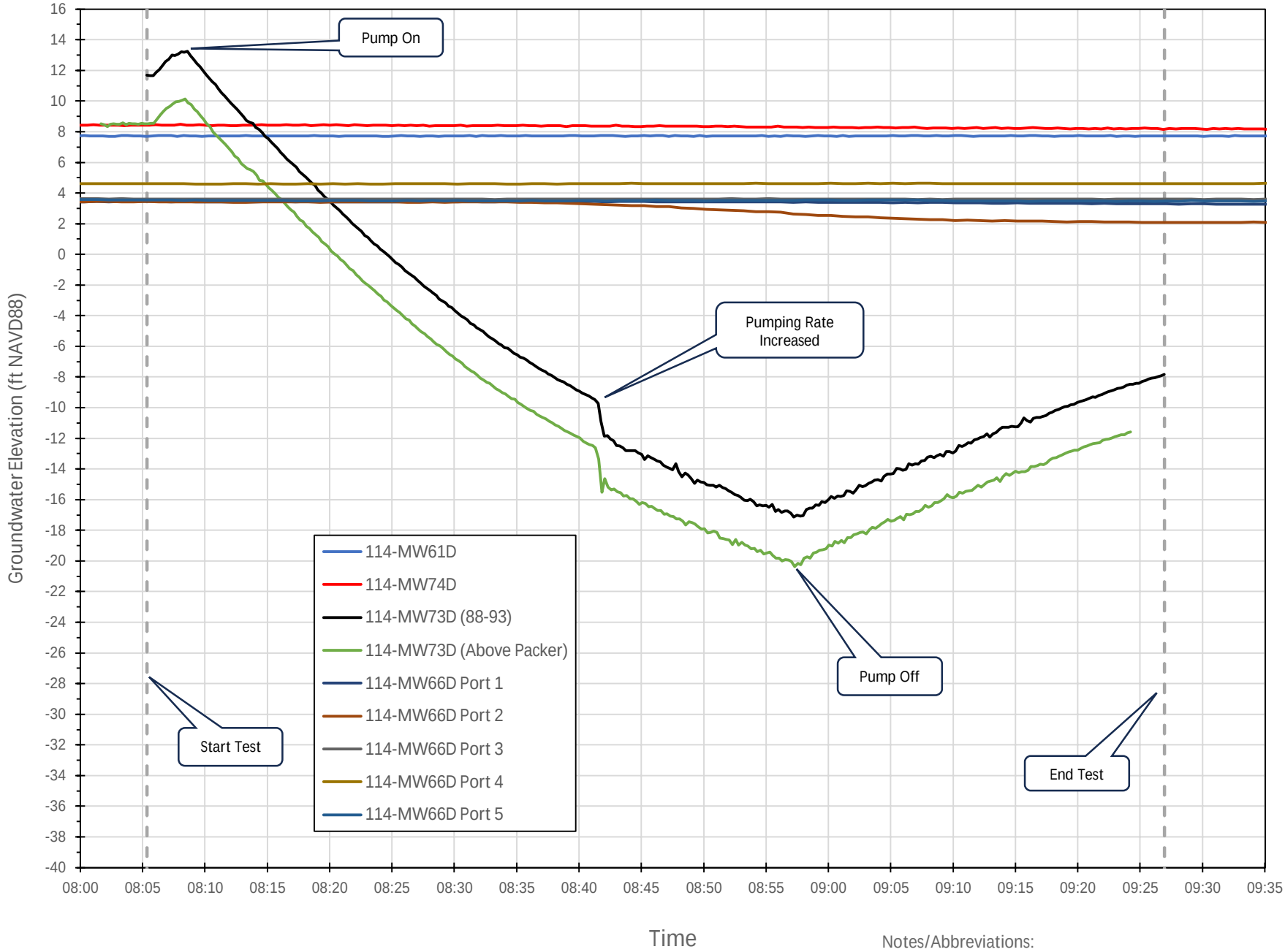
Attachment 3
Hydraulic Monitoring Data During Packer Testing at 114-MW73D

FIGURE A3-1
Packer Test Data - 114-MW73D



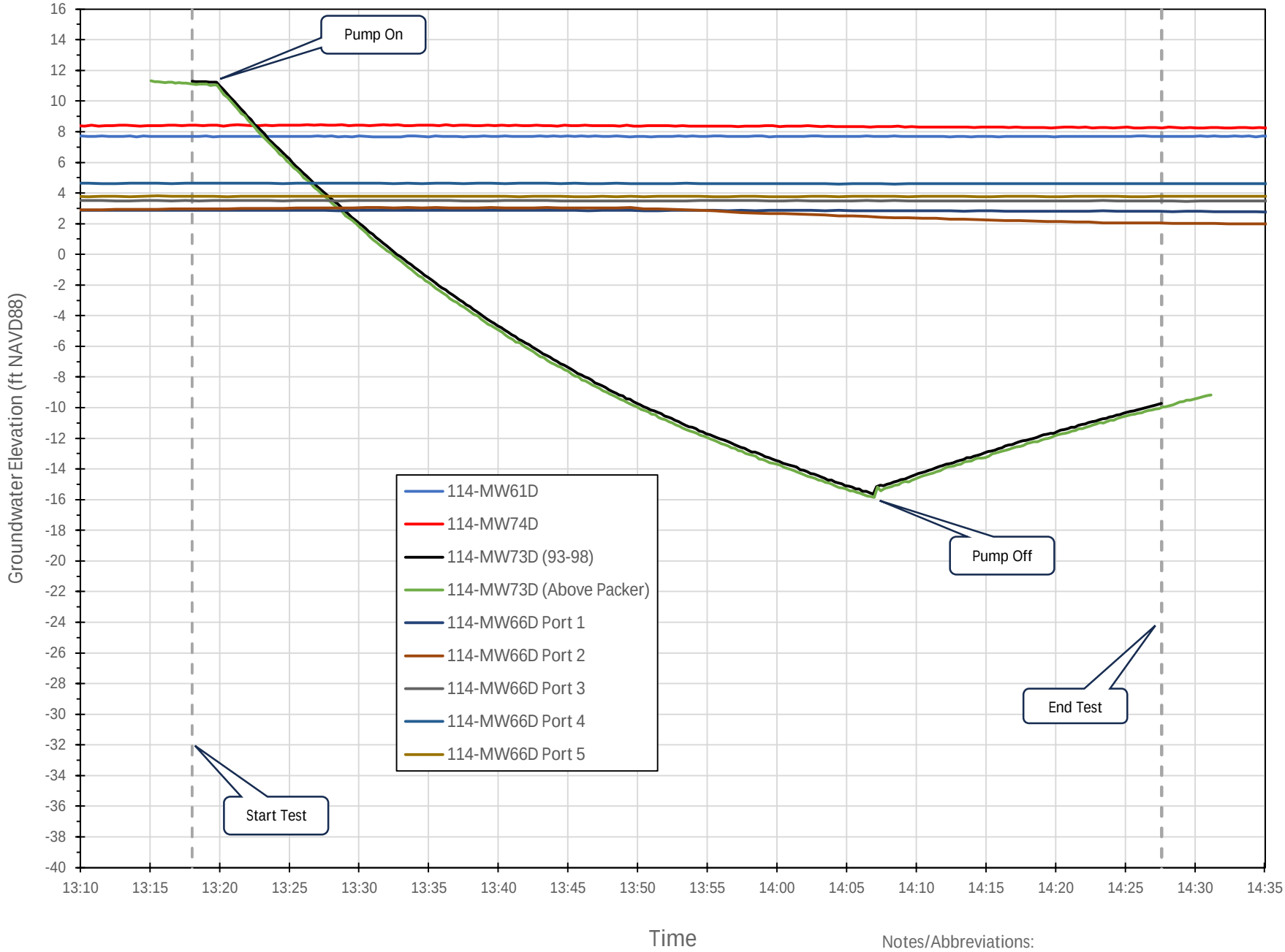
Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A3-2
Packer Test Data - 114-MW73D (88-93)



Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

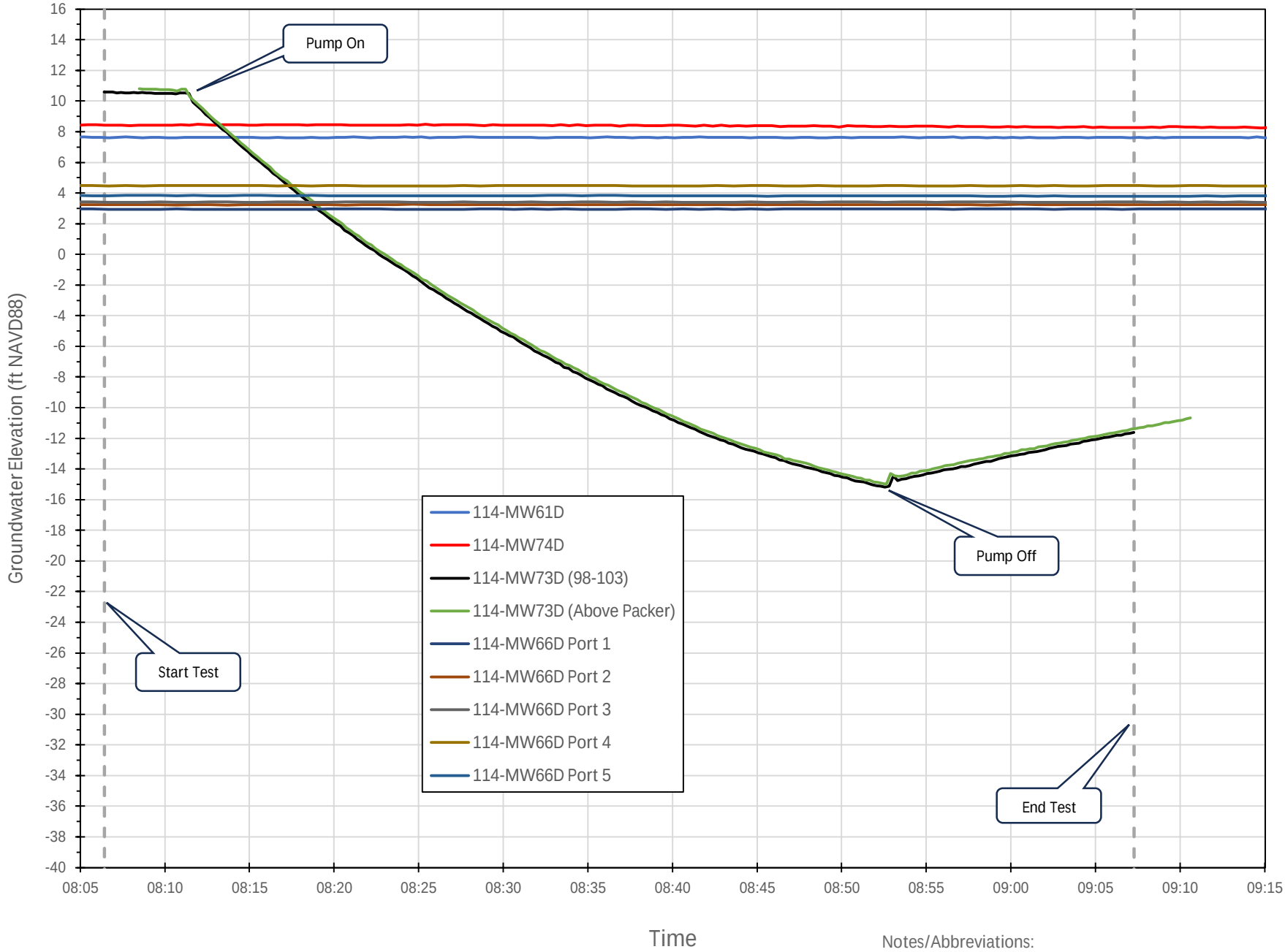
FIGURE A3-3
Packer Test Data - 114-MW73D (93-98)



Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A3-4

Packer Test Data - 114-MW73D (98-103)

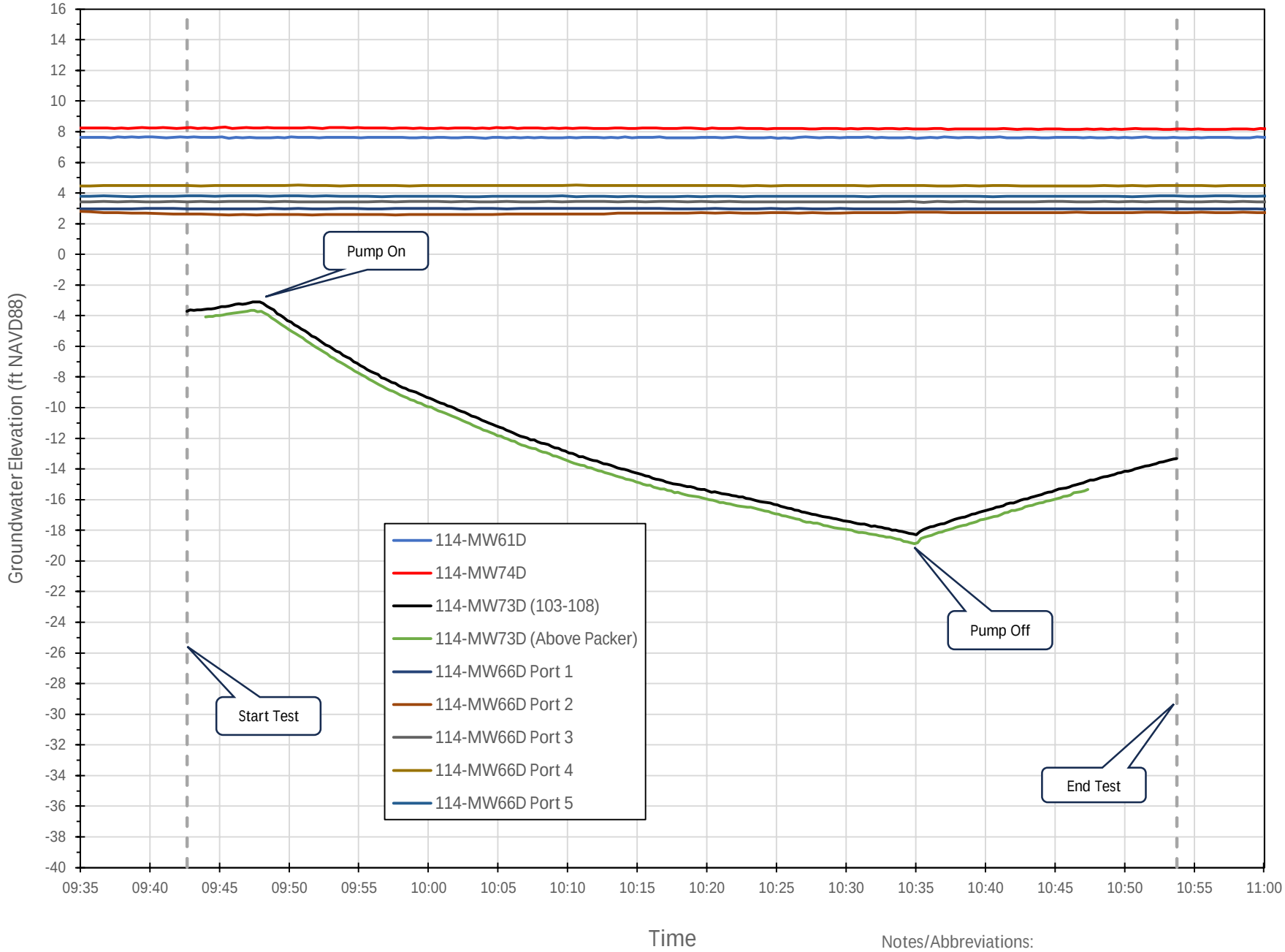


Notes/Abbreviations:

ft NAVD88 = Feet North American Vertical Datum of 1988

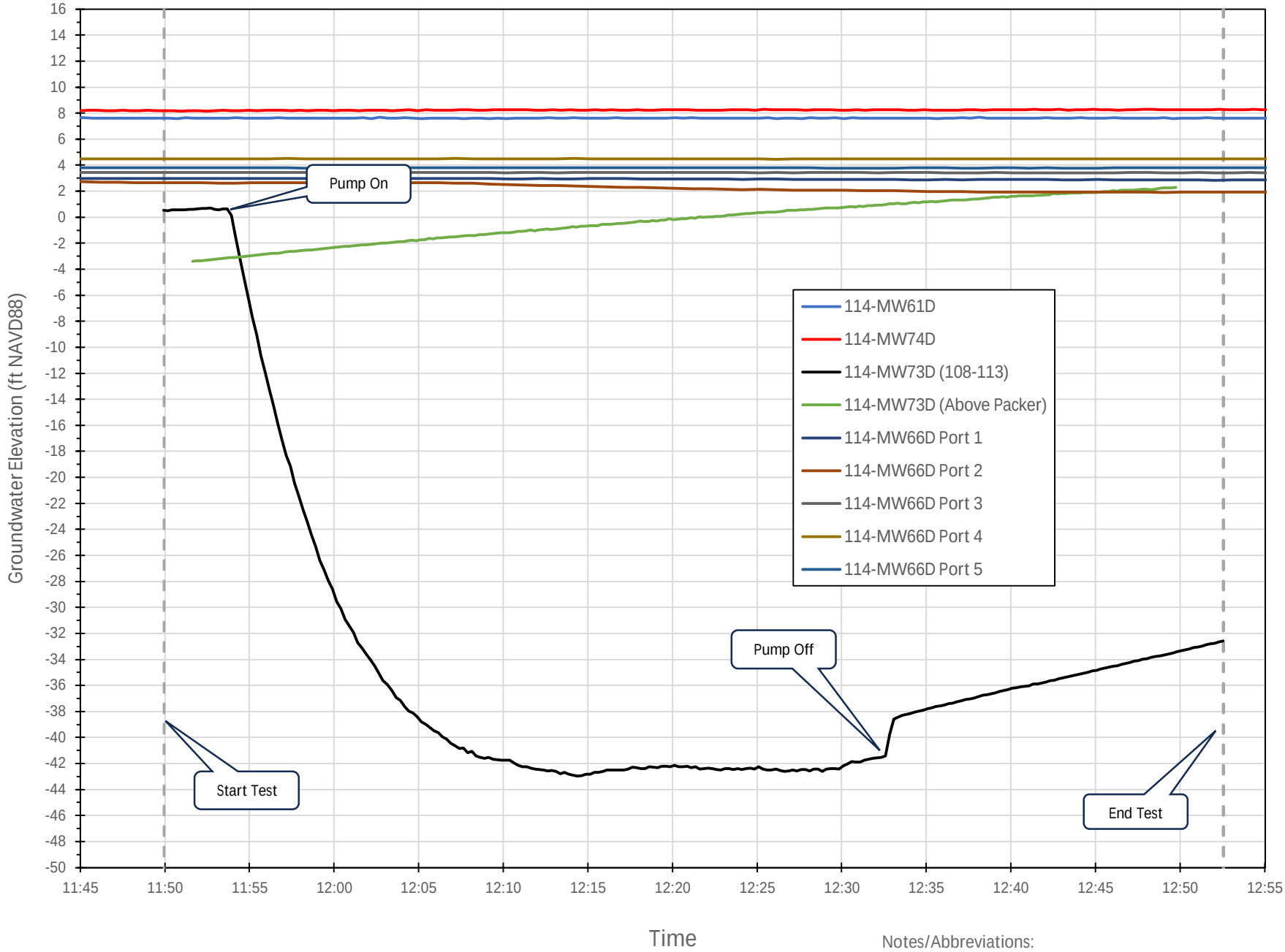
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A3-5
Packer Test Data - 114-MW73D (103-108)



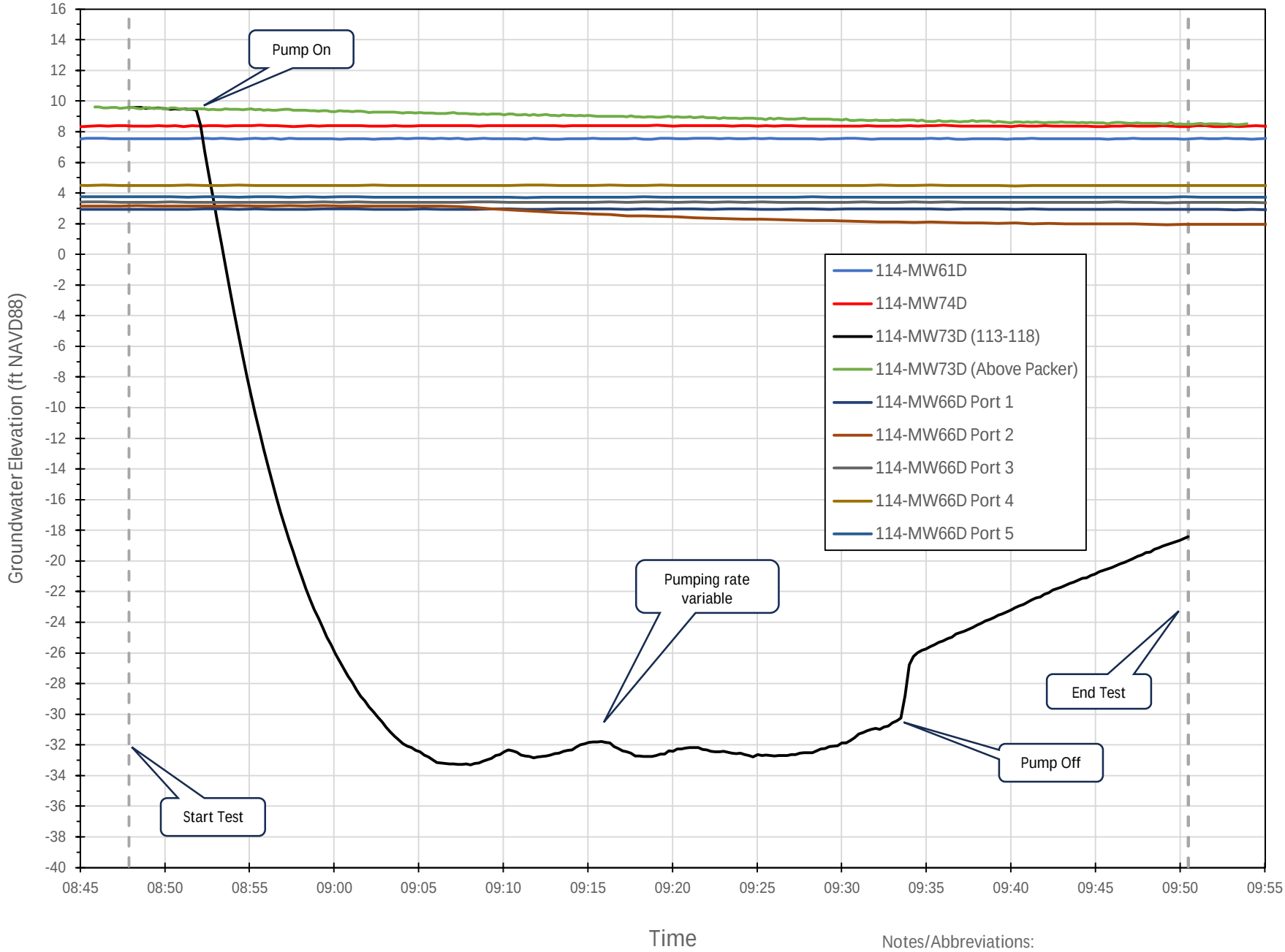
Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A3-6
Packer Test Data - 114-MW73D (108-113)



Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A3-7
Packer Test Data - 114-MW73D (113-118)



Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A3-8

Groundwater Elevation Response at 114-MW74D During Tests at 114-MW73D

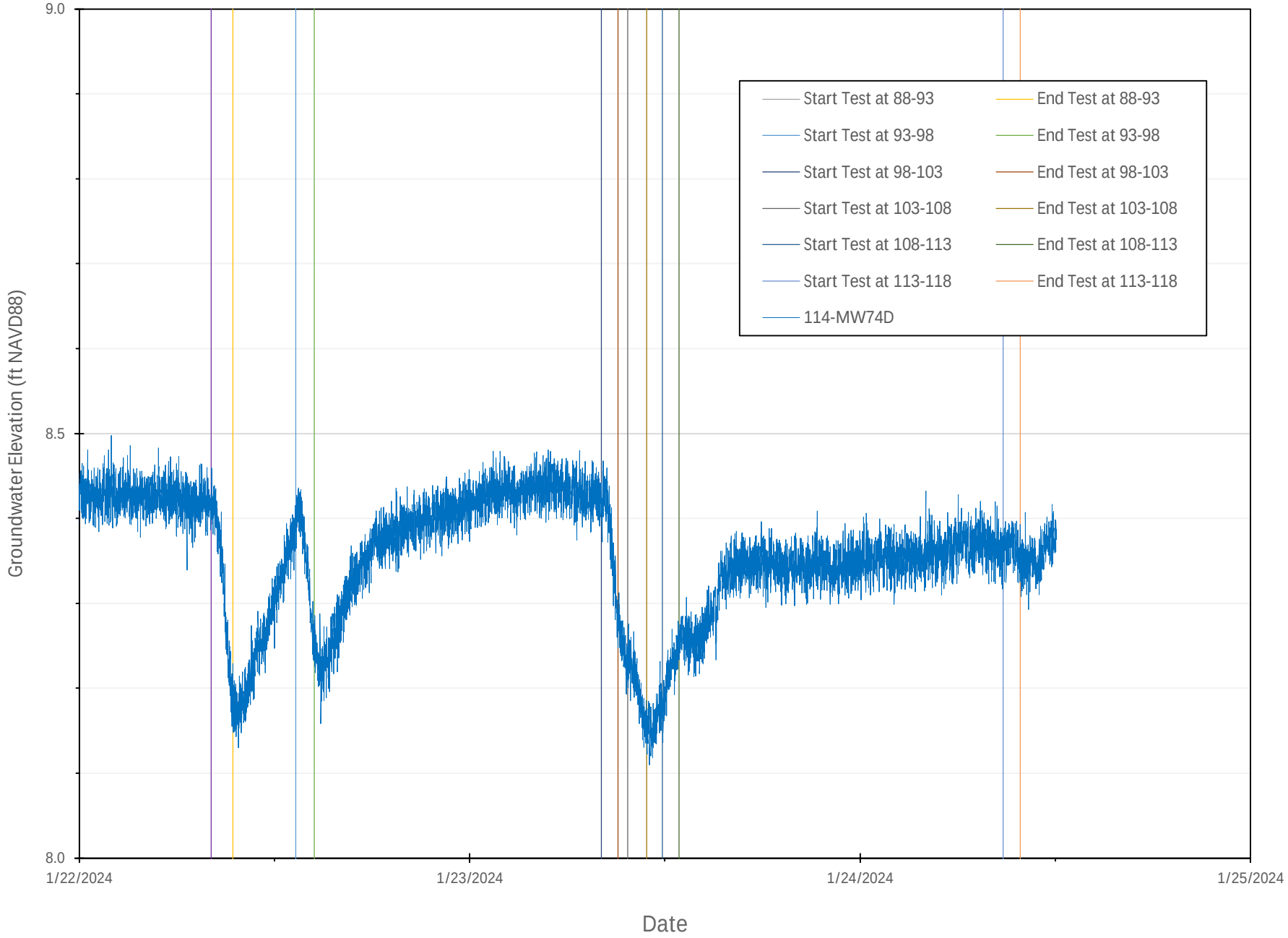


FIGURE A3-9

Groundwater Elevation Response at 114-MW61D During Tests at 114-MW73D

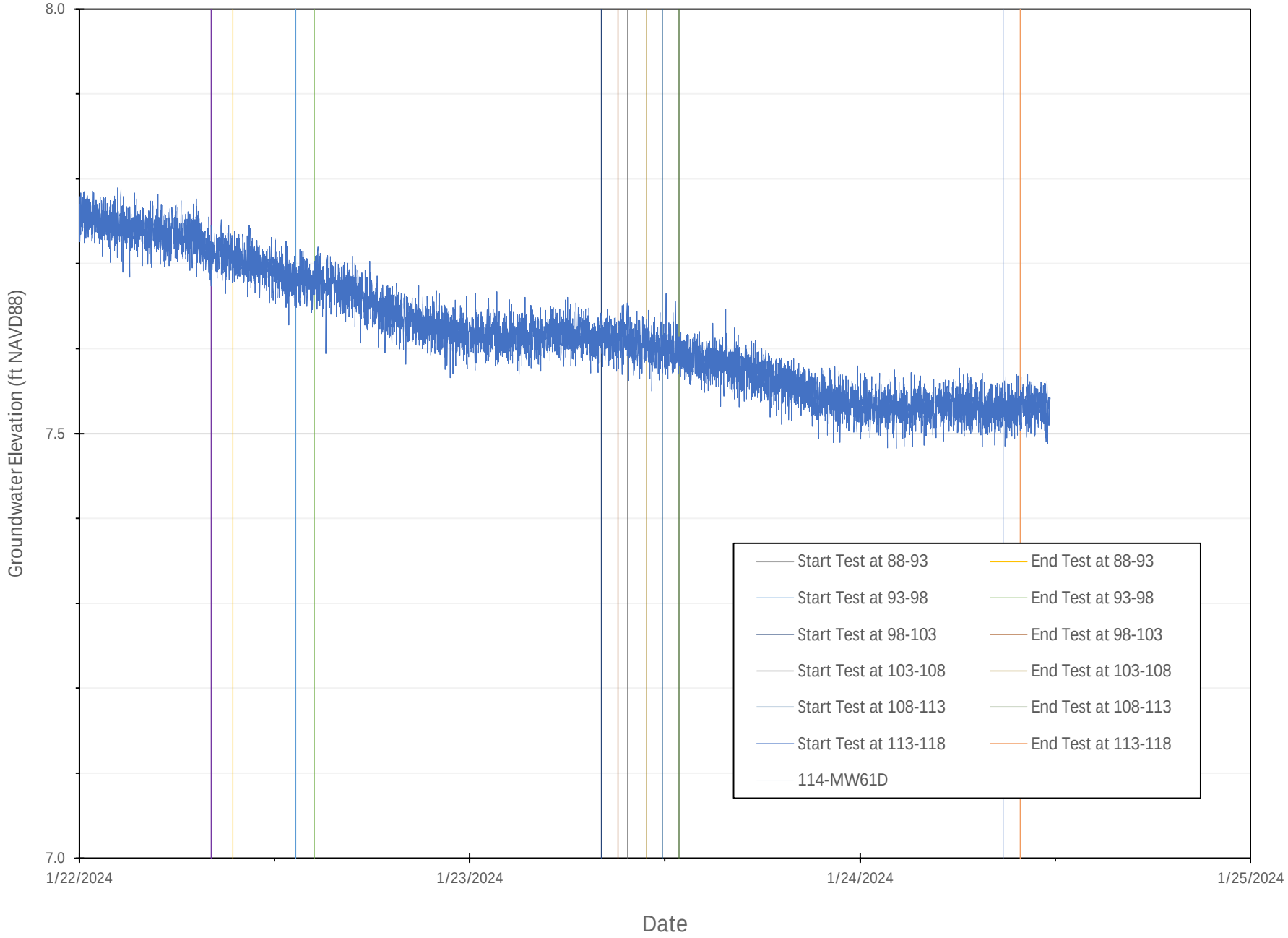
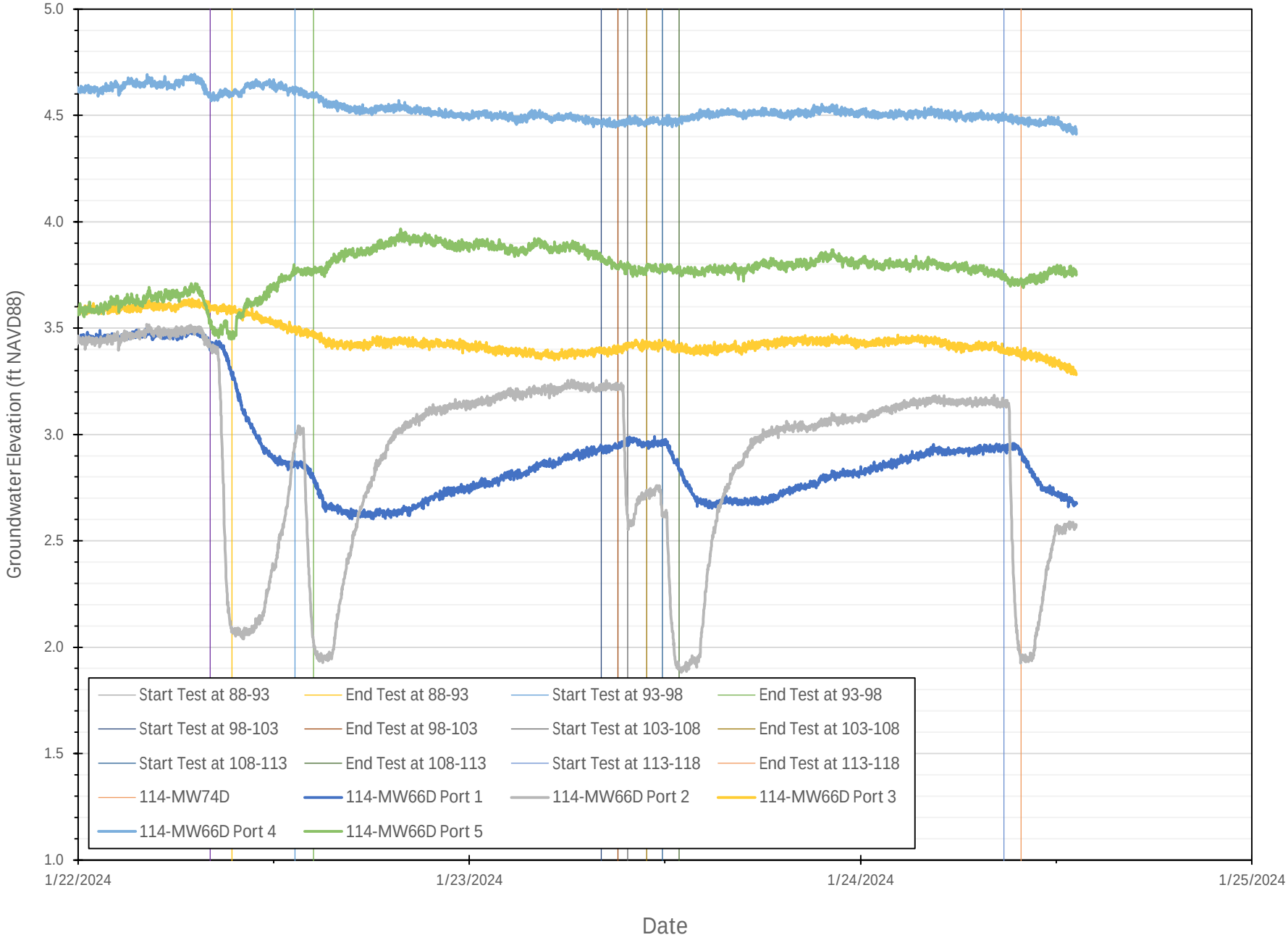


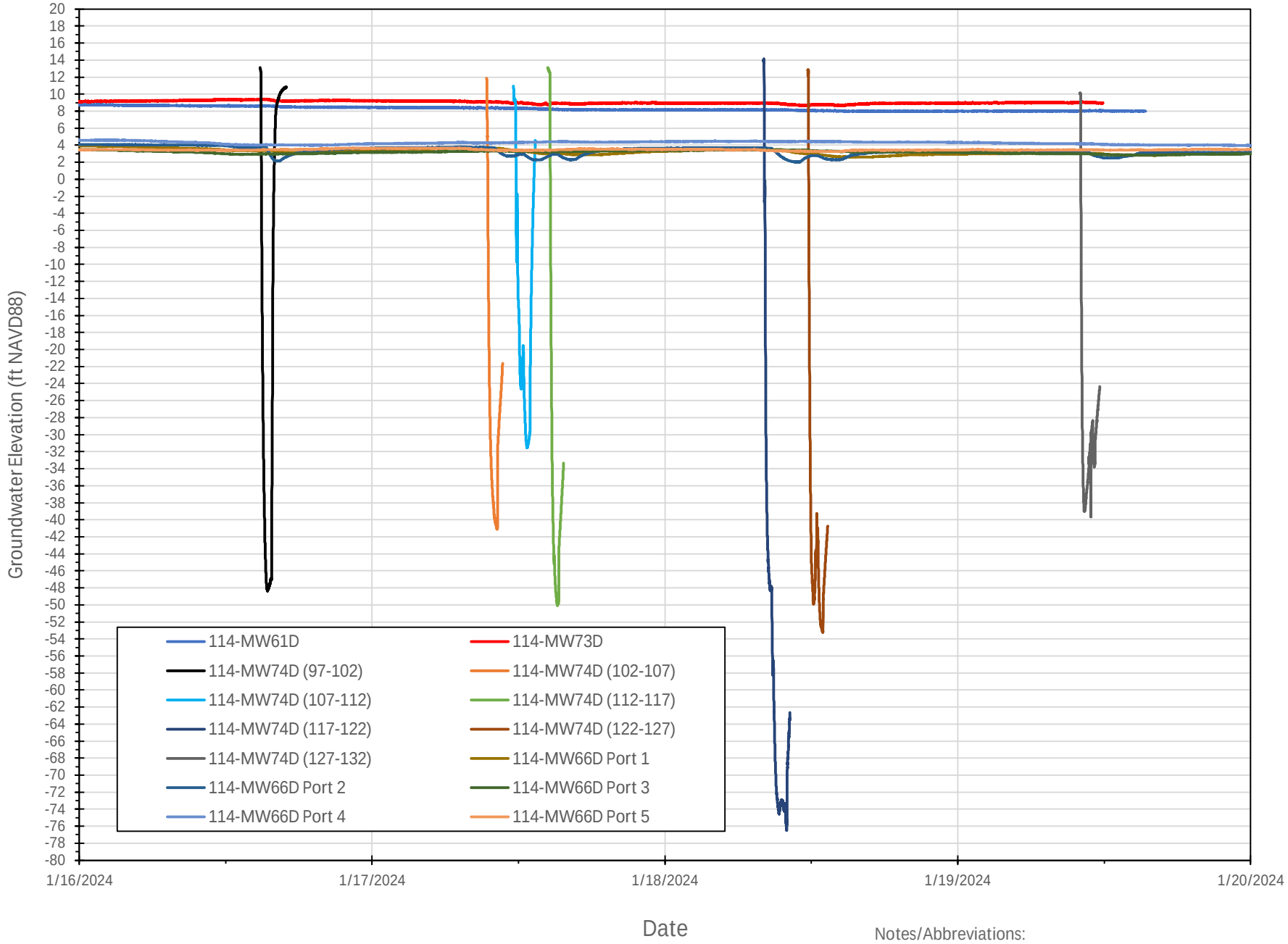
FIGURE A3-10

Groundwater Elevation Response at 114-MW66D During Tests at 114-MW73D



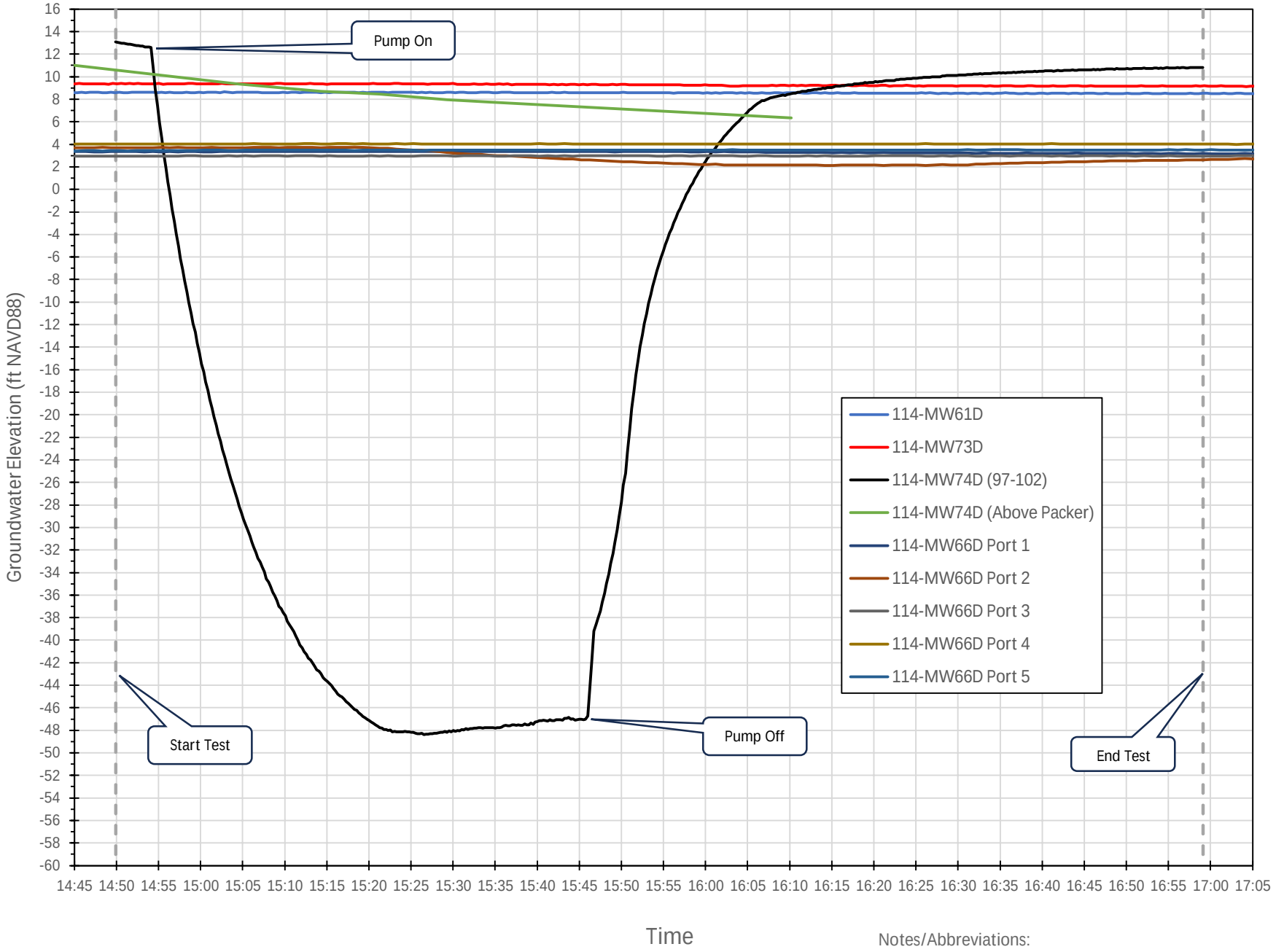
Attachment 4
Hydraulic Monitoring Data During Packer Testing at 114-MW74D

FIGURE A4-1
Packer Test Data - 114-MW74D



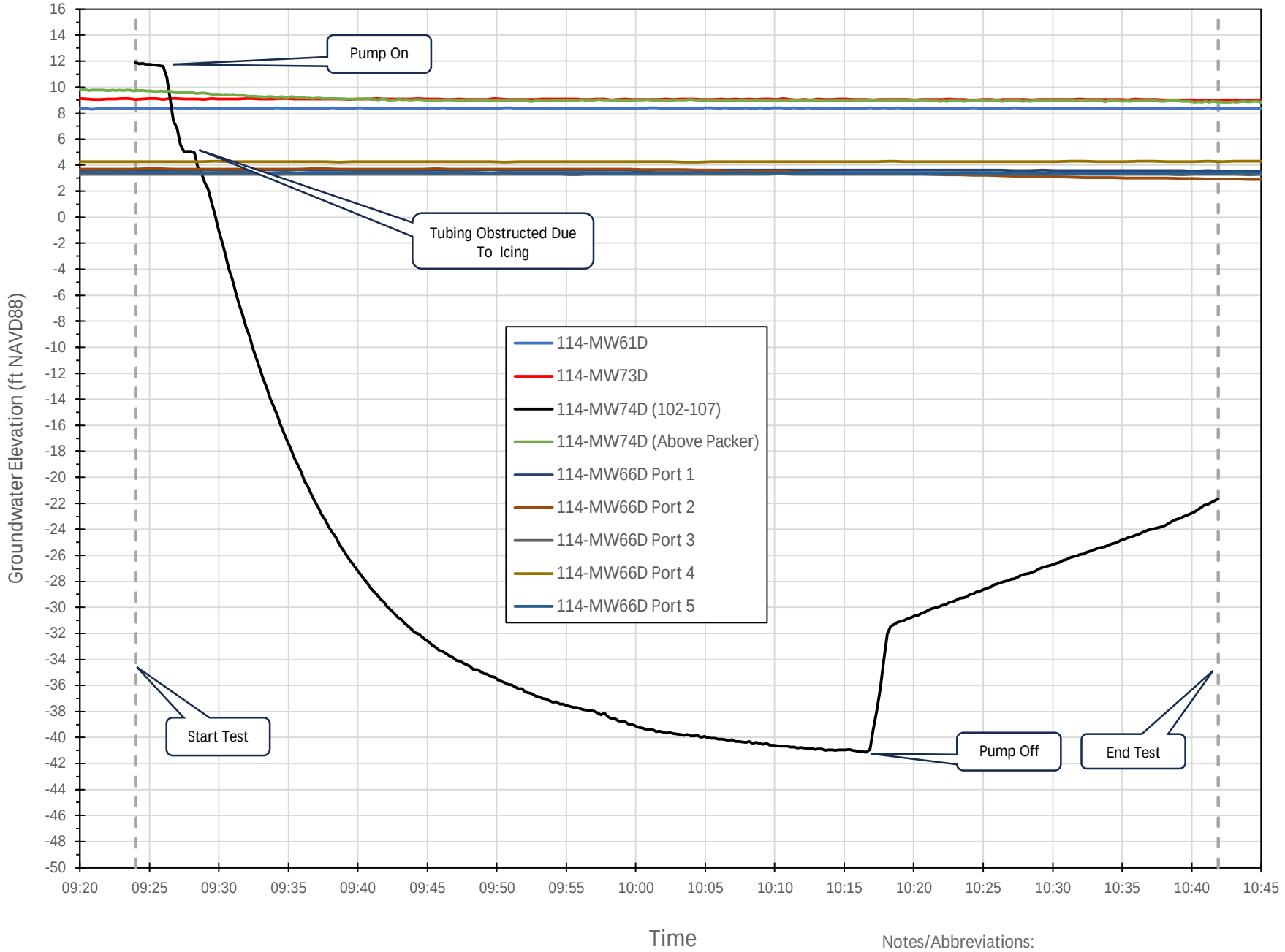
Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A4-2
Packer Test Data - 114-MW74D (97-102)



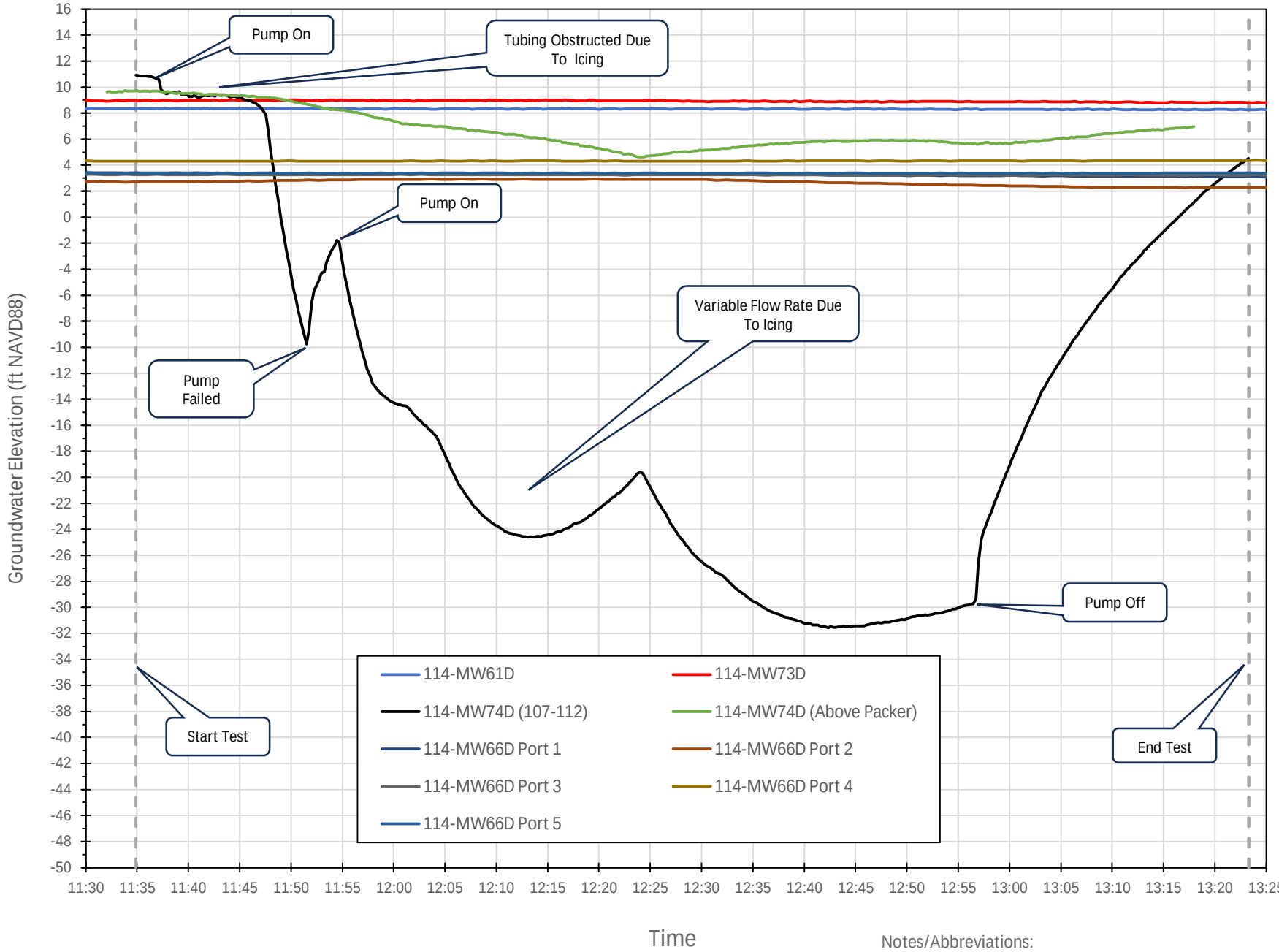
Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A4-3
Packer Test Data - 114-MW74D (102-107)



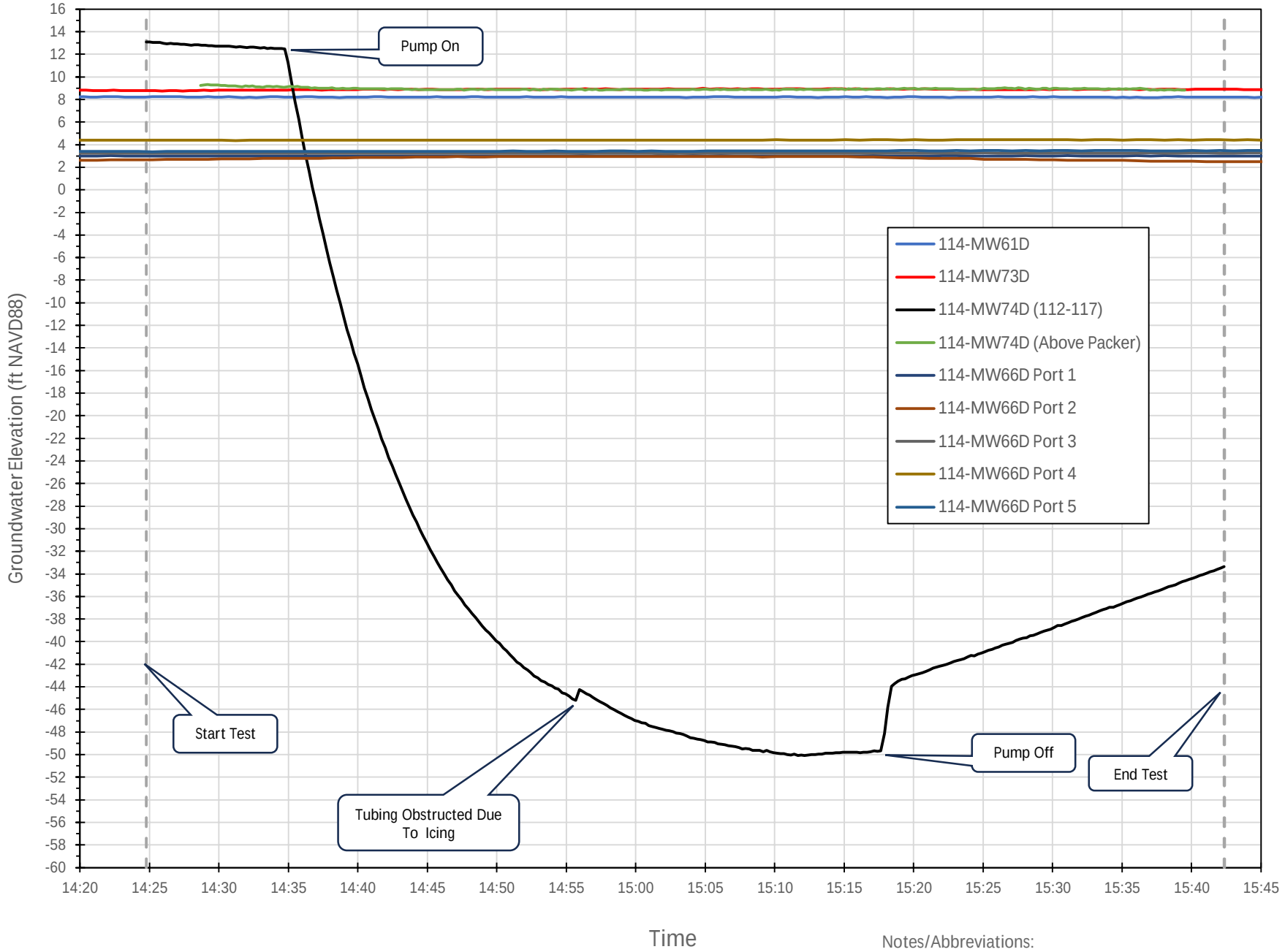
Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A4-4
Packer Test Data - 114-MW74D (107-112)



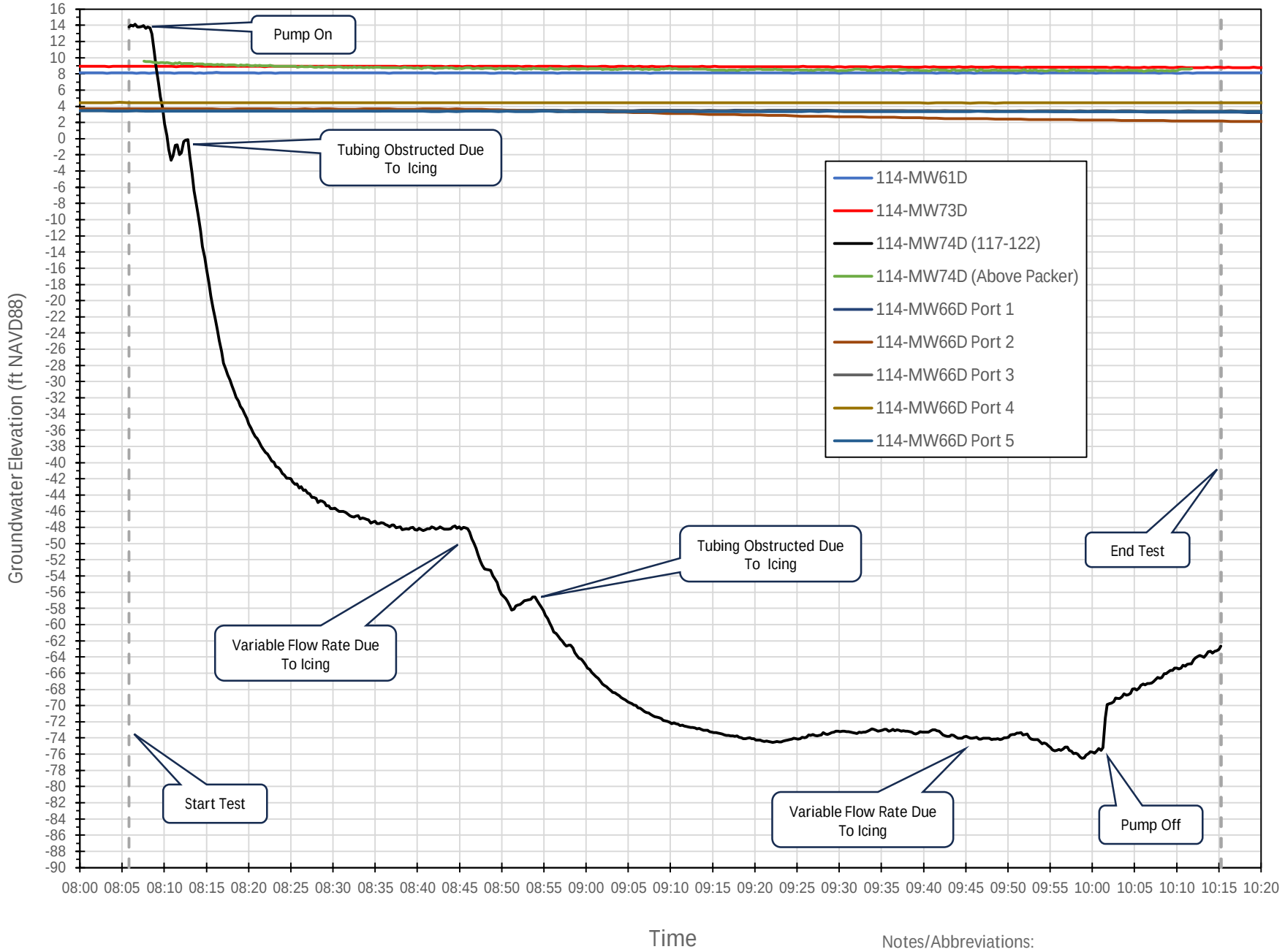
Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A4-5
Packer Test Data - 114-MW74D (112-117)



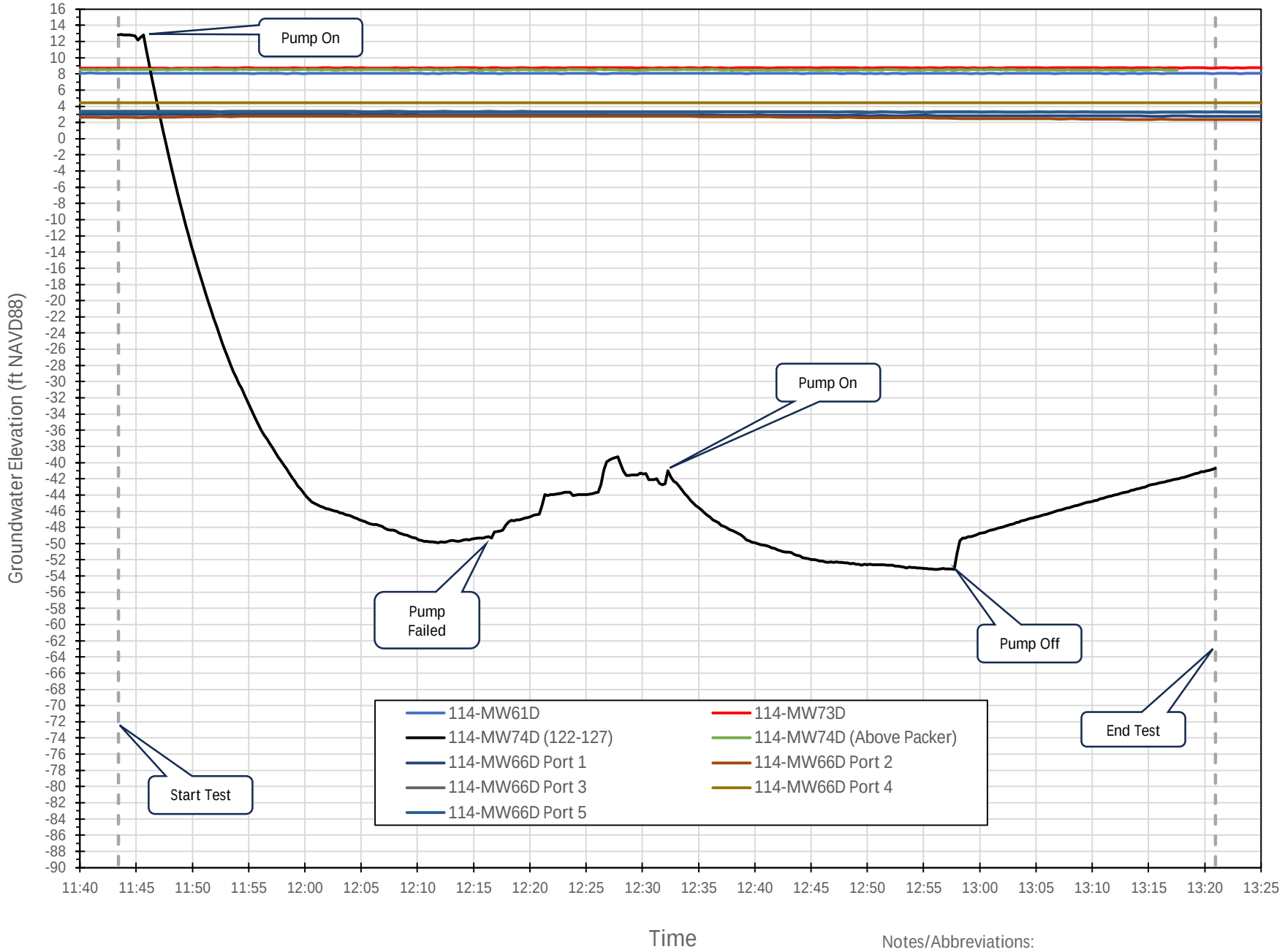
Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A4-6
Packer Test Data - 114-MW74D (117-122)



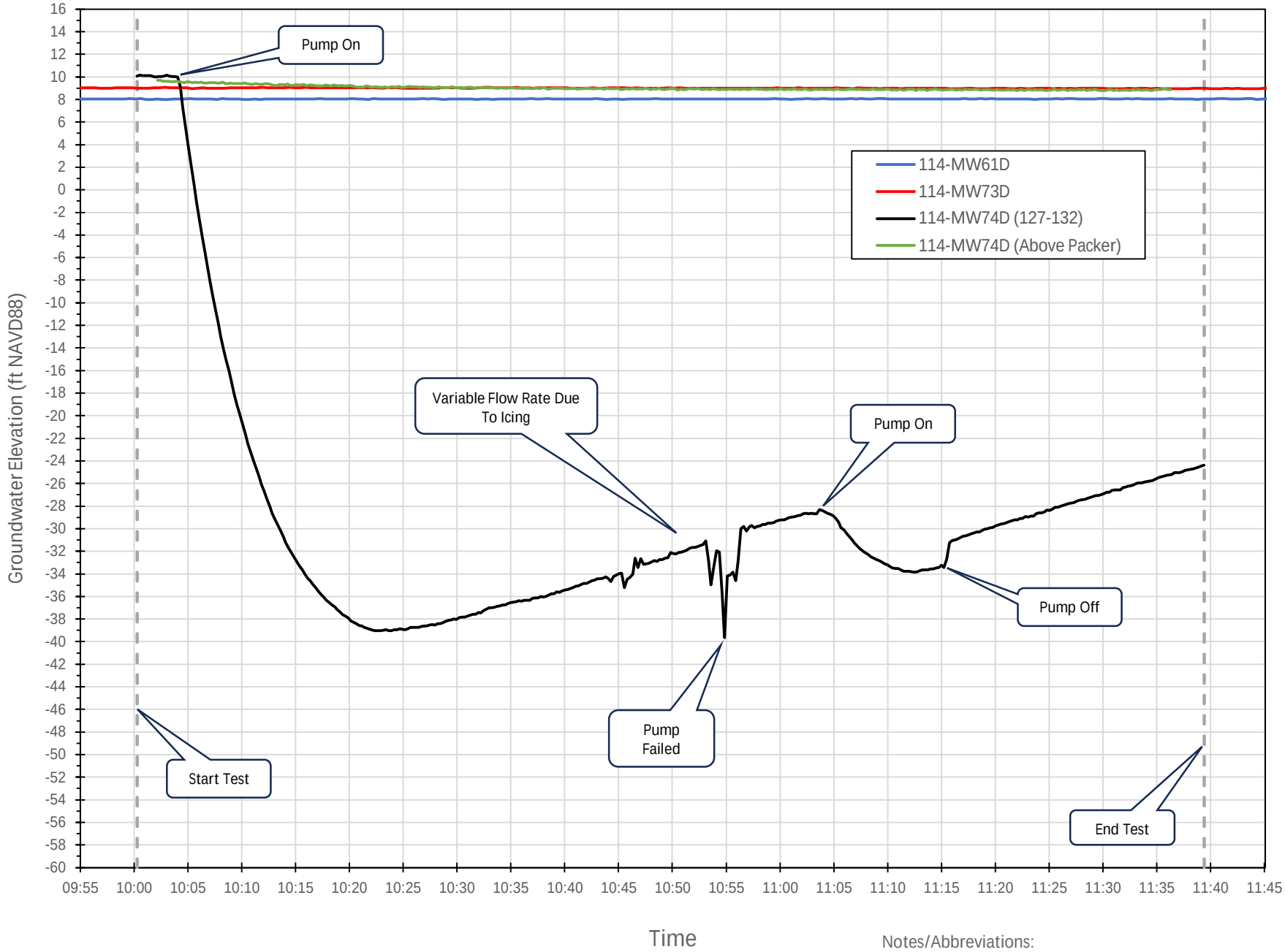
Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A4-7
Packer Test Data - 114-MW74D (122-127)



Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A4-8
Packer Test Data - 114-MW74D (127-132)



Notes/Abbreviations:
ft NAVD88 = Feet North American Vertical Datum of 1988
Numbers in parentheses indicate the depth of the packer test interval.

FIGURE A4-9

Groundwater Elevation Response at 114-MW73D During Tests at 114-MW74D

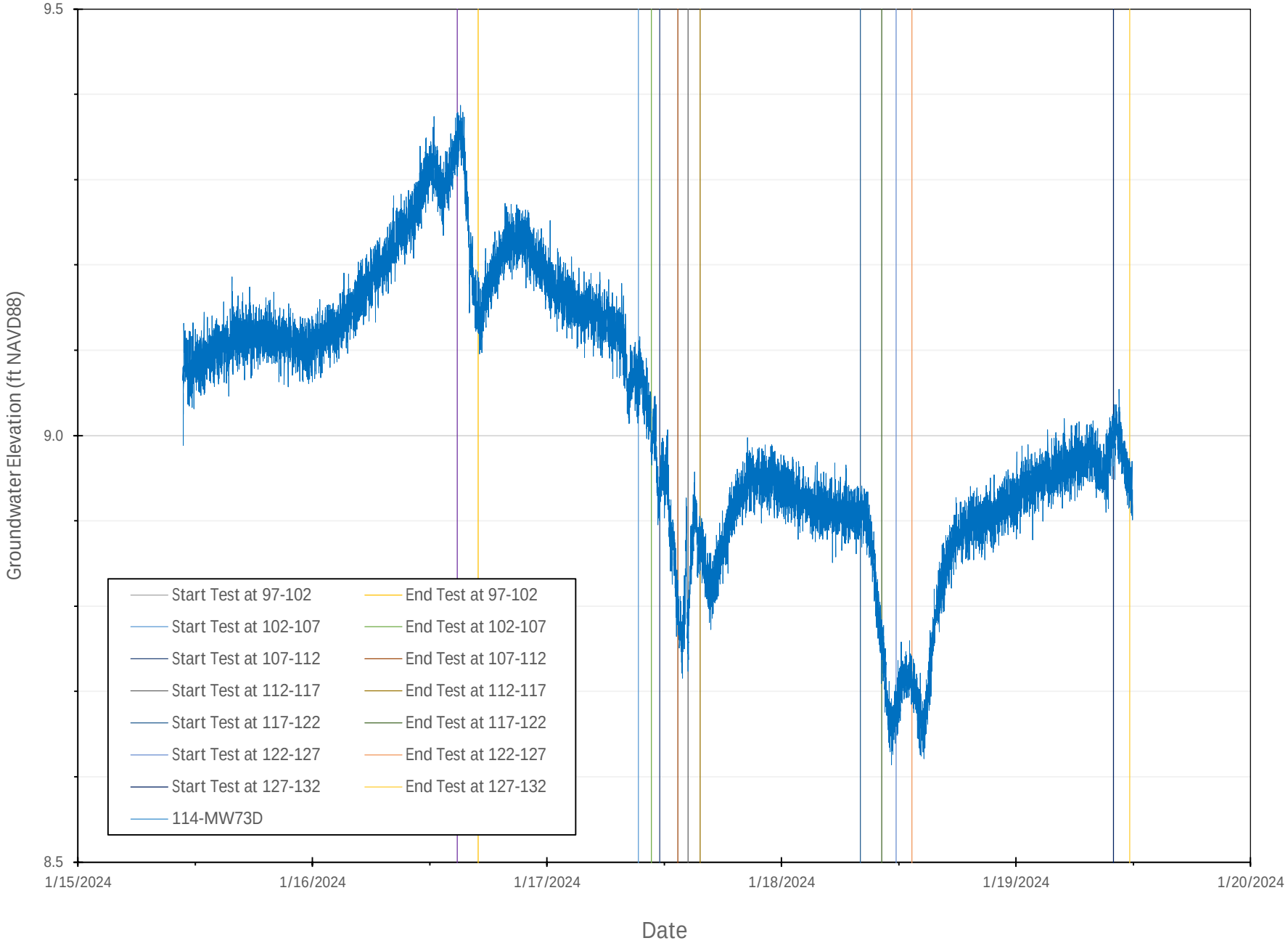


FIGURE A4-10
Groundwater Elevation Response at 114-MW61D During Tests at 114-MW74D

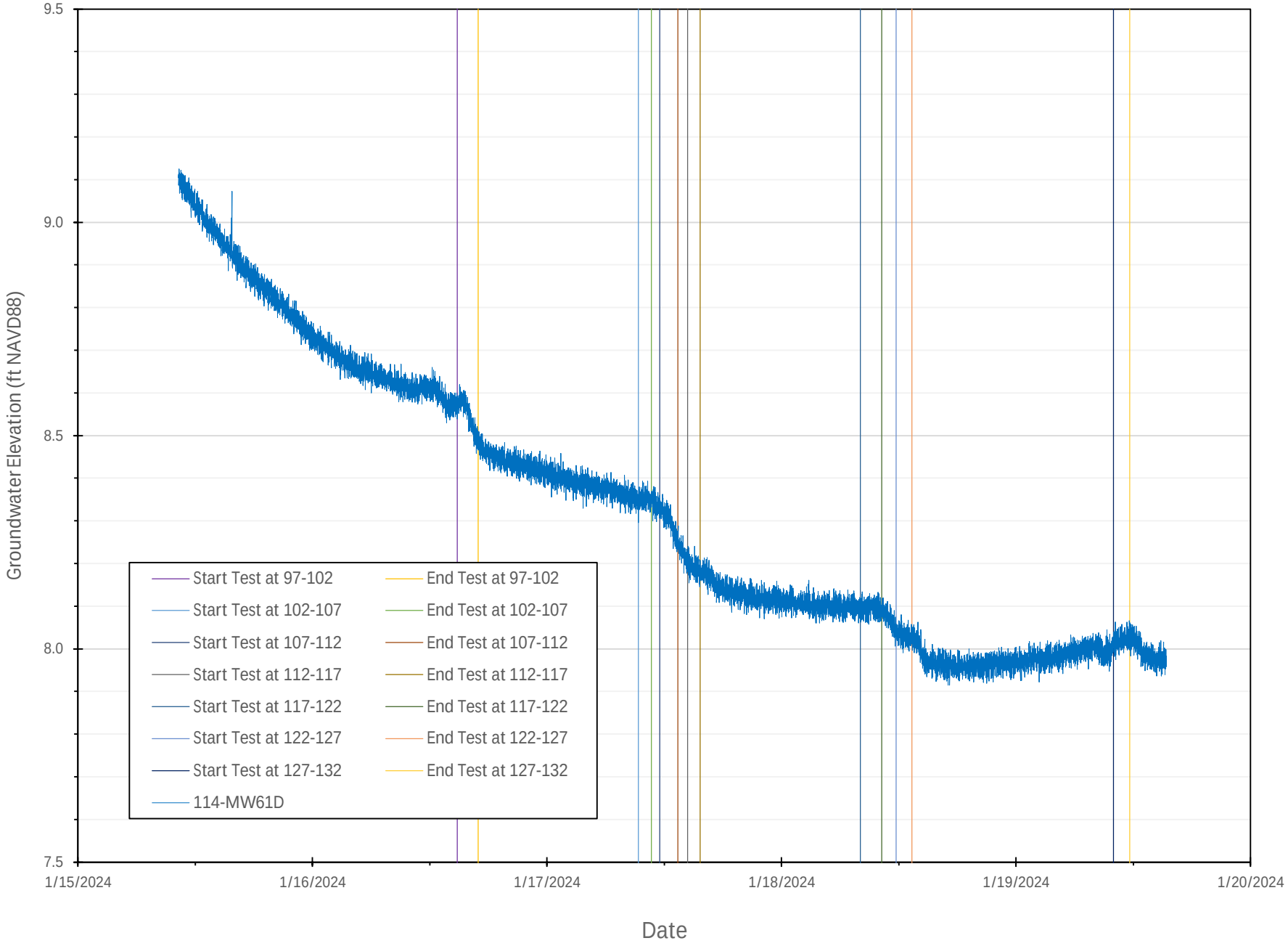
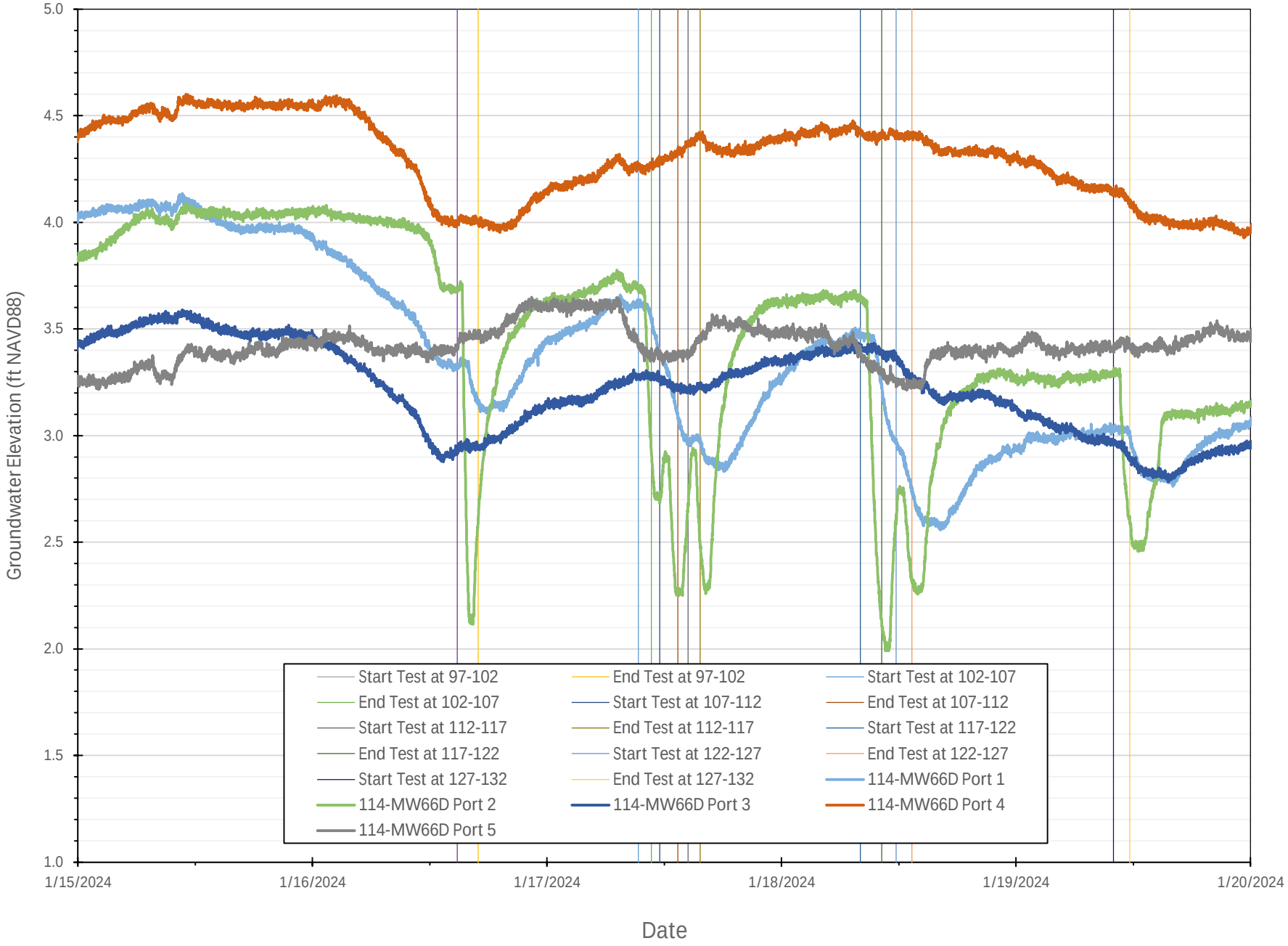
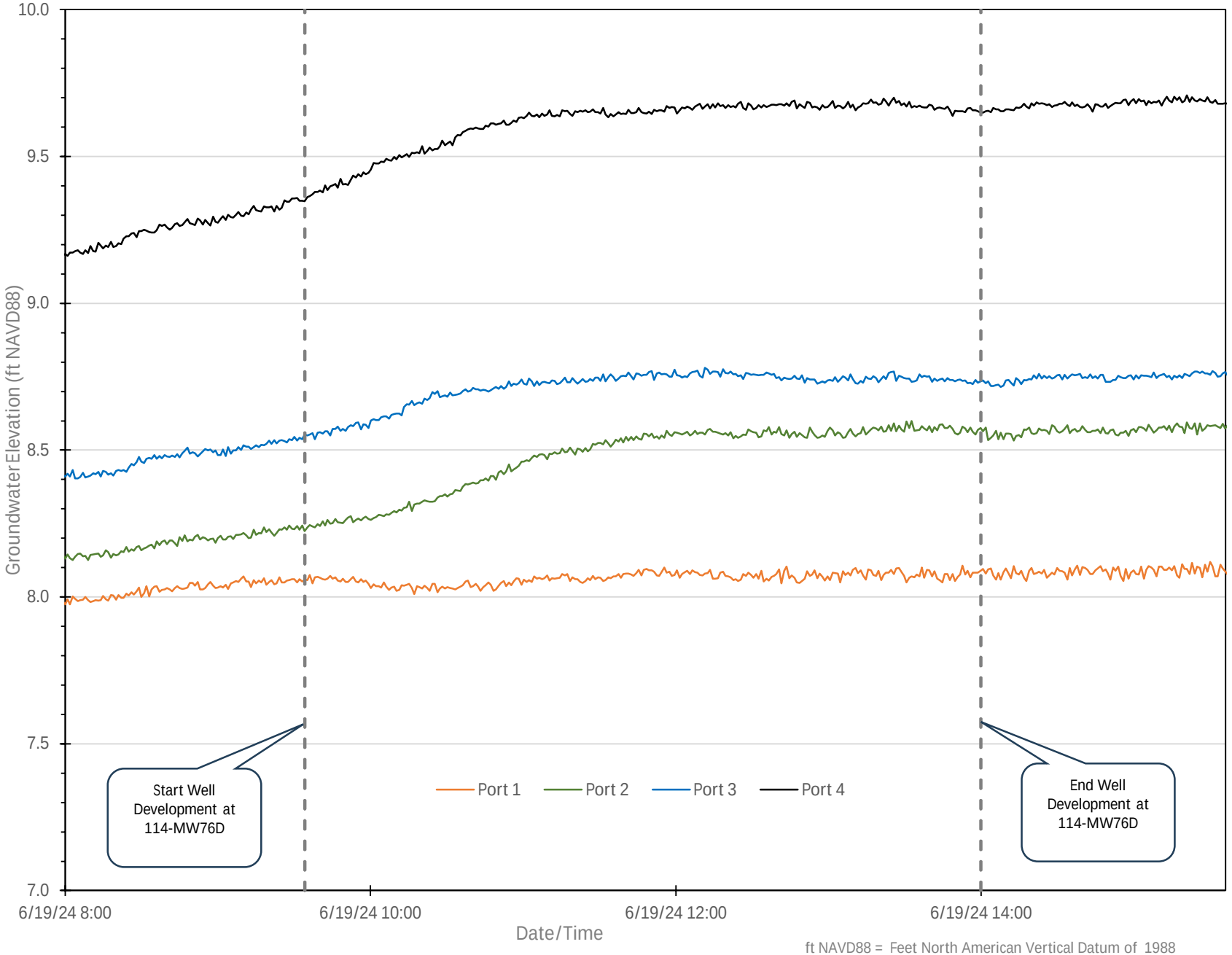


FIGURE A4-11
Groundwater Elevation Response at 114-MW66D During Tests at 114-MW74D



Attachment 5
Hydraulic Monitoring Data at 114-MW72D
During Development at 114-MW76D

FIGURE A5-1
Groundwater Elevation Response at 114-MW72D During Well Development at 114-MW76D



ft NAVD88 = Feet North American Vertical Datum of 1988

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Technical Memorandum

To	Brianne Hastings	Page 1
CC	Shannon Gleason	
Subject	Summary of Well Development, Pump Testing, Packer Testing, and Hydraulic Monitoring Results at wells 114-MW72D, 114-MW76D, and 114-MW81D Bedrock Groundwater Remedial Investigation Garfield Avenue Group Sites, City of Jersey City, Hudson County, New Jersey	
From	Frederik Schuele, Elizabeth Perry, Megan Clark	
Date	March 13, 2025	

Introduction

This Technical Memorandum presents the results of well development, pump testing, packer testing, and hydraulic monitoring conducted at wells 114-MW72D, 114-MW76D, and 114-MW81D as part of the bedrock groundwater Remedial Investigation (RI) at the Garfield Avenue (GA) Group Sites in Jersey City, New Jersey (the Site).

Background

Bedrock groundwater investigation activities have been conducted at the Site since 2006 to support completion of the RI as prescribed in the New Jersey Department of Environmental Protection (NJDEP) Technical Requirements for Site Remediation (NJDEP, 2018) and associated NJDEP technical guidance. Four bedrock wells (114-MW4D, 114-MW6D, 114-MW7D, and 114-MW16B) were installed during RI activities conducted in 2006 and 2007 and four bedrock wells (114-MW52D, 114-MW57D, 114-MW61D, and 114-MW66D) were installed during RI activities conducted in 2020 and 2021. Later in 2021 and in 2022, two additional bedrock wells were installed (114-MW71D and 114-MW72D) and existing bedrock wells 114-MW4D, 114-MW-61D, and 114-MW66D were deepened. Additional activities related to these bedrock investigations included well development, borehole geophysical logging, groundwater elevation gauging, groundwater sampling, hydraulic testing, and installation of multi-port water FLUTe systems at open borehole bedrock wells 114-MW4D, 114-MW52D, 114-MW57D, 114-MW66D, and 114-MW72D. A summary of well details is provided in **Table 1** and well locations are shown on **Figure 1**.

Results, findings, and conclusions pertaining to the bedrock groundwater investigation completed through 2022 are presented in the *Addendum to Groundwater Remedial Investigation Report and Groundwater Remedial Action Work Plan for Bedrock Water-Bearing Zone* (AECOM, 2023). Comments provided by the NJDEP on this document indicated that to complete the RI for the bedrock water-bearing zone, the direction of groundwater flow in the Lockatong Formation must be determined from potentiometric heads collected at three wells completed in the Lockatong Formation and shown to be hydraulically connected. In addition, the Department indicated that a new bedrock well must be installed south of well 114-MW72D to complete the delineation of the total chromium (Cr) plume in the bedrock water-bearing zone. The delineation would be deemed

complete if the new well exhibited Cr concentrations below the 70 micrograms per liter (µg/L) groundwater quality standard for Cr and if the well was shown to be hydraulically connected to 114-MW72D.

Pursuant to these comments, two bedrock boreholes (114-MW73D and 114-MW74D) were completed in December 2023/January 2024 to allow for evaluation of the direction of groundwater flow within the Lockatong Formation in the area around well 114-MW66D. In addition, well 114-MW76D was installed in June 2024 in an effort to complete delineation of the Cr plume within the Lockatong Formation south of well 114-MW72D. Results of the hydraulic testing completed at these wells are presented in the Technical Memorandum *Summary of Well Development, Packer Testing, and Hydraulic Monitoring Results for wells 114-MW61D, 114-MW66D, 114-M72D, 114-MW73D, and 114-MW76D* (AECOM, 2025a). The memorandum concludes the following:

- the prevailing directions of groundwater flow within the Lockatong Formation were determined to be to the south/southwest along bedding strike and to the west down bedding dip due to the anisotropy in the bedrock, and
- 114-MW76D is not hydraulically connected to 114-MW72D.

Groundwater quality samples collected from 114-MW76D indicate that concentrations of Cr at this well are below 70 µg/L.

The findings of the hydraulic testing and the groundwater quality results from 114-MW76D were discussed with NJDEP during a technical meeting held on September 12, 2024. During the meeting, NJDEP requested that one more bedrock well be installed along Lockatong Formation bedding strike between 114-MW72D and 114-MW76D to complete delineation of the Cr plume in the bedrock water-bearing zone. The Department indicated that delineation would be deemed complete if the new well exhibited Cr concentrations below the 70 µg/L groundwater quality standard for Cr and if the well was shown to be hydraulically connected to 114-MW72D. However, the Department further noted that if a hydraulic connection between the new well and 114-MW72D could not be established but the Cr concentrations at the new well were below 70 µg/L, then a variance from the clean point delineation requirement could be requested to complete the bedrock RI and no additional bedrock well installations would be required. Lastly, the Department noted that extrapolation of the 70 µg/L Cr contour in bedrock beneath and south of 114-MW72D based on available information would be appropriate for completion of the bedrock RI.

The location and scope of the investigation for the new bedrock well were also discussed during the September 12, 2024 meeting. Based on these discussions, the well location was selected, and it was agreed that a combination of pump testing, packer testing, and hydraulic monitoring would be used to evaluate for hydraulic connection between the new well and wells 114-MW72D and 114-MW76D. This technical memorandum describes the field work and data collection activities that were completed pursuant to the scope of work agreed upon during the September 12, 2024 meeting. In addition, the collected data are presented and discussed, and findings and conclusions based on the data are presented.

Field Activities

Field activities related to the pump test, packer testing, and hydraulic monitoring programs are presented below.

Bedrock Well Installation

One open borehole bedrock well (114-MW81D) was completed in the Lockatong Formation from November 14, 2024 to November 21, 2024. Well details are presented in **Table 1** and the well location is shown on **Figure 1**. Drilling and well installation activities were performed in accordance with N.J.A.C. 7:9D by a New Jersey (NJ)-licensed driller. Continuous soil logging from the ground surface to the top of bedrock was completed using sonic drilling. Upon reaching the top of bedrock, cores of the rock were collected using sonic drilling. A boring log with well construction details is presented in Appendix B of the *Addendum to Groundwater Remedial Investigation Report and Groundwater Remedial Action Work Plan for Bedrock Water-Bearing Zone* (AECOM, 2025b).

Well Development, Pump Test, and Hydraulic Monitoring at 114-MW72D and 114-MW76D

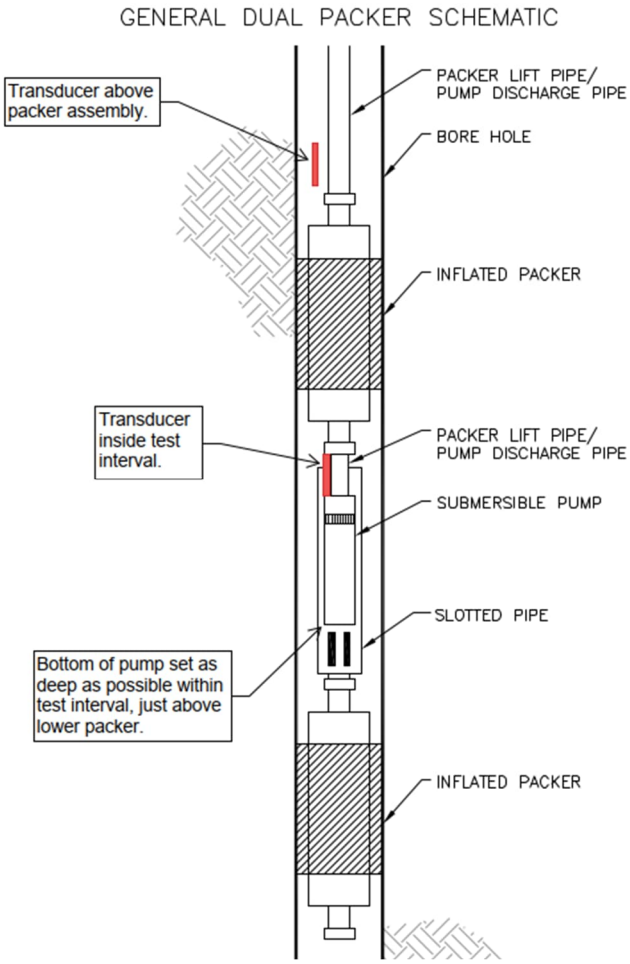
Upon completion of installation, well 114-MW81D was developed in accordance with the FSP-QAPP (AECOM, 2010). Well development activities were conducted on November 22, 2024. A pump test was performed at well 114-MW81D on November 25, 2024 during which the well was pumped for a period of three hours at flow rates ranging from 0.25 to 1.3 gallons per minute. The flow rate declined during the pump test in response to the continuously dropping water level in the pumping well. The starting depth to water at 114-MW81D was 9.87 feet below top of well casing and the final depth to water at the end of the pump test was 60.88 feet below top of well casing; the water level never stabilized.

Groundwater elevation data collected from the FLUTe ports at 114-MW72D and from the open borehole at 114-MW76D during well development and pump testing at 114-MW81D were used to evaluate for potential hydraulic connection between 114-MW72D and 114-MW81D and between 114-MW76D and 114-MW81D, respectively. Continuous water level response data were collected from each FLUTe port at 114-MW72D using Air Coupled Transducers (ACTs). The ACTs were installed at 114-MW72D by FLUTe and were programmed to collect readings at 2-minute intervals. A vented Level Troll 700 pressure transducer, provided by In-Situ, Inc. of Fort Collins, CO, was used to collect continuous water level data at well 114-MW76D. The transducer was deployed at 114-MW76D on November 21, 2024 and programmed to collect readings at 1-minute intervals.

Packer Testing and Hydraulic Monitoring

Packer testing was performed from December 4 to December 6, 2024 at well 114-MW81D to evaluate potential hydraulic connection between 114-MW81D and wells 114-MW76D and 114-MW72D. A dual packer assembly was used to isolate 5-foot intervals within the open boreholes at 114-MW81D for testing, as illustrated in the schematic below. The packer assembly allowed for deployment of a pump within the test interval. The first test interval started at the top of the open borehole, just below the bottom of the steel casing. The following intervals were tested at 114-MW81D (in feet below ground surface):

- 114-MW81D: 100-105, 105-110, 110-115, 115-120, and 120-125



For each test, the packers were inflated to isolate the test interval and the pump was activated to remove water from the test interval and induce drawdown within the isolated portion of the borehole. Observations noted during testing included pumping rates, packer pressure, depth to water readings, color of the purge water, and volume of water pumped from the well. Tests were terminated when drawdown in the isolated portion of the borehole stabilized or approached stabilization. Water generated from the packer testing program was containerized at the point of generation and disposed of at the groundwater treatment plant on Site 114. Field forms completed during each test are included in **Attachment 1**.

During packer testing, vented Level Troll 700 pressure transducers, provided by In-Situ, Inc. of Fort Collins, CO, were used to collect continuous water level data. A transducer was deployed within the packer assembly to monitor changes in water level in the test interval and a transducer was deployed above the packer assembly to monitor changes in water level above the test interval (see schematic above). Continuous water level readings within and above the packer assembly were collected at 15-second intervals. The transducer deployed at 114-MW76D, and the ACTs installed in the FLUTe ports at 114-MW72D, were used to monitoring water level changes during the packer testing program.

Upon completion of the packer testing, the ACTs were removed from 114-MW72D and shipped to FLUTe for data downloading and processing. The final dataset provided to AECOM by FLUTe was used to develop a graph of the water level response for each sample port at 114-MW72D during the packer testing program. The transducer at 114-MW76D was removed on December 6, 2024 and these data were used to develop a graph of the water level response at 114-MW76D during the packer testing program.

Results

Results of the well development, pump test, packer testing, and hydraulic monitoring program are presented below.

Well Development and Hydraulic Monitoring at 114-MW72D and 114-MW76D

Graphs depicting continuous water level data collected at 114-MW72D and 114-MW76D during development at well 114-MW81D are included in **Attachment 2**. These graphs were used to evaluate whether, or not, a hydraulic connection exists between the wells. Results of the data evaluation are presented on **Table 2**.

Pump Test and Hydraulic Monitoring at 114-MW72D and 114-MW76D

Graphs depicting continuous water level data collected at 114-MW72D and 114-MW76D during pump testing at well 114-MW81D are included in **Attachment 2**. These graphs were used to evaluate whether, or not, a hydraulic connection exists between the wells. Results of the data evaluation are presented on **Table 2**.

Packer Testing

Graphs depicting continuous water level data collected at wells 114-MW72D and 114-MW76D, and for each test interval during packer testing at 114-MW81D are included in **Attachment 3**. These graphs were used to evaluate whether, or not, a hydraulic connection exists between the wells. Results of the data evaluation are presented on **Table 3**. Pumping rates and volumes pumped during the packer testing at 114-MW81D are presented on **Table 4**.

Findings and Conclusions

The following findings and conclusion are based on the results of the well development, pump test, packer testing, and hydraulic monitoring programs described above:

- Based on hydraulic monitoring data collected at 114-MW72D and 114-MW76D during well development and pump testing at 114-MW81D, there is no hydraulic connection between these wells.
- Based on hydraulic monitoring data collected at 114-MW72D and 114-MW76D during packer testing at 114-MW81D, there is no hydraulic connection between these wells.

References

AECOM, 2010. *Updated Field Sampling Plan-Quality Assurance Field Sampling Plan / Quality Assurance Project Plan Non-Residential Chromium Sites, Hudson County, New Jersey.* June 2010.

AECOM, 2023. *Addendum to Groundwater Remedial Investigation Report and Groundwater Remedial Action Work Plan for Bedrock Water-Bearing Zone.* PPG Garfield Avenue Group, Hudson County Chromium Sites, Jersey City, New Jersey. March 2023.

AECOM, 2025a. *Summary of Well Development, Packer Testing, and Hydraulic Monitoring Results for wells 114-MW61D, 114-MW66D, 114-M72D, 114-MW73D, and 114-MW76D*. Bedrock Groundwater Remedial Investigation, Garfield Avenue Group Sites, City of Jersey City, Hudson County, New Jersey. January 2025.

AECOM, 2025b. *Addendum to Groundwater Remedial Investigation Report and Groundwater Remedial Action Work Plan for Bedrock Water-Bearing Zone.* PPG Garfield Avenue Group, Hudson County Chromium Sites, Jersey City, New Jersey. March 2025.

Herman, Gregory C., 2001. *Hydrogeological Framework of Bedrock Aquifers in the Newark Basin, New Jersey*. New Jersey Geological Service, Geology in Service to Public Health, 18th Annual Meeting of the Geological Association of New Jersey, South Brunswick, New Jersey, p. 6-45.

NJDEP, 2018. *N.J.A.C., 7.26E: Technical Requirements for Site Remediation.* August 6, 2018.

Tables

Table 1
Construction Details for Bedrock Monitoring Wells
Bedrock Groundwater Remedial Investigation
Garfield Avenue Group Sites
PPG, Jersey City, New Jersey

Well ID	Water-Bearing Zone	Total Depth (ft bgs)	Open Borehole/ Screened Interval/ FLUTe Port Intervals[4]	Ground Surface Elevation (ft NAVD88)	Top of Inner Casing Elevation (ft NAVD88)	Inner Casing Material	Inner Casing Diameter (inches)
114-MW4D	Bedrock (Open Borehole)[1,2] - Diabase, Lockatong	125	90-94, 98-102, 111-115, 121-125	13.1	15.77	Steel	6
114-MW6D	Bedrock (Open Borehole) - Lockatong	111	86-111	12.6	12.69	Steel	6
114-MW7D	Bedrock[2] - Indeterminate	90	85-90	12.4	11.92	PVC	6
114-MW16B	Bedrock[2] - Diabase	35.5	30.5-35.5	16.1	15.53	PVC	2
114-MW52D	Bedrock (Open Borehole)[1] - Lockatong	105	80-83, 87-90, 102-105	13.9	15.64	Steel	6
114-MW57D	Bedrock (Open Borehole)[1] - Lockatong	112.5	87.5-91.5, 96.5-100.5, 104-108, 109-113	12.7	14.70	Steel	6
114-MW61D	Bedrock[2,3] - Diabase, Lockatong	135	110-135	14.3	17.12	PVC	2
114-MW66D	Bedrock (Open Borehole)[1,2] - Lockatong	140	91-97, 107-111, 118-123, 124-129, 137-140	13.9	16.20	Steel	6
114-MW71D	Bedrock (Open Borehole) - Diabase, Lockatong	141	115-141	14.2	15.96	Steel	6
114-MW72D	Bedrock (Open Borehole)[1] - Lockatong	125	102-106, 110-114, 116-119, 123-126	12.3	14.41	Steel	6
114-MW73D	Bedrock (Open Borehole) - Lockatong	118	88-118	13.9	14.99	Steel	6
114-MW74D	Bedrock (Open Borehole) - Lockatong	132	97-132	14.2	15.23	Steel	6
114-MW76D	Bedrock (Open Borehole) - Lockatong	124	99-124	12.0	14.90	Steel	6
114-MW81D	Bedrock (Open Borehole) - Lockatong	125	100-125	12.2	15.45	Steel	6

Notes:

[1]Open borehole converted to FLUTe multi-port system

[2]Deepening of existing borehole

[3]Open borehole completed with 2-inch PVC screen and casing

[4]FLUTe port intervals are listed in feet blow top of steel casing. Open borehole and screened intervals are listed in feet below ground surface

bgs - below ground surface

ft - feet

NAVD88 - North American Vertical Datum of 1988

Table 2
Hydraulic Monitoring Results at 114-MW72D and 114-MW76D During Well Development and Pump Test at 114-MW81D
Bedrock Groundwater Remedial Investigation
Garfield Avenue Group Sites
PPG, Jersey City, New Jersey

		Well Development	Pump Test
	Well ID	**114-MW81D** (100-125)	**114-MW81D** (100-125)
Hydraulic Monitoring	**114-MW76D** (99-124)	--	--
	114-MW72D (Port 1, 102-106)	--	--
	114-MW72D (Port 2, 110-114)	--	--
	114-MW72D (Port 3, 116-119)	--	--
	114-MW72D (Port 4, 123-126)	--	--

Notes:
X = Test results indicate that a hydraulic connection exists between the noted test intervals and wells/FLUTe ports (see Attachment 2)
-- = Test results indicate that a hydraulic connection does not exist between the noted test intervals and wells/FLUTe ports
FLUTe port intervals for 114-MW72D are listed in feet below top of steel casing
Depths listed for 114-MW76D and 114-MW81D are for the open borehole interval, in feet below ground surface
Well development was performed on November 22, 2024
Some rain was observed during well development
Pump test was conducted on November 25, 2024
No rain was observed during the pump test

Table 3
Hydraulic Monitoring Results at 114-MW72D and 114-MW76D During Packer Testing at 114-MW81D
Bedrock Groundwater Remedial Investigation
Garfield Avenue Group Sites
PPG, Jersey City, New Jersey

		Test Interval				
	Well ID	114-MW81D (100-105)	114-MW81D (105-110)	114-MW81D (110-115)	114-MW81D (115-120)	114-MW81D (120-125)
Hydraulic Monitoring	114-MW76D (99-124)	--	--	--	--	--
	114-MW72D (Port 1, 102-106)	--	--	--	--	--
	114-MW72D (Port 2, 110-114)	--	--	--	--	--
	114-MW72D (Port 3, 116-119)	--	--	--	--	--
	114-MW72D (Port 4, 123-126)	--	--	--	--	--

Notes:
X = Test results indicate that a hydraulic connection exists between the noted test intervals and wells/FLUTe ports (see Attachment 3)
-- = Test results indicate that a hydraulic connection does not exist between the noted test intervals and wells/FLUTe ports
FLUTe port intervals for 114-MW72D are listed in feet blow top of steel casing
Depths listed for 114-MW76D are for the open borehole interval, in feet below ground surface
Depths listed for 114-MW81D are for the packer test intervals, in feet below ground surface
Packer testing was performed from December 4 to December 6, 2024
No rain was observed during packer testing

Table 4
Pumping Rates and Volumes Pumped for Packer Testing at Well 114-MW81D
Bedrock Groundwater Remedial Investigation
Garfield Avenue Group Sites
PPG, Jersey City, New Jersey

AECOM

Target Interval (ft bgs)	Test Duration (min)	Minimum Pump Rate (mL/min)	Maximum Pump Rate (mL/min)	Volume Pumped (gallons)
100-105	45	5200	5800	60
105-110	45	3000	6000	42
110-115	45	2300	3900	35
115-120	45	3800	4800	28
120-125	45	1200	3400	25

Notes:

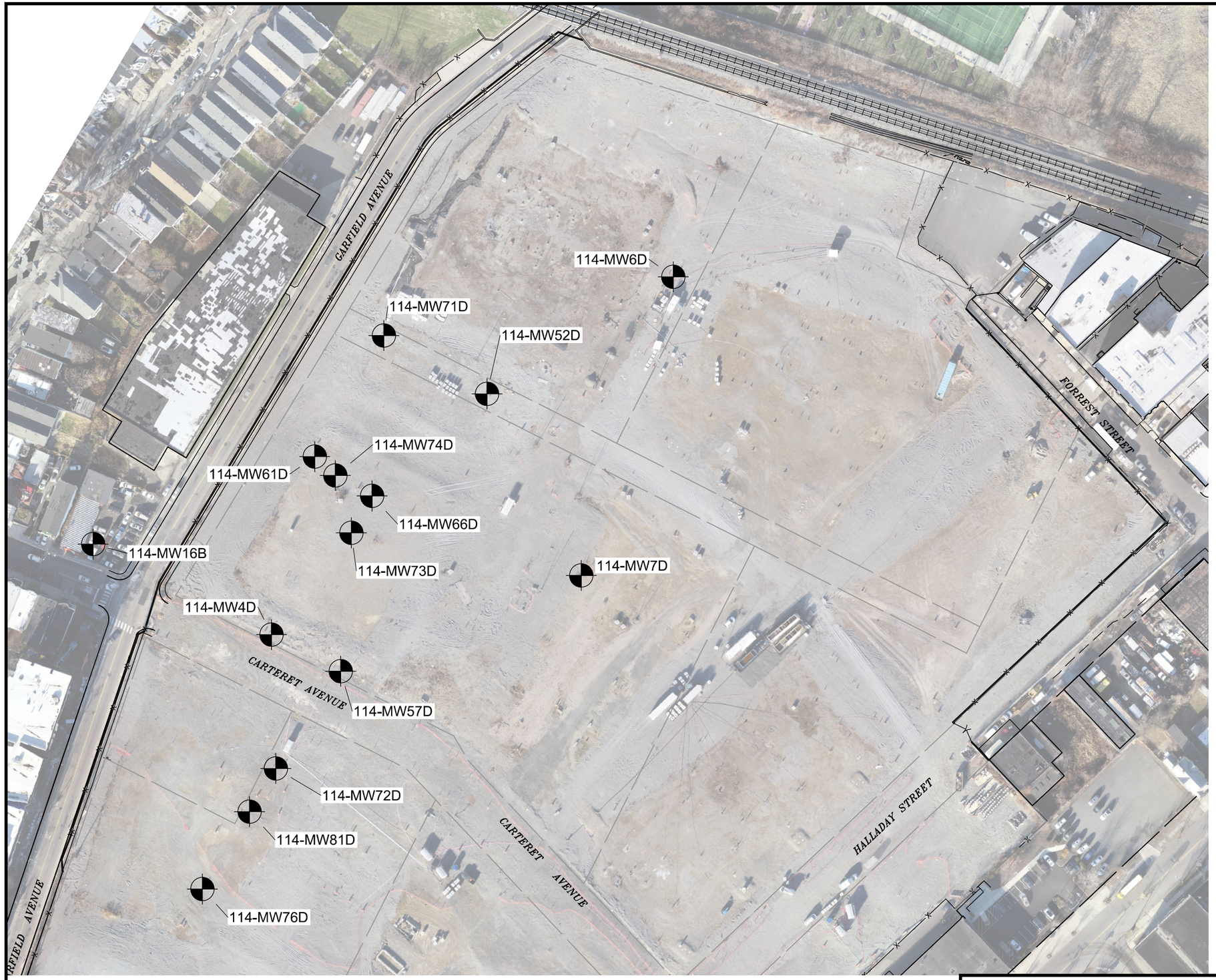
bgs - below ground surface

ft - feet

min - minutes

mL - milliliters

Figures



LEGEND

	PROPERTY LINE
	NEW JERSEY TRANSIT LIGHT RAIL
114-MW72D	MONITORING WELL ID
⊕	MONITORING WELL LOCATION

NOTES:

1. Aerial imagery dated December 20, 2021 sourced from aerial imagery provided by Borbas Surveying and Mapping, LLC.

60 0 120

GRAPHIC SCALE IN FEET

N

AECOM

PPG
GARFIELD AVENUE GROUP
JERSEY CITY, NEW JERSEY

BEDROCK MONITORING WELL LOCATIONS

DATE: 08/01/2024 | DRWN: GET | **FIGURE 1**

File: C:\USERS\FREDERIK.SCHUELE\AECOM DIRECTORY\PPG - GDS\910 CAD\20 SHEETS\GW2022 GW RIRPACKER TEST MEMO FIGURE 1.DWG

Attachment 1
Packer Testing Field Forms

Packer Testing Form

Well ID and Depth Interval: 114-MW81D(100-105)-2

Client: PPG
Project #: 60739015
Location: Site 114
Field Staff: Megan CLARK, ~~FREDERICK~~ Schuele

Date: 12/5/24
Weather: Mostly cloudy, 39°F

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	TROLL	700	R45194
Transducer 2 (Lower Unit)	TROLL	700	R45385
Water Level Meter	HERON	SKINNYDIPPER	32074(3010-1094)

Pre-Test Data

Depth to water in open borehole (ft btc): 15.75
Packer Interval top (ft btc): 103.92
Packer Interval Bottom (ft btc): 108.92
Pump Depth (ft btc): —
Length of packer assembly stickup above 6-inch steel casing (ft): 15.5
OUTER

Transducer 1 Depth (ft btc) (OUT): 70
Transducer 2 Depth (ft btc) (IN): —
Height of water column above Transducer 1 (ft): —
Height of water column above Transducer 2 (ft): —

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 15.75
Depth to water inside packer assembly (ft btc): 17.45
Height of water column above Transducer 1 (ft): 62.32
Height of water column above Transducer 2 (ft): 92.96

Upper Packer Pressure (psi): 70
Lower Packer Pressure (psi): 70

Test Data

START=75gal STOP=135gal

Packer Interval Volume (gal): —
Total volume pumped during test (gal): 60

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
9:32	5800	19.55	17.01	70	70	start test	CLEAR/NONE
9:40	5200	25.55	24.90	67	67		
9:50	5800	36.86	33.90	64	64		
10:00	5200	42.29	28.54	62	62		
10:10	5500	53.00	28.48	60	60		
10:17						pump off	
10:25		53.35	28.61				
10:30		52.78	28.61				
10:35						TRANSDUCER TAKEN OUT	

Comments

Signature: Megan Clark Date: 12/5/24

Packer Testing Form

Well ID and Depth Interval: 114-MW81D (105-110)

Client: PPG
Project #: 60739015
Location: Site 114
Field Staff: Megan Clark, Frederik Schuele

Date: 12/5/24
Weather: Mostly cloudy, 39°F

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	TROLL	700	R45194
Transducer 2 (Lower Unit)	TROLL	700	R45385
Water Level Meter	HERON	SKINNY DIPPER	32674 (3010-1094)

Pre-Test Data

Depth to water in open borehole (ft btc): —
Packer Interval top (ft btc): 108.92
Packer Interval Bottom (ft btc): 113.92
Pump Depth (ft btc): —
Length of packer assembly stickup above 6-inch steel casing (ft): 15 in outer

Transducer 1 Depth (ft btc): 90
Transducer 2 Depth (ft btc): —
Height of water column above Transducer 1 (ft): —
Height of water column above Transducer 2 (ft): —

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 49.12
Depth to water inside packer assembly (ft btc): 49.09
Height of water column above Transducer 1 (ft): 40.71
Height of water column above Transducer 2 (ft): 66.00

Upper Packer Pressure (psi): 64
Lower Packer Pressure (psi): 64

Test Data

Packer Interval Volume (gal): —

start: 135 gal stop: 177
Total volume pumped during test (gal): 42

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
1135	6000	49.97	30.80	60	60	start test	CLEAR/NONE
1145	3500	57.72	53.80	60	60		
1155	3600	63.43	58.46	61	61		
1205	3000	69.69	64.99	65	65		
1215	3100	73.30	68.42	62	62		
1220						Pump off	
1235		70.70	70.20			~~Water level + TRANSDUCER~~ filer	

Comments
DTW INSIDE PACKER ASSEMBLY at 1130 = 49.09 ft btc

Signature Megan Clark Date: 12/5/24

AECOM

Packer Testing Form

Well ID and Depth Interval: 114-MW81D (110-115)

Client: PPG
Project #: 60739015
Location: Site 114
Field Staff: Megan CLARK, Frederik Scherele

Date: 12/5/24
Weather: MOSTLY CLOUDY 39°F

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	TROLL	700	R45194
Transducer 2 (Lower Unit)	TROLL	700	R45385
Water Level Meter	Heron	Skinny dipper	32674 (3010-1094)

Pre-Test Data

Depth to water in open borehole (ft btc): 67.95
Packer Interval top (ft btc): 113.42
Packer Interval Bottom (ft btc): 118.92
Pump Depth (ft btc): —
Length of packer assembly stickup above 6-inch steel casing (ft): 21.5 in

Transducer 1 Depth (ft btc): —
Transducer 2 Depth (ft btc): —
Height of water column above Transducer 1 (ft): —
Height of water column above Transducer 2 (ft): —

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 38.6
Depth to water inside packer assembly (ft btc): 64.61
Height of water column above Transducer 1 (ft): 46.18
Height of water column above Transducer 2 (ft): 55.30

Upper Packer Pressure (psi): 60
Lower Packer Pressure (psi): 60

Test Data

Packer Interval Volume (gal): —

Start: 17 gal Stop: 212 gal
Total volume pumped during test (gal): 35

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
14:07	2800	67.18	37.6	64	64	start test	CLEAR/None
14:15	3900	73.85	70.35	64	64		
14:25	2700	75.48	—	64	64	WATER meter MALFUNCTION	
14:35	2600	78.79	76.10	62	62		
14:45	2300	82.70	79.85	60	60		
14:52		82.38	80.34			Pump off	
15:07		↓	↓			TRANSDUCER Stopped	

Comments

Signature: Megan Clark

Date: 12/5/24

Packer Testing Form

Well ID and Depth Interval: 114-MW81D (115-120)

Client: PPG
Project #: 60739015
Location: Site 114
Field Staff: Megan Clark

Date: 12/6/24
Weather: Partly Cloudy

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	Troll	700	R45194
Transducer 2 (Lower Unit)	Troll	700	R45385
Water Level Meter	Solinst	101	502891(3010-1295) + 502890(3010-1432)

Pre-Test Data

Depth to water in open borehole (ft btc): 27.2
Packer Interval top (ft btc): 118.92
Packer Interval Bottom (ft btc): 123.92
Pump Depth (ft btc): —
Length of packer assebmly stickup above 6-inch steel casing (ft): 25.5 inches

Transducer 1 Depth (ft btc): —
Transducer 2 Depth (ft btc): —
Height of water column above Transducer 1 (ft): —
Height of water column above Transducer 2 (ft): —

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 25.01
Depth to water inside packer assembly (ft btc): 27.35
Height of water column above Transducer 1 (ft): 87.87
Height of water column above Transducer 2 (ft): 98.44

Upper Packer Pressure (psi): 65
Lower Packer Pressure (psi): 65

Test Data

Start: 272 Stop: 300

Packer Interval Volume (gal): —
Total volume pumped during test (gal): 28

Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
8:40	4000	29.20	27.78	62	62	start test	Clear/None
8:50	4800	39.62	35.90	65	65		
9:00	4400	47.01	43.70	62	62		
9:10	4000	52.98	50.89	62	62		
9:20	3800	59.33	56.47	60	60		
9:25						Pump off	
9:40		59.18	57.05				
9:45							
						transducers stopped + removed	

Comments

Signature: Megan Clark
Date: 12/6/24

Packer Testing Form

Well ID and Depth Interval: 114-MW81D (120-125)

Client: PPG
Project #: 60739015
Location: Site 114
Field Staff: Megan Clark

Date: 12/6/24
Weather: Partly cloudy

Field Testing Equipment

Equipment	Make	Model	Serial Number
Transducer 1 (Upper Unit)	Troll	700	R45194
Transducer 2 (Lower Unit)	Troll	700	R45385
Water Level Meter	Solinst	101	502891 (3010-1295) (Out) + 502890 (3010-1432) (In)

Pre-Test Data

Depth to water in open borehole (ft btc): 54.01
Packer Interval top (ft btc): 123.92
Packer Interval Bottom (ft btc): 128.92
Pump Depth (ft btc): —
Length of packer assembly stickup above 6-inch steel casing (ft): 24.5 in

Transducer 1 Depth (ft btc): —
Transducer 2 Depth (ft btc): —
Height of water column above Transducer 1 (ft): —
Height of water column above Transducer 2 (ft): —

Post-Packer Inflation Data

Depth to water above packer assembly (ft btc): 50.45 (out)
Depth to water inside packer assembly (ft btc): 52.89 (In)
Height of water column above Transducer 1 (ft): 71.23 (out)
Height of water column above Transducer 2 (ft): 75.89 (In)

Upper Packer Pressure (psi): 68
Lower Packer Pressure (psi): —

Test Data

Packer Interval Volume (gal): —
Total volume pumped during test (gal): 25 *New Tote

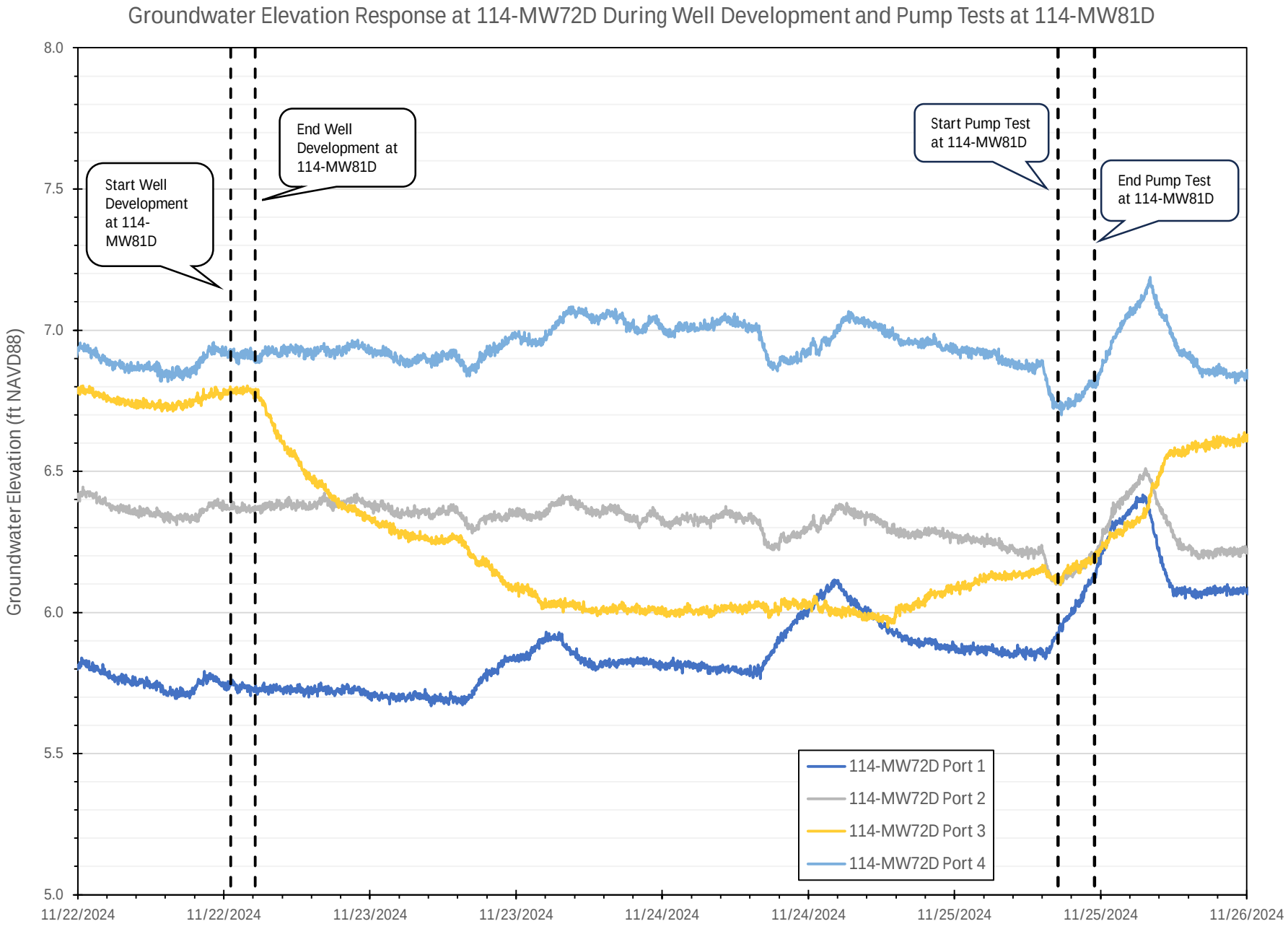
Time (24 Hr)	Pumping Rate (mL/min)	DTW Inside Packer Assembly (ft btc)	DTW Above Packer Assembly (ft btc)	Upper Packer Pressure (psi)	Lower Packer Pressure (psi)	Notes	Color / Odor
1230	3400	79.30	48.35	68	/	start test	BROWN/NONE Sediment
1240	2500	89.89	51.05	68	/		CLEAR/NONE
1250	1500	97.20	53.42	67	/		
1300	1700	98.55	53.05	67	/		
1310	1200	100.65	54.45	67	/		
1315		73.90	56.30			pump off	
1330						TRANSDUCER off	

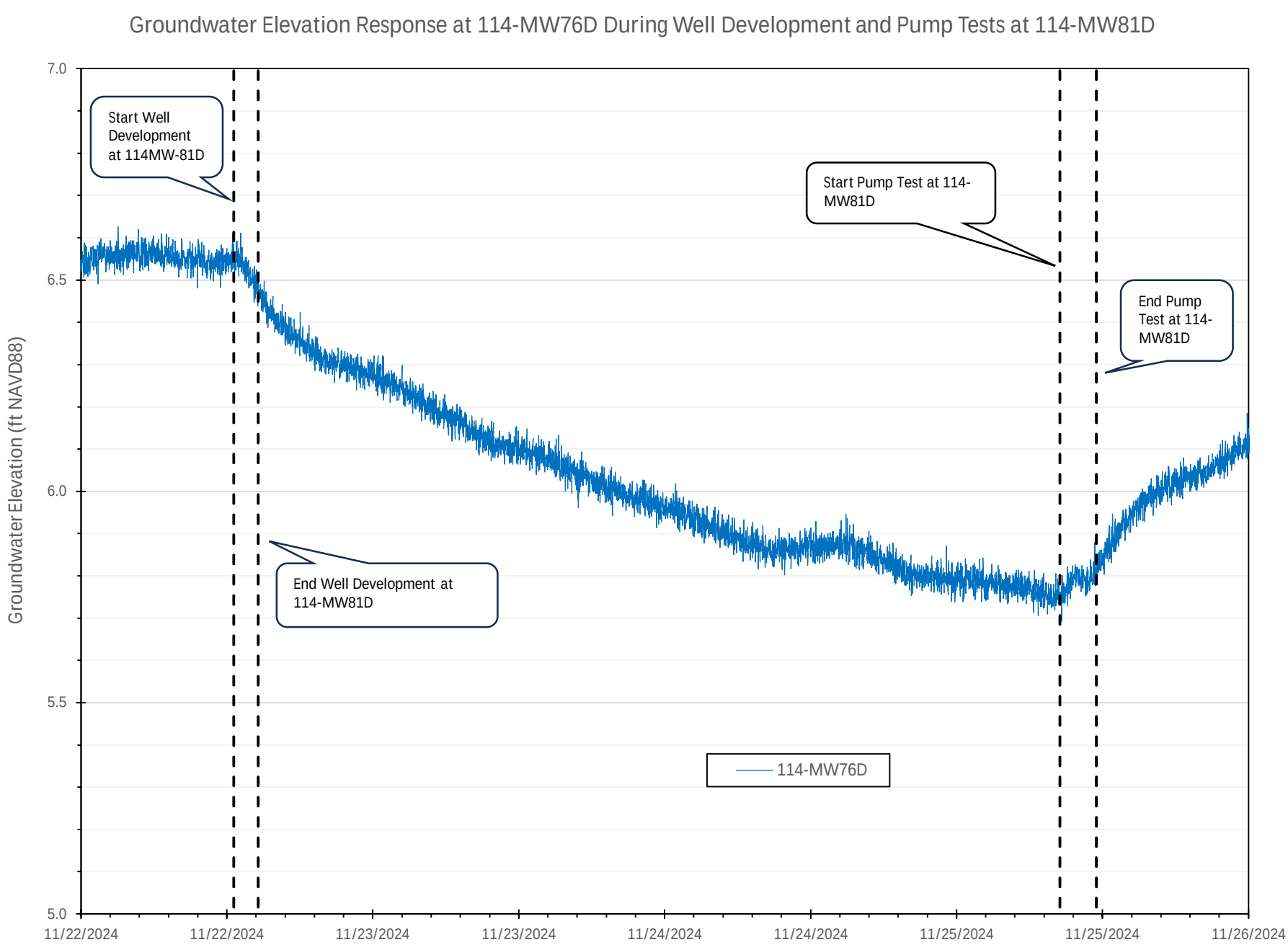
Comments

Originally planned to start pump at 11:50. Water was not coming up. The pump was taken out and we found that the tubing popped off. Pump was fixed and transducers were Restarted. Lower packer removed to pump last 5 ft of well.

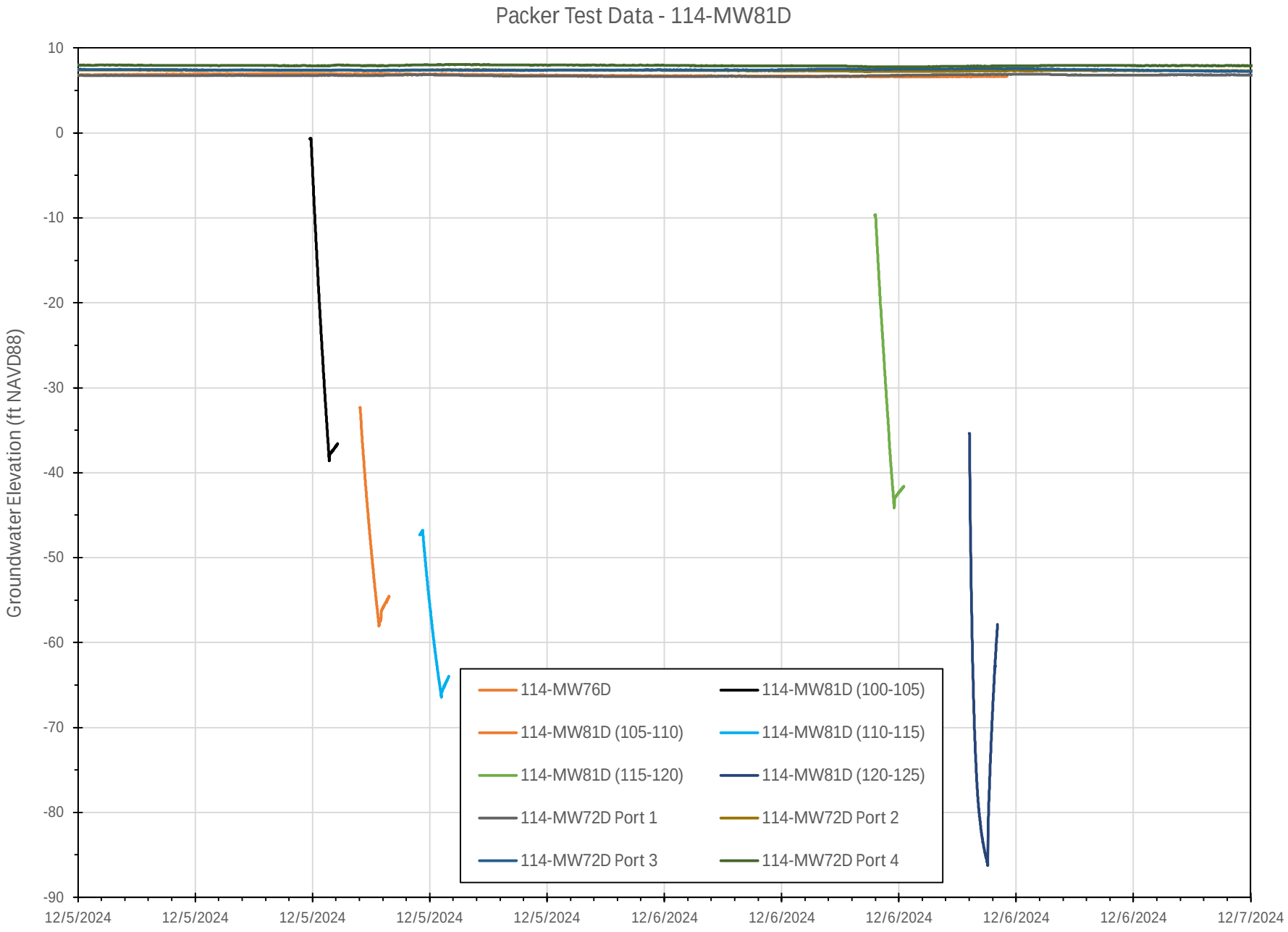
Signature: Megan Clark
Date: 12/6/24

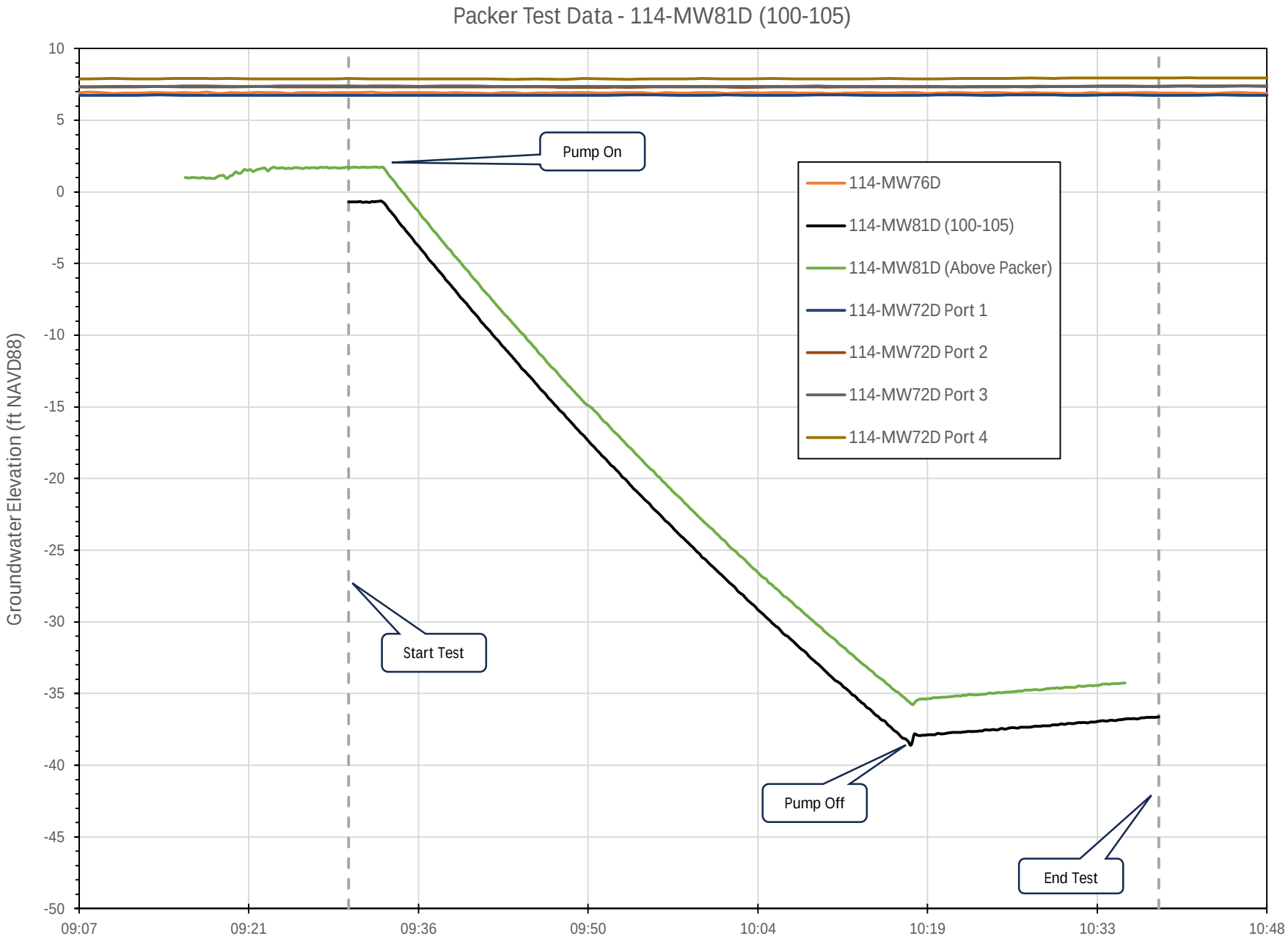
Attachment 2
Hydraulic Monitoring Data at 114-MW72D and 114-MW76D During Well Development and Pump Testing at 114-MW81D

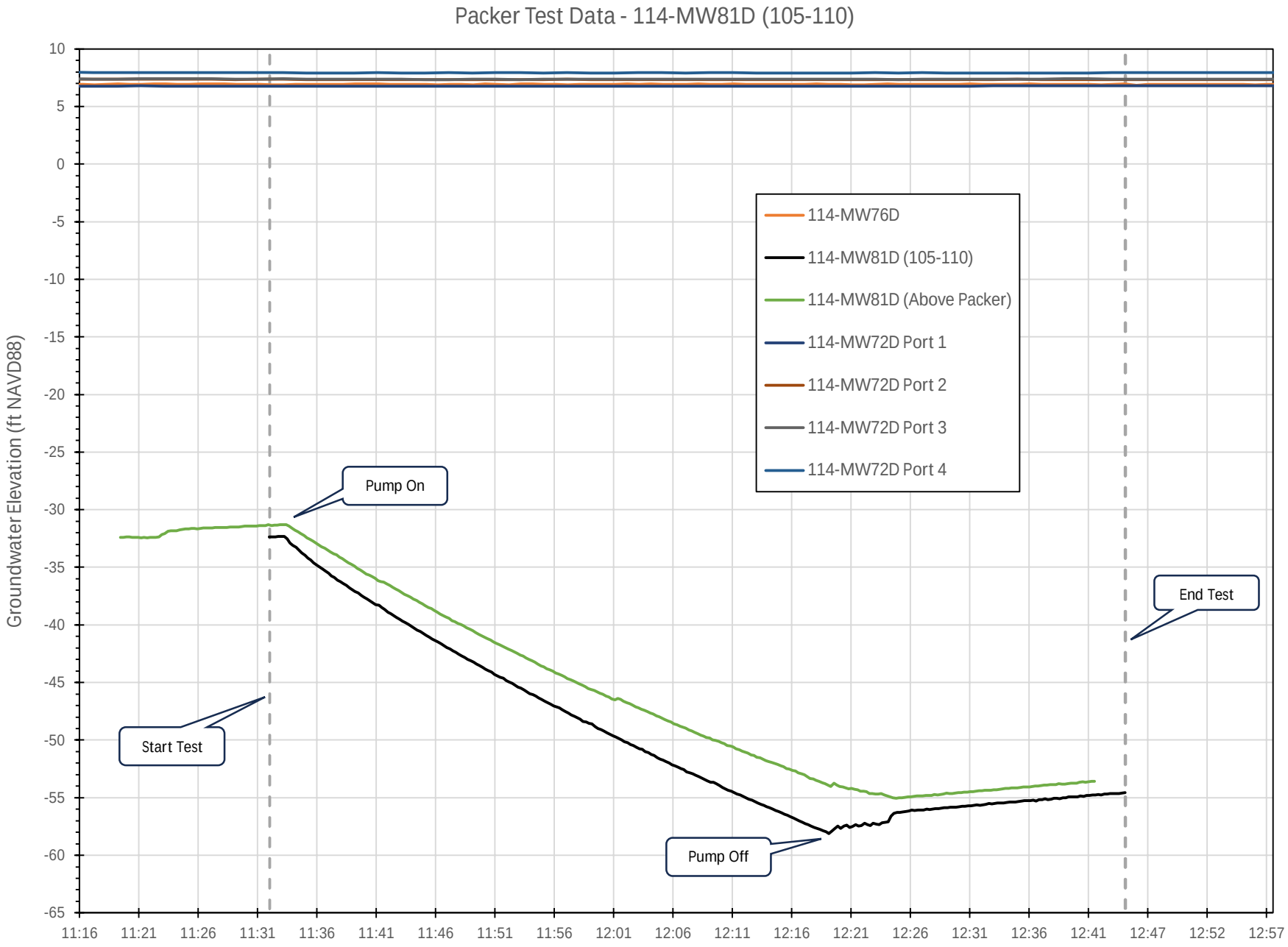

Groundwater Elevation Response at 114-MW72D During Well Development and Pump Tests at 114-MW81D
Groundwater Elevation (ft NAVD88)
8.0
7.5
7.0
6.5
6.0
5.5
5.0
11/22/2024
11/22/2024
11/23/2024
11/23/2024
11/24/2024
11/24/2024
11/25/2024
11/25/2024
11/26/2024
Start Well Development at 114-MW81D
End Well Development at 114-MW81D
Start Pump Test at 114-MW81D
End Pump Test at 114-MW81D
114-MW72D Port 1
114-MW72D Port 2
114-MW72D Port 3
114-MW72D Port 4

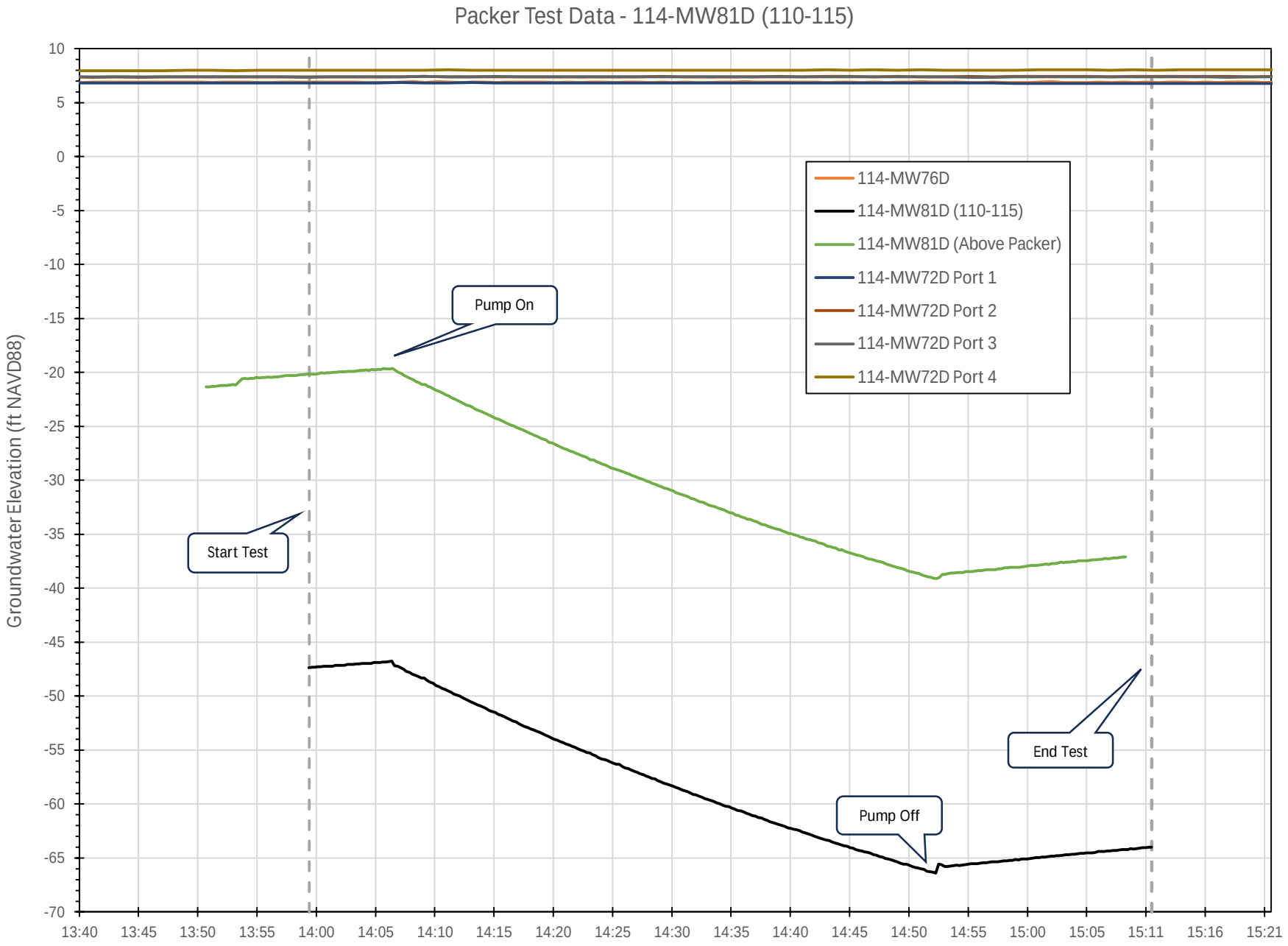

Groundwater Elevation Response at 114-MW76D During Well Development and Pump Tests at 114-MW81D
Groundwater Elevation (ft NAVD88)
7.0
6.5
6.0
5.5
5.0
11/22/2024
11/22/2024
11/23/2024
11/23/2024
11/24/2024
11/24/2024
11/25/2024
11/25/2024
11/26/2024
Start Well Development at 114MW-81D
End Well Development at 114-MW81D
Start Pump Test at 114-MW81D
End Pump Test at 114-MW81D
114-MW76D

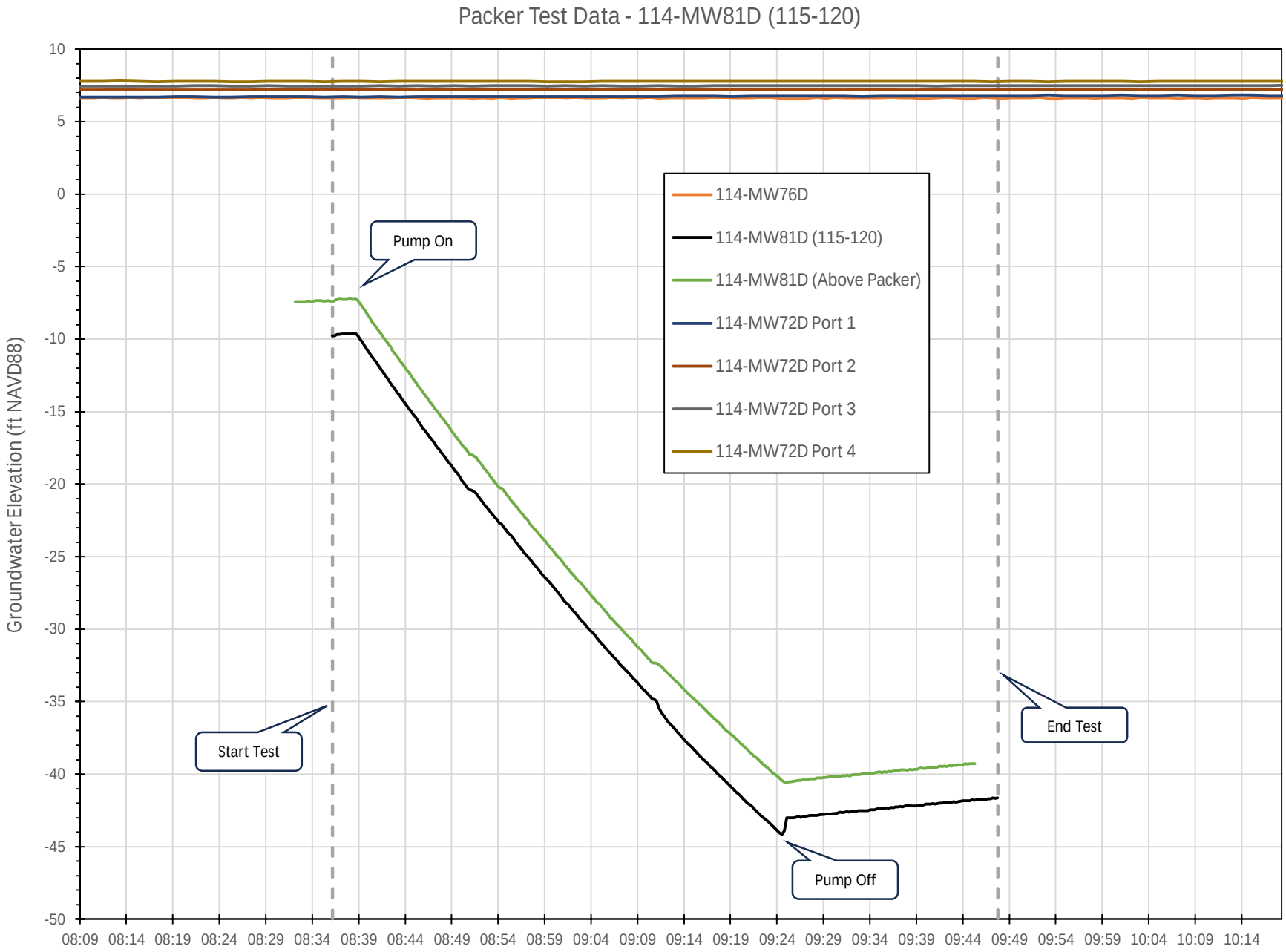
Attachment 3
Hydraulic Monitoring Data During Packer Testing at 114-MW81D

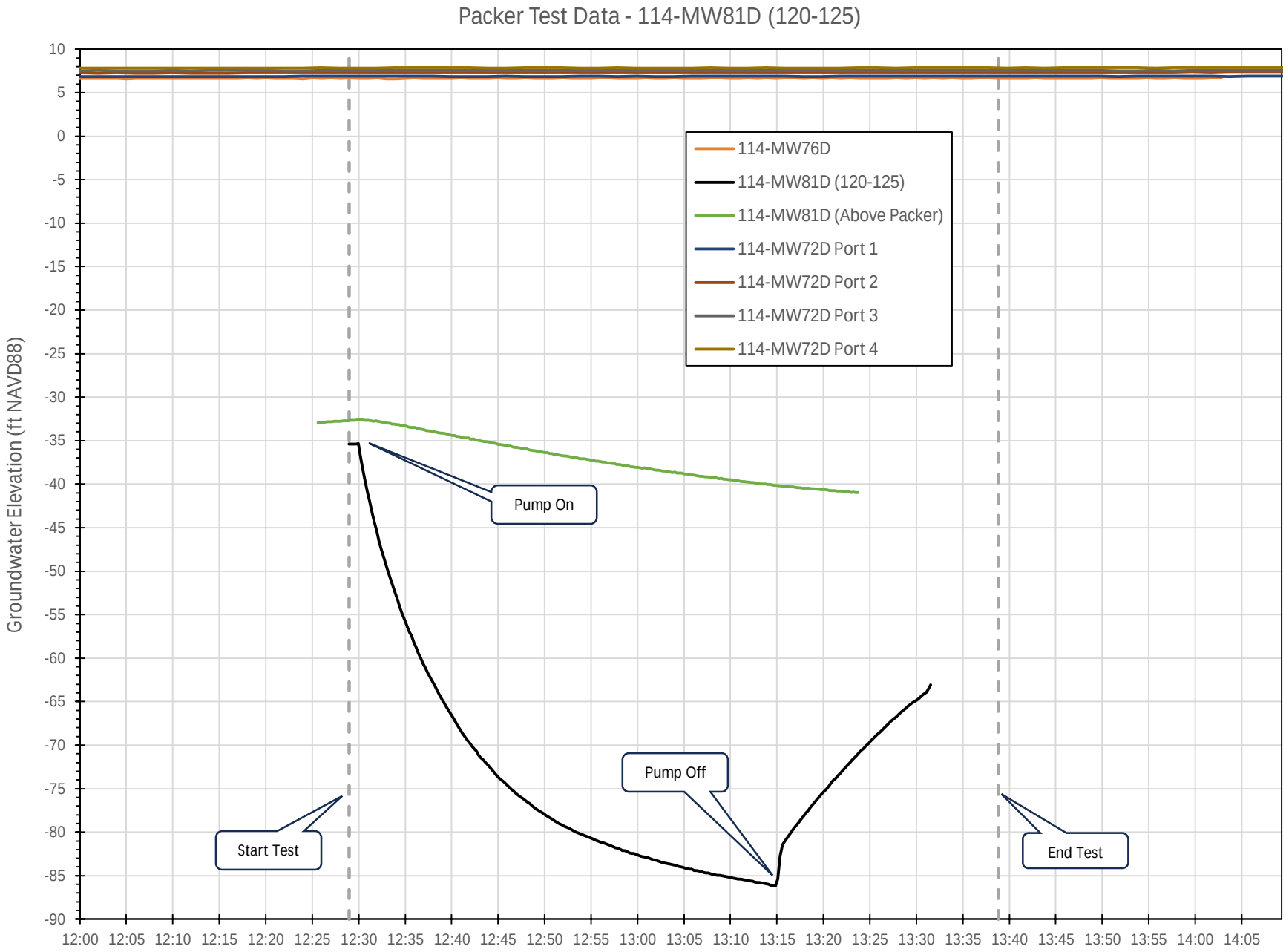

Packer Test Data - 114-MW81D
Groundwater Elevation (ft NAVD88)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
12/5/2024
12/5/2024
12/5/2024
12/5/2024
12/5/2024
12/6/2024
12/6/2024
12/6/2024
12/6/2024
12/6/2024
12/7/2024
114-MW76D
114-MW81D (100-105)
114-MW81D (105-110)
114-MW81D (110-115)
114-MW81D (115-120)
114-MW81D (120-125)
114-MW72D Port 1
114-MW72D Port 2
114-MW72D Port 3
114-MW72D Port 4

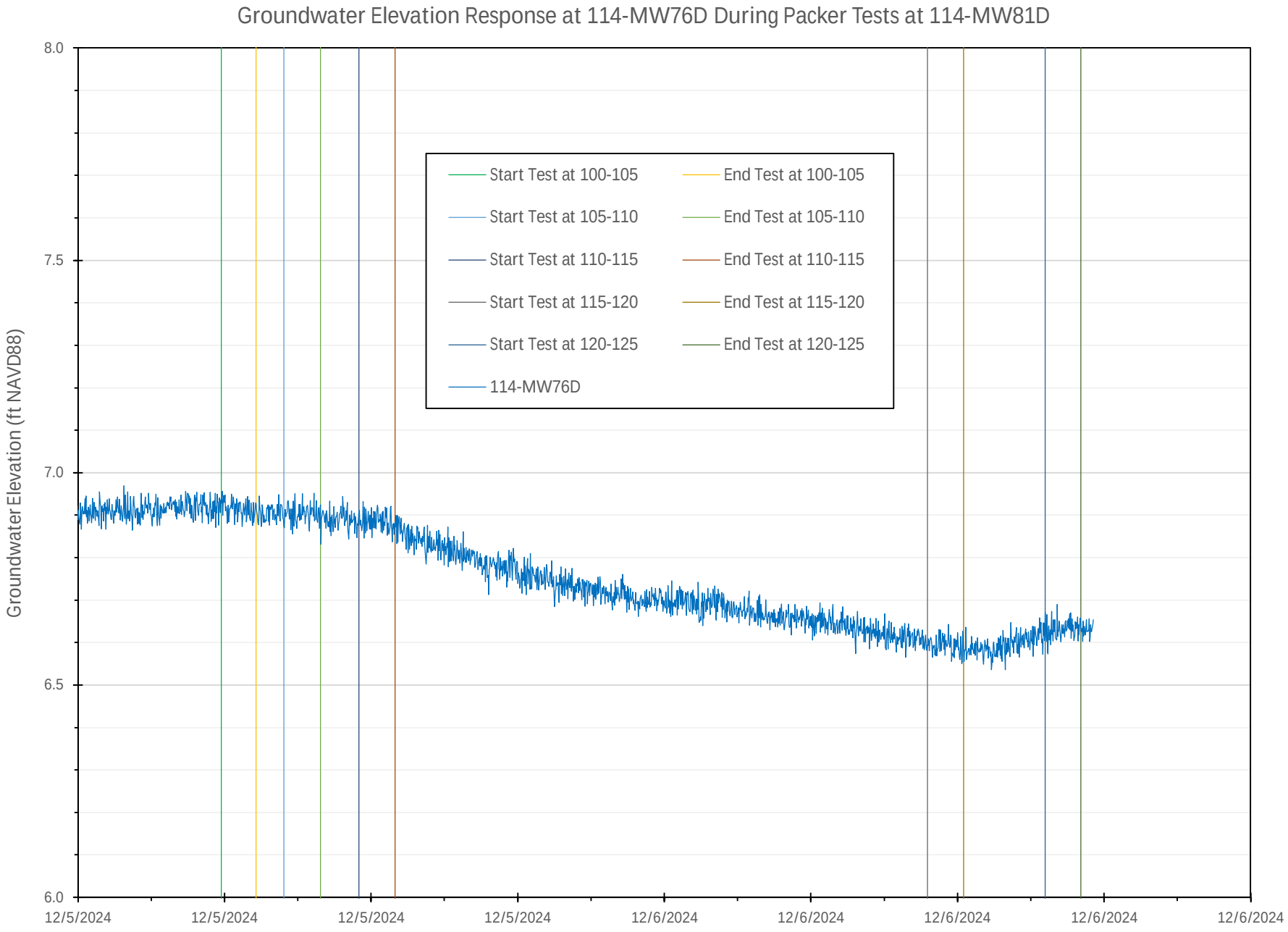

Packer Test Data - 114-MW81D (100-105)
Groundwater Elevation (ft NAVD88)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
09:07
09:21
09:36
09:50
10:04
10:19
10:33
10:48
Pump On
Start Test
Pump Off
End Test
114-MW76D
114-MW81D (100-105)
114-MW81D (Above Packer)
114-MW72D Port 1
114-MW72D Port 2
114-MW72D Port 3
114-MW72D Port 4

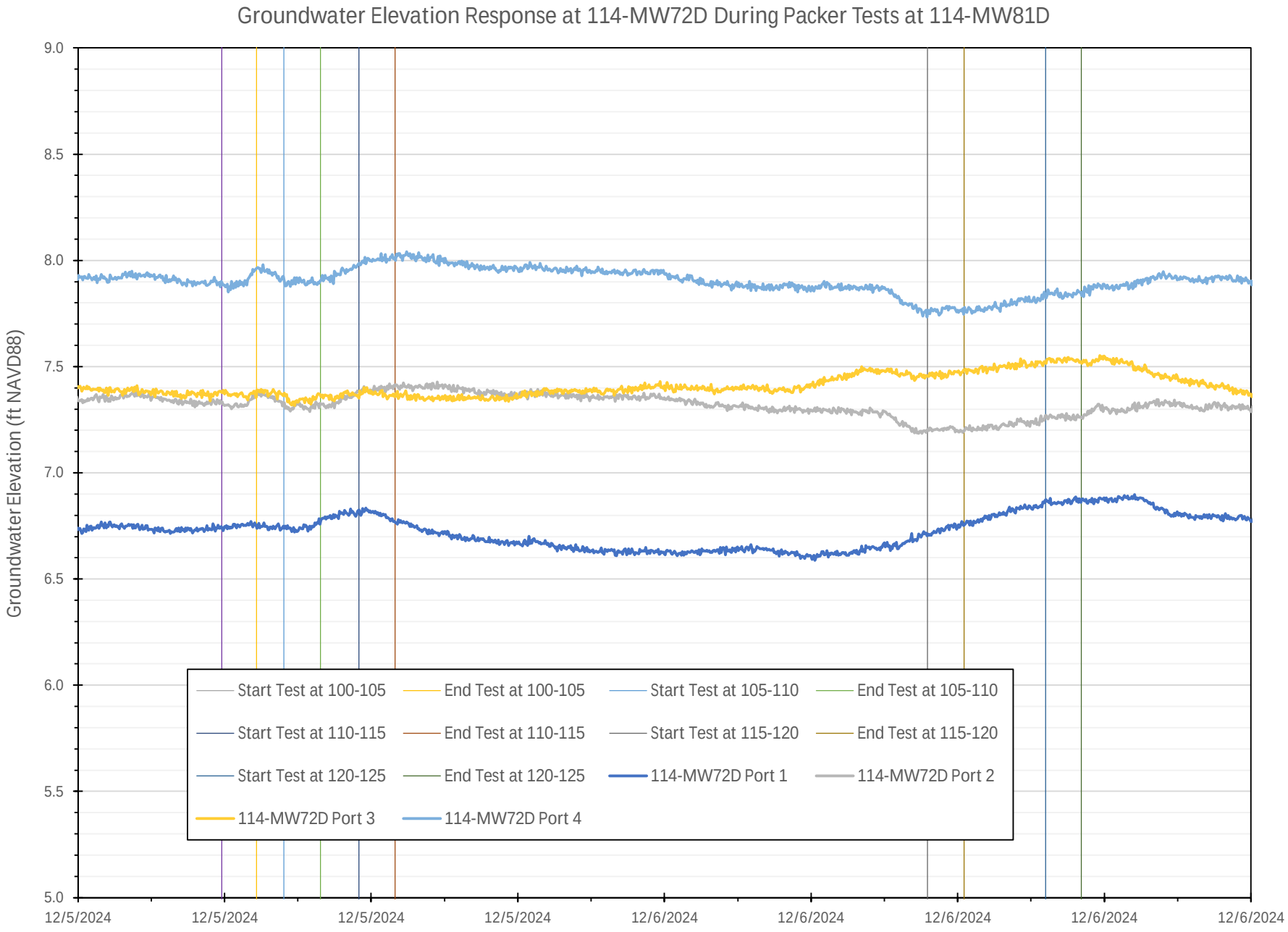

Packer Test Data - 114-MW81D (105-110)
Groundwater Elevation (ft NAVD88)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
11:16
11:21
11:26
11:31
11:36
11:41
11:46
11:51
11:56
12:01
12:06
12:11
12:16
12:21
12:26
12:31
12:36
12:41
12:47
12:52
12:57
114-MW76D
114-MW81D (105-110)
114-MW81D (Above Packer)
114-MW72D Port 1
114-MW72D Port 2
114-MW72D Port 3
114-MW72D Port 4
Pump On
Start Test
Pump Off
End Test


Packer Test Data - 114-MW81D (110-115)
Groundwater Elevation (ft NAVD88)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
13:40
13:45
13:50
13:55
14:00
14:05
14:10
14:15
14:20
14:25
14:30
14:35
14:40
14:45
14:50
14:55
15:00
15:05
15:11
15:16
15:21
114-MW76D
114-MW81D (110-115)
114-MW81D (Above Packer)
114-MW72D Port 1
114-MW72D Port 2
114-MW72D Port 3
114-MW72D Port 4
Pump On
Start Test
End Test
Pump Off


Packer Test Data - 114-MW81D (115-120)
Groundwater Elevation (ft NAVD88)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
08:09
08:14
08:19
08:24
08:29
08:34
08:39
08:44
08:49
08:54
08:59
09:04
09:09
09:14
09:19
09:24
09:29
09:34
09:39
09:44
09:49
09:54
09:59
10:04
10:09
10:14
114-MW76D
114-MW81D (115-120)
114-MW81D (Above Packer)
114-MW72D Port 1
114-MW72D Port 2
114-MW72D Port 3
114-MW72D Port 4
Pump On
Start Test
Pump Off
End Test


Packer Test Data - 114-MW81D (120-125)
Groundwater Elevation (ft NAVD88)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
-75
-80
-85
-90
12:00
12:05
12:10
12:15
12:20
12:25
12:30
12:35
12:40
12:45
12:50
12:55
13:00
13:05
13:10
13:15
13:20
13:25
13:30
13:35
13:40
13:45
13:50
13:55
14:00
14:05
114-MW76D
114-MW81D (120-125)
114-MW81D (Above Packer)
114-MW72D Port 1
114-MW72D Port 2
114-MW72D Port 3
114-MW72D Port 4
Pump On
Pump Off
Start Test
End Test


Groundwater Elevation Response at 114-MW76D During Packer Tests at 114-MW81D
Groundwater Elevation (ft NAVD88)
8.0
7.5
7.0
6.5
6.0
12/5/2024
12/5/2024
12/5/2024
12/5/2024
12/6/2024
12/6/2024
12/6/2024
12/6/2024
12/6/2024
Start Test at 100-105
End Test at 100-105
Start Test at 105-110
End Test at 105-110
Start Test at 110-115
End Test at 110-115
Start Test at 115-120
End Test at 115-120
Start Test at 120-125
End Test at 120-125
114-MW76D


Groundwater Elevation Response at 114-MW72D During Packer Tests at 114-MW81D
Groundwater Elevation (ft NAVD88)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
12/5/2024
12/5/2024
12/5/2024
12/5/2024
12/6/2024
12/6/2024
12/6/2024
12/6/2024
12/6/2024
Start Test at 100-105
End Test at 100-105
Start Test at 105-110
End Test at 105-110
Start Test at 110-115
End Test at 110-115
Start Test at 115-120
End Test at 115-120
Start Test at 120-125
End Test at 120-125
114-MW72D Port 1
114-MW72D Port 2
114-MW72D Port 3
114-MW72D Port 4