Memorandum

To: VTrans Lyndon IM 091-3(53)
Project File

Date: October 20, 2023

Project #: 58752.00 / 58926.06

From: Lydia Lee, PG

Re: VTrans Lyndon IM 091-3(53)
Project Area Groundwater Conditions

Introduction

VHB has prepared this memorandum to provide a summary of existing groundwater conditions and analyses that have been performed within the Lyndon IM 091-3(53) Project Area. The Project Area is considered as the general vicinity of the Project, located along an approximately 3.56-mile stretch of Interstate I-91 ("I-91") centered at 44.57024º N, -72.03984º W, in the town of Lyndon, VT (**Attachment 1**, **Figures 1 and 2**). The Project proposes the replacement of culverts 96-3N and 96-3S. Both culverts are corrugated galvanized metal plate pipe culverts under the northbound and southbound interstate lanes, respectively. This memorandum presents an evaluation of current groundwater conditions in the project area, and has been prepared in coordination with the Geotechnical Data Report (HNTB, 2023), Geotechnical Interpretation Report (HNTB, 2023), and Geotechnical Baseline Report (Mott McDonald, 2023).

Site Setting

The Project is located within the Northern Vermont Piedmont Biophysical Region of Vermont and falls within the Miller Run-Passumpsic River watershed (HUC10 #0108010203) and Miller Run subwatershed (HUC12 #010801020301). An unnamed tributary to Miller Run flows through the two culverts proposed for replacement. This unnamed tributary flows northeast to southwest through the center of the Project Area, making its confluence with Miller Run approximately 560 feet south of the Project Area. On-site elevations range from approximately 860 to 770 feet above mean sea level with the highest elevation occurring along the northbound lane. A presumed Class II wetland and an intermittent stream discharge into the unnamed tributary from the east. The watershed of the unnamed tributary at the downgradient point of the Project area is approximately 2.8 square miles.

The interstate was constructed in the 1970s, and involved the placement of up to 75 feet of fill over the culvert structures and original ground surface (Mott McDonald, 2023). The surficial geology of the Project Area is mapped as glaciofluvial, glaciolacustrine, and glacial deposits, which represent pre-construction conditions (**Figure 3, Attachment 1**; ANR, 2023). The immediate Project vicinity around the unnamed tributary is mapped as lake sand, which is described as well sorted sand, no pebbles or boulders. The area to the north and west of culvert 96-3N is mapped as glacial deposit (moraine), and the area to the south and west is mapped as glaciofluvial deposit (kame moraine, described as ice contact outwash). The surrounding areas upland of Miller Run are mapped as glacial till. Within the Project area and along the interstate, the natural deposits have likely been re-worked or replaced with structural fill appropriate for highway construction.

The Natural Resources Conservation Service ("NRCS") has mapped the dominant soils within the Study Area as Adams loamy fine sand, 3 to 8 percent slopes, Charles silt loam, 0 to 2 percent slopes, Colton-Duxbury complex, 3 to 8 percent slopes, Nicholville very fine sandy loam, 10 to 25 percent slopes, Salmon very find sandy loam, 25 to 50 percent slopes, Vershire-Lombard complex, 15 to 25 percent slopes, Vershire-Lombard complex, 15 to 35 percent slopes, and Vershire-Lombard 35 to 60 percent slopes.

Memorandum

Bedrock geology of the area is mapped as phyllite and metalimestone, which is a metasedimentary class of lower Devonian and upper Silurian age, found within the Connecticut Valley Trough of the Waits River Formation. This bedrock type is described as "*dark-gray to silvery-gray, lustrous, carbonaceous muscovite-biotite-quartz (+/-garnet) phyllite containing abundant beds of punky-brown-weathering, dark-bluish-gray micaceous quartz-rich limestone in beds ranging from 10 cm to 10 m thick*" (Ratcliffe et al, 2011).

Hydrogeologic Investigations

Field hydrogeologic investigations completed by others, with periodic assistance from VHB, included measuring groundwater levels in a network of monitoring wells to determine groundwater flow direction and hydrologic gradients and completing slug tests to estimate the hydraulic conductivity of soil in the overburden water table. Combined, these analyses could be used by the selected contractor to evaluate groundwater management strategies pending the final construction design and parameters.

Methods

Between October and December 2022, VTrans' geotechnical contractor (HNTB) advanced 10 soil borings throughout the Project Area to complete geotechnical and groundwater studies (**Attachment 1**, **Figures 1 and 2**). The borings were completed as monitoring wells with slotted screens spanning the water table. Soil boring and monitoring well information is summarized in **Table 1** (**Attachment 2**). Boring logs and soil grain size analyses are provided in HNTB's Geotechnical Data Report (HNTB, 2023; "HNTB Report"). Following monitoring well completion through January 2023, HNTB installed levelloggers to continuously monitor groundwater levels, and also collected several manual groundwater level measurements using a water level probe.

Following monitoring well installation, development, and monitoring to confirm water levels stabilized (by HNTB), HNTB and VHB staff completed slug tests in all but one well (B-9[1]) to estimate hydraulic conductivity of the water table soils. Rising head and falling head slug tests were completed using a solid pipe slug in accordance with VHB's Slug Testing standard operating procedure[2]. In general, the falling head test is performed by displacing a volume of water through the addition of a metal slug to the well and measuring the decline of the water level back to the static level. The rising head test consists of removing the slug from the well and measuring the rise of the water level back to static level. Water level measurements were collected with a manual water level probe and a levellogger installed in the well prior to the test. VHB hydrogeologists analyzed the data using the Bouwer and Rice Method (Bouwer and Rice, 1976).

[1] Drilling casing broke during advancement of the soil boring. A well was able to be installed within the casing for water level measurements, but the casing surrounds most of the screen. Therefore, slug testing would not be representative of the soil conditions around the boring.

[2] VHB's Slug Test SOP, was developed and results analyzed based on Bouwer and Rice (1976), and in general accordance with the USGS Groundwater Technical Procedures ("GWPD")-17: Conducting an instantaneous change in head (slug) test with a mechanical slug and submersible pressure transducer (USGS, 2011).

Results

Soil Stratigraphy

Soil borings confirmed the presence of varying thicknesses of fill, consisting of coarse to fine silty sand and sandy clayey silt, with varying amounts of gravel (HNTB, 2023a). The *Lyndon - IM091-3(53) Geotechnical Baseline Report* ("GBR"; Mott McDonald, 2023) further classifies the fill as fill and embankment fill. The granular fill is the bedding directly around the culverts and is comprised of medium dense sand with silt. Embankment fill consists of medium dense to very dense coarse to fine silty sand and sandy clayey silt with varying amount of gravel, cobbles, and boulders. Though cobbles and boulders were encountered in multiple borings, the GBR anticipates cobbles and boulders exist in higher density around the culverts due to their displacement during construction of the culverts.

Glacial till is interpreted to underly the granular and embankment fill. The GBR describes the till as a well sorted, medium dense to very dense sand, silt, clay, and gravel mixture, with periodic presence of cobbles and boulders. Below the till layer, carbonaceous phyllite bedrock was encountered. The GBR includes subsurface profiles depicting the interpretated strata and soil densities.

Groundwater Elevations

Manual and datalogger groundwater level measurements are provided in **Table 1** (**Attachment 2**). Time-series groundwater elevation data from October 2022 through October 2023 are also presented graphically on pages 2 through 10 of **Attachment 2**. The singular maximum water level elevations in each monitoring well from this monitoring period are depicted on the site plan and representative cross-sections included on pages 4 through 6 of **Attachment 1**[3]. Average groundwater depths range from 72 feet below ground surface ("bgs") at B-4A to 5.6 feet bgs at B-10. Average groundwater elevations range from 843.7 ft above mean sea level ("amsl") at B-1 to 754.9 ft amsl at B-10. B-1 is located in the northwest corner of the Project Area and represents the most upgradient monitoring location. B-4A is located on the northbound barrel, to the east of existing culvert 96-3N. B-10 is located to the south of the southbound lane and east of the unnamed tributary, and represents the most downgradient monitoring location.

Based on data collected to date, groundwater generally flows from north to south across the Project area. A slight groundwater gradient toward the middle of the barrels is inferred based on the presence of the presumed Class II wetland and intermittent stream located to east of the unnamed tributary. These features likely represent a groundwater/surface water interface, where groundwater is either recharged or discharged depending on seasonal water table conditions. From here, water flows toward the unnamed tributary and then through the southbound culvert.

Hydraulic Conductivity

Slug test data and analyses are presented in **Attachment 3**. In most cases, values calculated using the rising head data were very similar to those calculated using the falling head data, demonstrating repeatability of the tests and analyses. No water level changes were detected during the B-5 falling head test and both B-8 tests, suggesting that the water levels rebounded nearly immediately, and hydraulic conductivity could not be accurately measured by slug testing. Results from the B-12 falling head and rising head tests differed substantially. The rising head test results have been

[3] Note that the maximum water elevations may have occurred at different times for each well. For example, maximum elevations for Well B-9A were recorded in July of 2023, whereas maximum elevations in B-12A were recorded in December of 2022.

omitted from the summary analysis because of the lack of an accurate starting static level prior to removing the slug, and the lack of datalogger data[4] to supplement the analysis.

As summarized on page 1 of **Attachment 3**, results from the rising head and falling head tests for each well were averaged. Average hydraulic conductivity values, *K*, range from approximately 2.12 ft/day (7.5 x 10^{-4} cm/sec) at B-4A to 28.8 feet/day (1.0 x 10^{-2} cm/sec) at B-12. Soil types in the saturated zone for all borings are described as either silty soils or silty gravel and sand. The calculated K values for the Project area are within the range of textbook K values for these soil types, further affirming the reliability of the slug testing and analysis. For reference, representative K values (Todd, 1980) are as follows:

- 0.26 ft/day (9.26 x 10^{-5} cm/sec) for silt,
- 2.5 ft/day (2.89 x 10^{-3} cm/sec) for fine sand
- 1.6 ft/day (5.67 x 10^{-4} cm/sec) for till that is predominantly sand, and
- 98.4 ft/day (3.47 x 10^{-2} cm/sec) for till that is predominantly gravel

Hydrogeologic Understanding of the Project Area

VHB has evaluated the direction, gradient, and hydraulic conductivity of groundwater in the overburden material within the Project Area using a combination of desktop research and analyses, geotechnical borings, monitoring wells, and slug testing. These studies indicate that groundwater generally flows from north to south across the Project area. A slight groundwater gradient toward the middle of the barrels is inferred based on the presence of the presumed Class II wetland and intermittent stream located to east of the unnamed tributary. Field tested hydraulic conductivity values range from approximately 2.12 ft/day (7.5 x 10^{-4} cm/sec) at B-4A to 28.8 feet/day (1.0 x 10^{-2} cm/sec) at B-12, which fall into the range of textbook K values for the Project soil types.

Attachments

1 - Figures

2 – Groundwater Data

3 – Slug Test Analysis and Data

References:

ANR, 1997. Protecting Public Water Sources in Vermont.

ANR, 2023. Natural Resources Atlas. Accessed March 2022 – March 2023.

[4] Field crew started the falling head test in the afternoon of 12/6/22 and water levels did not appear to stabilize quickly. The crew left the logger and slug in the well for the night. The logger battery died overnight. When the crew retuned the next day, they inadvertently forgot to record the starting static water level. The first manual measurement after removal of the slug was higher than the static level on 12/6/22 due to heavy rains. Therefore, the falling head test did not have an accurate starting point. For the analysis presented in the attachment, the last available datalogger measurement was used for the "static" level.

Memorandum

Bouwer, H. and Rice R.C., 1976. Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Complete or Partially Penetrating Wells. Water Resources Research. Volume 12, No. 3. June 1976.

HNTB, 2023. Lyndon-IM 091-3(53) Final Geotechnical Data Report. January 31, 2023.

Mott McDonald, 2023. Lyndon - IM091-3(53) Geotechnical Baseline Report. *DRAFT* dated March 24, 2023.

Ratcliffe, et al. 2011. Bedrock Geologic Map of Vermont. Access via ANR Atlas.

Todd, 1980. Groundwater Hydrology. Second Edition. John Wiley & Sons.

USGS, 2011. Groundwater Technical Procedures of the US Geological Survey. GWPD 17 - Conducting an instantaneous change in head (slug) test with a mechanical slug and submersible pressure transducer. Version 2010.2.

Attachment 1

Figure 1: Project Map

Lyndon IM 091-3(53) | Lyndon, Vermont

January 26, 2023

- Boring Location (VHB)
- Short Structure (6-20 ft; VTrans)
- Long Structure (>20 ft; VTrans)
- Culvert (VTrans)
- VHD Stream (VCGI)
- VHD Waterbody (VCGI)
- Town Boundary (VCGI)
- 10 ft Contour (VCGI)
- 2 ft Contour (VCGI)

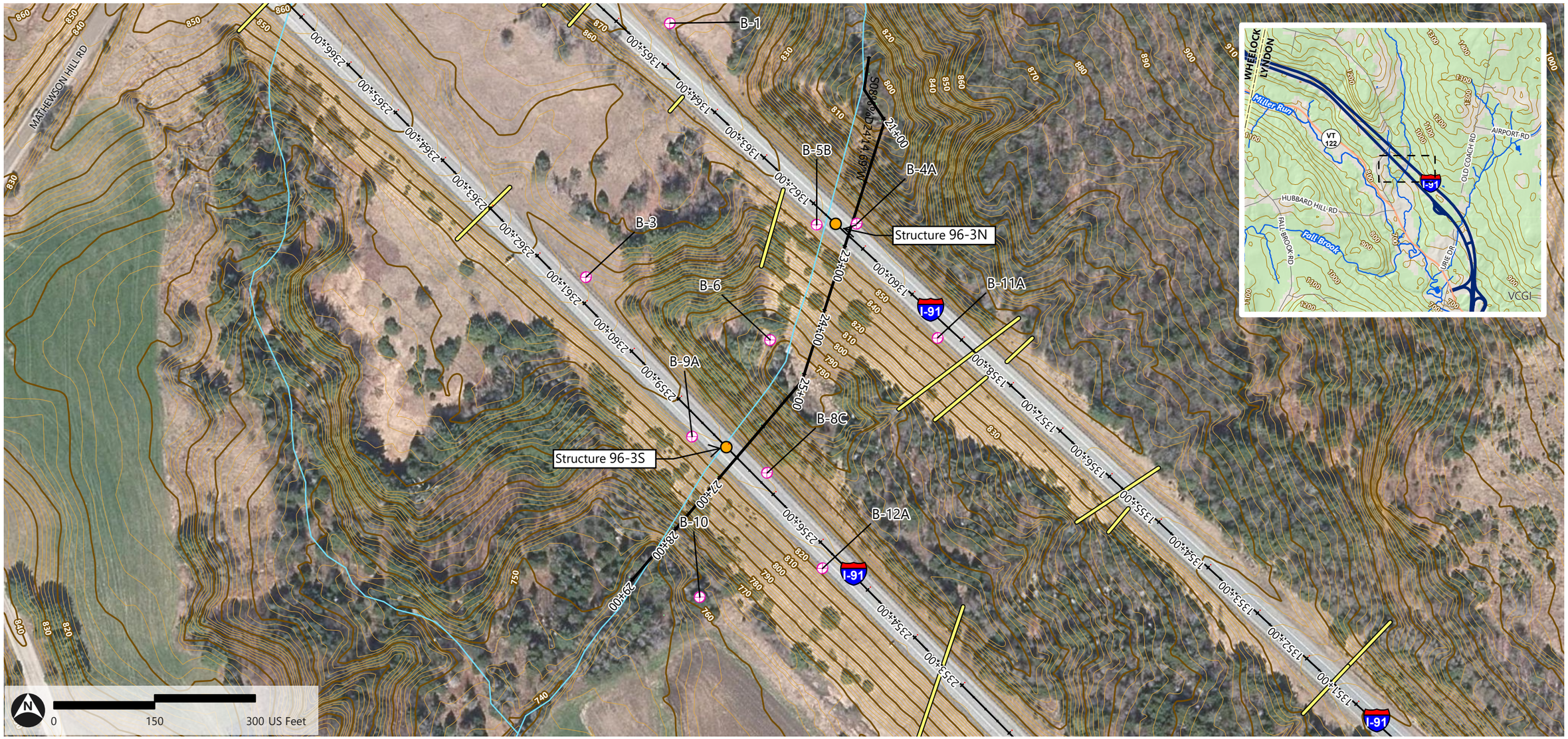
*B-11A was completed as Monitoring Well B-11B in the same approximate location as 11-A

Sources: Background imagery by VCGI (Collected in 2021); VCGI (Vermont Center for Geographic Information - Various Dates); VTrans (Vermont Agency of Transportation - Hosted Feature Service); VHB - 2022

Figure 2: Project Map - Large Scale

Lyndon IM 091-3(53) | Lyndon, Vermont

January 26, 2023



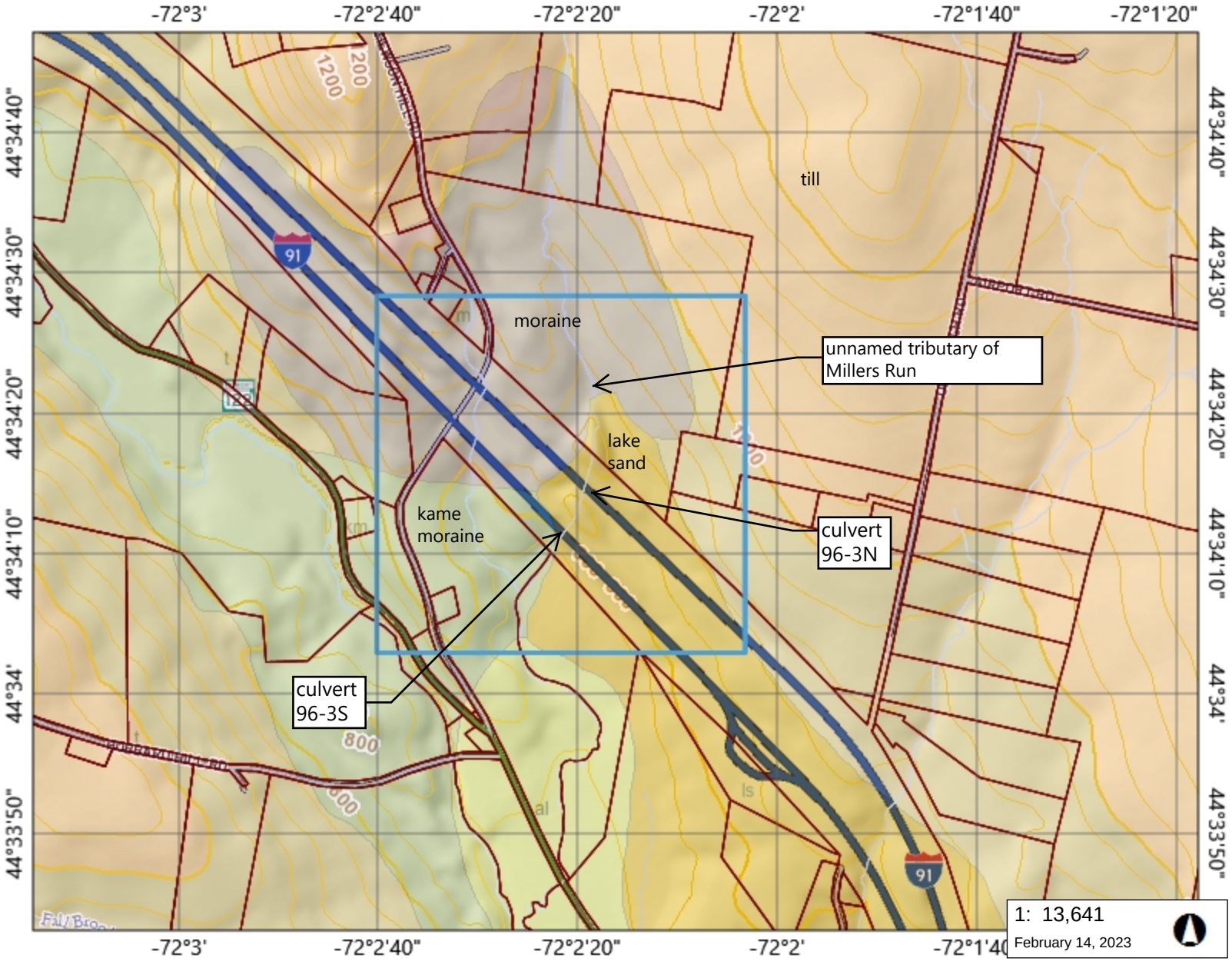
*B-11A was completed as Monitoring Well B-11B in the same approximate location as 11-A

Sources: Background imagery by VCGI (Collected in 2021); VCGI (Vermont Center for Geographic Information - Various Dates); VTrans (Vermont Agency of Transportation - Hosted Feature Service); VHB - 2022

Lyndon IM 091-3(53) Surficial Geology

Vermont Agency of Natural Resources

vermont.gov



1: 13,641

February 14, 2023

LEGEND

Surficial Geology (Lithology)

- till
- terminal moraine
- moraine
- isolated kame
- kame terrace
- kame moraine
- outwash
- esker
- eolian sand
- lake gravel
- beach gravel
- delta gravel
- delta
- lake sand
- pebbly sand
- boulders in sand
- delta sand
- silt, silty clay, and clay
- varved clay
- boulders in clay
- wave-washed till
- fluvial gravel
- fluvial sand
- alluvium
- marine beach gravel
- marine sand

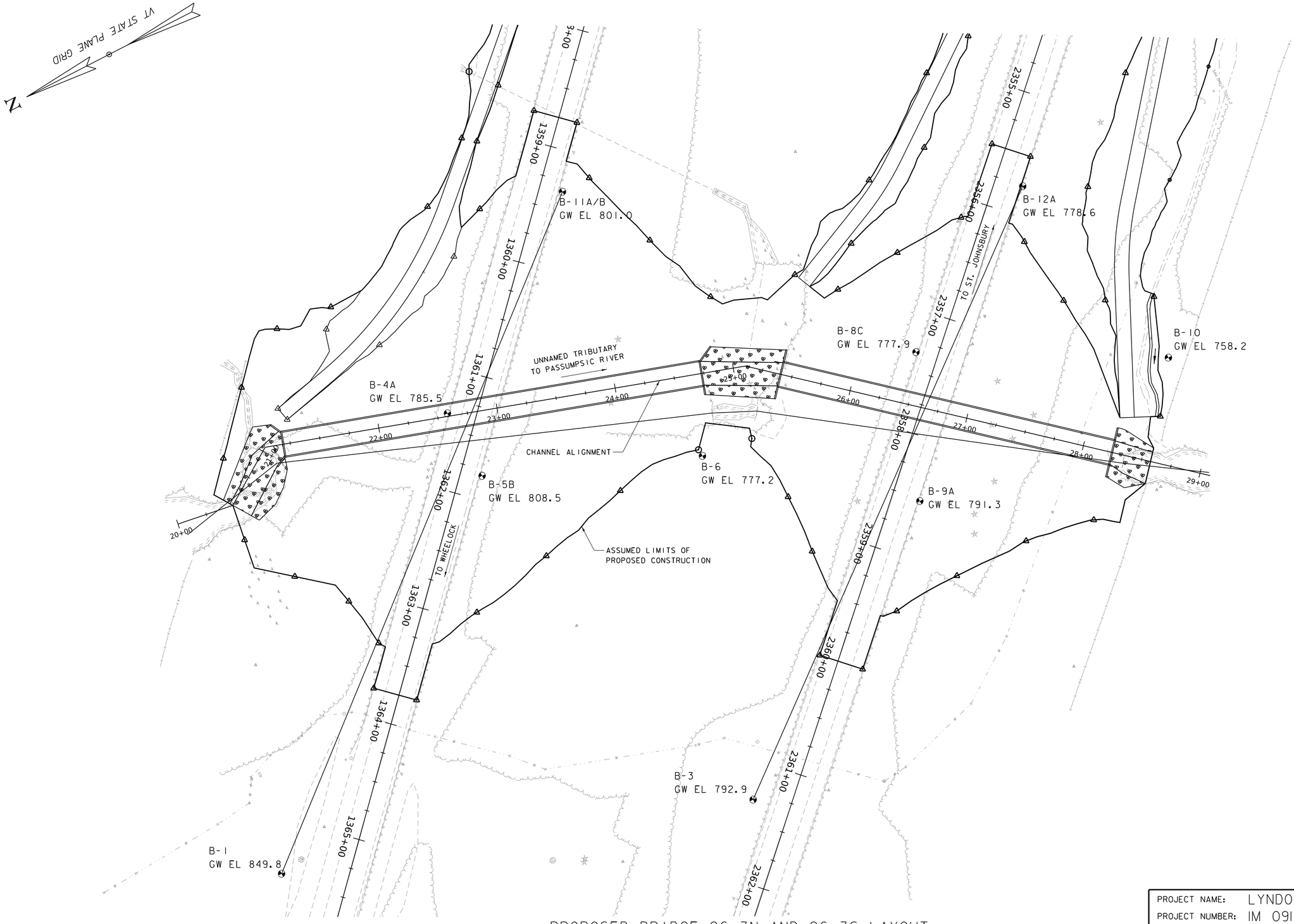
NOTES

Map created using ANR's Natural Resources Atlas

693.0 0 346.00 693.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1137 Ft. 1cm = 136 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

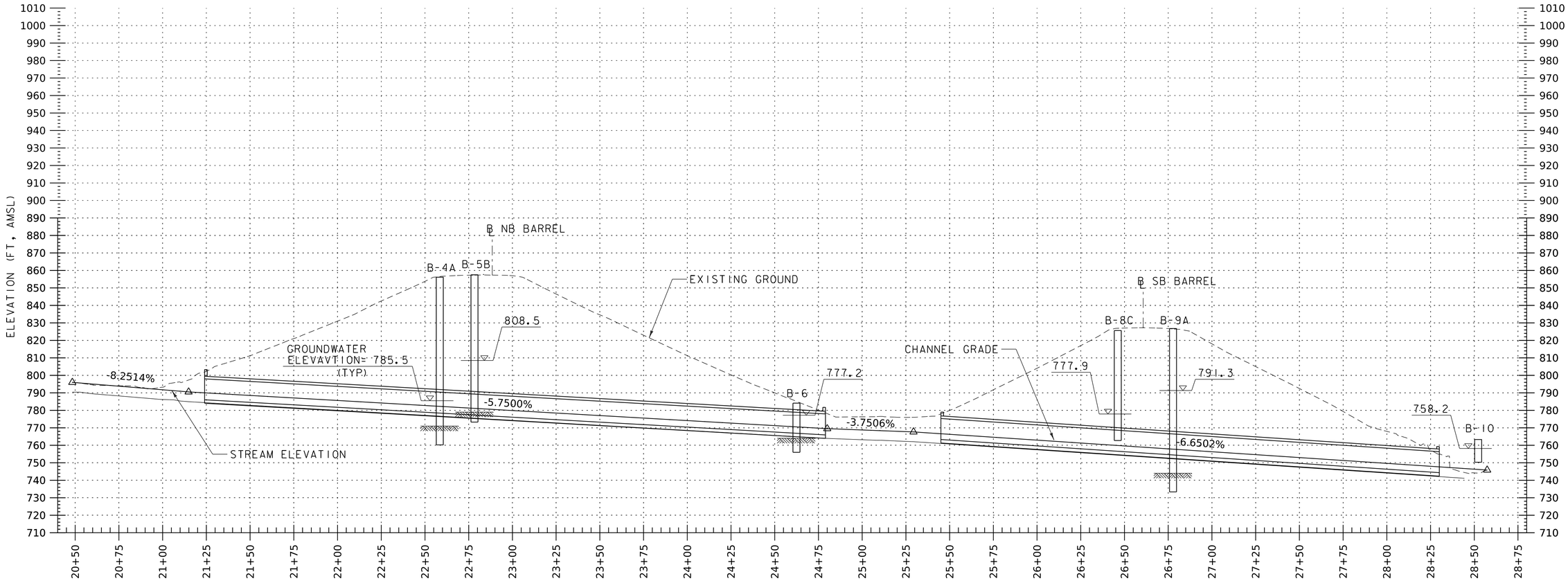


PROPOSED BRIDGE 96-3N AND 96-3S LAYOUT

GROUNDWATER BORING PLAN

SCALE 1" = 40'-0"

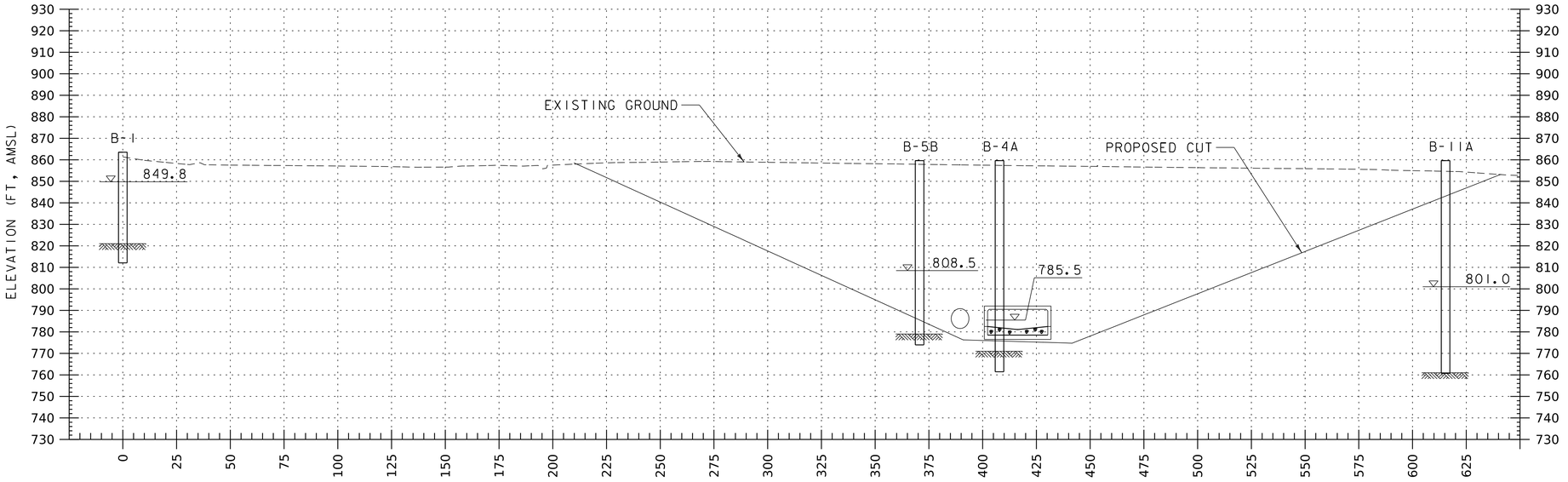
PROJECT NAME:	LYNDON
PROJECT NUMBER:	IM 091-3(53)
FILE NAME: zl9al89_pe.dgn	PLOT DATE: 20-OCT-2023
PROJECT LEADER: A.P. GUYETTE	DRAWN BY: N.A. TRUSLOW
DESIGNED BY: N.A. TRUSLOW	CHECKED BY: L. LEE
GROUNDWATER PLAN	SHEET 1 OF 3



PROPOSED BRIDGE 96-3N AND 96-3S LONGITUDINAL SECTION

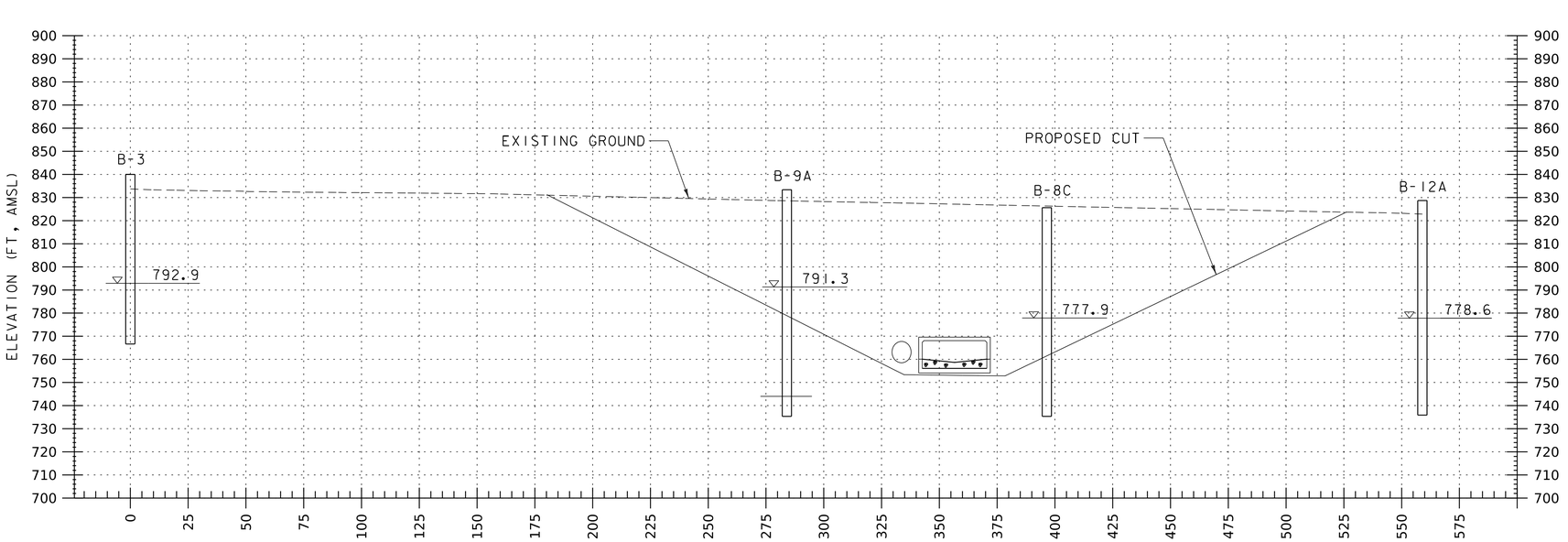
SCALE 1" = 30'-0"

PROJECT NAME:	LYNDON
PROJECT NUMBER:	IM 091-3(53)
FILE NAME: z19al89_pe.dgn	PLOT DATE: 20-OCT-2023
PROJECT LEADER: A.P. GUYETTE	DRAWN BY: N.A. TRUSLOW
DESIGNED BY: N.A. TRUSLOW	CHECKED BY: L. LEE
CULVERT SECTION	SHEET 2 OF 3



PROFILE FROM B-1 TO B-11A

SCALE 1" = 30'-0"



PROFILE FROM B-3 TO B-12A

SCALE 1" = 30'-0"

PROJECT NAME: LYNDON
PROJECT NUMBER: IM 091-3(53)

FILE NAME: z19a189_pe.dgn
PROJECT LEADER: A.P. GUYETTE
DESIGNED BY: N.A. TRUSLOW
GROUNDWATER PROFILES

PLOT DATE: 20-OCT-2023
DRAWN BY: N.A. TRUSLOW
CHECKED BY: L. LEE
SHEET 3 OF 3

Attachment 2

VTrans Lyndon - IM 091-3(53)

Table 1: Monitoring Well Installation and Groundwater Elevation Summary

Last Updated: 10/10/23

Boring/Monitoring Well Construction Information

		West Side of Stream					East Side of Stream				
	Boring/ MW ID	**B-1**	**B-6**	**B-5B**	**B-3**	**B-9A**	**B-4A**	**B-10**	**B-8C**	**B-11A/B**	**B-12A**
	Completion Date	9/28/2022	9/29/2022	10/3/2022	10/4/2022	12/1/2022	10/18/2022	10/6/2022	11/14/2022	9/28/2022	12/5/2022
	Ground Elevation (approx.) [1]	861.2	785.5	857.5	834.1	827.4	856.6	760.5	825.8	854.8	823.1
	MW Screen Diamater (in)	2	2	2	2	2	2	2	2	2	2
	Stick Up Height (ft)	2.92	3.00	0.00	2.86	0.00	0.00	3.00	0.00	0.00	0.00
Below Ground Surface (BGS)	Total Depth of Boring (ft)	49.0	30.0	84.0	67.0	93.2	96.0	50.0	64.0	94.0	87.0
	Top of Rock (BGS)	39.0	20.0	79.0	64.0	83.0	86.0	--	--	94.0	87.0
	Total Well Depth (Below Stick Up)	35.1	23.22	78.6	66.9	70.0	85.0	15.0	54.0	94.0	70.0
	Total Well Depth (BGS)	32.2	20.22	78.6	64.0	70.0	85.0	12.0	54.0	90.5	70.0
	Screen Length (ft)	20	10.0	45.0	25.0	25.0	30.0	10.0	10.0	50.0	20.0
	Top of Screen (BGS)	12.2	10.2	33.6	39.0	45.0	55.0	2.0	44.0	40.5	50.0
Elevations	Top of Riser/Pipe	864.1	788.5	857.5	837.0	827.4	856.6	763.5	825.8	854.8	823.1
	Top of Screen	849.0	775.3	823.9	795.1	782.4	801.6	758.5	781.8	814.3	773.1
	Bottom of Well/Screen	829.0	765.3	778.9	770.1	757.4	771.6	748.5	771.8	764.3	753.1
	Bottom of Boring	812.2	755.5	773.5	767.1	734.2	760.6	710.5	761.8	760.8	736.1
	Top of Rock	822.2	765.5	778.5	770.1	744.4	770.6			760.8	736.1
	Slug Test Completed? Y/N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
	Soil type in Water Table [2]	Silty Soils	Silty Gravel and Sand	Silty Gravel and Sand	Silty Soils	Silty Gravel and Sand	Silty Gravel and Sand	Silty Gravel and Sand	Gravel and Sand	Silty Soils	Silty Soils

[1] HNTB Well Logs (1/31/23)

[2] AASTHO Descriptions based on grain size analysis from representative soil sample, per HNTB Geotechnical Data Report (1/31/23).

Datalogger Groundwater Elevations - Summary*

		West Side of Stream					East Side of Stream				
		B-1	**B-6**	**B-5B**	**B-3**	**B-9A**	**B-4A**	**B-10**	**B-8C**	**B-11A/B**	**B-12A**
	Data Range:	10/6/22 - 10/9/23	10/4/22 - 10/10/23	10/4/22 - 10/9/23	10/6/22 - 10/9/23	12/7/22 - 10/9/23	10/20/22 - 10/9/23	10/17/22 - 10/9/23	11/15/22 - 10/9/23	10/3/22 - 10/9/23	12/6/22 - 10/9/23
	Average:	843.7	775.4	807.6	791.7	774.4	784.7	754.9	775.8	799.4	768.2
	Min:	837.1	773.5	806.5	790.4	771.9	783.4	752.9	772.1	797.0	766.9
	Max:	849.8	777.2	808.5	792.9	791.3	785.5	758.2	777.9	801.0	778.6

*See separate charts for visual representation of all available data. NA = no data provided by HNTB. For B-12, the static water level prior to the slug test is provided.

Manual Groundwater Depth(s) and Elevations

		West Side of Stream					East Side of Stream				
	Date	**B-1**	**B-6**	**B-5B**	**B-3**	**B-9A**	**B-4A**	**B-10**	**B-8C**	**B-11B**	**B-12A**
Depth -ft BGS	9/29/2022	24.2								57.2	
	9/30/2022	24.1	12.03							57.2	
	10/3/2022			49.5						57.1	
	10/4/2022	24.0	12.06	49.5							
	10/5/2022	24.1	11.9	49.6	43.4					57.0	
	10/7/2022							7.0			
	10/19/2022	23.7		49.7							
	10/20/2022						72.5				
	11/15/2022								49		
	11/23/2022	23.2									
	11/29/2022		10.5	49.7	43.6		72.2	5.5	48.7		
	12/1/2022										
	12/2/2022					53.3					
	12/6/2022					52.8		7.1	48.9		55.9
	12/7/2022										
	1/23/2023	17.3	9.7	49.0	43.4	53.2	71.3	4.0	49.2	55.3	53.5
	3/19/2023	18.2	10.1	49.7	42.4	52.9	71.3	4.1	48.9	54.9	55.0
	Ave Depth	23.0	11.2	49.5	43.5	53.0	72.0	5.9	49.0	56.7	54.7
Elevation - ft amsl	9/29/2022	837.0								797.7	
	9/30/2022	837.1	773.5							797.6	
	10/3/2022			808.0						797.7	
	10/4/2022	837.2	773.4	808.0							
	10/5/2022	837.1	773.6	808.0	790.74					797.8	
	10/7/2022							753.47			
	10/19/2022	837.5		807.84							
	10/20/2022						784.1				
	11/15/2022								776.8		
	11/23/2022	838.0									
	11/29/2022		774.99	807.84	790.54		784.4	754.97	777.1		
	12/1/2022										
	12/2/2022					774.083					
	12/6/2022					774.6		753.4	776.9		767.162
	12/7/2022										
	1/23/2023	843.9	775.79	808.54	790.74	774.183	785.3	756.47	776.6	799.5	769.562
	3/19/2023	843.0	775.4	807.84	791.8	774.5	785.4	756.37	776.9	799.9	768.1
	Ave Elevation	838.2	774.3	808.0	790.7	774.3	784.6	754.6	776.9	798.1	768.4

Notes:

Boring, Monitoring Well Construction, and Groundwater Depths from HNTB's Geotechnical Data Report, January 31, 2023.

BGS = Below Ground Surface

ft = feet

VTrans Lyndon IM 091-3(53)

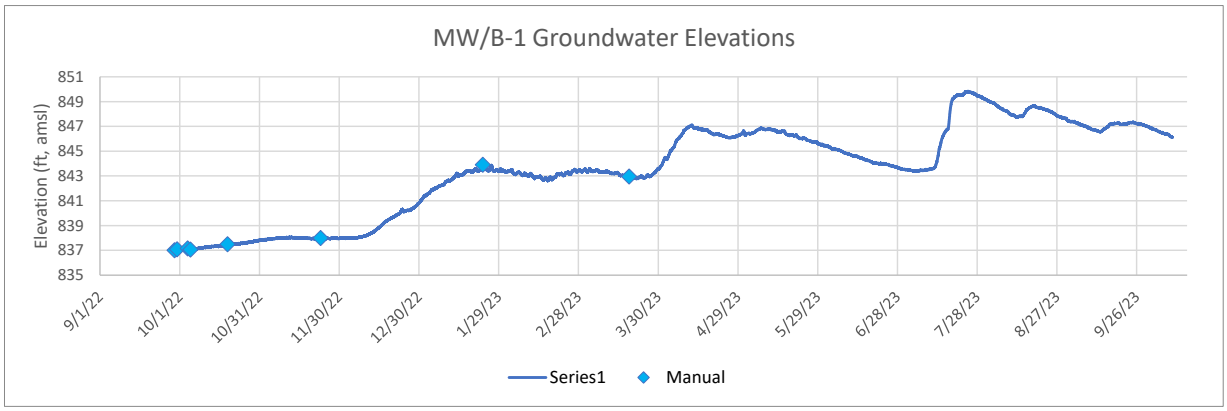
Monitoring Well - Groundwater Elevation Data

Monitoring Well B-1

Datalogger Data

Stickup:	2.92	HNTB Geotech Report - Well Log (1/31/23)
Ground Surface Elevation:	**861.2**	HNTB Geotech Report - Well Log (1/31/23)
Period of record:	10/6/22 - 10/9/23	

Groundwater Elevation Statistics (ft amsl)	
Min	837.06
Max	**849.84**
Running Average	**843.74**
Monthly Averages	
Oct-22	*837.46*
Nov-22	*837.97*
Dec-22	*839.20*
Jan-23	*842.94*
Feb-23	*843.10*
Mar-23	*843.21*
Apr-23	*846.22*
May-23	*846.29*
Jun-23	*844.39*
Jul-23	*846.65*
Aug-23	848.21
Sep-23	847.07
Oct-23	846.52



Source: Datalogger data provided by HNTB

\\vhb\gbl\proj\SBurlington\58752.00 Lyndon Design-Build\tech\Geotechnical Coordination\Groundwater Data\2023_07-20_Lyndon_Groundwater

VTrans Lyndon IM 091-3(53)

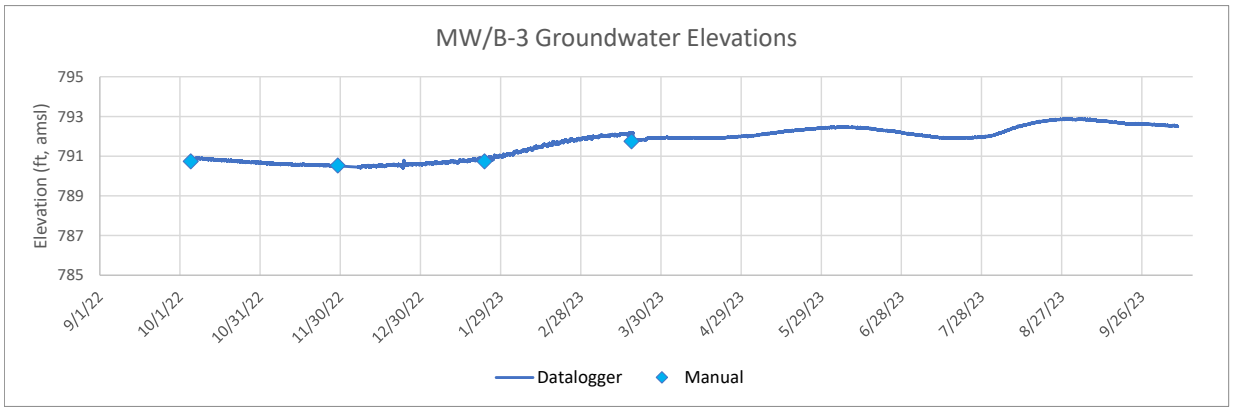
Monitoring Well - Groundwater Elevation Data

Monitoring Well B-3

Datalogger Data

Stickup:	2.86	HNTB Geotech Report - Well Log (1/31/23)
Ground Surface Elevation:	**834.1**	HNTB Geotech Report - Well Log (1/31/23)
Period of record:	10/6/22 - 10/9/23	

Groundwater Elevation Statistics (ft amsl)	
Min Elevation	**790.39**
Max Elevation	**792.89**
Running Average	**791.72**
Monthly Averages	
Oct-22	*790.78*
Nov-22	*790.58*
Dec-22	*790.54*
Jan-23	*790.80*
Feb-23	*791.53*
Mar-23	*791.97*
Apr-23	*791.93*
May-23	*792.24*
Jun-23	*792.36*
Jul-23	*791.97*
Aug-23	792.60
Sep-23	792.72
Oct-23	792.55



Source: Datalogger data provided by HNTB

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VTrans Lyndon IM 091-3(53)

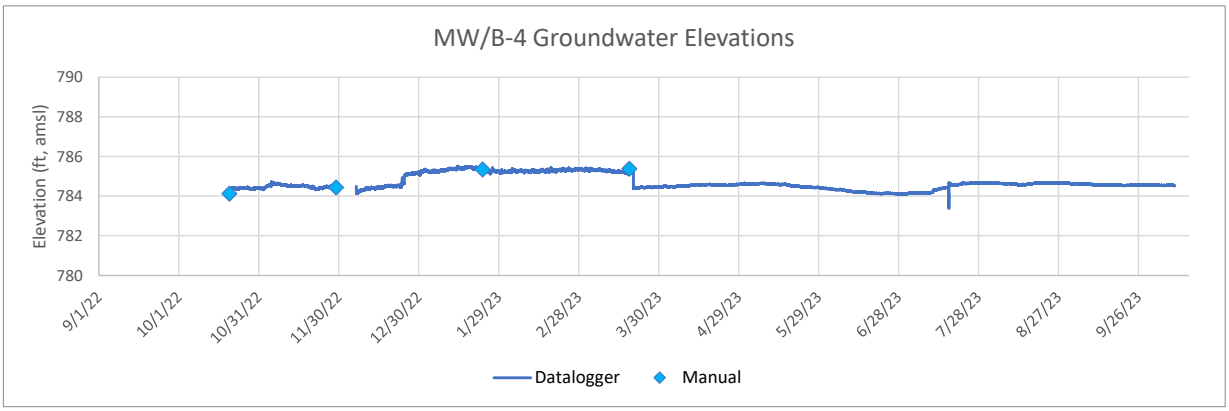
Monitoring Well - Groundwater Elevation Data

Monitoring Well B-4A

Datalogger Data

Stickup:	0	HNTB Geotech Report - Well Log (1/31/23)
Ground Surface Elevation:	**856.6**	HNTB Geotech Report - Well Log (1/31/23)
Period of record:	10/20/22 - 10/9/23	

Groundwater Elevation Statistics (ft amsl)	
Min	**783.40**
Max	**785.52**
Running Average	**784.68**
Monthly Averages	
Oct-22	*784.40*
Nov-22	*784.50*
Dec-22	*784.65*
Jan-23	*785.32*
Feb-23	*785.29*
Mar-23	*784.97*
Apr-23	*784.54*
May-23	*784.54*
Jun-23	784.21
Jul-23	784.43
Aug-23	784.64
Sep-23	784.57
Oct-23	784.55



Source: Datalogger data provided by HNTB

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VTrans Lyndon IM 091-3(53)

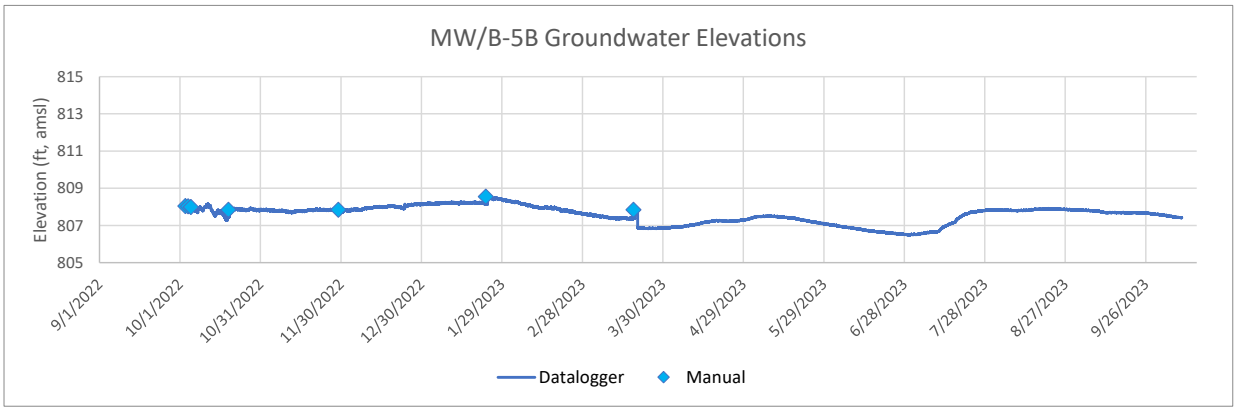
Monitoring Well - Groundwater Elevation Data

Monitoring Well B-5B

Datalogger Data

Stickup:	0	HNTB Geotech Report - Well Log (1/31/23)
Ground Surface Elevation:	**857.5**	HNTB Geotech Report - Well Log (1/31/23)
Period of record:	10/4/22 - 10/9/23	

Groundwater Elevation Statistics (ft amsl)	
Min	**806.49**
Max	**808.51**
Running Average	**807.58**
Monthly Averages	
Oct-22	*807.81*
Nov-22	*807.80*
Dec-22	*807.98*
Jan-23	*808.26*
Feb-23	*807.94*
Mar-23	*807.24*
Apr-23	*807.13*
May-23	*807.34*
Jun-23	*806.72*
Jul-23	*807.20*
Aug-23	807.84
Sep-23	807.71
Oct-23	807.49



Source: Datalogger data provided by HNTB

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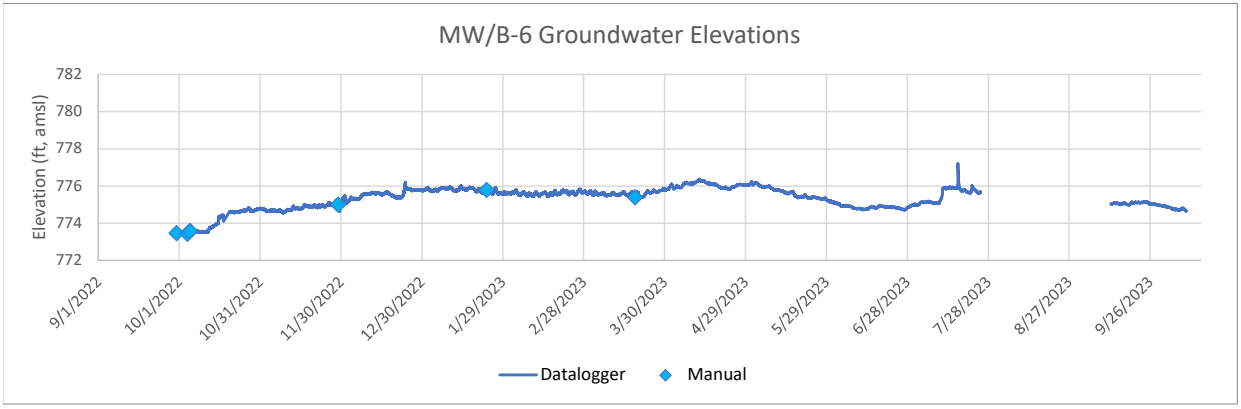
VTrans Lyndon IM 091-3(53)
Monitoring Well - Groundwater Elevation Data

Monitoring Well B-6
Datalogger Data
Stickup: 3.00 HNTB Geotech Report - Well Log (1/31/23)
Ground Surface Elevation: **785.5** HNTB Geotech Report - Well Log (1/31/23)
Period of record: 10/4/22 - 10/10/23

Groundwater Elevation Statistics (ft amsl)	
Min	**773.49**
Max	**777.21**
Running Average	**775.35**
Monthly Averages	
Oct-22	*774.21*
Nov-22	*774.85*
Dec-22	*775.56*
Jan-23	*775.77*
Feb-23	*775.61*
Mar-23	*775.62*
Apr-23	*776.06*
May-23	*775.61*
Jun-23	*774.87*
Jul-23	*775.53*
Aug-23	--
Sep-23	*775.06*
Oct-23	*774.79*



Source: Datalogger data provided by HNTB

VTrans Lyndon IM 091-3(53)

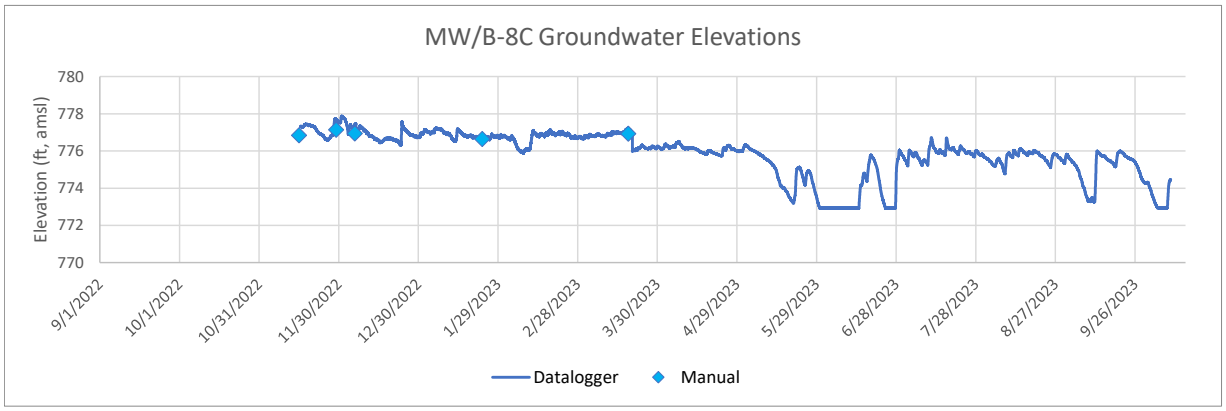
Monitoring Well - Groundwater Elevation Data

Monitoring Well B-8C

Datalogger Data

Stickup:	0	HNTB Geotech Report - Well Log (1/31/23)
Ground Surface Elevation:	**825.8**	HNTB Geotech Report - Well Log (1/31/23)
Period of record:	11/15/22 - 10/9/23	

Groundwater Elevation Statistics (ft amsl)	
Min	**772.08**
Max	**777.87**
Running Average	**775.82**
Monthly Averages	
Nov-22	*777.17*
Dec-22	*776.93*
Jan-23	*776.86*
Feb-23	*776.69*
Mar-23	*776.63*
Apr-23	*776.09*
May-23	*774.76*
Jun-23	*773.76*
Jul-23	*775.88*
Aug-23	775.65
Sep-23	775.04
Oct-23	773.35



Source: Datalogger data provided by HNTB

VTrans Lyndon IM 091-3(53)

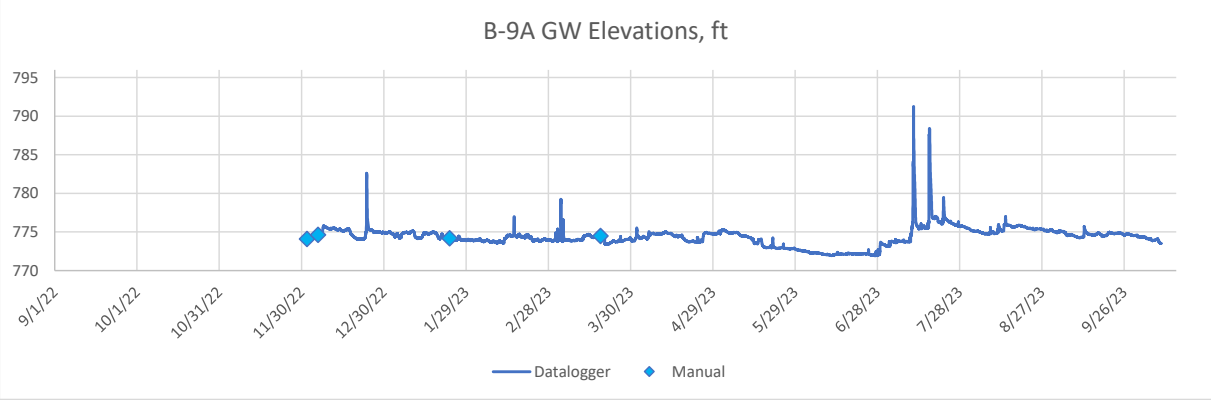
Monitoring Well - Groundwater Elevation Data

Monitoring Well B-9A

Datalogger Data

Stickup:	0	HNTB Geotech Report - Well Log (1/31/23)
Ground Surface Elevation:	**827.4**	HNTB Geotech Report - Well Log (1/31/23)
Period of record:	12/7/22 - 10/9/23	

Groundwater Elevation Statistics (ft amsl)	
Min	**771.93**
Max	**791.26**
Running Average	**774.38**
Monthly Averages	
Nov-22	*NA*
Dec-22	*775.09*
Jan-23	*774.44*
Feb-23	*774.07*
Mar-23	*774.11*
Apr-23	*774.44*
May-23	*773.74*
Jun-23	*772.26*
Jul-23	*775.81*
Aug-23	775.32
Sep-23	774.70
Oct-23	774.09



VTrans Lyndon IM 091-3(53)

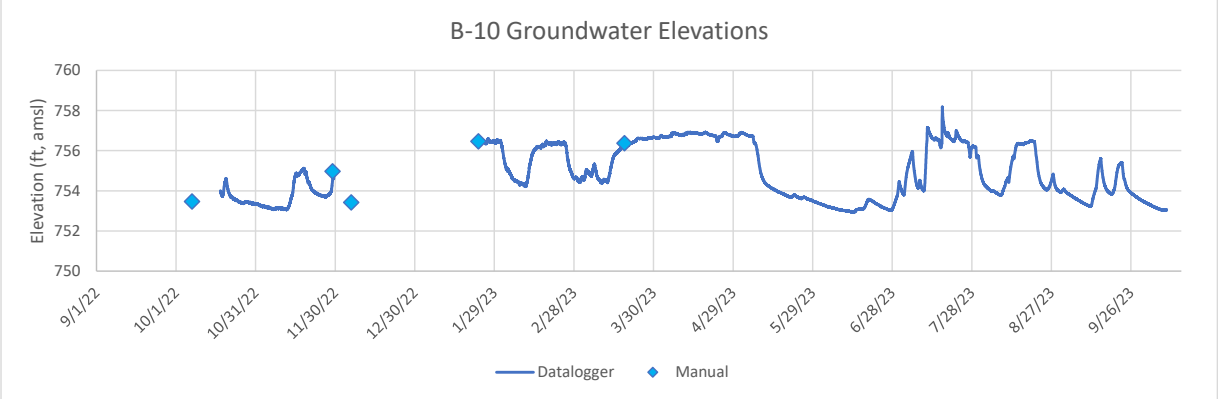
Monitoring Well - Groundwater Elevation Data

Monitoring Well B-10

Datalogger Data

Stickup:	3.00	HNTB Geotech Report - Well Log (1/31/23)
Ground Surface Elevation:	**760.5**	HNTB Geotech Report - Well Log (1/31/23)
Period of record:	10/17/22 - 10/9/23	

Groundwater Elevation Statistics (ft amsl)	
Min	**752.93**
Max	**758.18**
Running Average	**754.85**
Monthly Averages	
Oct-22	*753.62*
Nov-22	*753.78*
Dec-22	*no data*
Jan-23	*756.45*
Feb-23	*755.51*
Mar-23	*755.67*
Apr-23	756.79
May-23	754.56
Jun-23	*753.22*
Jul-23	*755.86*
Aug-23	754.85
Sep-23	754.01
Oct-23	753.20



Source: Datalogger data provided by HNTB

VTrans Lyndon IM 091-3(53)

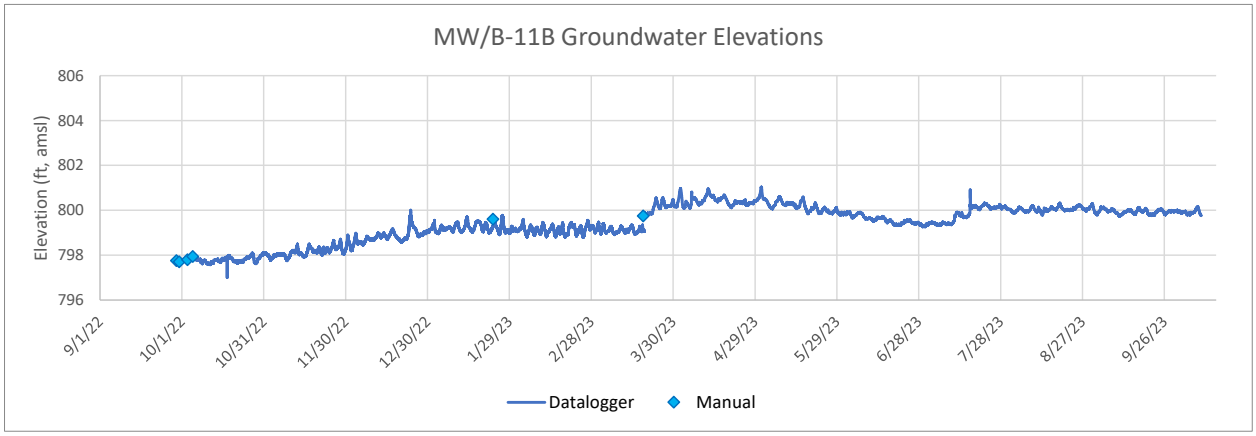
Monitoring Well - Groundwater Elevation Data

Monitoring Well 11-B

Datalogger Data

Stickup:	0	HNTB Geotech Report - Well Log (1/31/23)
Ground Surface Elevation:	**854.8**	HNTB Geotech Report - Well Log (1/31/23)
Period of record:	10/3/22 - 10/9/23	

Groundwater Elevation Statistics (ft amsl)	
Min	**797.00**
Max	**801.04**
Running Average	**799.41**
Monthly Averages	
Oct-22	*797.81*
Nov-22	*798.16*
Dec-22	*798.85*
Jan-23	*799.22*
Feb-23	*799.13*
Mar-23	*799.54*
Apr-23	*800.42*
May-23	*800.17*
Jun-23	*799.57*
Jul-23	*799.84*
Aug-23	800.05
Sep-23	799.94
Oct-23	799.92



Source: Datalogger data provided by HNTB

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VTrans Lyndon IM 091-3(53)

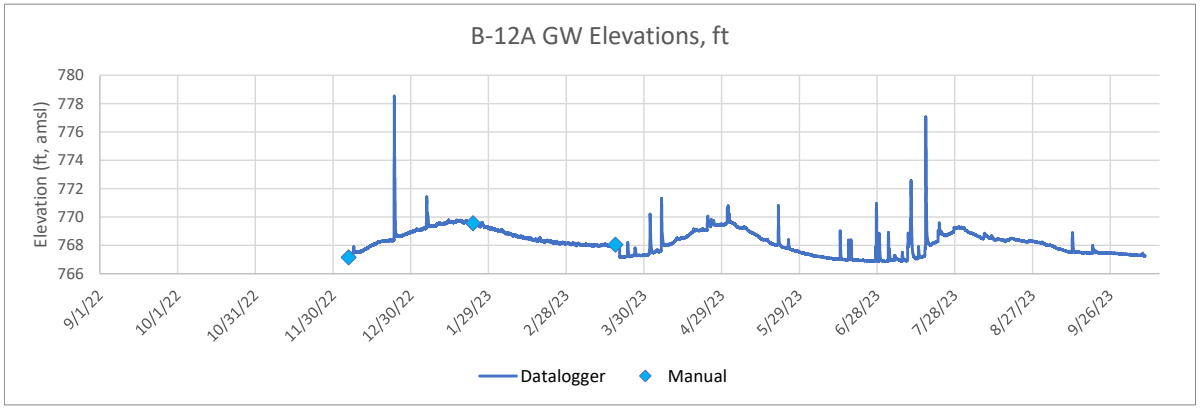
Monitoring Well - Groundwater Elevation Data

Well 12A

Datalogger Data

Stickup:	0	HNTB Geotech Report - Well Log (1/31/23)
Ground Surface Elevation:	**823.1**	HNTB Geotech Report - Well Log (1/31/23)
Period of record:	12/6/22 - 10/9/23	

Groundwater Elevation Statistics (ft amsl)	
Min	**766.86**
Max	**778.55**
Running Average	**768.23**
Monthly Averages	
Dec-22	*768.37*
Jan-23	*769.47*
Feb-23	*768.50*
Mar-23	*767.78*
Apr-23	*768.75*
May-23	*768.47*
Jun-23	767.13
Jul-23	768.09
Aug-23	768.46
Sep-23	767.60
Oct-23	767.33



Attachment 3

Lyndon IM 091-3(53)
Slug Test Field Data Summary
Bouwer and Rice Method

Summary in feet/day				
Test Location	**Interstate Barrel**	**Falling Head Method feet/day**	**Rising Head Method feet/day**	**Mean feet/day**
West Side of Stream				
B-1	Northbound	23.18	5.94	**14.56**
B-5B	Northbound	--	19.15	**19.15**
B-6	Center	19.03	13.96	**16.49**
B-3	Southbound	7.26	3.53	**5.40**
			Mean:	**13.90**
			Max:	**19.15**
East Side of Stream				
B-4A	Northbound	0.95	3.29	**2.12**
B-11A/B	Northbound	4.68	1.94	**3.31**
B-8	Southbound	--	--	**--**
B-10	Southbound	3.95	4.71	**4.33**
B-12	Southbound	28.82	--	**28.82**
			Mean:	**9.64**
			Max:	**28.82**

Summary in cm/sec				
Test Location	**Interstate Barrel**	**Falling Head Method cm/sec**	**Rising Head Method cm/sec**	**Mean cm/sec**
West Side of Stream				
B-1	Northbound	8.18E-03	2.09E-03	**5.14E-03**
B-5	Northbound	--	6.75E-03	**6.75E-03**
B-6	Center	6.71E-03	4.92E-03	**5.82E-03**
B-3	Southbound	2.56E-03	1.25E-03	**1.90E-03**
			Mean:	**4.29E-03**
			Max:	**5.82E-03**
East Side of Stream				
B-4A	Northbound	3.34E-04	1.16E-03	**7.48E-04**
B-11B	Northbound	1.65E-03	6.83E-04	**1.17E-03**
B-8	Southbound	--	--	**--**
B-10	Southbound	1.39E-03	1.66E-03	**1.53E-03**
B-12	Southbound	1.02E-02	--	**1.02E-02**
			Mean:	**3.40E-03**
			Max:	**1.02E-02**

Notes:
-- indicates data not available or rejected
Refer to associated data tables and calculations

Lyndon IM 091-3(53)
Slug Test Field Data - Hydraulic Conductivity Calculations
Bouwer and Rice Method - Impermeable Below Base of Wells

East Side of Stream

B-8: Falling Head Test

stickup = 0 feet
screen length = 10 feet
total depth = 54.00 Ft BGS or 54.00 feet BTC
depth to impermeable = 100 feet BGS or 100.00 ft BTC
static level = 48.51 feet BTC

H =	51.49	feet	A =	2.505	
L_w =	5.49	feet	B =	0.370	
r_w =	0.17	feet	C =	2.100	
L_e =	5.49	feet	ln R_e/r_w =	2.43	
r_c =	0.08	feet			
t =	NA	sec	K =	NA	ft/sec
y_0 =	NA		K =	NA	ft/day
y_t =	NA				

*No measureable change in WLs; calculations unavailable

B-8: Rising Head Test

stickup = 0 feet
screen length = 5 feet
total depth = 54.00 Ft BGS or 54.00 feet BTC
depth to impermeable = 100 feet BGS or 100.00 ft BTC
static level = 48.51 feet BTC

H =	51.49	feet	A =	2.423	
L_w =	5.49	feet	B =	0.360	
r_w =	0.17	feet	C =	2.000	
L_e =	5.00	feet	ln R_e/r_w =	2.40	
r_c =	0.08	feet			
t =	NA	sec	K =	NA	ft/sec
y_0 =	NA		K =	NA	ft/day
y_t =	NA				

*No measureable change in WLs; calculations unavailable

B-10: Falling Head Test

stickup = 0 feet
screen length = 10 feet
total depth = 14.91 Ft BGS or 14.91 feet BTC
depth to impermeable = 100 feet BGS or 100.00 ft BTC
static level = 7.05 feet BTC

H =	92.95	feet	A =	2.933	
L_w =	7.86	feet	B =	0.443	
r_w =	0.17	feet	C =	2.583	
L_e =	7.86	feet	ln R_e/r_w =	2.74	
r_c =	0.08	feet			
t =	122	sec	K =	4.57E-05	ft/sec
y_0 =	1.000		K =	3.95	ft/day
y_t =	0.010				

B-10: Rising Head Test

stickup = 0.00 feet
screen length = 10 feet
total depth = 14.91 Ft BGS or 14.91 feet BTC
depth to impermeable = 100 feet BGS or 100.00 ft BTC
static level = 7.05 feet BTC

H =	92.95	feet	A =	2.933	
L_w =	7.86	feet	B =	0.677	
r_w =	0.17	feet	C =	2.583	
L_e =	7.86	feet	ln R_e/r_w =	2.68	
r_c =	0.08	feet			
t =	100	sec	K =	5.45E-05	ft/sec
y_0 =	1.000		K =	4.71	ft/day
y_t =	0.010				

B-12A: Falling Head Test

stickup = 0.00 feet
screen length = 20 feet
total depth = 70.00 Ft BGS or 70.00 feet BTC
depth to impermeable = 87 feet BGS or 87.00 ft BTC
static level = 55.90 feet BTC

H =	31.10	feet	A =	3.967	
L_w =	14.10	feet	B =	0.677	
r_w =	0.17	feet	C =	3.750	
L_e =	14.10	feet	ln R_e/r_w =	3.24	
r_c =	0.08	feet			
t =	11	sec	K =	3.34E-04	ft/sec
y_0 =	1.000		K =	28.82	ft/day
y_t =	0.010				

B-12A: Rising Head Test

stickup = 0.00 feet
screen length = 20 feet
total depth = 70.00 Ft BGS or 70.00 feet BTC
depth to impermeable = 87 feet BGS or 87.00 ft BTC
static level = 55.90 feet BTC

H =	31.10	feet	A =	3.967	
L_w =	14.10	feet	B =	0.677	
r_w =	0.17	feet	C =	3.750	
L_e =	14.10	feet	ln R_e/r_w =	3.24	
r_c =	0.08	feet			
t =	5000	sec	K =	7.34E-07	ft/sec
y_0 =	1.00		K =	0.06	ft/day
y_t =	0.01				

*no data logger data available

Lyndon IM 091-3(53)
Slug Test Field Data - Hydraulic Conductivity Calculations
Bouwer and Rice Method - Impermeable Below Base of Wells

Condition: Impermeable layer is below base of well:

$$K = \frac{r_c^2 \ln(R_e/r_w) \ln(y_0/y_t)}{2L_e t} \qquad \ln R_e/r_w = \frac{1}{\frac{1.1}{\ln(L_w/r_w)} + \frac{A + B(\ln[(H-L_w)/r_w])}{L_e/r_w}} \qquad \text{where } H\text{-}L_w/r_w \le 6$$

H = depth from water table to impermeable layer
L_w = depth from water table to bottom of open section in the well
r_w = radial distance between well center and undistubed aquifer
L_e = height of wetted portion of well screen
r_c = radius of the well section where the water level is rising
t = time since start of test
y_0 = H/H_0 at time zero
y_t = H/H_0 at time t
A = type curve constant related to L_e/r_w (Bouwer and Rice, 1976)
B = type curve constant related to L_e/r_w (Bouwer and Rice, 1976)
C = type curve constant related to L_e/r_w (Bouwer and Rice, 1976)

Lyndon IM 091-3(53)
Slug Test Field Data - Hydraulic Conductivity Calculations
Bouwer and Rice Method - Impermeable at Base of Wells

West Side of Stream

B-1: Falling Head Test

screen length =	20	feet			
total depth =	35.15	feet			
static level =	26.58	feet			
L_w =	8.57	feet			
r_w =	0.17	feet	C =	2.675	
L_e =	8.57	feet	ln R_e/r_w =	3.02	
r_c =	0.08	feet			
t =	21	sec	K =	2.68E-04	ft/sec
y_0 =	1.00		K =	23.18	ft/day
y_t =	0.01				

B-1: Rising Head Test

screen length =	20	feet			
total depth =	35.15	feet			
static level =	26.58	feet			
L_w =	8.57	feet			
r_w =	0.17	feet	C =	2.675	
L_e =	8.57	feet	ln R_e/r_w =	3.02	
r_c =	0.08	feet			
t =	82	sec	K =	6.87E-05	ft/sec
y_0 =	1.00		K =	5.94	ft/day
y_t =	0.01				

B-5B: Falling Head Test

screen length =	45	feet			
total depth =	79	feet			
static level =	49.98	feet			
L_w =	29.02	feet			
r_w =	0.17	feet	C =	6.175	
L_e =	29.02	feet	ln R_e/r_w =	4.02	
r_c =	0.08	feet			
t =	NA	sec	K =	NA	ft/sec
y_0 =	NA		K =	NA	ft/day
y_t =	NA				

*little detectable change in WLs. Not useable.

B-5B: Rising Head Test

screen length =	45	feet			
total depth =	79	feet			
static level =	49.98	feet			
L_w =	29.02	feet			
r_w =	0.17	feet	C =	6.175	
L_e =	29.02	feet	ln R_e/r_w =	4.02	
r_c =	0.08	feet			
t =	10	sec	K =	2.22E-04	ft/sec
y_0 =	1.00		K =	19.15	ft/day
y_t =	0.01				

*little detectable change in WLs; estimate

B-3: Falling Head Test

screen length =	25	feet			
total depth =	64	feet			
static level =	46.45	feet			
L_w =	17.55	feet			
r_w =	0.17	feet	C =	4.150	
L_e =	17.55	feet	ln R_e/r_w =	3.60	
r_c =	0.08	feet			
t =	36	sec	K =	8.41E-05	ft/sec
y_0 =	1.00		K =	7.26	ft/day
y_t =	0.01				

B-3: Rising Head Test

screen length =	25	feet			
total depth =	64	feet			
static level =	46.45	feet			
L_w =	17.55	feet			
r_w =	0.17	feet	C =	4.150	
L_e =	17.55	feet	ln R_e/r_w =	3.60	
r_c =	0.08	feet			
t =	74	sec	K =	4.09E-05	ft/sec
y_0 =	1.00		K =	3.53	ft/day
y_t =	0.01				

B-6: Falling Head Test

screen length =	10	feet			
total depth =	23.22	feet, btop			
static level =	13.85	feet, btop			
L_w =	9.37	feet			
r_w =	0.17	feet	C =	2.767	
L_e =	9.37	feet	ln R_e/r_w =	3.08	
r_c =	0.08	feet			
t =	22	sec	K =	2.20E-04	ft/sec
y_0 =	1.00		K =	19.03	ft/day
y_t =	0.01				

B-6: Rising Head Test

screen length =	10	feet			
total depth =	23.22	feet, btop			
static level =	13.85	feet, btop			
L_w =	9.37	feet			
r_w =	0.17	feet	C =	2.767	
L_e =	9.37	feet	ln R_e/r_w =	3.08	
r_c =	0.08	feet			
t =	30	sec	K =	1.62E-04	ft/sec
y_0 =	1.00		K =	13.96	ft/day
y_t =	0.01				

Lyndon IM 091-3(53)
Slug Test Field Data - Hydraulic Conductivity Calculations
Bouwer and Rice Method - Impermeable at Base of Wells

East Side of Stream

B-4A: Falling Head Test

screen length =	30	feet			
total depth =	85	feet			
static level =	72.00	feet			
L_w =	13.00	feet			
r_w =	0.17	feet	C =	3.350	
L_e =	13.00	feet	$\ln R_e/r_w$ =	3.36	
r_c =	0.08	feet			
t =	348	sec	K =	1.10E-05	ft/sec
y_0 =	1.00		K =	0.95	ft/day
y_t =	0.01				

B-4A: Rising Head Test

screen length =	30	feet			
total depth =	85	feet			
static level =	72.00	feet			
L_w =	13.00	feet			
r_w =	0.17	feet	C =	3.350	
L_e =	13.00	feet	$\ln R_e/r_w$ =	3.36	
r_c =	0.08	feet			
t =	100	sec	K =	3.81E-05	ft/sec
y_0 =	1.00		K =	3.29	ft/day
y_t =	0.01				

B-11B: Falling Head Test

screen length =	50	feet			
total depth =	90.5	feet			
static level =	57.18	feet			
L_w =	33.32	feet			
r_w =	0.36	feet	C =	3.950	
L_e =	33.32	feet	$\ln R_e/r_w$ =	3.50	
r_c =	0.08	feet			
t =	31	sec	K =	5.42E-05	ft/sec
y_0 =	1.00		K =	4.68	ft/day
y_t =	0.01				

B-11B: Rising Head Test

screen length =	50	feet			
total depth =	90.5	feet			
static level =	57.18	feet			
L_w =	33.32	feet			
r_w =	0.36	feet	C =	3.950	
L_e =	33.32	feet	$\ln R_e/r_w$ =	3.50	
r_c =	0.08	feet			
t =	75	sec	K =	2.24E-05	ft/sec
y_0 =	1.00		K =	1.94	ft/day
y_t =	0.01				

Condition: Impermeable layer is at or above base of well

$$K = \frac{r_c^2 \ln(R_e/r_w) \ln(y_0/y_t)}{2L_e t} \qquad \ln R_e/r_w = \frac{1}{\frac{1.1}{\ln(L_w/r_w)} + \frac{C}{(L_e/r_w)}}$$

L_w = depth from water table to bottom of open section in the well
r_w = radial distance between well center and undisturbed aquifer
L_e = height of wetted portion of well screen
r_c = radius of the well section where the water level is rising
t = time since start of test
y_0 = H/H_0 at time zero
y_t = H/H_0 at time t
C = type curve constant related to L_e/r_w (Bouwer and Rice, 1976)

Lyndon IM 091-3(53)
Slug Test Field Data: **B-1**
Bouwer and Rice Method
Testing Conducted by HNTB on: 10/19/2022

Field Measurements:	Total Depth (ft btp) =	35.15
	Pipe stickup above grade (ft) =	2.92
	Pipe inside diameter (in) =	2.00
	datalogger set to (ft btp) =	33.30
	Static Level (ft btp) =	26.40

Falling Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
8:30:00	Static Level	26.40		
8:50:10	Slug Inserted	27.63		
8:50:20	20	25.55	0.85	0.41
8:51:00	78	25.60	0.80	0.38
8:52:00	138	25.62	0.78	0.37
8:53:00	198	25.70	0.70	0.34
8:54:00	258	25.71	0.69	0.33
8:55:00	318	25.75	0.65	0.31
8:56:00	378	25.76	0.64	0.31
8:57:00	438	25.79	0.61	0.29
8:58:00	498	25.81	0.59	0.28
8:59:00	558	25.84	0.56	0.27
9:00:00	618	25.85	0.55	0.26
9:01:00	678	25.87	0.53	0.25
9:02:00	738	25.89	0.51	0.24
9:03:00	798	25.91	0.49	0.24
9:04:00	858	25.93	0.47	0.23
9:05:00	918	25.95	0.45	0.22
9:06:00	978	25.96	0.44	0.21
9:07:00	1038	25.98	0.42	0.20
9:08:00	1098	25.99	0.41	0.20
9:09:00	1158	26.00	0.40	0.19
9:10:00	1218	26.02	0.38	0.18
9:15:00	1518	26.08	0.32	0.15
9:20:00	1818	26.13	0.27	0.13
9:25:00	2118	26.18	0.22	0.11
9:35:00	2718	26.24	0.16	0.08

Rising Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
9:37:20	slug removed	26.46		
9:37:50	30	27.14	-0.68	0.33
9:39:00	100	27.03	-0.57	0.28
9:40:00	160	26.97	-0.51	0.25
9:41:00	220	26.93	-0.47	0.23
9:42:00	280	26.89	-0.43	0.21
9:43:00	340	26.85	-0.39	0.19
9:44:00	400	26.83	-0.37	0.18
9:45:00	460	26.81	-0.35	0.17
9:46:00	520	26.89	-0.43	0.21
9:47:00	580	26.77	-0.31	0.15
9:48:00	640	26.76	-0.30	0.15
9:49:00	700	26.75	-0.29	0.14
9:50:00	760	26.73	-0.27	0.13
9:51:00	820	26.72	-0.26	0.13
9:52:00	880	26.71	-0.25	0.12
9:53:00	940	26.70	-0.24	0.12
9:54:00	1000	26.69	-0.23	0.11
9:55:00	1060	26.68	-0.22	0.11
9:56:00	1120	26.66	-0.20	0.10
9:57:00	1180	26.65	-0.19	0.09
9:58:00	1240	26.65	-0.19	0.09
10:03:00	1540	26.61	-0.15	0.07
10:08:00	1840	26.57	-0.11	
10:18:00	2440	26.52	-0.06	

Falling Head Test - Datalogger Data

H_0 (initial head difference, ft) = 2.08

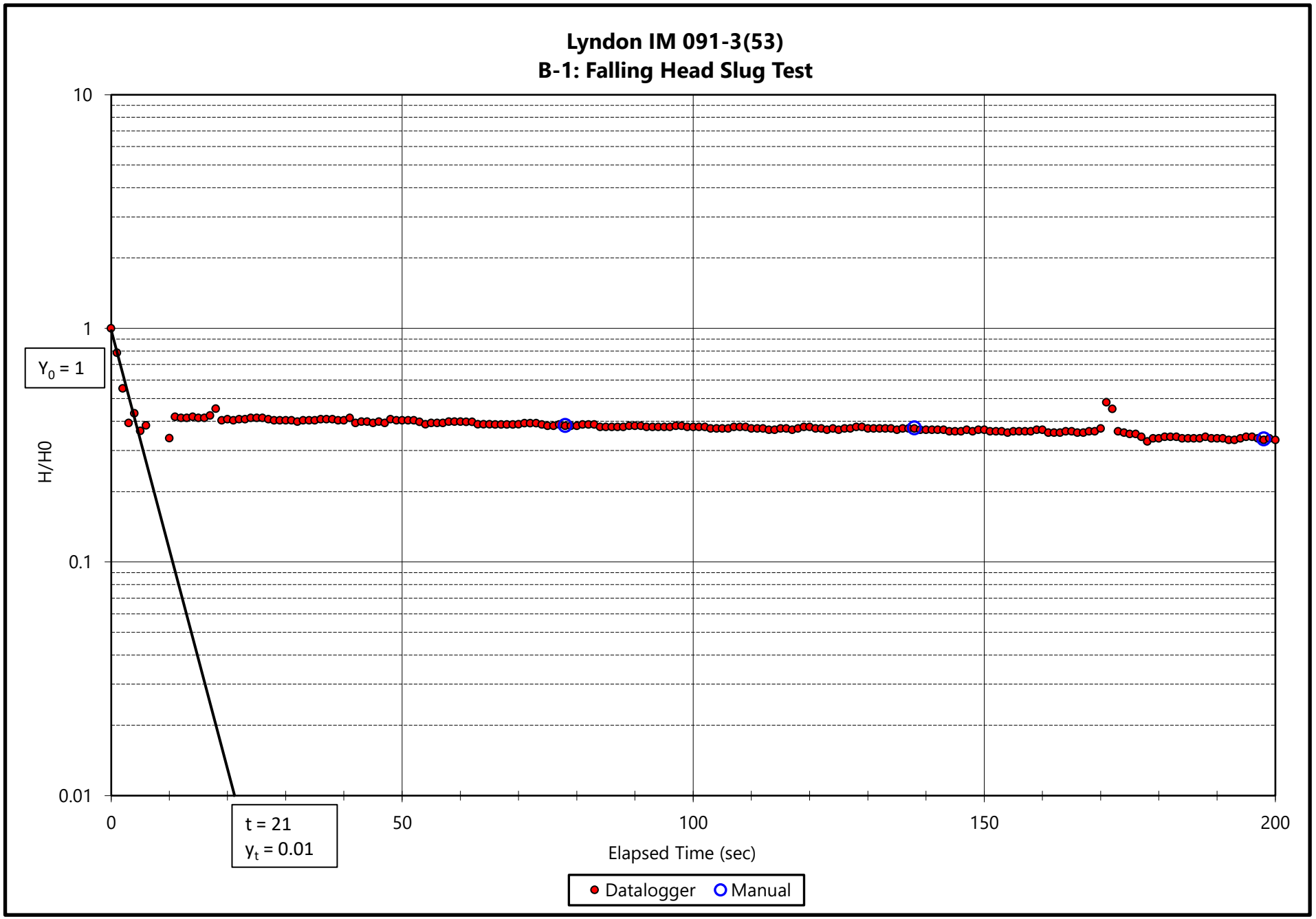
Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
8:49:41	Static Level	NA	26.58		
	Slug Inserted		26.58		
8:49:42	0		24.50	2.08	1.00
8:49:43	1		24.94	1.64	0.79
8:49:44	2		25.43	1.15	0.55
8:49:45	3		25.76	0.82	0.39
8:49:46	4		25.68	0.90	0.43
8:49:47	5		25.82	0.76	0.36
8:49:48	6		25.78	0.80	0.38
8:49:49	7		26.25	0.33	
8:49:50	8		25.64	0.94	
8:49:51	9		25.26	1.32	
8:49:52	10		25.88	0.70	0.34
8:49:53	11		25.71	0.87	0.42
8:49:54	12		25.72	0.86	0.41
8:49:55	13		25.72	0.86	0.41
8:49:56	14		25.71	0.87	0.42
8:49:57	15		25.72	0.86	0.41
8:49:58	16		25.72	0.86	0.41
8:49:59	17		25.70	0.88	0.42
8:50:00	18		25.64	0.94	0.45
8:50:01	19		25.74	0.84	0.40
8:50:02	20		25.73	0.85	0.41
8:50:03	21		25.74	0.84	0.40
8:50:04	22		25.73	0.85	0.41
8:50:05	23		25.73	0.85	0.41
8:50:06	24		25.72	0.86	0.41
8:50:07	25		25.72	0.86	0.41
8:50:08	26		25.72	0.86	0.41
8:50:09	27		25.73	0.85	0.41
8:50:10	28		25.74	0.84	0.40
8:50:11	29		25.74	0.84	0.40
8:50:12	30		25.74	0.84	0.40
8:50:13	31		25.74	0.84	0.40

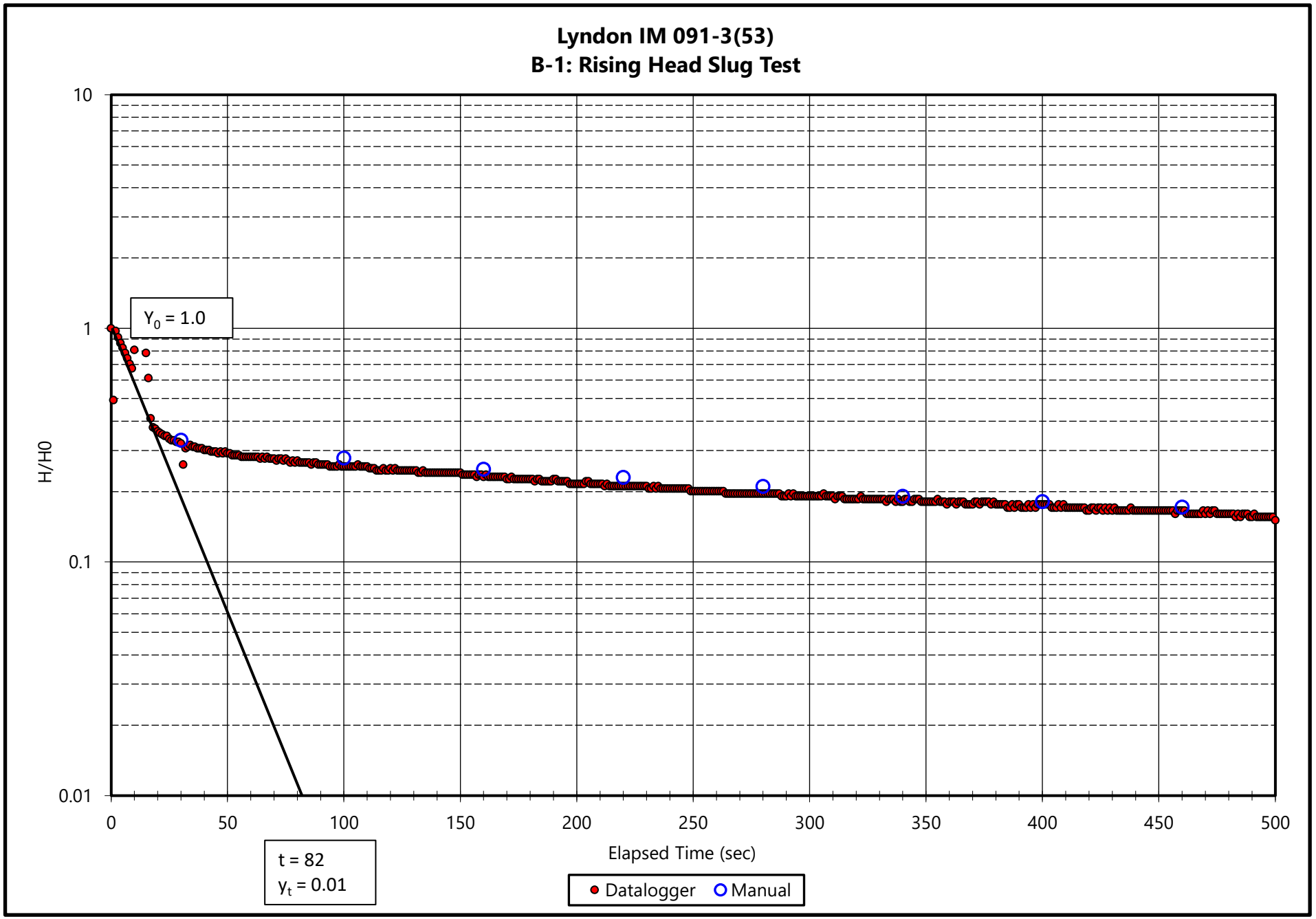
Rising Head Test - Datalogger Data

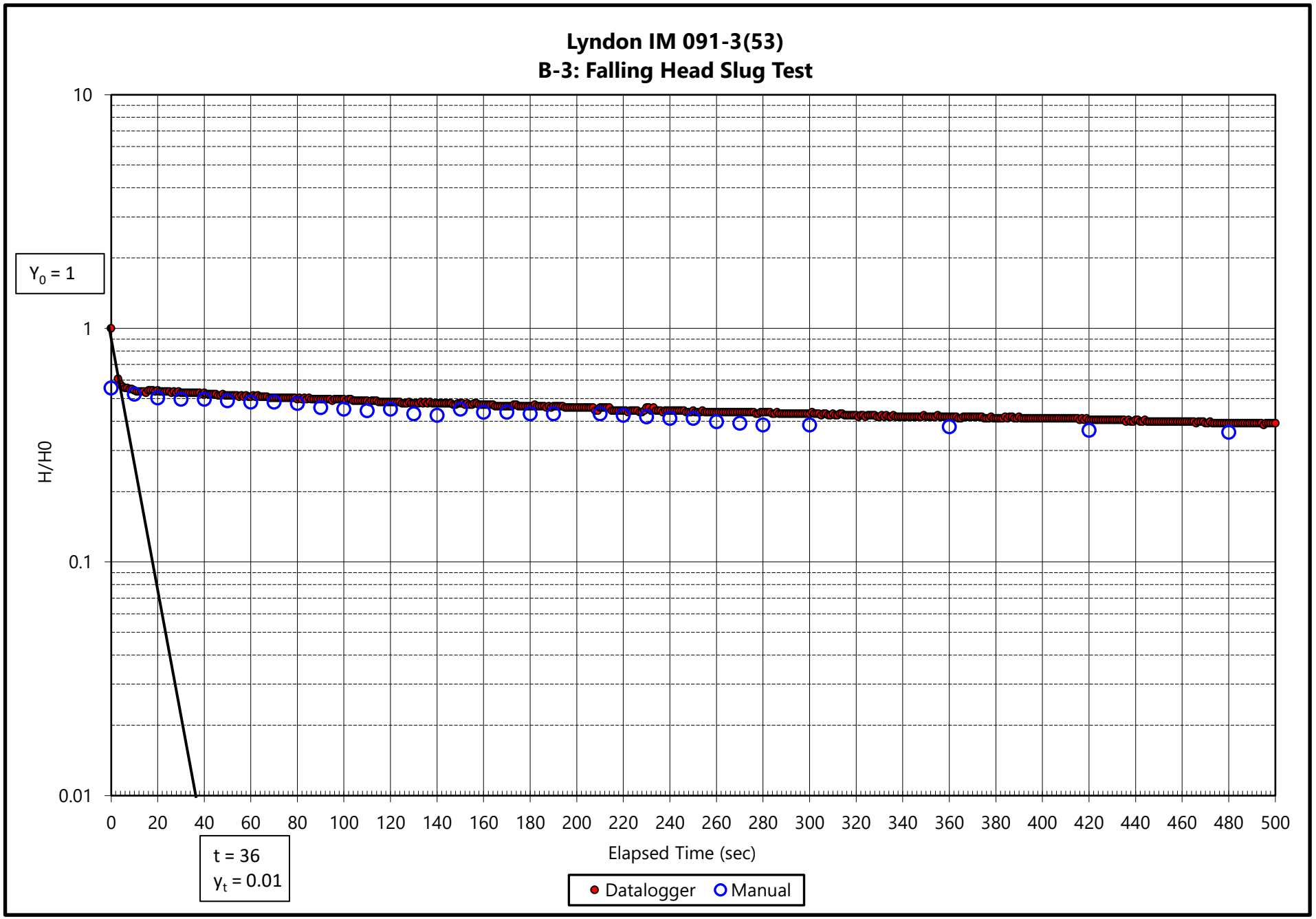
H_0 (initial head difference, ft) = -2.06

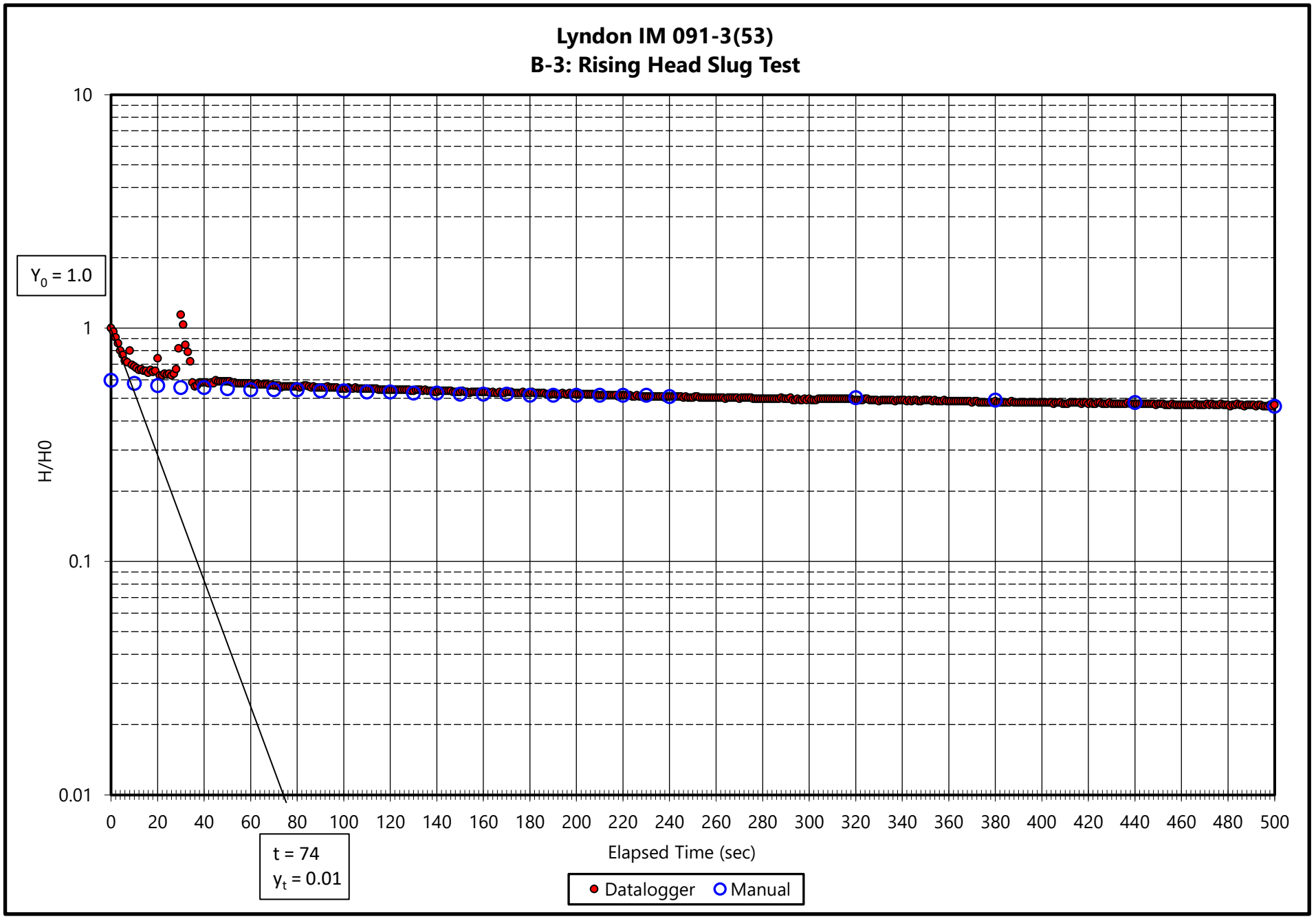
Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
9:37:18	Slug Removal	1.37	26.46		
9:37:19	0	0.16	28.52	-2.06	1.00
9:37:20	1	1.15	27.47	-1.01	0.49
9:37:21	2	1.16	28.47	-2.01	0.97
9:37:22	3	1.16	28.34	-1.89	0.91
9:37:23	4	1.17	28.24	-1.78	0.86
9:37:24	5	1.22	28.15	-1.70	0.82
9:37:25	6	1.22	28.07	-1.61	0.78
9:37:26	7	1.22	27.99	-1.53	0.74
9:37:27	8	1.20	27.91	-1.45	0.70
9:37:28	9	1.20	27.84	-1.39	0.67
9:37:29	10	1.19	28.12	-1.67	0.81
9:37:30	11	1.21	28.78	-2.32	1.13
9:37:31	12	1.19	28.70	-2.25	1.09
9:37:32	13	1.19	28.58	-2.12	1.03
9:37:33	14	1.19	28.43	-1.98	0.96
9:37:34	15	1.19	28.07	-1.61	0.78
9:37:35	16	1.18	27.72	-1.26	0.61
9:37:36	17	1.18	27.31	-0.85	0.41
9:37:37	18	1.16	27.23	-0.78	0.38
9:37:38	19	1.17	27.22	-0.77	0.37
9:37:39	20	1.19	27.20	-0.75	0.36
9:37:40	21	1.16	27.19	-0.73	0.36
9:37:41	22	1.17	27.18	-0.72	0.35
9:37:42	23	1.16	27.17	-0.71	0.35
9:37:43	24	1.16	27.17	-0.71	0.35
9:37:44	25	1.16	27.15	-0.69	0.34
9:37:45	26	1.16	27.14	-0.68	0.33
9:37:46	27	1.17	27.14	-0.68	0.33
9:37:47	28	1.17	27.13	-0.67	0.33
9:37:48	29	1.17	27.13	-0.67	0.33
9:37:49	30	1.18	27.12	-0.66	0.32
9:37:50	31	1.19	26.99	-0.54	0.26
9:37:51	32	1.19	27.09	-0.63	0.31

Remaining Datalogger data presented in following charts. Excel tables available upon request


Lyndon IM 091-3(53)
B-1: Falling Head Slug Test
10
1
0.1
0.01
H/H0
Y0 = 1
t = 21
yt = 0.01
0
50
100
150
200
Elapsed Time (sec)
Datalogger
Manual


Lyndon IM 091-3(53)
B-1: Rising Head Slug Test
10
1
0.1
0.01
H/H0
Y_0 = 1.0
0
50
100
150
200
250
300
350
400
450
500
Elapsed Time (sec)
t = 82
y_t = 0.01
Datalogger
Manual


Lyndon IM 091-3(53)
B-3: Falling Head Slug Test
10
1
0.1
0.01
H/H0
Y_0 = 1
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
Elapsed Time (sec)
t = 36
y_t = 0.01
Datalogger
Manual


Lyndon IM 091-3(53)
B-3: Rising Head Slug Test
10
1
0.1
0.01
H/H0
Y_0 = 1.0
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
Elapsed Time (sec)
t = 74
y_t = 0.01
Datalogger
Manual

Lyndon IM 091-3(53)
Slug Test Field Data: **B-3**
Bouwer and Rice Method
Testing Conducted by HNTB and VHB on: 12/6/2022

Field Measurements:	Total Depth (ft btp) =	67.00
	Pipe stickup above grade (ft) =	2.86
	Pipe inside diameter (in) =	2.00
	datalogger set to (ft btp) =	
	Static Level (ft btp) =	46.45

Falling Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
0:00:00	Static Level	46.45		
0:00:00	0	45.60	0.85	0.56
0:00:10	10	45.65	0.80	0.52
0:00:20	20	45.68	0.77	0.50
0:00:30	30	45.69	0.76	0.50
0:00:40	40	45.69	0.76	0.50
0:00:50	50	45.70	0.75	0.49
0:01:00	60	45.71	0.74	0.48
0:01:10	70	45.71	0.74	0.48
0:01:20	80	45.72	0.73	0.48
0:01:30	90	45.75	0.70	0.46
0:01:40	100	45.76	0.69	0.45
0:01:50	110	45.77	0.68	0.44
0:02:00	120	45.76	0.69	0.45
0:02:10	130	45.79	0.66	0.43
0:02:20	140	45.80	0.65	0.42
0:02:30	150	45.76	0.69	0.45
0:02:40	160	45.78	0.67	0.44
0:02:50	170	45.78	0.67	0.44
0:03:00	180	45.79	0.66	0.43
0:03:10	190	45.79	0.66	0.43
0:03:30	210	45.79	0.66	0.43
0:03:40	220	45.80	0.65	0.42
0:03:50	230	45.81	0.64	0.42
0:04:00	240	45.82	0.63	0.41
0:04:10	250	45.82	0.63	0.41
0:04:20	260	45.84	0.61	0.40
0:04:30	270	45.85	0.60	0.39
0:04:40	280	45.86	0.59	0.39
0:05:00	300	45.86	0.59	0.39
0:06:00	360	45.87	0.58	0.38
0:07:00	420	45.89	0.56	0.37
0:08:00	480	45.90	0.55	0.36
0:09:00	540	45.91	0.54	0.35
0:10:00	600	45.92	0.53	0.35
0:11:00	660	45.95	0.50	0.33
0:13:00	780	45.99	0.46	0.30
0:15:00	900	46.01	0.44	0.29
0:17:00	1020	46.02	0.43	0.28
0:22:00	1320	46.07	0.38	0.25
0:27:00	1620	46.15	0.30	0.20
0:32:00	1920	46.19	0.26	0.17
0:58:50	3530	46.36	0.09	0.06

Rising Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
0:00:00	Static Level	46.36		
0:00:00	0	47.38	-1.02	0.60
0:00:10	10	47.35	-0.99	0.58
0:00:20	20	47.33	-0.97	0.57
0:00:30	30	47.31	-0.95	0.56
0:00:40	40	47.31	-0.95	0.56
0:00:50	50	47.30	-0.94	0.55
0:01:00	60	47.29	-0.93	0.54
0:01:10	70	47.29	-0.93	0.54
0:01:20	80	47.29	-0.93	0.54
0:01:30	90	47.28	-0.92	0.54
0:01:40	100	47.28	-0.92	0.54
0:01:50	110	47.27	-0.91	0.53
0:02:00	120	47.27	-0.91	0.53
0:02:10	130	47.26	-0.90	0.53
0:02:20	140	47.26	-0.90	0.53
0:02:30	150	47.25	-0.89	0.52
0:02:40	160	47.25	-0.89	0.52
0:02:50	170	47.25	-0.89	0.52
0:03:00	180	47.24	-0.88	0.51
0:03:10	190	47.24	-0.88	0.51
0:03:20	200	47.24	-0.88	0.51
0:03:30	210	47.24	-0.88	0.51
0:03:40	220	47.24	-0.88	0.51
0:03:50	230	47.24	-0.88	0.51
0:04:00	240	47.23	-0.87	0.51
0:05:20	320	47.22	-0.86	0.50
0:06:20	380	47.20	-0.84	0.49
0:07:20	440	47.18	-0.82	0.48
0:08:20	500	47.15	-0.79	0.46
0:09:20	560	47.12	-0.76	0.44
0:11:20	680	47.12	-0.76	0.44
0:13:20	800	47.09	-0.73	0.43
0:15:20	920	47.06	-0.70	0.41
0:20:20	1220	47.03	-0.67	0.39
1:17:40	4660	46.75	-0.39	0.23
1:40:40	6040	46.70	-0.34	0.20

Falling Head Test - Datalogger Data

H_0 (initial head difference, ft) = 1.53

Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
10:41:00 AM	Static Level	NA	46.47		
10:41:20 AM	Slug Inserted				
			46.26	0.19	0.12
			46.23	0.22	0.14
			46.03	0.42	0.27
			46.05	0.40	0.26
			45.87	0.58	0.38
			45.84	0.61	0.40
			45.78	0.67	0.44
			45.81	0.64	0.42
			45.62	0.83	0.54
			45.92	0.53	0.35
	0	max-->	44.92	1.53	1.00
		erroneous -->	46.04	0.41	
		erroneous -->	46.12	0.33	
	3		45.52	0.93	0.61
	4		45.57	0.88	0.58
	5		45.59	0.86	0.56
	6		45.6	0.85	0.56
	7		45.6	0.85	0.56
	8		45.61	0.84	0.55
	9		45.61	0.84	0.55
	10		45.62	0.83	0.54
	11		45.63	0.82	0.54

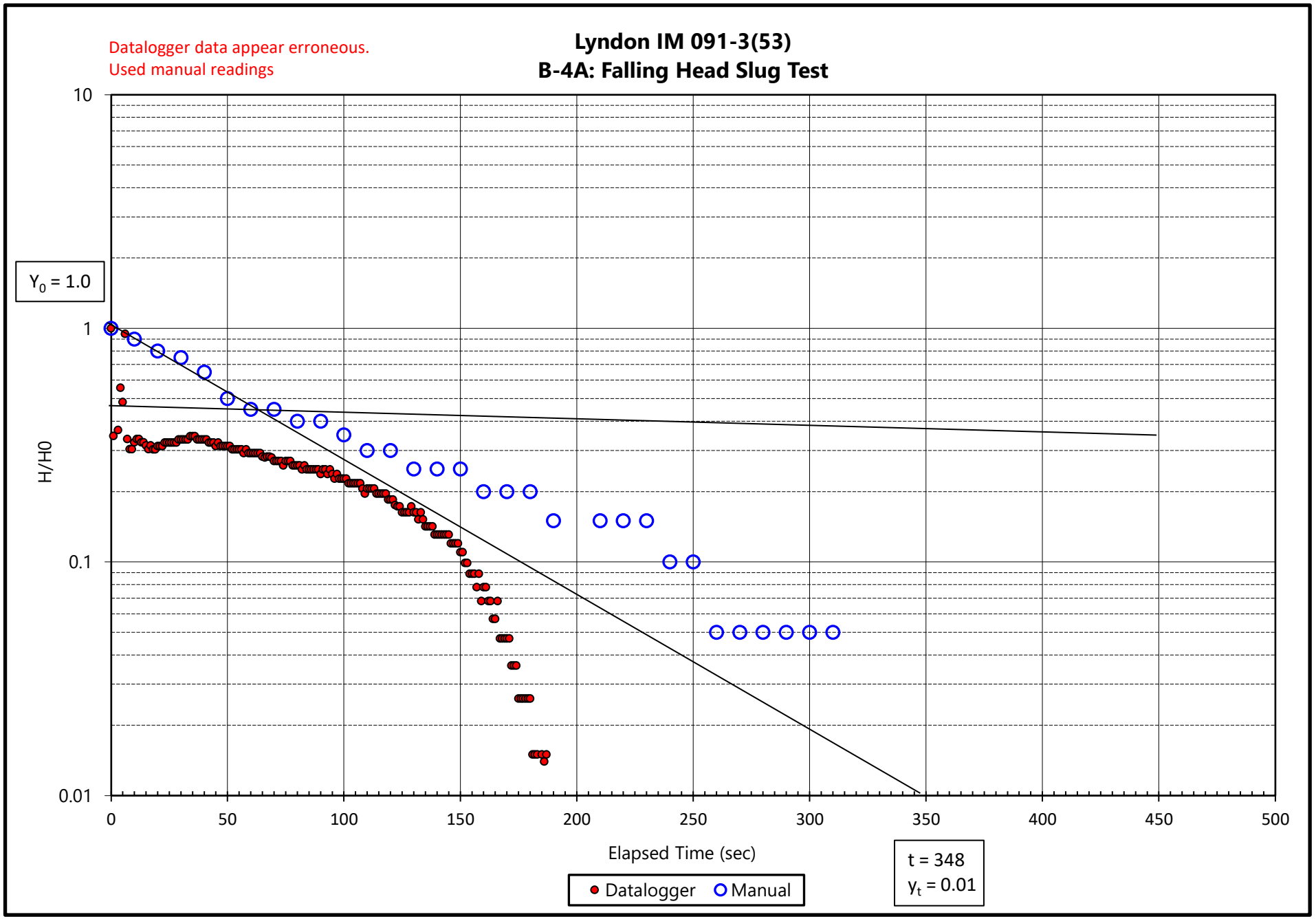
Rising Head Test - Datalogger Data

H_0 (initial head difference, ft) = -1.71

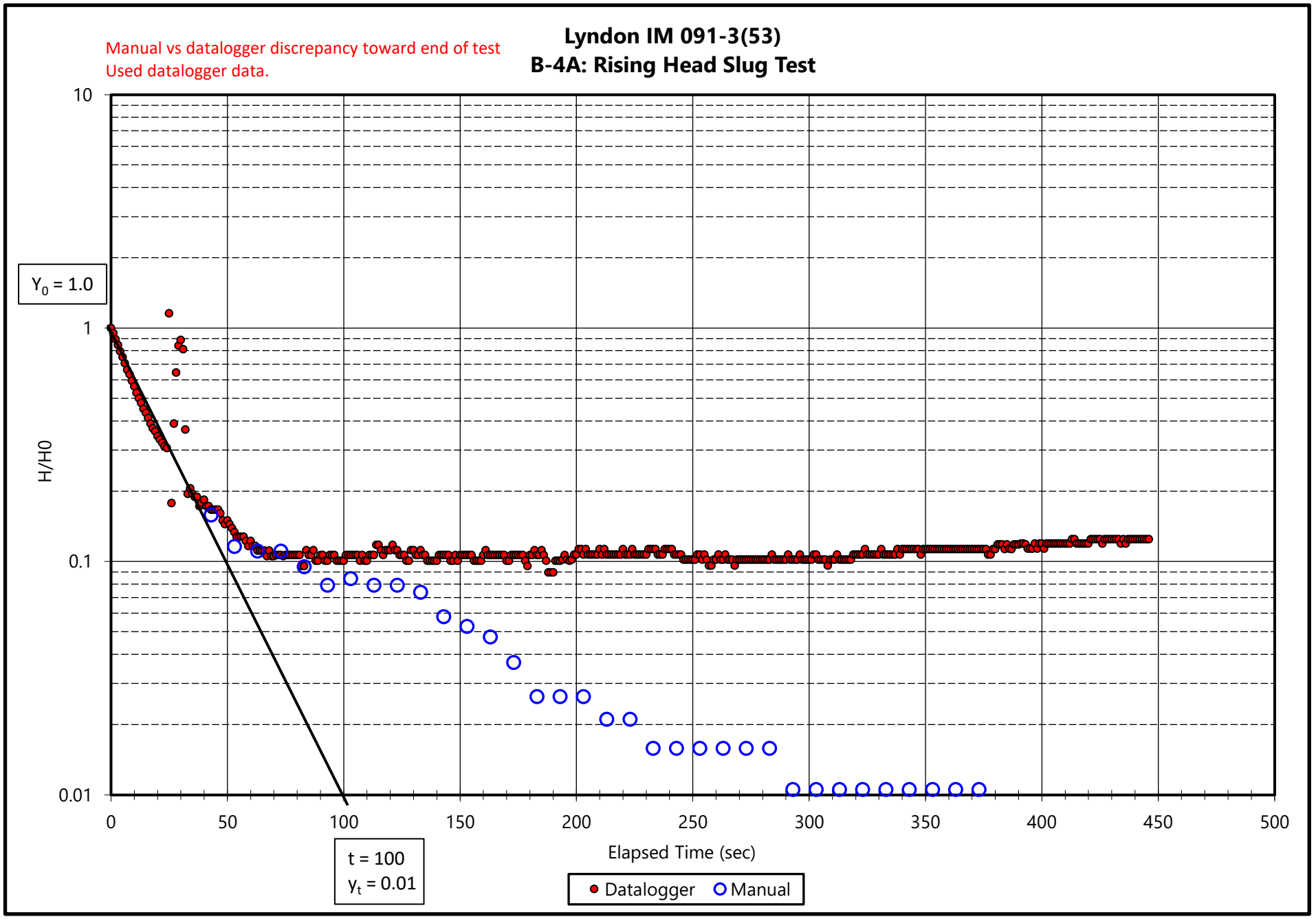
Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
11:40:50 AM	Slug Removal	NA	46.37		
	0		48.08	-1.71	1.00
	1		48.02	-1.65	0.96
	2		47.93	-1.56	0.91
	3		47.84	-1.47	0.86
	4		47.74	-1.37	0.80
	5		47.68	-1.31	0.77
	6		47.61	-1.24	0.73
	7		47.59	-1.22	0.71
	8		47.74	-1.37	0.80
	9		47.56	-1.19	0.70
	10		47.54	-1.17	0.68
	11		47.52	-1.15	0.67
	12		47.5	-1.13	0.66
	13		47.51	-1.14	0.67
	14		47.49	-1.12	0.65
	15		47.49	-1.12	0.65
	16		47.47	-1.10	0.64
	17		47.5	-1.13	0.66
	18		47.48	-1.11	0.65
	19		47.49	-1.12	0.65
	20		47.64	-1.27	0.74
	21		47.44	-1.07	0.63

Remaining datalogger data are graphically presented in following charts.

Datalogger data appear erroneous.
Used manual readings



Manual vs datalogger discrepancy toward end of test
Used datalogger data.



Lyndon IM 091-3(53)
Slug Test Field Data: **B-4A**
Bouwer and Rice Method
Testing Conducted by HNTB and VHB on: 12/6/2022

Field Measurements:		
	Total Depth (ft btp) =	85.00
	Pipe stickup above grade (ft) =	0.00
	Pipe inside diameter (in) =	2.00
	datalogger set to (ft btp) =	
	Static Level (ft btp) =	72.00

Falling Head Test - Manual Data

H_0 (initial head difference, ft) = 0.20

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0	
0:00:00	Static Level	72.00			
0:00:00	0	71.80	0.20	1.00	0.20
0:00:10	10	71.82	0.18	0.90	
0:00:20	20	71.84	0.16	0.80	
0:00:30	30	71.85	0.15	0.75	
0:00:40	40	71.87	0.13	0.65	
0:00:50	50	71.90	0.10	0.50	
0:01:00	60	71.91	0.09	0.45	
0:01:10	70	71.91	0.09	0.45	
0:01:20	80	71.92	0.08	0.40	
0:01:30	90	71.92	0.08	0.40	
0:01:40	100	71.93	0.07	0.35	
0:01:50	110	71.94	0.06	0.30	
0:02:00	120	71.94	0.06	0.30	
0:02:10	130	71.95	0.05	0.25	
0:02:20	140	71.95	0.05	0.25	
0:02:30	150	71.95	0.05	0.25	
0:02:40	160	71.96	0.04	0.20	
0:02:50	170	71.96	0.04	0.20	
0:03:00	180	71.96	0.04	0.20	
0:03:10	190	71.97	0.03	0.15	
0:03:30	210	71.97	0.03	0.15	
0:03:40	220	71.97	0.03	0.15	
0:03:50	230	71.97	0.03	0.15	
0:04:00	240	71.98	0.02	0.10	
0:04:10	250	71.98	0.02	0.10	
0:04:20	260	71.99	0.01	0.05	
0:04:30	270	71.99	0.01	0.05	
0:04:40	280	71.99	0.01	0.05	
0:04:50	290	71.99	0.01	0.05	
0:05:00	300	71.99	0.01	0.05	
0:05:10	310	71.99	0.01	0.05	
0:05:20	320	72.00	0.00	0.00	

Rising Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
0:00:00	Static Level	72.00		
0:00:00	43	72.3	-0.30	0.16
0:00:10	53	72.22	-0.22	0.12
0:00:20	63	72.21	-0.21	0.11
0:00:30	73	72.21	-0.21	0.11
0:00:40	83	72.18	-0.18	0.09
0:00:50	93	72.15	-0.15	0.08
0:01:00	103	72.16	-0.16	0.08
0:01:10	113	72.15	-0.15	0.08
0:01:20	123	72.15	-0.15	0.08
0:01:30	133	72.14	-0.14	0.07
0:01:40	143	72.11	-0.11	0.06
0:01:50	153	72.10	-0.10	0.05
0:02:00	163	72.09	-0.09	0.05
0:02:10	173	72.07	-0.07	0.04
0:02:20	183	72.05	-0.05	0.03
0:02:30	193	72.05	-0.05	0.03
0:02:40	203	72.05	-0.05	0.03
0:02:50	213	72.04	-0.04	0.02
0:03:00	223	72.04	-0.04	0.02
0:03:10	233	72.03	-0.03	0.02
0:03:20	243	72.03	-0.03	0.02
0:03:30	253	72.03	-0.03	0.02
0:03:40	263	72.03	-0.03	0.02
0:03:50	273	72.03	-0.03	0.02
0:04:00	283	72.03	-0.03	0.02
0:04:10	293	72.02	-0.02	0.01
0:04:20	303	72.02	-0.02	0.01
0:04:30	313	72.02	-0.02	0.01
0:04:40	323	72.02	-0.02	0.01
0:04:50	333	72.02	-0.02	0.01
0:05:00	343	72.02	-0.02	0.01
0:05:10	353	72.02	-0.02	0.01
0:05:20	363	72.02	-0.02	0.01
0:05:30	373	72.02	-0.02	0.01
0:06:30	433	72.00	0.00	0.00

Falling Head Test - Datalogger Data

H_0 (initial head difference, ft) = 1.00

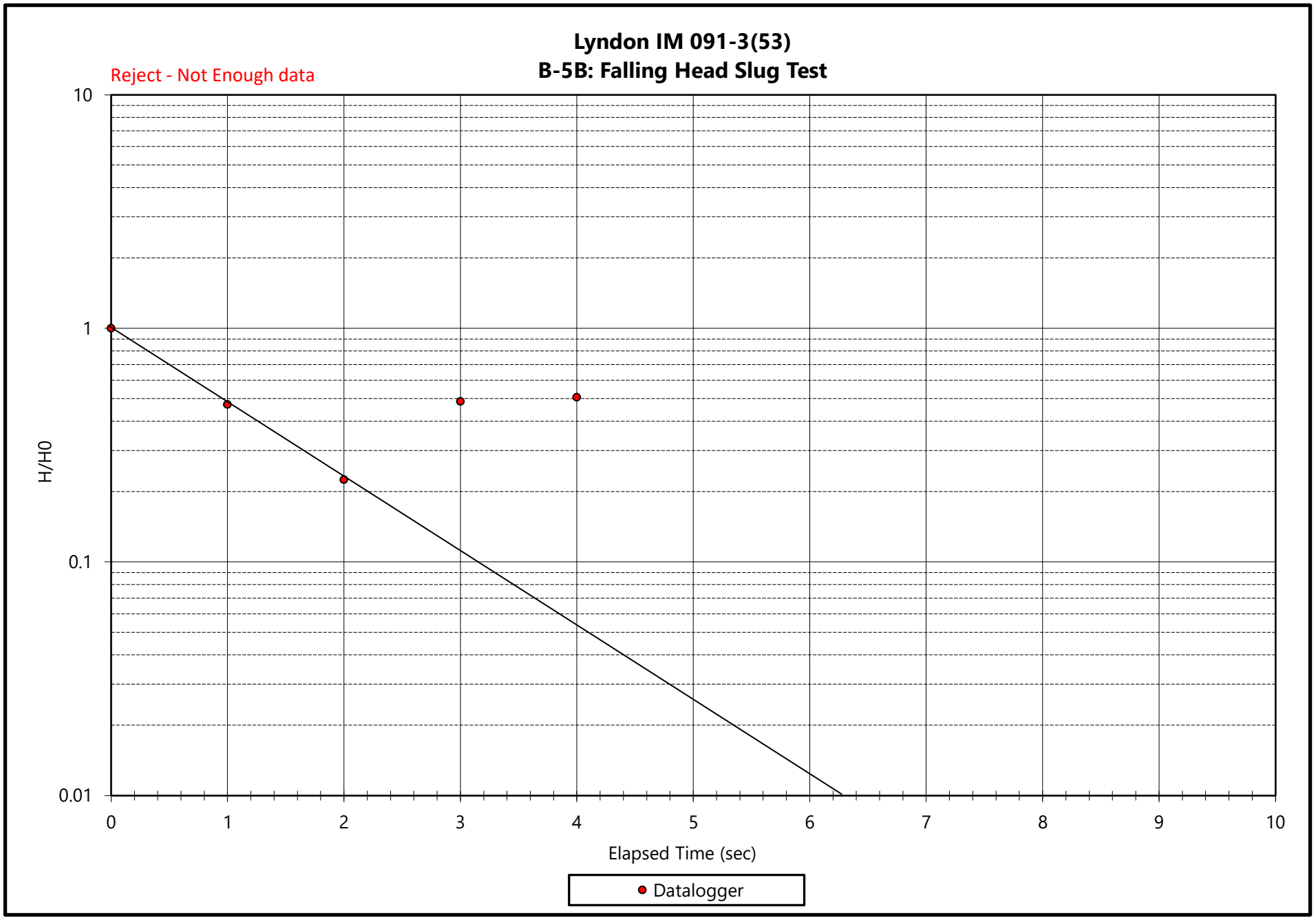
Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
1:13:10 PM	Static Level	NA	72.20		
	Slug Inserted				
	0		71.00	1.00	1.00
	1		71.65	0.35	0.35
	2		72.30		
	3		71.63	0.37	0.37
	4		71.44	0.56	0.56
	5		71.52	0.48	0.48
	6		71.05	0.95	0.95
	7		71.66	0.34	0.34
	8		71.70	0.30	0.30
	9		71.70	0.30	0.30
	10		71.68	0.33	0.33
	11		71.66	0.34	0.34
	12		71.66	0.34	0.34
	13		71.68	0.33	0.33
	14		71.68	0.33	0.33
	15		71.69	0.31	0.31
	16		71.70	0.30	0.30
	17		71.69	0.31	0.31
	18		71.70	0.30	0.30
	19		71.70	0.30	0.30
	20		71.69	0.31	0.31
	21		71.69	0.31	0.31
	22		71.69	0.31	0.31
	23		71.68	0.32	0.32
	24		71.68	0.32	0.32
	25		71.68	0.32	0.32

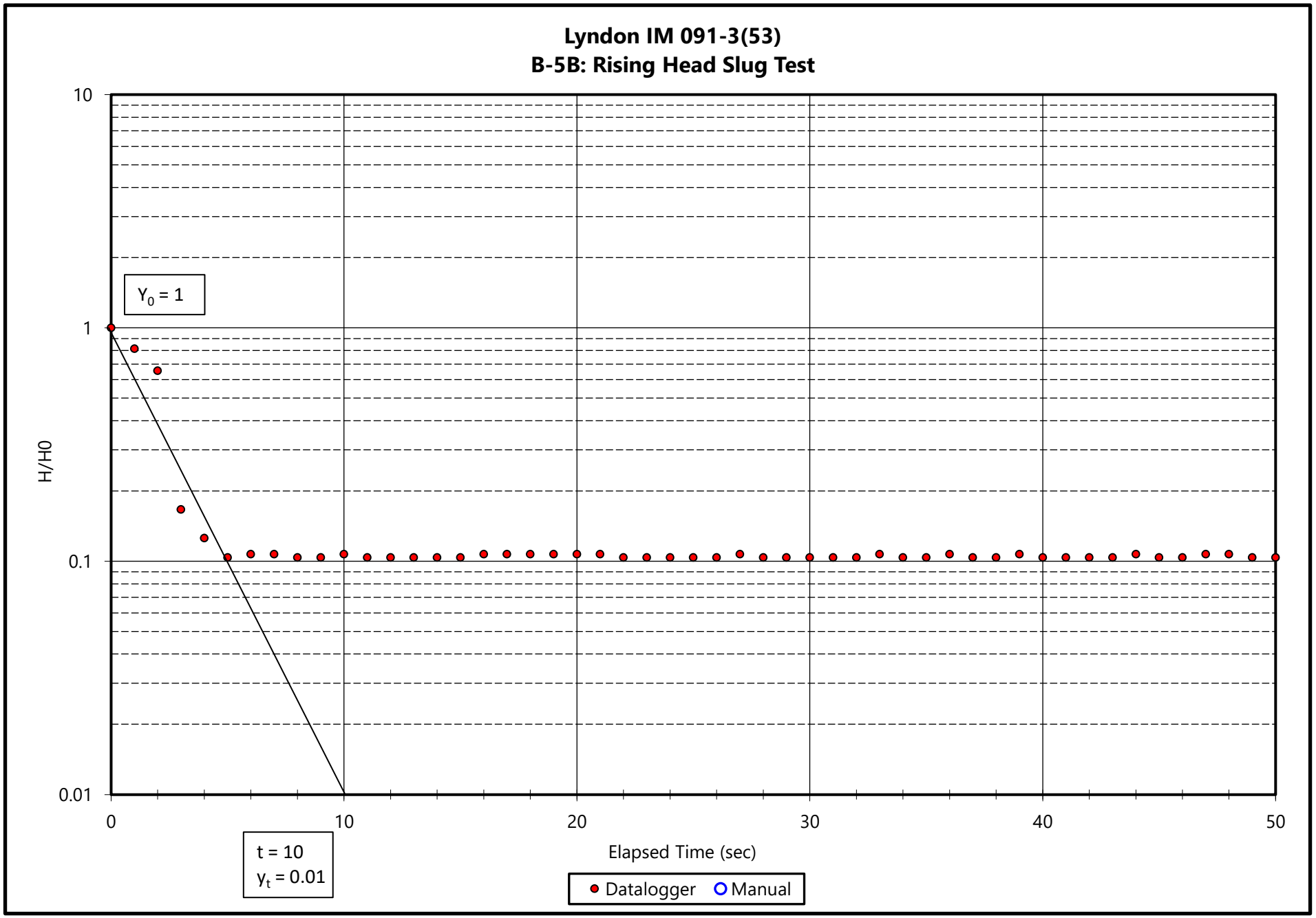
Rising Head Test - Datalogger Data

H_0 (initial head difference, ft) = -1.90

Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
1:37:40 PM	Slug Removal	NA	72.00		
	0		73.897	-1.90	1.00
	1		73.803	-1.80	0.95
	2		73.697	-1.70	0.89
	3		73.602	-1.60	0.84
	4		73.507	-1.51	0.79
	5		73.423	-1.42	0.75
	6		73.339	-1.34	0.71
	7		73.254	-1.25	0.66
	8		73.202	-1.20	0.63
	9		73.128	-1.13	0.59
	10		73.065	-1.07	0.56
	11		73.001	-1.00	0.53
	12		72.948	-0.95	0.50
	13		72.906	-0.91	0.48
	14		72.854	-0.85	0.45
	15		72.822	-0.82	0.43
	16		72.78	-0.78	0.41
	17		72.738	-0.74	0.39
	18		72.706	-0.71	0.37
	19		72.685	-0.69	0.36
	20		72.653	-0.65	0.34
	21		72.632	-0.63	0.33
	22		72.611	-0.61	0.32
	23		72.59	-0.59	0.31
	24		72.58	-0.58	0.31
	25		74.193	-2.19	1.16

Remaining datalogger data are graphically presented in following charts.


Lyndon IM 091-3(53)
B-5B: Falling Head Slug Test
Reject - Not Enough data
10
1
0.1
0.01
H/H0
0
1
2
3
4
5
6
7
8
9
10
Elapsed Time (sec)
Datalogger


Lyndon IM 091-3(53)
B-5B: Rising Head Slug Test
10
1
0.1
0.01
H/H0
Y0 = 1
0
10
20
30
40
50
Elapsed Time (sec)
t = 10
yt = 0.01
Datalogger
Manual

Lyndon IM 091-3(53)
Slug Test Field Data: **B-5B**
Bouwer and Rice Method
Testing Conducted by HNTB on: 10/19/2022

Field Measurements:		
	Total Depth (ft btp) =	78.80
	Pipe stickup above grade (ft) =	0.00
	Pipe inside diameter (in) =	2.00
	datalogger set to (ft btp) =	75.00
	Static Level (ft btp) =	49.64

Falling Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
8:30:00	Static Level	49.64		
11:25:00	Slug Inserted	48.13	1.51	1.00
11:25:10	10	49.65	-0.01	-0.01
11:25:20	20	49.65	-0.01	-0.01
11:25:30	30	49.65	-0.01	-0.01
11:25:40	40	49.64	0.00	0.00
11:25:50	50	49.64	0.00	0.00
11:26:00	60	49.64	0.00	0.00
11:26:10	70	49.64	0.00	0.00
11:26:20	80	49.64	0.00	0.00
11:26:30	90	49.64	0.00	0.00
11:26:40	100	49.64	0.00	0.00
11:26:50	110	49.64	0.00	0.00
11:27:00	120	49.64	0.00	0.00
11:27:10	130	49.64	0.00	0.00
11:27:20	140	49.64	0.00	0.00
11:27:30	150	49.64	0.00	0.00
11:27:40	160	49.64	0.00	0.00
11:27:50	170	49.64	0.00	0.00
11:28:00	180	49.64	0.00	0.00

Rising Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
11:30:00	Static Level	49.64		
11:30:00	Slug Removed	49.64		
11:30:10	-5	49.64	0.00	0.00
11:30:20	5	49.64	0.00	0.00
11:30:30	15	49.64	0.00	0.00
11:30:40	25	49.64	0.00	0.00
11:30:50	35	49.64	0.00	0.00
11:31:00	45	49.64	0.00	0.00
11:31:10	55	49.64	0.00	0.00
11:31:20	65	49.64	0.00	0.00
11:31:30	75	49.64	0.00	0.00
11:31:40	85	49.64	0.00	0.00
11:31:50	95	49.64	0.00	0.00
11:32:00	105	49.64	0.00	0.00

Falling Head Test - Datalogger Data

H_0 (initial head difference, ft) = 1.51

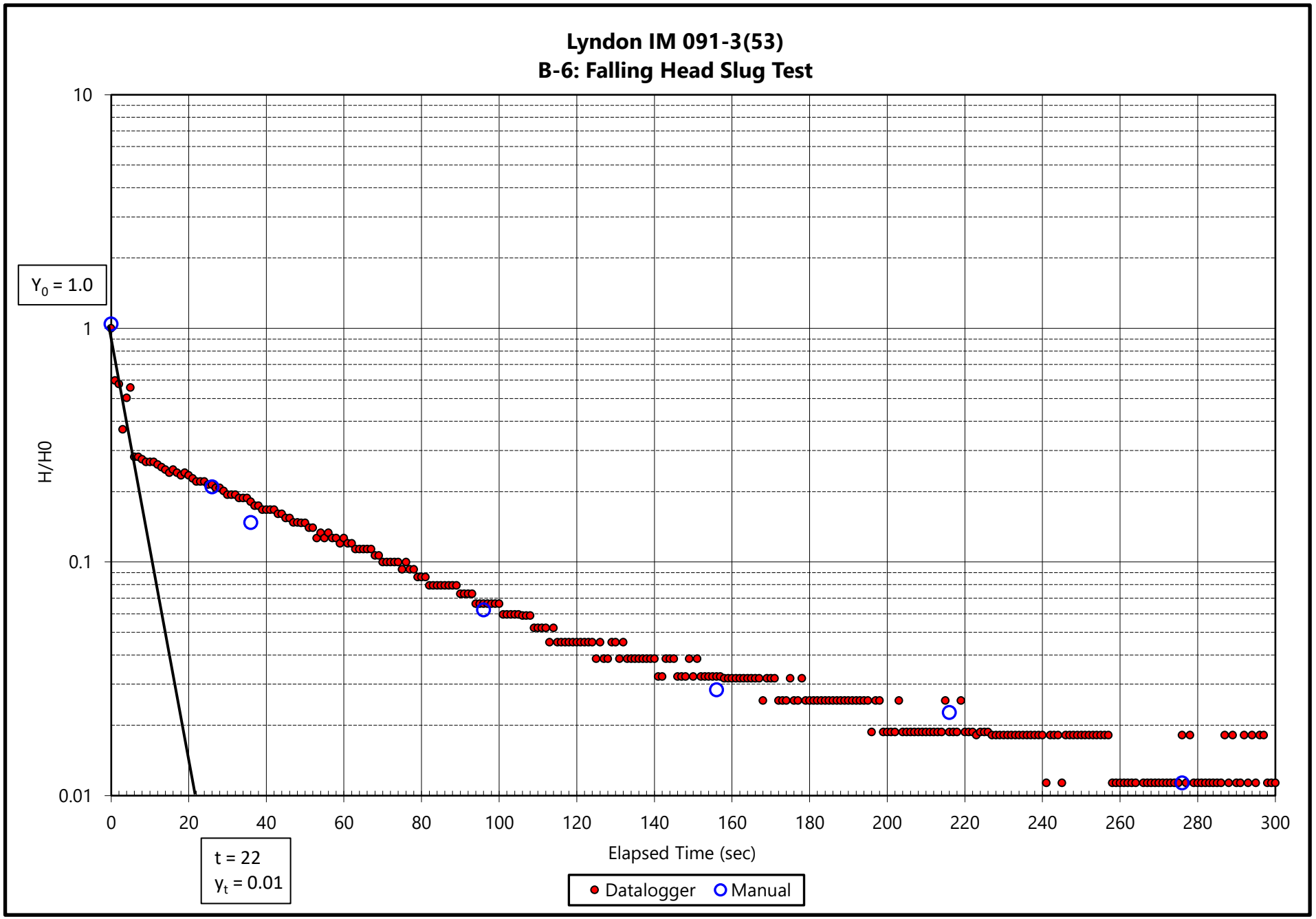
Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
11:25:00	Static Level	NA	49.98		
11:25:55 AM	Slug Inserted		49.96		
11:25:55 AM	0		48.45	1.51	1.00
11:25:56 AM	1		49.25	0.71	0.47
11:25:57 AM	2		49.62	0.34	0.23
11:25:58 AM	3		49.22	0.73	0.49
11:25:59 AM	4		49.19	0.77	0.51
11:26:00 AM	5		51.76		
11:26:01 AM	6		49.95	0.01	0.01
11:26:02 AM	7		49.96	0.00	0.00
11:26:03 AM	8		49.97		
11:26:04 AM	9		49.95	0.01	0.01
11:26:05 AM	10		49.96	0.00	0.00
11:26:06 AM	11		49.96	0.00	0.00
11:26:07 AM	12		49.95	0.01	0.01
11:26:08 AM	13		49.95	0.01	0.01
11:26:09 AM	14		49.95	0.01	0.01
11:26:10 AM	15		49.95	0.01	0.01
11:26:11 AM	16		49.96	0.00	0.00
11:26:12 AM	17		49.96	0.00	0.00
11:26:13 AM	18		49.95	0.01	0.01
11:26:14 AM	19		49.95	0.01	0.01
11:26:15 AM	20		49.95	0.01	0.01
11:26:16 AM	21		49.95	0.01	0.01
11:26:17 AM	22		49.95	0.01	0.01
11:26:18 AM	23		49.96	0.00	0.00
11:26:19 AM	24		49.95	0.01	0.01
11:26:20 AM	25		49.95	0.01	0.01
11:26:21 AM	26		49.95	0.01	0.01
11:26:22 AM	27		49.95	0.01	0.01
11:26:23 AM	28		49.95	0.01	0.01
11:26:24 AM	29		49.95	0.01	0.01
11:26:25 AM	30		49.96	0.00	0.00
11:26:26 AM	31		49.95	0.01	0.01
11:26:27 AM	32		49.95	0.01	0.01
11:26:28 AM	33		49.95	0.01	0.01
11:26:29 AM	34		49.95	0.01	0.01
11:26:30 AM	35		49.96	0.00	0.00
11:26:31 AM	36		49.96	0.00	0.00
11:26:32 AM	37		49.95	0.01	0.01
11:26:33 AM	38		49.96	0.00	0.00
11:26:34 AM	39		49.95	0.01	0.01
11:26:35 AM	40		49.95	0.01	0.01
11:26:36 AM	41		49.95	0.01	0.01
11:26:37 AM	42		49.95	0.01	0.01
11:26:38 AM	43		49.96	0.00	0.00
11:26:39 AM	44		49.95	0.01	0.01

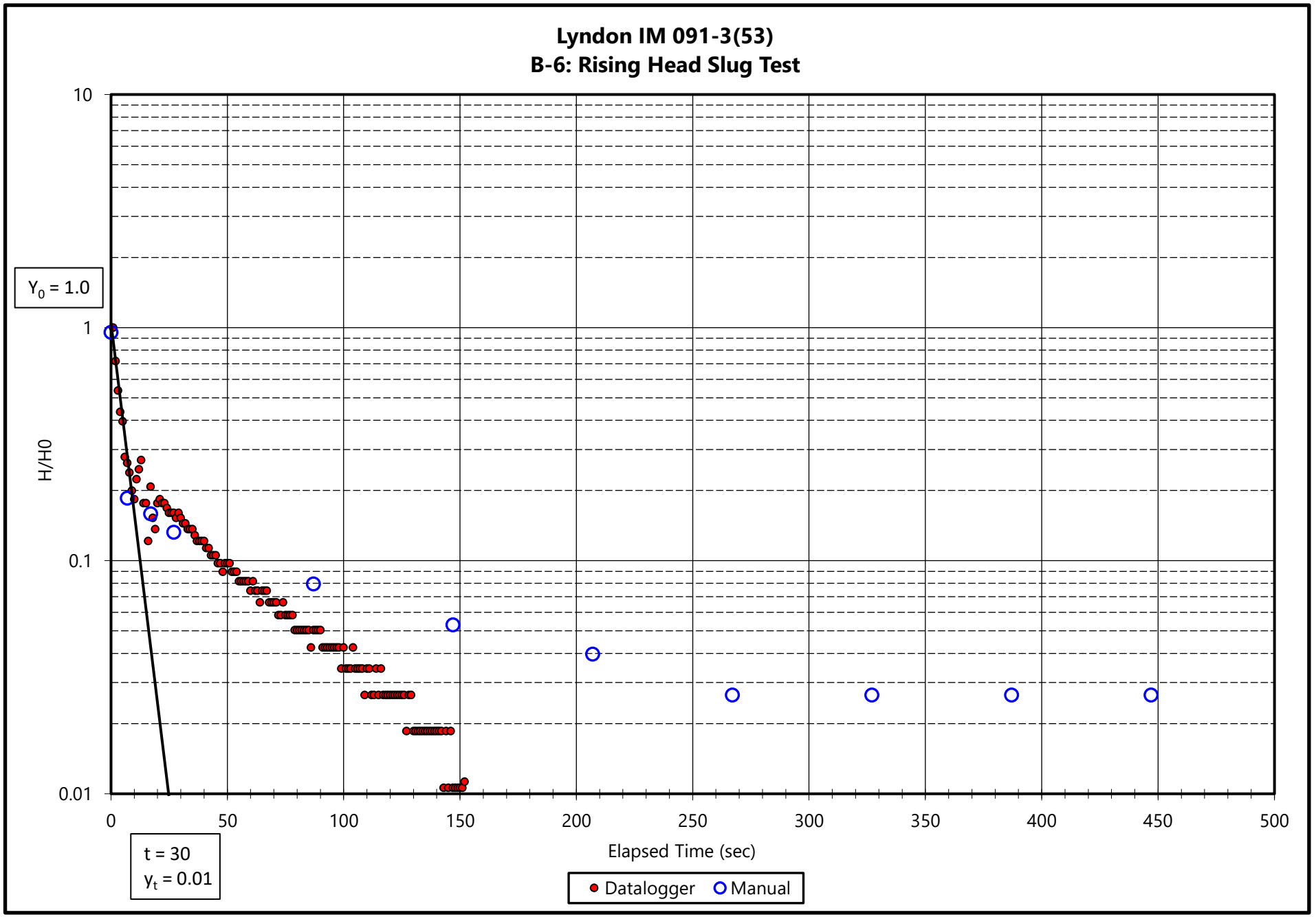
Rising Head Test - Datalogger Data

H_0 (initial head difference, ft) = -2.87

Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
11:30:15	Slug Removal		49.94		
11:30:17 AM	0		52.51	-2.87	1.00
11:30:18	1		51.98	-2.34	0.81
11:30:19	2		51.52	-1.88	0.66
11:30:20	3		50.12	-0.48	0.17
11:30:21	4		50.00	-0.36	0.13
11:30:22	5		49.94	-0.30	0.10
11:30:23	6		49.95	-0.31	0.11
11:30:24	7		49.95	-0.31	0.11
11:30:25	8		49.94	-0.30	0.10
11:30:26	9		49.94	-0.30	0.10
11:30:27	10		49.95	-0.31	0.11
11:30:28	11		49.94	-0.30	0.10
11:30:29	12		49.94	-0.30	0.10
11:30:30	13		49.94	-0.30	0.10
11:30:31	14		49.94	-0.30	0.10
11:30:32	15		49.94	-0.30	0.10
11:30:33	16		49.95	-0.31	0.11
11:30:34	17		49.95	-0.31	0.11
11:30:35	18		49.95	-0.31	0.11
11:30:36	19		49.95	-0.31	0.11
11:30:37	20		49.95	-0.31	0.11
11:30:38	21		49.95	-0.31	0.11
11:30:39	22		49.94	-0.30	0.10
11:30:40	23		49.94	-0.30	0.10
11:30:41	24		49.94	-0.30	0.10
11:30:42	25		49.94	-0.30	0.10
11:30:43	26		49.94	-0.30	0.10
11:30:44	27		49.95	-0.31	0.11
11:30:45	28		49.94	-0.30	0.10
11:30:46	29		49.94	-0.30	0.10
11:30:47	30		49.94	-0.30	0.10
11:30:48	31		49.94	-0.30	0.10
11:30:49	32		49.94	-0.30	0.10
11:30:50	33		49.95	-0.31	0.11
11:30:51	34		49.94	-0.30	0.10
11:30:52	35		49.94	-0.30	0.10
11:30:53	36		49.95	-0.31	0.11
11:30:54	37		49.94	-0.30	0.10
11:30:55	38		49.94	-0.30	0.10
11:30:56	39		49.95	-0.31	0.11
11:30:57	40		49.94	-0.30	0.10
11:30:58	41		49.94	-0.30	0.10
11:30:59	42		49.94	-0.30	0.10
11:31:00	43		49.94	-0.30	0.10
11:31:01	44		49.95	-0.31	0.11
11:31:02	45		49.94	-0.30	0.10

Remaining datalogger data are graphically presented in following charts.


Lyndon IM 091-3(53)
B-6: Falling Head Slug Test
10
1
0.1
0.01
H/H0
Y_0 = 1.0
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
Elapsed Time (sec)
t = 22
y_t = 0.01
Datalogger
Manual


Lyndon IM 091-3(53)
B-6: Rising Head Slug Test
10
1
0.1
0.01
H/H0
Y0 = 1.0
t = 30
yt = 0.01
0
50
100
150
200
250
300
350
400
450
500
Elapsed Time (sec)
Datalogger
Manual

Lyndon IM 091-3(53)
Slug Test Field Data: **B-6**
Bouwer and Rice Method
Testing Conducted by HNTB on: 10/19/2022

Field Measurements:		
	Total Depth (ft btp) =	23.22
	Pipe stickup above grade (ft) =	2.90
	Pipe inside diameter (in) =	2.00
	datalogger set to (ft btp) =	22.50
	Static Level (ft btp) =	13.85

Falling Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
14:00:00	Static Level	13.93		
14:00:20	0	12.09	1.84	1.05
14:00:50	26	13.56	0.37	0.21
14:01:00	36	13.67	0.26	0.15
14:02:00	96	13.82	0.11	0.06
14:03:00	156	13.88	0.05	0.03
14:04:00	216	13.89	0.04	0.02
14:05:00	276	13.91	0.02	0.01
14:06:00	336	13.91	0.02	0.01
14:07:00	396	13.91	0.02	0.01
14:08:00	456	13.92	0.01	0.01
14:09:00	516	13.92	0.01	0.01
14:10:00	576	13.92	0.01	0.01

Rising Head Test - Manual Data

Time	Elapsed Time (sec)*	Depth to Water (ft btp)	Delta H (ft)	h/H_0
14:18:00	Static Level	13.92		
14:18:00	0.0	15.36	-1.44	0.95
14:18:40	7	14.20	-0.28	0.19
14:18:50	17	14.16	-0.24	0.16
14:19:00	27	14.12	-0.20	0.13
14:20:00	87	14.04	-0.12	0.08
14:21:00	147	14.00	-0.08	0.05
14:22:00	207	13.98	-0.06	0.04
14:23:00	267	13.96	-0.04	0.03
14:24:00	327	13.96	-0.04	0.03
14:25:00	387	13.96	-0.04	0.03
14:26:00	447	13.96	-0.04	0.03

* manual readings shifted by 33 seconds to match datalogger readings

Falling Head Test - Datalogger Data

H_0 (initial head difference, ft) = 1.76

Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
2:00:23 PM	Static Level	NA	13.85		
2:00:24 PM	Slug Inserted				
2:00:26 PM	0		12.09	1.76	1.00
2:00:27 PM	1		12.80	1.05	0.60
2:00:28 PM	2		12.83	1.02	0.58
2:00:29 PM	3		13.20	0.65	0.37
2:00:30 PM	4		12.96	0.89	0.50
2:00:31 PM	5		12.87	0.98	0.56
2:00:32 PM	6		13.35	0.50	0.28
2:00:33 PM	7		13.35	0.50	0.28
2:00:34 PM	8		13.37	0.48	0.27
2:00:35 PM	9		13.38	0.47	0.27
2:00:36 PM	10		13.38	0.47	0.27
2:00:37 PM	11		13.38	0.47	0.27
2:00:38 PM	12		13.39	0.46	0.26
2:00:39 PM	13		13.40	0.45	0.25
2:00:40 PM	14		13.41	0.44	0.25
2:00:41 PM	15		13.43	0.42	0.24
2:00:42 PM	16		13.41	0.44	0.25
2:00:43 PM	17		13.43	0.42	0.24
2:00:44 PM	18		13.44	0.41	0.23
2:00:45 PM	19		13.43	0.42	0.24
2:00:46 PM	20		13.44	0.41	0.23
2:00:47 PM	21		13.45	0.40	0.23
2:00:48 PM	22		13.46	0.39	0.22
2:00:49 PM	23		13.46	0.39	0.22
2:00:50 PM	24		13.46	0.39	0.22
2:00:51 PM	25		13.47	0.38	0.21
2:00:52 PM	26		13.47	0.38	0.21
2:00:53 PM	27		13.48	0.37	0.21
2:00:54 PM	28		13.48	0.37	0.21
2:00:55 PM	29		13.50	0.36	0.20
2:00:56 PM	30		13.51	0.34	0.19
2:00:57 PM	31		13.51	0.34	0.19
2:00:58 PM	32		13.51	0.34	0.19
2:00:59 PM	33		13.52	0.33	0.19
2:01:00 PM	34		13.52	0.33	0.19
2:01:01 PM	35		13.52	0.33	0.19
2:01:02 PM	36		13.53	0.32	0.18
2:01:03 PM	37		13.54	0.31	0.17
2:01:04 PM	38		13.54	0.31	0.17
2:01:05 PM	39		13.56	0.30	0.17
2:01:06 PM	40		13.56	0.30	0.17
2:01:07 PM	41		13.56	0.30	0.17
2:01:08 PM	42		13.56	0.30	0.17
2:01:09 PM	43		13.57	0.28	0.16
2:01:10 PM	44		13.57	0.28	0.16
2:01:11 PM	45		13.58	0.27	0.15
2:01:12 PM	46		13.58	0.27	0.15
2:01:13 PM	47		13.59	0.26	0.15
2:01:14 PM	48		13.59	0.26	0.15
2:01:15 PM	49		13.59	0.26	0.15
2:01:16 PM	50		13.59	0.26	0.15

Rising Head Test - Datalogger Data

H_0 (initial head difference, ft) = -1.51

Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
2:17:59 PM	Slug Removal	NA	13.86		
2:18:01 PM	0		15.36	-1.51	1.00
2:18:02 PM	1		14.93	-1.08	0.72
2:18:03 PM	2		14.66	-0.81	0.54
2:18:04 PM	3		14.51	-0.66	0.43
2:18:05 PM	4		14.45	-0.60	0.40
2:18:06 PM	5		14.27	-0.42	0.28
2:18:07 PM	6		14.25	-0.40	0.26
2:18:08 PM	7		14.21	-0.36	0.24
2:18:09 PM	8		14.15	-0.30	0.20
2:18:10 PM	9		14.13	-0.28	0.18
2:18:11 PM	10		14.19	-0.34	0.22
2:18:12 PM	11		14.22	-0.37	0.25
2:18:13 PM	12		14.26	-0.41	0.27
2:18:14 PM	13		14.12	-0.27	0.18
2:18:15 PM	14		14.12	-0.27	0.18
2:18:16 PM	15		14.03	-0.18	0.12
2:18:17 PM	16		14.16	-0.31	0.21
2:18:18 PM	17		14.08	-0.23	0.15
2:18:19 PM	18		14.06	-0.21	0.14
2:18:20 PM	19		14.12	-0.27	0.18
2:18:21 PM	20		14.13	-0.28	0.18
2:18:22 PM	21		14.12	-0.27	0.18
2:18:23 PM	22		14.12	-0.27	0.18
2:18:24 PM	23		14.10	-0.25	0.17
2:18:25 PM	24		14.09	-0.24	0.16
2:18:26 PM	25		14.09	-0.24	0.16
2:18:27 PM	26		14.09	-0.24	0.16
2:18:28 PM	27		14.08	-0.23	0.15
2:18:29 PM	28		14.09	-0.24	0.16
2:18:30 PM	29		14.08	-0.23	0.15
2:18:31 PM	30		14.07	-0.22	0.14
2:18:32 PM	31		14.07	-0.22	0.14
2:18:33 PM	32		14.06	-0.21	0.14
2:18:34 PM	33		14.06	-0.21	0.14
2:18:35 PM	34		14.06	-0.21	0.14
2:18:36 PM	35		14.04	-0.19	0.13
2:18:37 PM	36		14.03	-0.18	0.12
2:18:38 PM	37		14.03	-0.18	0.12
2:18:39 PM	38		14.03	-0.18	0.12
2:18:40 PM	39		14.03	-0.18	0.12
2:18:41 PM	40		14.02	-0.17	0.11
2:18:42 PM	41		14.02	-0.17	0.11
2:18:43 PM	42		14.01	-0.16	0.11
2:18:44 PM	43		14.01	-0.16	0.11
2:18:45 PM	44		14.01	-0.16	0.11
2:18:46 PM	45		14.00	-0.15	0.10
2:18:47 PM	46		14.00	-0.15	0.10
2:18:48 PM	47		13.99	-0.14	0.09
2:18:49 PM	48		14.00	-0.15	0.10
2:18:50 PM	49		14.00	-0.15	0.10
2:18:51 PM	50		14.00	-0.15	0.10

Remaining datalogger data are graphically presented in following charts.

Lyndon IM 091-3(53)
Slug Test Field Data: **B-8C**
Bouwer and Rice Method
Testing Conducted by HNTB and VHB on: 12/6/2022

Field Measurements:	Total Depth (ft btp) =	53.65
	Pipe stickup above grade (ft) =	0.00
	Pipe inside diameter (in) =	2.00
	datalogger set to (ft btp) =	53.65
	Static Level (ft btp) =	48.51

Falling Head Test - Manual Data

H_0 (initial head difference, ft) = **-0.01**

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
0:00:00	Static Level	48.51		
0:00:00	0	48.52	-0.01	1.00
0:00:10	10	48.54	-0.03	3.00
0:00:20	20	48.52	-0.01	1.00
0:00:30	30	48.51	0.00	0.00
0:00:40	40	48.51	0.00	0.00
0:00:50	50	48.51	0.00	0.00
0:03:00	180	48.51	0.00	0.00
data not usable due to no water change				

Rising Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
0:00:00	Static Level	48.51		
0:00:00	0	48.52	-0.01	0.01
0:00:10	10	48.52	-0.01	0.01
0:00:20	20	48.52	-0.01	0.01
0:00:30	30	48.51	0.00	0.00
0:00:40	40	48.51	0.00	0.00
0:00:50	50	48.51	0.00	0.00
0:03:00	180	48.51	0.00	0.00
	data not usable due to no water change			

Falling Head Test - Datalogger Data

H_0 (initial head difference, ft) =

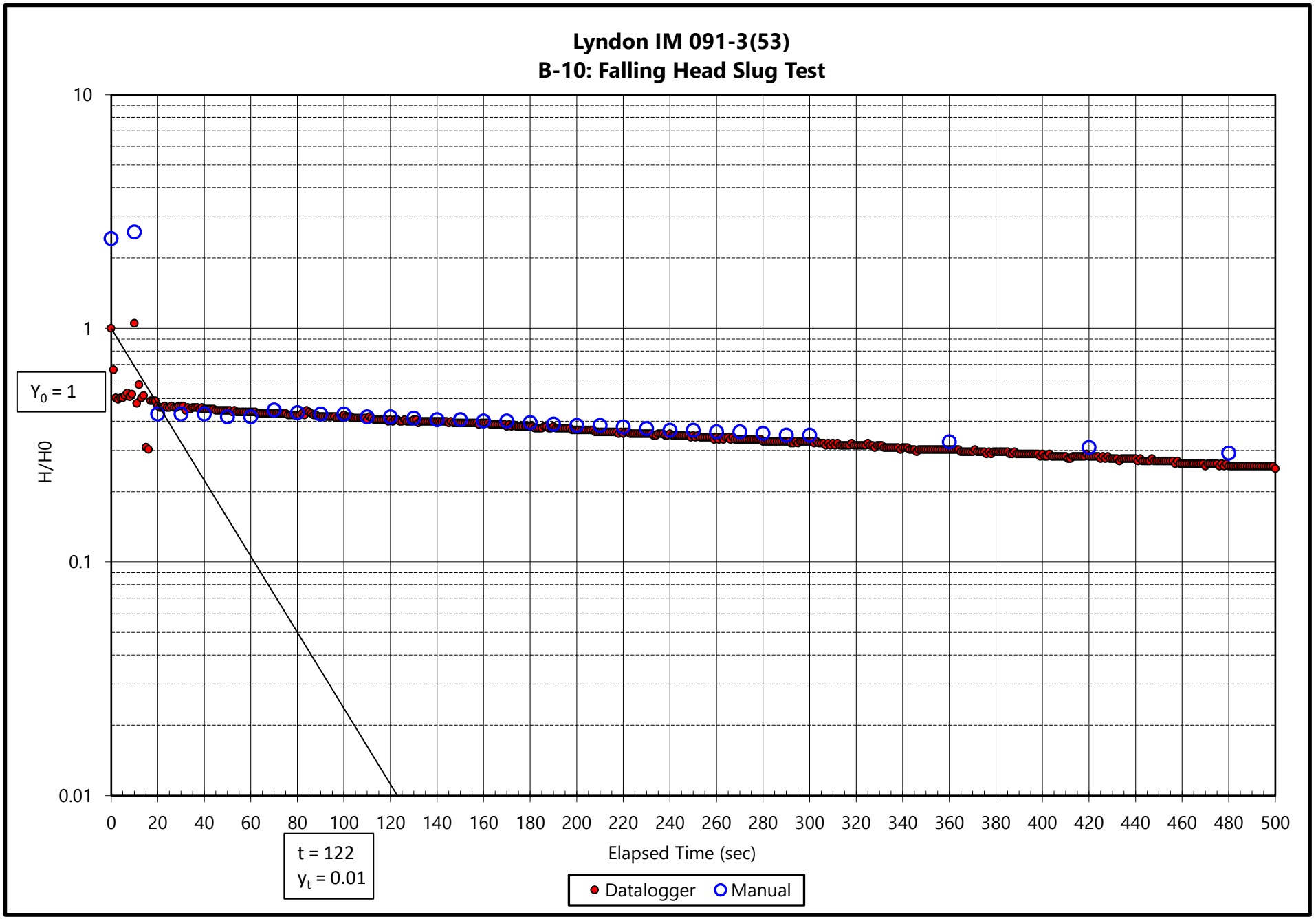
Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
11:10:00 PM	Static Level	NA	48.51		
11:11:40 PM	Slug Inserted				
	0.00		48.51	0.00	
Data logger data not useable due to no WL change	1.00		48.51	0.00	
	2.00		48.51	0.00	
	3.00		48.5	0.01	
	4.00		48.5	0.01	
	5.00		48.51	0.00	
	6.00		48.5	0.01	
	7.00		48.51	0.00	
	8.00		48.5	0.01	
	9.00		48.5	0.01	
	10.00		48.5	0.01	
	11.00		48.5	0.01	
	12.00		48.51	0.00	
	13.00		48.5	0.01	
	14.00		48.502	0.01	
	15.00		48.502	0.01	
	16.00		48.502	0.01	
	17.00		48.512	0.00	
	18.00		48.512	0.00	
	19.00		48.502	0.01	
	20.00		48.512	0.00	
	21.00		48.512	0.00	
	22.00		48.512	0.00	
	23.00		48.512	0.00	
	24.00		48.502	0.01	
	25.00		48.512	0.00	
	26.00		48.502	0.01	
	27.00		48.512	0.00	
	28.00		48.502	0.01	
	29.00		48.512	0.00	
	30.00		48.502	0.01	
	31.00		48.512	0.00	
	32.00		48.512	0.00	
	33.00		48.502	0.01	
	34.00		48.502	0.01	
	35.00		48.502	0.01	
	36.00		48.502	0.01	
	37.00		48.502	0.01	
	38.00		48.505	0.01	
	39.00		48.515	-0.01	
	40.00		48.505	0.01	
	41.00		48.515	-0.01	
	42.00		48.505	0.01	
	43.00		48.515	-0.01	
	44.00		48.515	-0.01	
	45.00		48.505	0.01	
	46.00		48.515	-0.01	
	47.00		48.515	-0.01	
	48.00		48.515	-0.01	
	49.00		48.505	0.01	
	50.00		48.515	-0.01	
	51.00		48.515	-0.01	
	52.00		48.515	-0.01	
	53.00		48.515	-0.01	

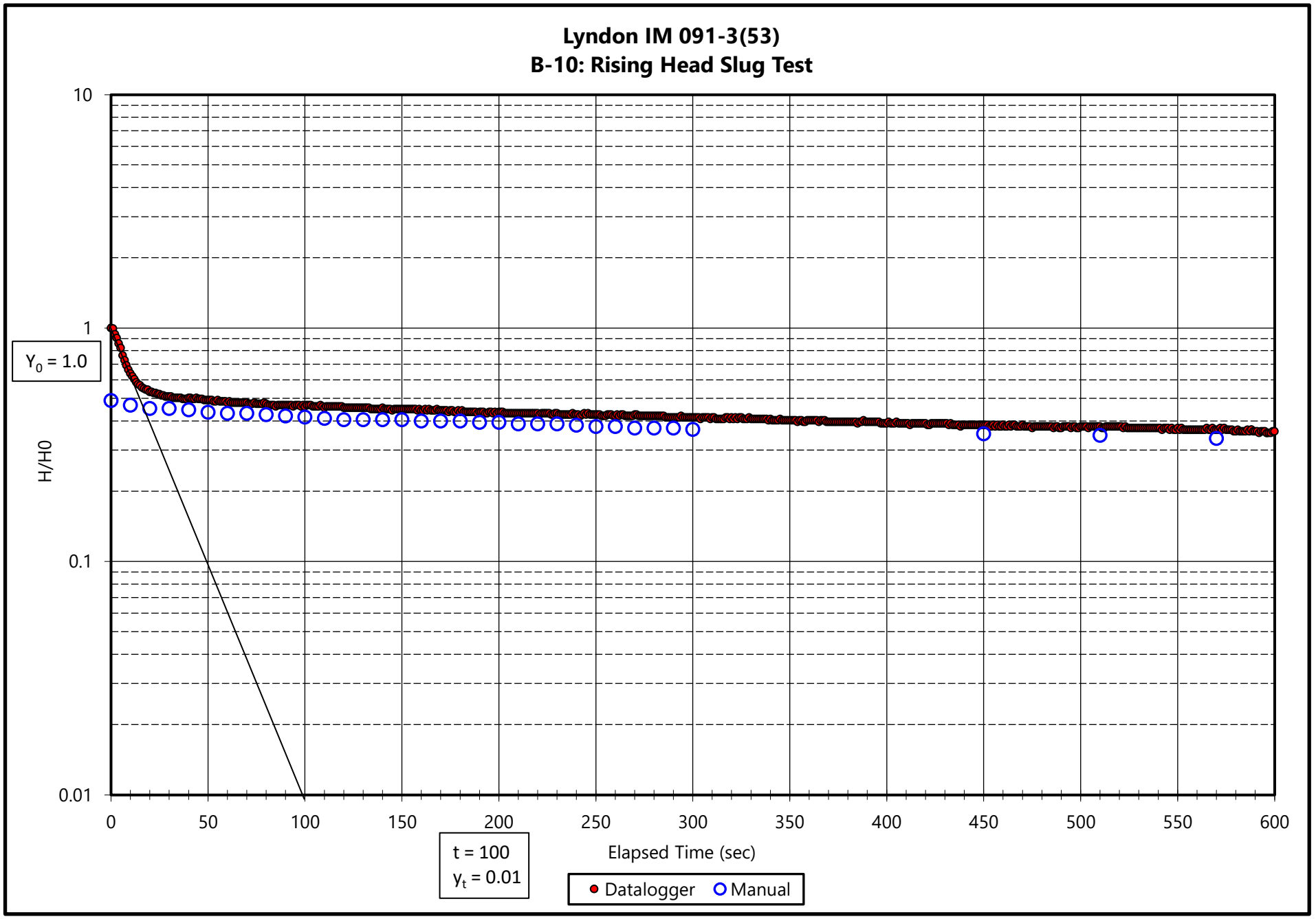
Rising Head Test - Datalogger Data

H_0 (initial head difference, ft) = -2.00

Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
2:17:59 PM	Slug Removal	NA	56.31		

Remaining datalogger data are graphically presented in following charts.


Lyndon IM 091-3(53)
B-10: Falling Head Slug Test
10
1
0.1
0.01
H/H0
Y0 = 1
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
Elapsed Time (sec)
t = 122
yt = 0.01
Datalogger
Manual


Lyndon IM 091-3(53)
B-10: Rising Head Slug Test
10
1
0.1
0.01
H/H0
Y0 = 1.0
0
50
100
150
200
250
300
350
400
450
500
550
600
Elapsed Time (sec)
t = 100
yt = 0.01
Datalogger
Manual

Lyndon IM 091-3(53)
Slug Test Field Data: **B-10**
Bouwer and Rice Method
Testing Conducted by HNTB and VHB on: 12/6/2022

Field Measurements:	Total Depth (ft btp) =	14.91
	Pipe stickup above grade (ft) =	0.00
	Pipe inside diameter (in) =	2.00
	datalogger set to (ft btp) =	
	Static Level (ft btp) =	7.05

Falling Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
0:00:00	Static Level	7.05		
0:00:00	0	2.82	4.23	2.42
0:00:10	10	2.53	4.52	2.59
0:00:20	20	6.30	0.75	0.43
0:00:30	30	6.30	0.75	0.43
0:00:40	40	6.30	0.75	0.43
0:00:50	50	6.32	0.73	0.42
0:01:00	60	6.32	0.73	0.42
0:01:10	70	6.27	0.78	0.45
0:01:20	80	6.29	0.76	0.44
0:01:30	90	6.30	0.75	0.43
0:01:40	100	6.30	0.75	0.43
0:01:50	110	6.32	0.73	0.42
0:02:00	120	6.32	0.73	0.42
0:02:10	130	6.33	0.72	0.41
0:02:20	140	6.34	0.71	0.41
0:02:30	150	6.34	0.71	0.41
0:02:40	160	6.35	0.70	0.40
0:02:50	170	6.35	0.70	0.40
0:03:00	180	6.36	0.69	0.40
0:03:10	190	6.37	0.68	0.39
0:03:20	200	6.38	0.67	0.38
0:03:30	210	6.38	0.67	0.38
0:03:40	220	6.39	0.66	0.38
0:03:50	230	6.40	0.65	0.37
0:04:00	240	6.41	0.64	0.37
0:04:10	250	6.41	0.64	0.37
0:04:20	260	6.42	0.63	0.36
0:04:30	270	6.42	0.63	0.36
0:04:40	280	6.43	0.62	0.36
0:04:50	290	6.44	0.61	0.35
0:05:00	300	6.44	0.61	0.35
0:06:00	360	6.48	0.57	0.33
0:07:00	420	6.51	0.54	0.31
0:08:00	480	6.54	0.51	0.29
0:09:10	550	6.60	0.45	0.26
0:10:10	610	6.61	0.44	0.25
0:15:10	910	6.73	0.32	0.18
0:20:10	1210	6.80	0.25	0.14
0:22:10	1330	6.82	0.23	0.13
0:24:10	1450	6.83	0.22	0.13
0:29:10	1750	6.87	0.18	0.10
0:34:10	2050	6.89	0.16	0.09
0:39:10	2350	6.91	0.14	0.08
0:42:10	2530	6.92	0.13	0.07
0:49:10	2950	6.93	0.12	0.07
0:57:10	3430	6.93	0.12	0.07

Rising Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
0:00:00	Static Level	7.05		
0:00:00	0	7.98	-0.93	0.49
0:00:10	10	7.94	-0.89	0.47
0:00:20	20	7.91	-0.86	0.45
0:00:30	30	7.91	-0.86	0.45
0:00:40	40	7.90	-0.85	0.45
0:00:50	50	7.88	-0.83	0.44
0:01:00	60	7.87	-0.82	0.43
0:01:10	70	7.87	-0.82	0.43
0:01:20	80	7.86	-0.81	0.43
0:01:30	90	7.85	-0.80	0.42
0:01:40	100	7.84	-0.79	0.42
0:01:50	110	7.83	-0.78	0.41
0:02:00	120	7.82	-0.77	0.40
0:02:10	130	7.82	-0.77	0.40
0:02:20	140	7.82	-0.77	0.40
0:02:30	150	7.82	-0.77	0.40
0:02:40	160	7.81	-0.76	0.40
0:02:50	170	7.81	-0.76	0.40
0:03:00	180	7.81	-0.76	0.40
0:03:10	190	7.80	-0.75	0.39
0:03:20	200	7.80	-0.75	0.39
0:03:30	210	7.79	-0.74	0.39
0:03:40	220	7.79	-0.74	0.39
0:03:50	230	7.79	-0.74	0.39
0:04:00	240	7.78	-0.73	0.38
0:04:10	250	7.77	-0.72	0.38
0:04:20	260	7.77	-0.72	0.38
0:04:30	270	7.76	-0.71	0.37
0:04:40	280	7.76	-0.71	0.37
0:04:50	290	7.76	-0.71	0.37
0:05:00	300	7.75	-0.70	0.37
0:07:30	450	7.72	-0.67	0.35
0:08:30	510	7.71	-0.66	0.35
0:09:30	570	7.69	-0.64	0.34
0:10:30	630	7.67	-0.62	0.33
0:12:30	750	7.65	-0.60	0.32
0:14:30	870	7.63	-0.58	0.30
0:16:30	990	7.61	-0.56	0.29
0:18:30	1110	7.59	-0.54	0.28
0:20:30	1230	7.51	-0.46	0.24
0:22:30	1350	7.50	-0.45	0.24
0:24:30	1470	7.48	-0.43	0.23
0:27:30	1650	7.45	-0.40	0.21
0:32:30	1950	7.41	-0.36	0.19
0:37:30	2250	7.37	-0.32	0.17
0:42:30	2550	7.34	-0.29	0.15
0:47:30	2850	7.31	-0.26	0.14
0:52:30	3150	7.30	-0.25	0.13
1:39:58	5998	7.21	-0.16	0.08

Falling Head Test - Datalogger Data

H_0 (initial head difference, ft) = 1.75

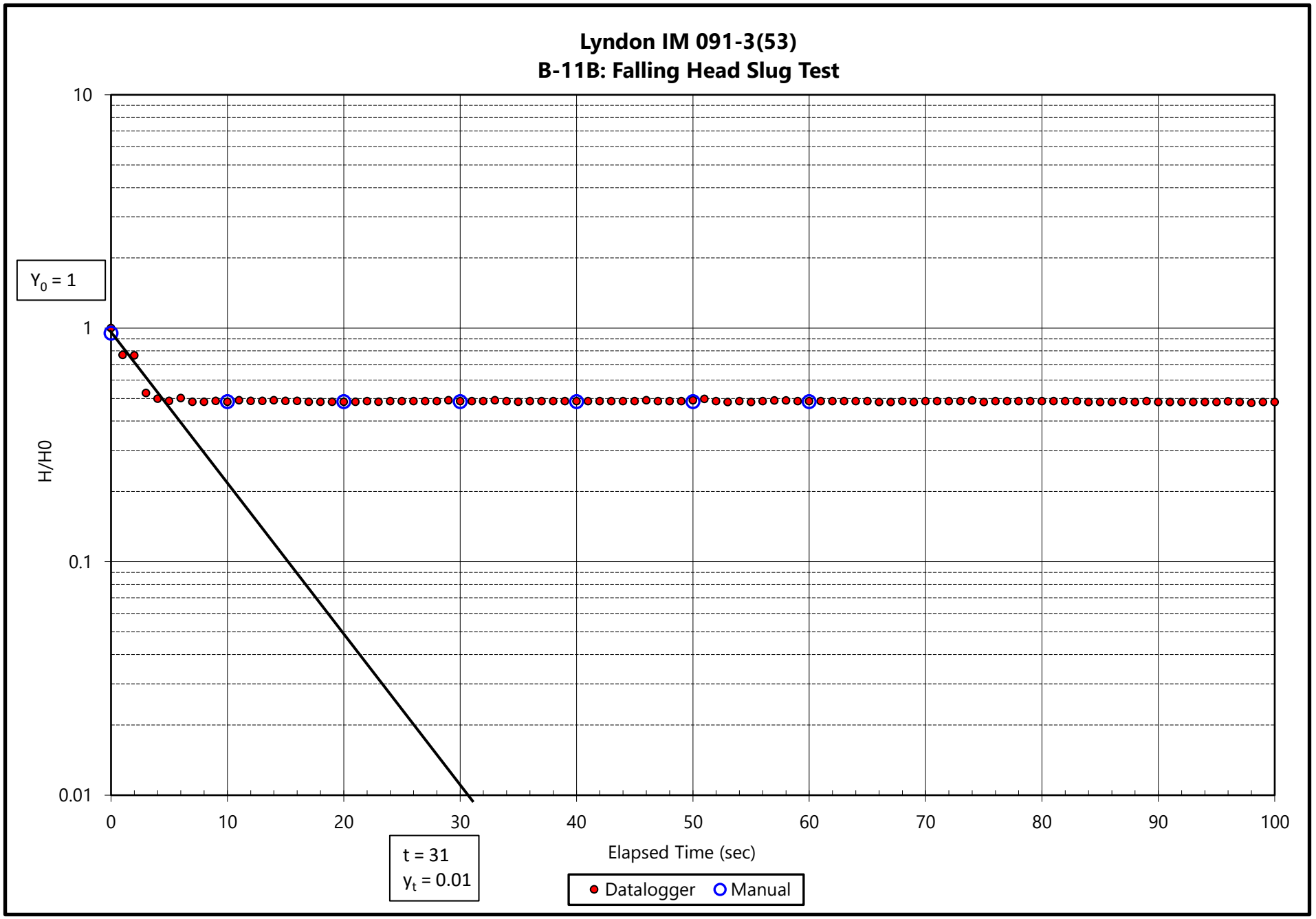
Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
12:05:03 PM	Static Level	NA	57.19		
12:05:05 PM	Slug Inserted				
	0		5.30	1.75	1.00
	1		5.89	1.16	0.66
	2		6.17	0.88	0.50
	3		6.18	0.87	0.50
	4		6.17	0.88	0.50
	5		6.17	0.88	0.50
	6		6.15	0.90	0.52
	7		6.13	0.92	0.53
	8		6.16	0.89	0.51
	9		6.14	0.91	0.52
	10		5.21	1.84	1.05
	11		6.22	0.83	0.48
	12		6.05	1.00	0.57

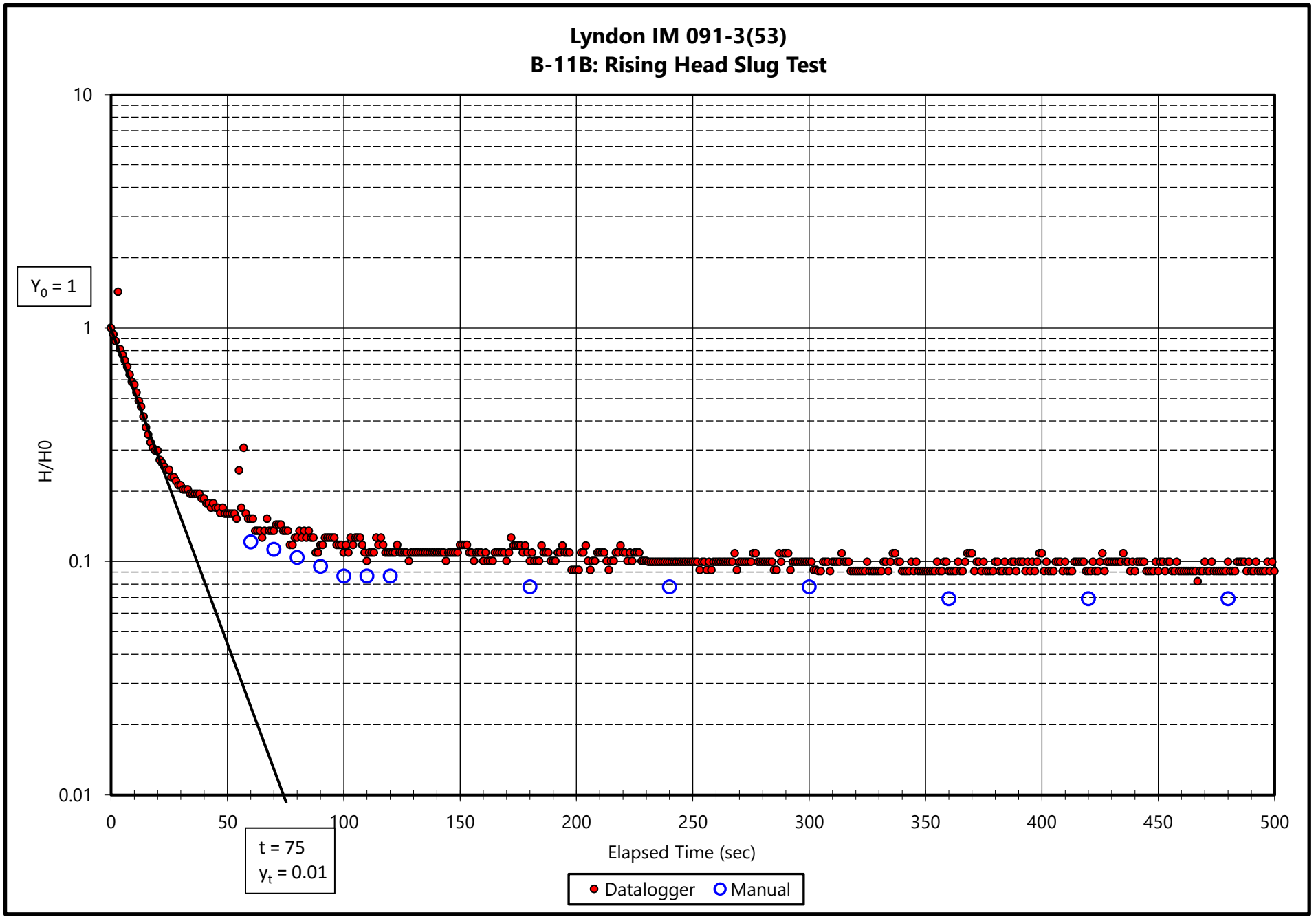
Rising Head Test - Datalogger Data

H_0 (initial head difference, ft) = -1.90

Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
2:17:59 PM	Slug Removal	NA	7.02		
	0.00		8.95	-1.90	1.00
	1.00		8.94	-1.89	0.99
	2.00		8.84	-1.79	0.94
	3.00		8.77	-1.72	0.91
	4.00		8.68	-1.63	0.86
	5.00		8.62	-1.57	0.82
	6.00		8.50	-1.45	0.76
	7.00		8.43	-1.38	0.73
	8.00		8.37	-1.32	0.69
	9.00		8.31	-1.26	0.66
	10.00		8.27	-1.22	0.64
	11.00		8.23	-1.18	0.62
	12.00		8.20	-1.15	0.60

Remaining datalogger data are graphically presented in following charts.


Lyndon IM 091-3(53)
B-11B: Falling Head Slug Test
10
1
0.1
0.01
H/H0
Y_0 = 1
0
10
20
30
40
50
60
70
80
90
100
Elapsed Time (sec)
t = 31
y_t = 0.01
Datalogger
Manual


Lyndon IM 091-3(53)
B-11B: Rising Head Slug Test
10
1
0.1
0.01
H/H0
Y_0 = 1
0
50
100
150
200
250
300
350
400
450
500
Elapsed Time (sec)
t = 75
y_t = 0.01
Datalogger
Manual

Lyndon IM 091-3(53)
Slug Test Field Data: **B-11B**
Bouwer and Rice Method
Testing Conducted by HNTB on: 10/19/2022

Field Measurements:		
	Total Depth (ft btp) =	90.50
	Pipe stickup above grade (ft) =	0.00
	Pipe inside diameter (in) =	2.00
	datalogger set to (ft btp) =	86.90
	Static Level (ft btp) =	57.18

Falling Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
11:59:00	Static Level	57.18		
12:00:00	0	54.59	2.59	0.95
12:00:10	10	55.86	1.32	0.48
12:00:20	20	55.86	1.32	0.48
12:00:30	30	55.86	1.32	0.48
12:00:40	40	55.86	1.32	0.48
12:00:50	50	55.86	1.32	0.48
12:01:00	60	55.86	1.32	0.48
12:02:00	120	55.87	1.31	0.48
12:03:00	180	55.89	1.29	0.47
12:04:00	240	55.90	1.28	0.47
12:05:00	300	55.91	1.27	0.47
12:06:00	360	55.93	1.25	0.46
12:07:00	420	55.94	1.24	0.46
12:08:00	480	55.95	1.23	0.45
12:09:00	540	55.97	1.21	0.44
12:10:00	600	55.98	1.20	0.44
12:11:00	660	55.99	1.19	0.44
12:12:00	720	56.00	1.18	0.43
12:13:00	780	56.00	1.18	0.43
12:14:00	840	56.01	1.17	0.43
12:15:00	900	56.02	1.16	0.43
12:16:00	960	56.03	1.15	0.42
12:17:00	1020	56.04	1.14	0.42
12:18:00	1080	56.05	1.13	0.42
12:19:00	1140	56.06	1.12	0.41
12:20:00	1200	56.07	1.11	0.41
12:25:00	1500	56.11	1.07	0.39
12:30:00	1800	56.14	1.04	0.38

Rising Head Test - Manual Data

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
12:37:00	Static Level	57.32		
12:37:00	60	57.32	-0.14	0.12
12:37:10	70	57.31	-0.13	0.11
12:37:20	80	57.30	-0.12	0.10
12:37:30	90	57.29	-0.11	0.10
12:37:40	100	57.28	-0.10	0.09
12:37:50	110	57.28	-0.10	0.09
12:38:00	120	57.28	-0.10	0.09
12:39:00	180	57.27	-0.09	0.08
12:40:00	240	57.27	-0.09	0.08
12:41:00	300	57.27	-0.09	0.08
12:42:00	360	57.26	-0.08	0.07
12:43:00	420	57.26	-0.08	0.07
12:44:00	480	57.26	-0.08	0.07

Falling Head Test - Datalogger Data

H_0 (initial head difference, ft) = 2.72

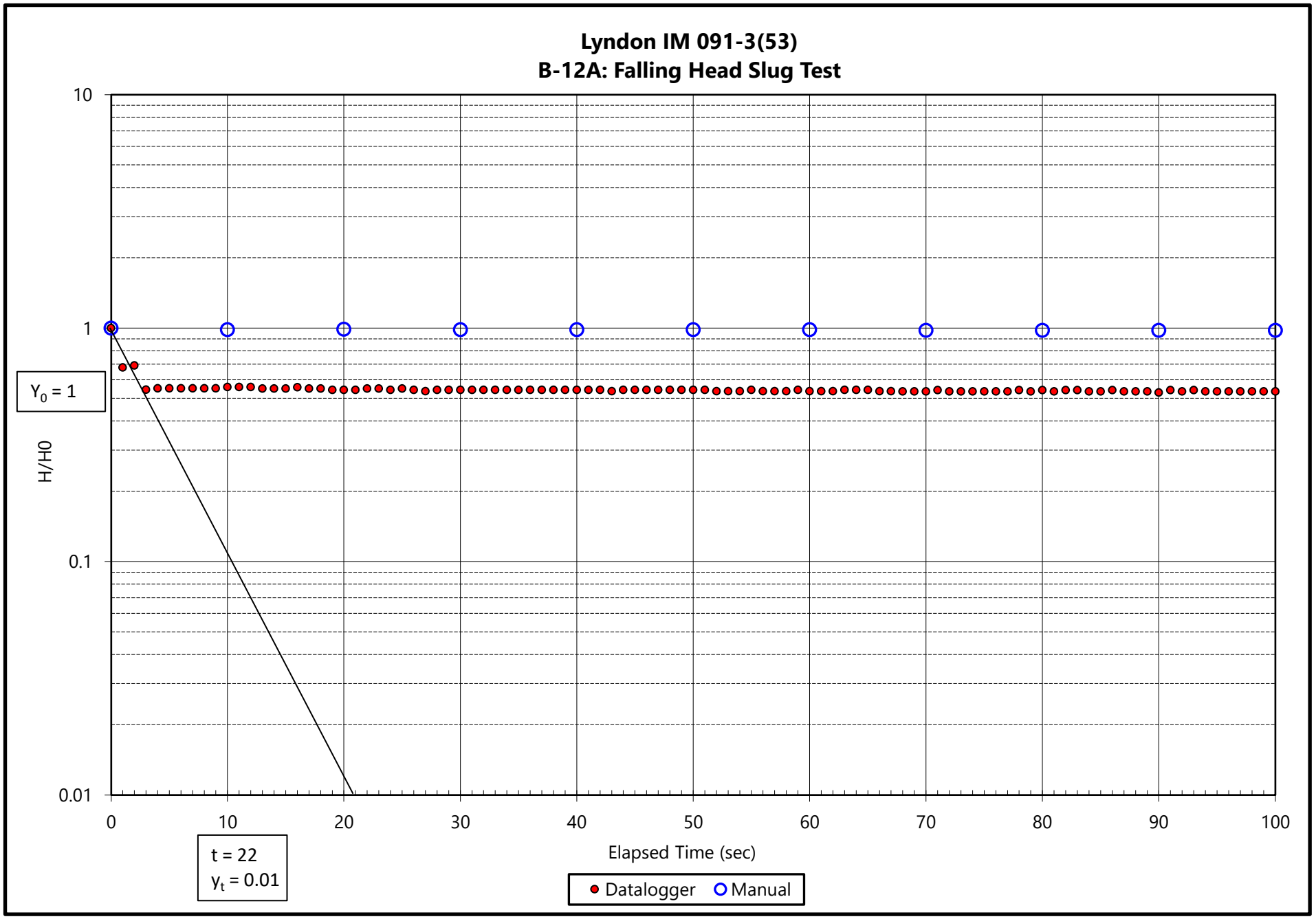
Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
12:05:03 PM	Static Level	NA	57.19		
12:05:05 PM	Slug Inserted				
12:05:06 PM	0		54.46	2.72	1.00
12:05:07 PM	1		55.09	2.09	0.77
12:05:08 PM	2		55.10	2.08	0.76
12:05:09 PM	3		55.74	1.44	0.53
12:05:10 PM	4		55.82	1.36	0.50
12:05:11 PM	5		55.85	1.33	0.49
12:05:12 PM	6		55.81	1.37	0.50
12:05:13 PM	7		55.86	1.32	0.48
12:05:14 PM	8		55.86	1.32	0.48
12:05:15 PM	9		55.85	1.33	0.49
12:05:16 PM	10		55.86	1.32	0.48
12:05:17 PM	11		55.84	1.34	0.49
12:05:18 PM	12		55.85	1.33	0.49
12:05:19 PM	13		55.85	1.33	0.49
12:05:20 PM	14		55.84	1.34	0.49
12:05:21 PM	15		55.85	1.33	0.49
12:05:22 PM	16		55.85	1.33	0.49
12:05:23 PM	17		55.86	1.32	0.48
12:05:24 PM	18		55.86	1.32	0.48
12:05:25 PM	19		55.86	1.32	0.48
12:05:26 PM	20		55.86	1.32	0.48
12:05:27 PM	21		55.86	1.32	0.48
12:05:28 PM	22		55.85	1.33	0.49
12:05:29 PM	23		55.86	1.32	0.48
12:05:30 PM	24		55.85	1.33	0.49
12:05:31 PM	25		55.85	1.33	0.49
12:05:32 PM	26		55.85	1.33	0.49
12:05:33 PM	27		55.85	1.33	0.49
12:05:34 PM	28		55.85	1.33	0.49
12:05:35 PM	29		55.84	1.34	0.49
12:05:36 PM	30		55.85	1.33	0.49
12:05:37 PM	31		55.85	1.33	0.49
12:05:38 PM	32		55.85	1.33	0.49
12:05:39 PM	33		55.84	1.34	0.49
12:05:40 PM	34		55.85	1.33	0.49

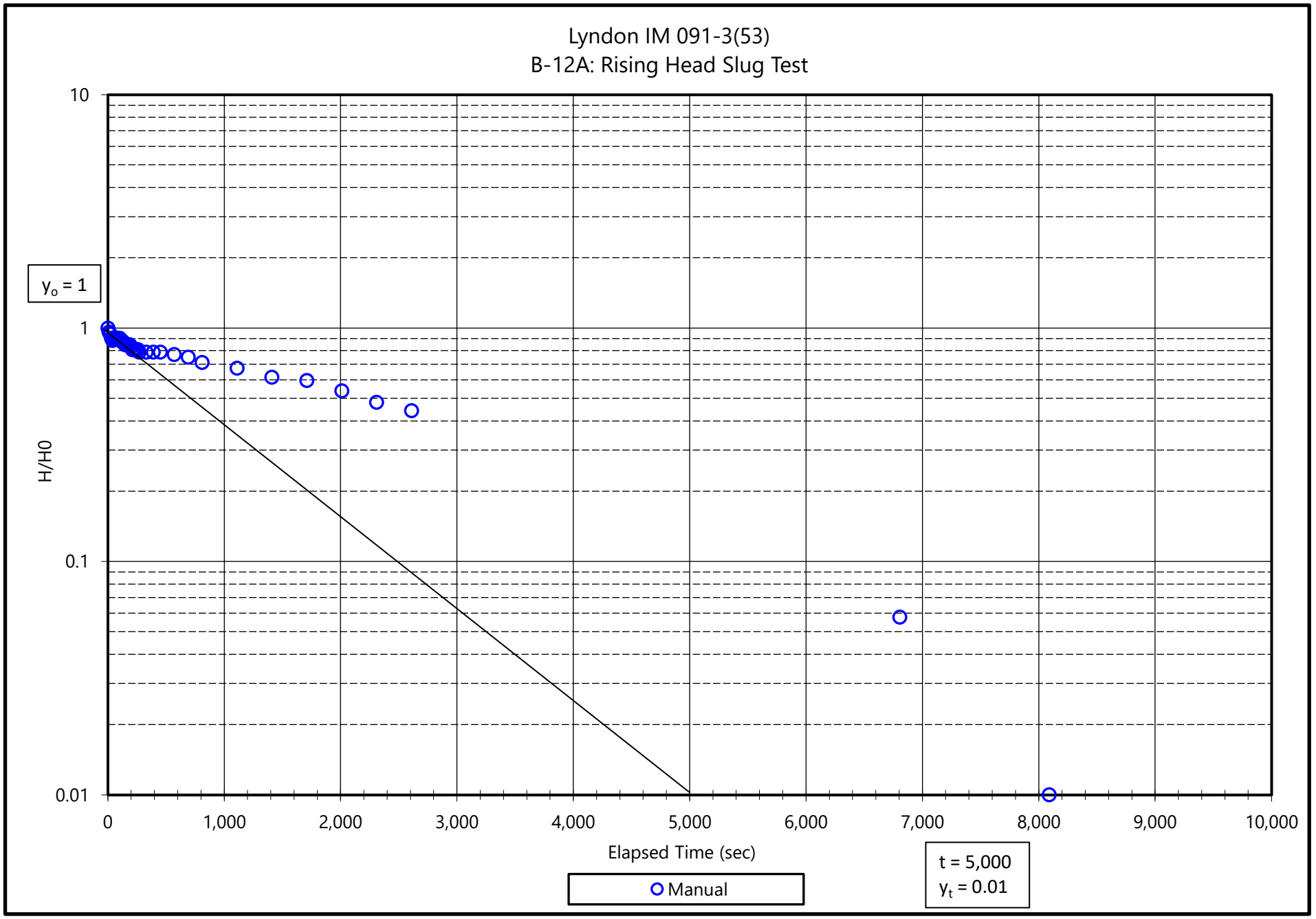
Rising Head Test - Datalogger Data

H_0 (initial head difference, ft) = -1.16

Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
2:17:59 PM	Slug Removal	NA	56.31		
12:37:25 PM	0		58.34	-1.16	1.00
12:37:26 PM	1		58.27	-1.09	0.94
12:37:27 PM	2		58.20	-1.02	0.88
12:37:28 PM	3		58.83	-1.65	1.43
12:37:29 PM	4		58.12	-0.94	0.81
12:37:30 PM	5		58.07	-0.89	0.77
12:37:31 PM	6		58.02	-0.84	0.73
12:37:32 PM	7		57.97	-0.79	0.68
12:37:33 PM	8		57.91	-0.73	0.63
12:37:34 PM	9		57.86	-0.68	0.59
12:37:35 PM	10		57.84	-0.66	0.57
12:37:36 PM	11		57.79	-0.61	0.53
12:37:37 PM	12		57.74	-0.56	0.49
12:37:38 PM	13		57.71	-0.53	0.46
12:37:39 PM	14		57.66	-0.48	0.42
12:37:40 PM	15		57.61	-0.43	0.37
12:37:41 PM	16		57.58	-0.40	0.35
12:37:42 PM	17		57.55	-0.37	0.32
12:37:43 PM	18		57.53	-0.35	0.31
12:37:44 PM	19		57.52	-0.34	0.30
12:37:45 PM	20		57.52	-0.34	0.30
12:37:46 PM	21		57.49	-0.31	0.27
12:37:47 PM	22		57.48	-0.30	0.26
12:37:48 PM	23		57.47	-0.29	0.25
12:37:49 PM	24		57.47	-0.29	0.25
12:37:50 PM	25		57.47	-0.29	0.25
12:37:51 PM	26		57.45	-0.27	0.23
12:37:52 PM	27		57.45	-0.27	0.23
12:37:53 PM	28		57.44	-0.26	0.22
12:37:54 PM	29		57.43	-0.24	0.21
12:37:55 PM	30		57.43	-0.24	0.21
12:37:56 PM	31		57.42	-0.23	0.20
12:37:57 PM	32		57.42	-0.23	0.20
12:37:58 PM	33		57.42	-0.23	0.20
12:37:59 PM	34		57.41	-0.23	0.19

Remaining datalogger data are graphically presented in following charts.


Lyndon IM 091-3(53)
B-12A: Falling Head Slug Test
10
1
0.1
0.01
H/H0
Y_0 = 1
0
10
20
30
40
50
60
70
80
90
100
Elapsed Time (sec)
t = 22
y_t = 0.01
Datalogger
Manual


Lyndon IM 091-3(53)
B-12A: Rising Head Slug Test
10
1
0.1
0.01
H/H0
y_o = 1
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
Elapsed Time (sec)
Manual
t = 5,000
y_t = 0.01

Lyndon IM 091-3(53)
Slug Test Field Data: **B-12A**
Bouwer and Rice Method
Testing Conducted by HNTB and VHB on: 12/6/2022

Field Measurements:		
	Total Depth (ft btp) =	70.00
	Pipe stickup above grade (ft) =	0.00
	Pipe inside diameter (in) =	2.00
	datalogger set to (ft btp) =	69.00
	Static Level (ft btp) =	55.90

Falling Head Test - Manual Data

H_0 (initial head difference, ft) = 1.87

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
0:00:00	Static Level	55.90		
0:00:00	0	54.03	1.87	1.00
0:00:10	10	54.06	1.84	0.98
0:00:20	20	54.05	1.85	0.99
0:00:30	30	54.06	1.84	0.98
0:00:40	40	54.06	1.84	0.98
0:00:50	50	54.06	1.84	0.98
0:01:00	60	54.06	1.84	0.98
0:01:10	70	54.07	1.83	0.98
0:01:20	80	54.07	1.83	0.98
0:01:30	90	54.07	1.83	0.98
0:01:40	100	54.07	1.83	0.98
0:01:50	110	54.07	1.83	0.98
0:02:00	120	54.07	1.83	0.98
0:02:10	130	54.07	1.83	0.98
0:02:20	140	54.07	1.83	0.98
0:02:30	150	54.07	1.83	0.98
0:02:40	160	54.08	1.82	0.97
0:02:50	170	54.08	1.82	0.97
0:03:00	180	54.08	1.82	0.97
0:03:10	190	54.09	1.81	0.97
0:03:20	200	54.09	1.81	0.97
0:03:30	210	54.09	1.81	0.97
0:03:40	220	54.09	1.81	0.97
0:03:50	230	54.09	1.81	0.97
0:04:00	240	54.09	1.81	0.97
0:04:10	250	54.09	1.81	0.97
0:04:20	260	54.09	1.81	0.97
0:05:20	320	54.10	1.80	0.96
0:06:20	380	54.11	1.79	0.96
0:07:20	440	54.11	1.79	0.96
0:08:20	500	54.12	1.78	0.95
0:09:20	560	54.15	1.75	0.94
0:10:20	620	54.15	1.75	0.94
0:11:20	680	54.15	1.75	0.94
0:12:20	740	54.15	1.75	0.94
0:17:20	1040	54.17	1.73	0.93
0:22:20	1340	54.20	1.70	0.91
0:27:20	1640	54.23	1.67	0.89
0:32:20	1940	54.23	1.67	0.89
0:37:20	2240	54.25	1.65	0.88
0:42:20	2540	54.30	1.60	0.86
0:47:20	2840	54.30	1.60	0.86
0:52:20	3140	54.32	1.58	0.84
0:57:20	3440	54.35	1.55	0.83

Rising Head Test - Manual Data

H_0 (initial head difference, ft) = -0.52

Time	Elapsed Time (sec)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
0:00:00	Static Level	55.24		
0:00:00		55.73	-0.49	0.94
0:00:10		55.74	-0.50	0.96
0:00:20		55.75	-0.51	0.98
0:00:30	0	55.76	-0.52	1.00
0:00:40	10	55.74	-0.50	0.96
0:00:50	20	55.73	-0.49	0.94
0:01:00	30	55.71	-0.47	0.90
0:01:10	40	55.70	-0.46	0.88
0:01:20	50	55.71	-0.47	0.90
0:01:30	60	55.71	-0.47	0.90
0:01:40	70	55.71	-0.47	0.90
0:01:50	80	55.71	-0.47	0.90
0:02:00	90	55.71	-0.47	0.90
0:02:10	100	55.71	-0.47	0.90
0:02:20	110	55.70	-0.46	0.88
0:02:30	120	55.70	-0.46	0.88
0:02:40	130	55.69	-0.45	0.87
0:02:50	140	55.69	-0.45	0.87
0:03:00	150	55.68	-0.44	0.85
0:03:10	160	55.68	-0.44	0.85
0:03:20	170	55.68	-0.44	0.85
0:03:30	180	55.68	-0.44	0.85
0:03:40	190	55.68	-0.44	0.85
0:03:50	200	55.67	-0.43	0.83
0:04:00	210	55.66	-0.42	0.81
0:04:10	220	55.66	-0.42	0.81
0:04:20	230	55.66	-0.42	0.81
0:04:30	240	55.66	-0.42	0.81
0:04:40	250	55.66	-0.42	0.81
0:04:50	260	55.66	-0.42	0.81
0:05:00	270	55.65	-0.41	0.79
0:06:00	330	55.65	-0.41	0.79
0:07:00	390	55.65	-0.41	0.79
0:08:00	450	55.65	-0.41	0.79
0:10:00	570	55.64	-0.40	0.77
0:12:00	690	55.63	-0.39	0.75
0:14:00	810	55.61	-0.37	0.71
0:19:00	1110	55.59	-0.35	0.67
0:24:00	1410	55.56	-0.32	0.62
0:29:00	1710	55.55	-0.31	0.60
0:34:00	2010	55.52	-0.28	0.54
0:39:00	2310	55.49	-0.25	0.48
0:44:00	2610	55.47	-0.23	0.44
1:53:55	6805	55.27	-0.03	0.06
2:15:20	8090	55.24	0.00	0.01

Falling Head Test - Datalogger Data

H_0 (initial head difference, ft) = 1.41

Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
1:06:00 PM	Static Level	NA	57.19		
1:06:00 PM	Slug Inserted				
1:06:00 PM			55.428	0.47	0.33
			55.023	0.88	0.62
			54.668	1.23	0.87
			54.519	1.38	0.98
			54.756	1.14	0.81
			54.944	0.96	0.68
	0		54.49	1.41	1.00
	1		54.944	0.96	0.68
	2		54.924	0.98	0.69
	3		55.132	0.77	0.54
	4		55.122	0.78	0.55
	5		55.122	0.78	0.55
	6		55.122	0.78	0.55
	7		55.122	0.78	0.55
	8		55.122	0.78	0.55
	9		55.122	0.78	0.55

Rising Head Test - Datalogger Data

H_0 (initial head difference, ft) = -2.00

Time	Elapsed Time (sec)	Datalogger Head (ft)	Depth to Water (ft btp)	Delta H (ft)	h/H_0
No datalogger data available					

Remaining datalogger data are graphically presented in following charts.