

BASF Corporation

Hydraulic Investigation Work Plan

**Point Hennepin
Wayne County, Michigan**

December 22, 2022

Hydraulic Investigation Work Plan

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Wayne County, Michigan**

December 22, 2022

Prepared By:

Arcadis of Michigan, LLC
28550 Cabot Drive, Suite 500
Novi
Michigan 48377
Phone: 248 994 2240

Prepared For:

Michael Gerdenich
Senior Remediation Specialist
BASF Corporation
1609 Biddle Avenue
Wyandotte, MI 48192

Our Ref:

30137334



Jacelyn Saling
Technical Expert, PE-MI



Everett H. Fortner III, PG
Principal Geologist



Colleen O. Barton
Project Geologist, PG

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Acronyms and Abbreviations

| | |
|-----------|--|
| Arcadis | Arcadis of Michigan, LLC |
| BASF | BASF Corporation |
| CSM | conceptual site model |
| DBO | distiller blowoff |
| EC | electrical conductivity |
| ECT | electrical conductivity tool |
| EGLE | Department of Environment, Great Lakes, and Energy |
| ERI | electrical resistivity imaging |
| GSI | groundwater to surface water interface |
| Work Plan | Hydraulic Investigation Work Plan |
| HPT | hydraulic profiling tool |
| NREPA | Natural Resources and Environmental Protection Act |
| PVC | polyvinyl chloride |
| report | Geophysical Report |
| SC | specific conductance |
| Site | Point Hennepin, located in Wayne County, Michigan |

1 Introduction

On behalf of BASF Corporation (BASF), Arcadis of Michigan, LLC (Arcadis) prepared this Hydraulic Investigation Work Plan (Work Plan) for Point Hennepin, located in Wayne County, Michigan (Site; Figure 1). Point Hennepin is a 225-acre island located in the Detroit River located immediately north of Grand Isle and east of Wyandotte, Michigan. The objective of this Work Plan is to outline the hydraulic investigation to be conducted at the Site, which will be used to evaluate groundwater interaction with and potential flux to surface water in key areas identified during the geophysical field activities. Results of the hydraulic investigation will be integrated into the refined conceptual site model (CSM) that will help identify potential groundwater discharge areas and develop next steps for further assessment. The overarching goal for the Site is to obtain site closure through the Michigan Department of Environment, Great Lakes, and Energy (EGLE) voluntary Part 201 program that incorporates a sustainable perimeter groundwater management approach and allows for the establishment of the Site as a wildlife refuge. The general approach and rationale for this Work Plan were presented to the EGLE at a meeting held on November 9, 2022.

1.1 Objective and Approach

Point Hennepin is an island in the Detroit River upon which distiller blowoff (DBO) was placed from the early to mid-1900s. Historical conditions associated with the island have the potential to exhibit elevated electrical conductivity, as such EC was selected as the preferred geophysical method. A geophysical investigation was completed between November 3, 2021 and July 15, 2022 (Arcadis 2022) to identify zones of anomalous electrical conductivity (EC), which were detected around Point Hennepin.

The objective of the hydraulic investigation is to collect high-resolution water level and specific conductance(SC) data, which will aid in identifying groundwater flux (if any) to surface water in key areas of anomalous EC identified by the geophysical survey. The groundwater flux results will assist in identifying areas for further assessment.

The following activities will be included in the hydraulic investigation:

- Installation of 10 sets of onshore nested piezometers (shallow and deep) along the site perimeter
- Installation of one onshore piezometer along the channel on the southern portion of the Site
- Installation of four stilling wells near shore in the Detroit River
- Installation of pressure transducers and/or sondes to collect high-resolution water level, temperature, and SC from each location (piezometers, Detroit River, and monitoring wells).
- Collection of groundwater elevation data from upland monitoring wells.

1.2 Applicable Regulatory Framework

This Work Plan was developed to investigate potential groundwater discharge to prioritize areas for further assessment and achieve Site closure via Part 201 of Michigan's Natural Resources and Environmental Protection Act (NREPA). Pursuant to Section 324.20220e of NREPA, BASF is developing a response activity to assess and accordingly address potential venting groundwater from the Site. The primary exposure pathway at the Site is the groundwater to surface water interface (GSI) because the potential exists for groundwater above relevant criteria

from the Site to discharge to the Detroit River. The approach presented in this Work Plan follows EGLE (2018) guidance as a first step to understanding groundwater flux around the island.

2 Investigation Activities

This section discusses piezometer and stilling well installation, piezometer development, and high-resolution data collection. Prior installation, utility clearance will be completed and documented in accordance with Arcadis' utility locate policy, which includes contacting Michigan's one call underground utility location service (MISSDIG). A private utility locator will also perform a geophysical survey (e.g., ground-penetrating radar, electromagnetic survey) over an area measuring approximately 25 by 25 feet to locate potential utilities at each proposed boring location. An Arcadis representative will oversee the contractor and inspect the proposed drilling locations to assess the presence of any previously unidentified subsurface utilities.

2.1 Piezometer Location and Interval Selection

Multiple data sets were considered when identifying the key locations for piezometer installation and screened intervals from the 2021-2022 geophysics investigation data. The 11 proposed piezometer locations are shown on Figure 2. The proposed piezometer locations were chosen based on areas of anomalous EC onshore and offshore, and sand layers encountered onshore, as well as to provide coverage of the study area along the perimeter and/or alignment with existing wells. Proposed screen intervals were estimated based on previous boring logs and HPT/ECT and ERI data. The proposed screened intervals target sand lenses, permeable DBO, and relatively permeable clays/silts present at elevations where GSI interaction may occur. Adjustments to final piezometer and stilling well locations and screened intervals will be determined in the field, guided by field conditions, access, and subsurface data collected. Proposed screened intervals are included in Table 1 for each piezometer along with a justification summary based on the reviewed data discussed above.

2.2 Piezometer Installation and Development

A direct-push/hollow stem auger rig will be used to install co-located piezometers (shallow and deep) along the site perimeter on the riverbank.

Each piezometer will be installed to the proposed depths (Table 1) with 2-inch Schedule 40 polyvinyl chloride (PVC) riser and 5 feet of 0.010-inch wire-wrapped stainless steel screen. The piezometer well screen intervals are shown on the associated HPT/EC boring log in Appendix A.

The soil from each piezometer boring will be continuously sampled and logged by trained Arcadis staff. Following installation, the piezometers will be developed using surge and purge development techniques. The piezometers will be surveyed by a licensed professional for horizontal coordinate location and vertical elevation of the top of casing and ground surface. Lithologic boring logs and piezometer construction logs will be developed for each new piezometer.

2.3 Stilling Well Installation

Five stilling wells will be installed, two each on the east and west sides of the island and one in the channel to the south to measure elevations in the Detroit River for comparison to groundwater elevations within the island and

on the island perimeter. These installations will refine the understanding of groundwater to surface water interactions. Each stilling well will be constructed of a 5-foot length of 0.010-inch Schedule 40 PVC slotted pipe, secured to a steel pipe that will be driven several feet into the sediment bottom of the shore. The steel pipe will be installed using a slide hammer. The stilling wells will be stable or permanent enough in nature to withstand movement from the river current. A combination of concrete blocks, metal drive pipe, or green safety fence posts may be used to stabilize and reinforce the stilling well.

A staff gauge will be installed and secured at each stilling well. The staff gauge will be installed flush with the top of the stilling well to allow for quick manual measurements of water level stage and to easily correlate the surface water to a known elevation above mean sea level. The gauge will include a U.S. Geological Survey style graduated staff gauge label so that measurements can be taken by a photograph. The stilling wells will be surveyed by a licensed professional for horizontal coordinate location and vertical elevation of the top of casing.

2.4 High-Resolution Water Level and SC Collection

High-resolution water level and/or SC data will be collected at each piezometer, stilling well, and several existing monitoring wells (Table 1) using non-vented pressure transducers. The pressure transducers will continuously collect water level data, temperature, and/or SC data for a total of 3 months to encompass one wet and one dry season. A barometric pressure transducer will be deployed at the Site to measure atmospheric pressure during the monitoring periods. The barometric pressure measurements will be used to compensate and evaluate the influence of and correct for barometric pressure induced changes to groundwater levels. Manual water levels to a survey reference point will be collected during pressure transducer deployment and download events (monthly). During the monthly download, manual water levels will also be collected at all existing monitoring wells (labeled as DMW on Figure 2) across the Site in addition to locations where pressure transducers will be deployed to gain a better understanding of water levels across the Site through time.

3 Data Analysis and Interpretation

Following the 3 months of monitoring, data collected from the pressure transducers will be processed by removing shifts in water levels resulting from the movement of the instruments that may occur when accessed and by calibrating the instrument water level measurements to water elevation with manual water levels measured at the respective well from a known survey reference point. SC and/or temperature data will also be evaluated at each location, as applicable, as additional lines of evidence to support the hydraulic analysis. Potential dike locations near the piezometers will be considered when assessing water level and SC data. These data, in combination with co-located HPT/EC data, will be used to evaluate hydraulic gradients from the Site to the river and assess groundwater flux to the river. Some potential endmember outcomes may include:

- High Groundwater Flux:
 - Observed steep horizontal hydraulic gradient from inland to the river, dominant downward vertical hydraulic gradient, correlating area high hydraulic conductivity, and high in-river EC from geophysics
- Potential Perimeter Dike Barrier:
 - Observed shallow horizontal hydraulic gradient from inland to the river, little to no correlation with groundwater levels and river levels, and low in-river EC from geophysics
- Little to No Groundwater Flux:

- Observed shallow horizontal hydraulic gradient from inland to the river, low downward to upward vertical hydraulic gradient from groundwater to the river, correlating area low hydraulic conductivity, and low in-river EC from geophysics
- Little to No Groundwater Flux and Presence of DBO:
 - Observed shallow horizontal hydraulic gradient from inland to the river, low downward to upward vertical hydraulic gradient from groundwater to the river, correlating area low hydraulic conductivity, and high in-river EC from geophysics

4 Reporting

The results from the execution of this Work Plan and data evaluation will be summarized in a technical memorandum and submitted to EGLE. The memorandum will include the summary of activities and supporting documentation. The data evaluation will include charted data and supporting tables and figures to support the groundwater flux evaluation. Results will be used to develop a flux-based GSI strategy and to identify areas for potential further assessment.

5 Implementation Schedule

Implementation of the activities discussed in this Work Plan will begin upon approval from the EGLE. Piezometer and stilling well installation will be completed in early spring 2023. High-resolution water level monitoring will take place in spring 2023 (wet season) and summer 2023 (dry season). Results of the hydraulic and flux evaluation will be discussed with the EGLE following data evaluation.

6 References

Arcadis. 2022. Geophysical Report. Point Hennepin, Wayne County, Michigan. December.

EGLE. 2018. Groundwater-Surface Water Pathway Compliance Options. Remediation and Redevelopment Division Resource Materials. April 23.

Table

Table 1
Hydraulic Monitoring Network
Hydraulic Investigation Work Plan
Point Hennepin
Wayne County, Michigan

| Piezometer/ Stilling Well Location | Associated HPT/ECT Boring from 2022 Geophysics | Proposed/Existing Location | Proposed Shallow Screen Interval (feet bgs) | Proposed Shallow Interval Justification ¹ | Proposed Deep Screen Interval (feet bgs) | Proposed Deep Interval Justification ¹ | Water Level, Temperature, and Specific Conductivity | Water Level and Temperature |
|--|---|-------------------------------|---|---|--|---|--|-----------------------------------|
| P01 | E1 | Proposed Piezometers | 9-14 | DBO; K > 20 ft/day; Elevated EC (ERI and HPT/ECT) up to > 1000 mS/m | 25-30 | Clay; Potential K anomalies; low EC (both ERI and HPT/ECT); confirm low K / low flux | X | -- |
| P02 | W2 | Proposed Piezometers | 5-10 | Shallow sands; K > 20 ft/day; variable EC >/< 500 mS/m | 13-18 | Low HPT pressure; Increasing ERI and EC; permeable clay zone located above tighter clay; confirm lower K / low flux | X | -- |
| P03 | W4 | Proposed Piezometers | 5-10 | Shallow sands, silts, and DBO; K > 20 ft/day; ERI at 1000 mS/m and EC > 2000 mS/m | 13-18 | Intermediate sands, EC > 1000 mS/m and maxed out ERI (2500 mS/m); and K > 20 ft/day | X | -- |
| P04 | W8 | Proposed Piezometers | 15-20 | Very soft, silt/DBO and K up to 20 ft/day; K maxed at 100 ft/day; EC > 500 mS/m | 26-31 | Permeable clay, silt, and sand; HPT data shows K 10-20 ft/day; EC/ERI ~ 300 mS/m | X | -- |
| P05 | W10 | Proposed Piezometers | 8-13 | Very soft silt/DBO; HPT data shows K at 100 ft/day ; EC variable up to 1000 mS/m | 23-28 | Intermediate sands; HPT data shows K up to 75 ft/day; ERI increasing and EC > 1500 mS/m | X | -- |
| P06 | W11 | Proposed Piezometers | 10-15 | Adjacent boring log in DBO; HPT data shows K 20-40 ft/day; ERI increasing and EC > 1000 mS/m | 20-25 | HPT data shows K > 60 ft/day a; HPT pressure low to variable; ERI and EC > 1000 mS/m | X | -- |
| P07 | E11 | Proposed Piezometers | 9-14 | Silty DBO; HPT data shows K > 60 ft/day a; ERI increasing and EC > 1000 mS/m | 20-25 | Permeable clay; HPT data shows K ~ 20 ft/day; low HPT pressure; ERI spike > 2000 mS/m and EC > 1000 mS/m | X | -- |
| P08 | E8 | Proposed Piezometers | 10-15 | DBO, sands, and silts; HPT data shows K at 20 ft/day; ERI increasing and EC at 1500 mS/m | 25-30 | Sands and silts; K up to 30 ft/day; ERI and EC > 1500 mS/m | X | -- |
| P09 | E7 | Proposed Piezometers | 9-14 | DBO and top of clay; K > 20 ft/day; Elevated EC (HPT/ECT only) up to 2000 mS/m | 22-27 | Clay; Potential K anomalies; lower EC (both ERI and HPT/ECT) at 500 mS/m; confirm low K / low flux | X | -- |
| P10 | E5 | Proposed Piezometers | 8-13 | Sandy DBO; K varies up to > 80 ft/day; Elevated EC (ERI and HPT/ECT) up to 1000 mS/m | 17-22 | Clay; K > 20 ft/day; Elevated EC (ERI and HPT/ECT) up to 2000 mS/m; Confirm K | X | -- |
| P11 | E2 | Proposed Piezometer | -- | Surface elevation is high at this location and a shallow piezometer would not aid in GSI assessment | 23-28 | Base of DBO and top of clay; K up to 20 ft/day; Elevated EC (ERI and HPT/ECT) up to > 1500 mS/m | X | -- |
| SW01 | -- | Proposed Stilling Well | -- | -- | -- | -- | -- | X |
| SW02 | -- | Proposed Stilling Well | -- | -- | -- | -- | -- | X |

Table 1
Hydraulic Monitoring Network
Hydraulic Investigation Work Plan
Point Hennepin
Wayne County, Michigan

| Piezometer/ Stilling Well Location | Associated HPT/ECT Boring from 2022 Geophysics | Proposed/Existing Location | Proposed Shallow Screen Interval (feet bgs) | Proposed Shallow Interval Justification ¹ | Proposed Deep Screen Interval (feet bgs) | Proposed Deep Interval Justification ¹ | Water Level, Temperature, and Specific Conductivity | Water Level and Temperature |
|--|---|---------------------------------------|---|---|--|--|--|-----------------------------------|
| SW03 | -- | Proposed Stilling Well | -- | -- | -- | -- | -- | X |
| SW04 | -- | Proposed Stilling Well | -- | -- | -- | -- | -- | X |
| SW05 | -- | Proposed Stilling Well | -- | -- | -- | -- | -- | X |
| DMW-1 | -- | Existing Monitoring Well ² | -- | -- | -- | -- | -- | X |
| DMW-6 | -- | Existing Monitoring Well ² | -- | -- | -- | -- | -- | X |
| DMW-7 | -- | Existing Monitoring Well ² | -- | -- | -- | -- | -- | X |
| DMW-8 | -- | Existing Monitoring Well ² | -- | -- | -- | -- | -- | X |
| DMW-10 | -- | Existing Monitoring Well ² | -- | -- | -- | -- | -- | X |
| SMW-3 | -- | Existing Monitoring Well ² | -- | -- | -- | -- | -- | X |
| SMW-4 | -- | Existing Monitoring Well ² | -- | -- | -- | -- | -- | X |

Acronyms and Abbreviations:

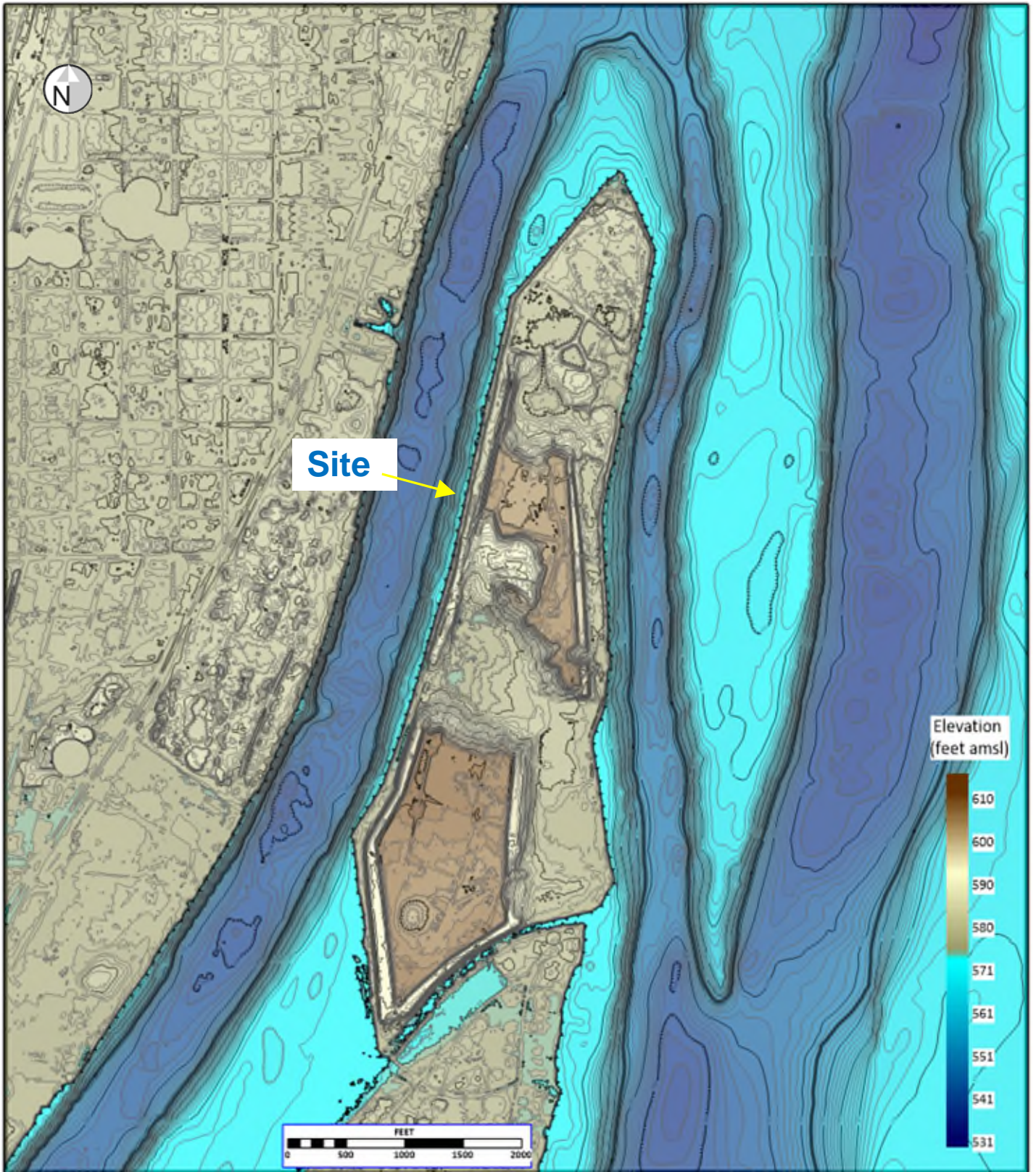
-- = not applicable
bgs = below ground surface
DBO = distiller blowoff
EC = electrical conductivity
ECT = electrical conductivity tool
ERI = electrical resistivity imaging
ft/day = feet per day
GSI = groundwater to surface water interface
HPT = hydraulic profiling tool
K = hydraulic conductivity
mL/min = milliliter per minute
mS/m = milliSiemen per meter
X = applicable monitoring parameters

Notes:

¹ Piezometer interval justification based on boring logs and HPT/ECT and ERI data near proposed location.

² The number of existing monitoring wells fitted with transducers may be adjusted on field conditions

Figures

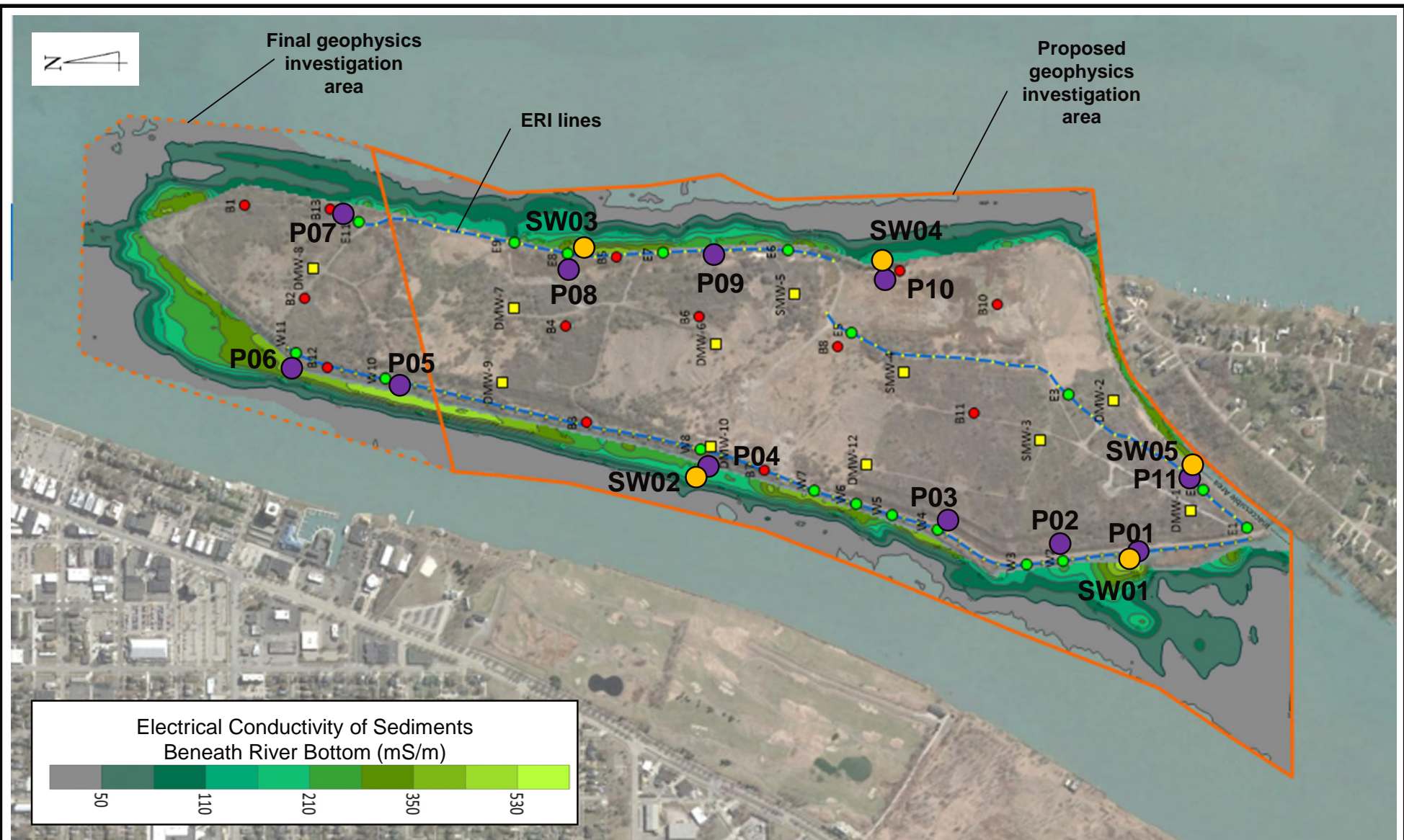


BASF CORPORATION
POINT HENNEPIN, WAYNE COUNTY, MICHIGAN
HYDRAULIC INVESTIGATION WORK PLAN

SITE LOCATION MAP



FIGURE
1



- Proposed piezometer location
- Proposed stilling well location
- Golder 2021 boring locations
- HPT/ECT boring locations
- Existing monitoring wells

Notes:
 HPT = hydraulic profiling tool
 EC = electrical conductivity tool
 ERI = electrical resistivity imaging
 mS/m = milliSiemen per meter

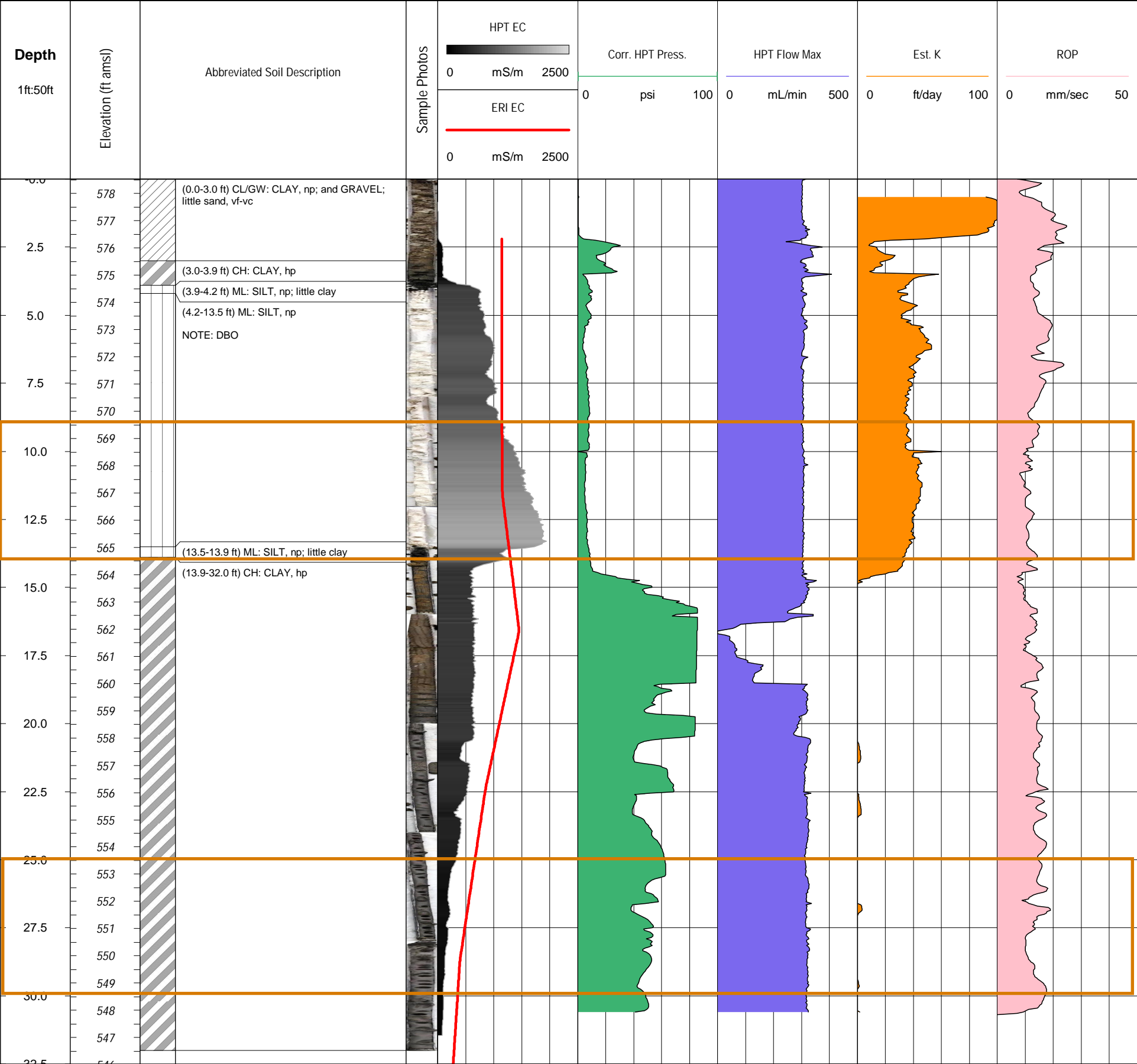
BASF CORPORATION
 POINT HENNEPIN, WAYNE COUNTY, MICHIGAN
HYDRAULIC INVESTIGATION WORK PLAN

PROPOSED PIEZOMETER AND STILLING WELL LOCATIONS

Appendix A

HPT / ERI EC / Confirmation Soil Boring Logs

| | | | | |
|--|--|---|--|--|
| BORING NAME: E1 | | CLIENT: BASF | | Logging Methods <div><input checked="" type="checkbox"/> Soil Description</div> <div><input checked="" type="checkbox"/> Sample Photo</div> <div><input checked="" type="checkbox"/> HPT Pressure</div> <div><input checked="" type="checkbox"/> HPT Flow Max</div> <div><input checked="" type="checkbox"/> HPT Estimated Hydraulic Conductivity</div> <div><input checked="" type="checkbox"/> HPT Rate of Penetration</div> <div><input checked="" type="checkbox"/> HPT Electrical Conductivity (EC)</div> <div><input checked="" type="checkbox"/> Electrical Resistivity Imaging (ERI)</div> <div>Electrical Conductivity (EC)</div> <div><input type="checkbox"/> Proposed Piezometer P-01 Screen Intervals for Hydraulic Investigation Work Plan</div> |
| PROJECT NAME: BASF Point Hennepin | | PROJECT NUMBER: 30107326 | | |
| DATE LOGGED: 03/31/2022 | | LOGGED BY: Arcadis - SB and Geophysics Dakota - HPT | | |
| BORING COORDINATES: X 322536.23 Y 4672165.76 | | HPT TOTAL DEPTH: 31.5 ft bgs | | |
| PROJECTION: Universal Transverse Mercator (UTM) | | SB TOTAL DEPTH: 32 ft bgs | | |
| SURFACE ELEVATION: 758.5 ft amsl | | REMARKS: See Appendix A for more detailed soil description | | |
| ELEVATION DATUM: World Geodetic System 1984 | | | | |



BORING NAME: E2

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 04/06/2022

LOGGED BY: Arcadis - SB and
Geophysics
Dakota - HPT

Logging Methods

- ☒ Soil Description
- ☒ Sample Photo
- ☒ HPT Pressure
- ☒ HPT Flow Max
- ☒ HPT Estimated Hydraulic Conductivity
- ☒ HPT Rate of Penetration
- ☒ HPT Electrical Conductivity (EC)
- ☒ Electrical Resistivity Imaging (ERI)
- ☒ Electrical Conductivity (EC)

☐

 Proposed Piezometer P-11 Screen Interval
for Hydraulic Investigation Work Plan

BORING COORDINATES: X 322613.54
Y 4672255.04

HPT TOTAL DEPTH: 51.3 ft bgs

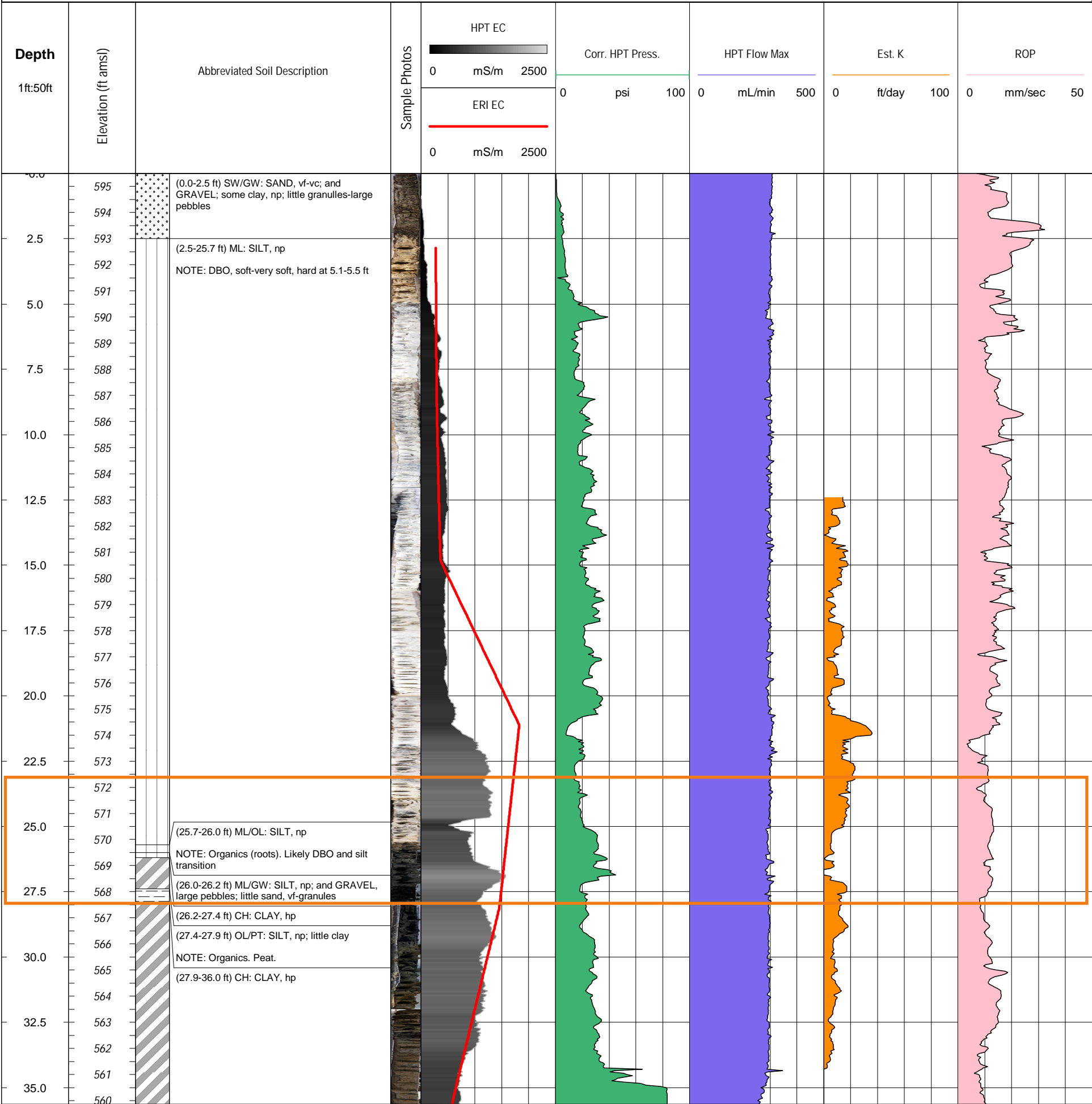
PROJECTION: Universal Transverse Mercator (UTM)

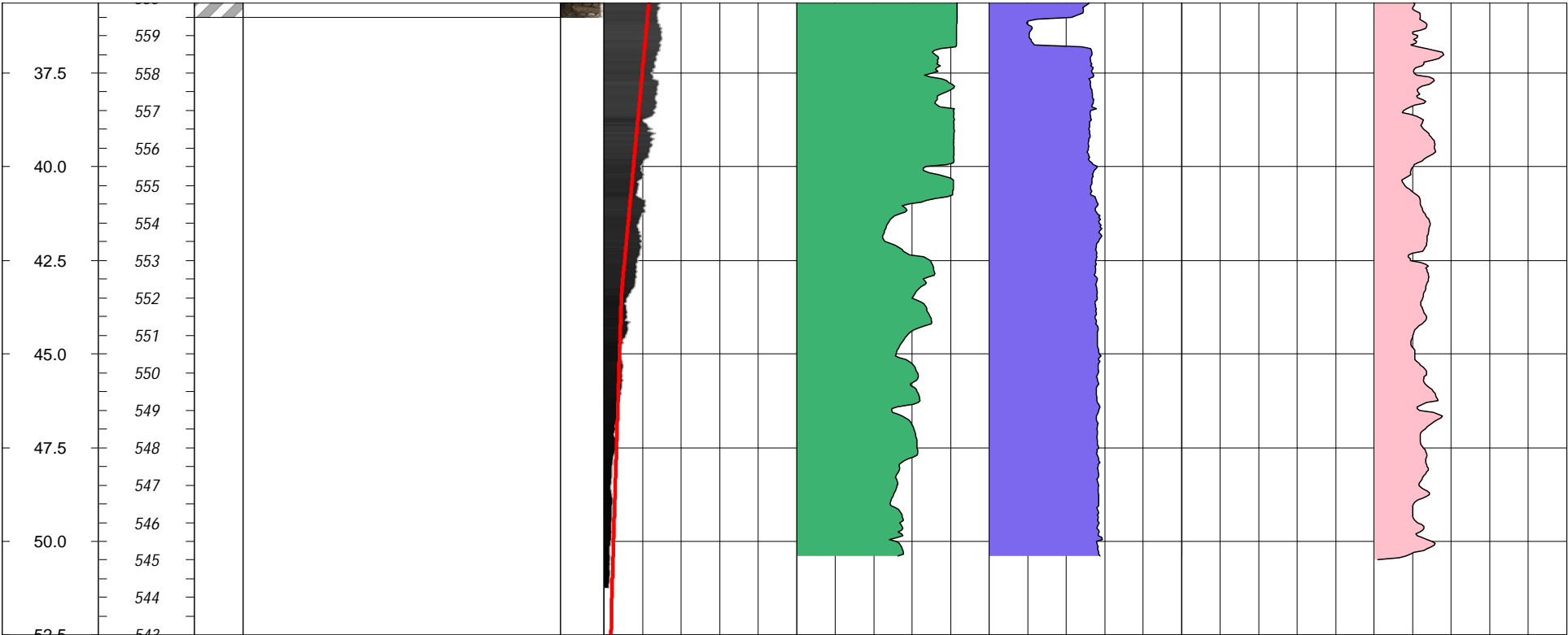
SB TOTAL DEPTH: 36 ft bgs

SURFACE ELEVATION: 595.5 ft amsl

REMARKS: See Appendix A for more
detailed soil description

ELEVATION DATUM: World Geodetic System 1984





BORING NAME: E5

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/29/2022

LOGGED BY: Arcadis - SB and
Geophysics
Dakota - HPT

Logging Methods

- ☒ Soil Description
- ☒ Sample Photo
- ☒ HPT Pressure
- ☒ HPT Flow Max
- ☒ HPT Estimated Hydraulic Conductivity
- ☒ HPT Rate of Penetration
- ☒ HPT Electrical Conductivity (EC)
- ☒ Electrical Resistivity Imaging (ERI)
- ☒ Electrical Conductivity (EC)

☐

Proposed Piezometer P-10 Screen Intervals
for Hydraulic Investigation Work Plan

BORING COORDINATES: X 322934.52
Y 4672970.93

HPT TOTAL DEPTH: 41.4 ft bgs

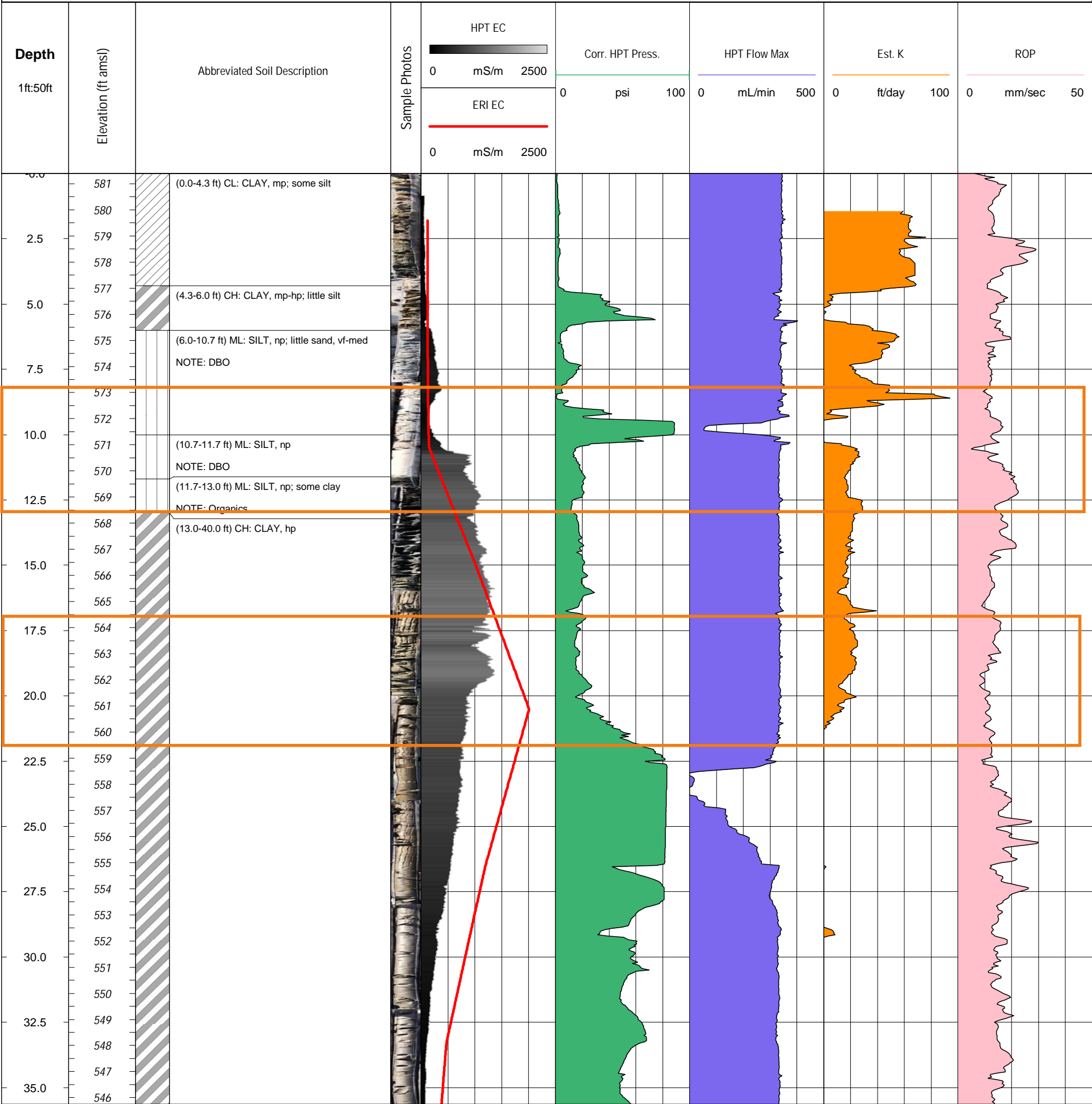
PROJECTION: Universal Transverse Mercator (UTM)

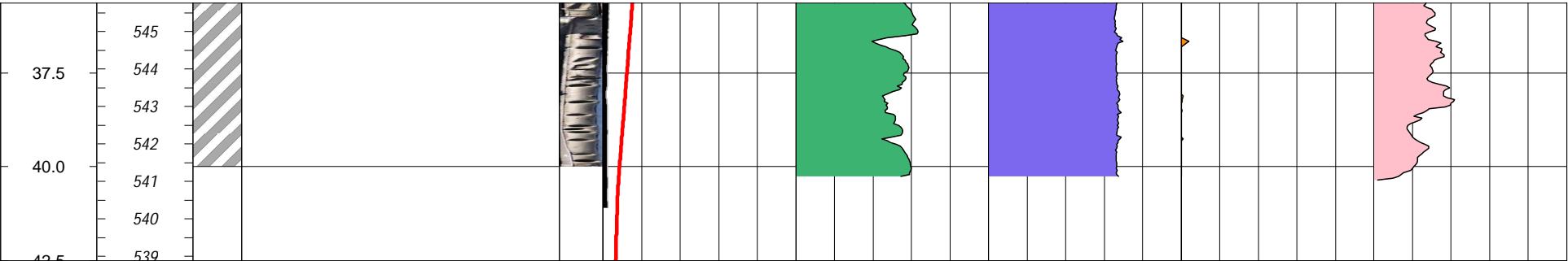
SB TOTAL DEPTH: 40 ft bgs

SURFACE ELEVATION: 581.4 ft amsl

REMARKS: See Appendix A for more
detailed soil description

ELEVATION DATUM: World Geodetic System 1984





BORING NAME: E7

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 04/06/2022

LOGGED BY: Arcadis - SB and
Geophysics
Dakota - HPT

Logging Methods

- ☒ Soil Description
- ☒ Sample Photo
- ☒ HPT Pressure
- ☒ HPT Flow Max
- ☒ HPT Estimated Hydraulic Conductivity
- ☒ HPT Rate of Penetration
- ☒ HPT Electrical Conductivity (EC)
- ☒ Electrical Resistivity Imaging (ERI)
- ☒ Electrical Conductivity (EC)

BORING COORDINATES: X 323098.38
Y 4673354.55

HPT TOTAL DEPTH: 35.8 ft bgs

PROJECTION: Universal Transverse Mercator (UTM)

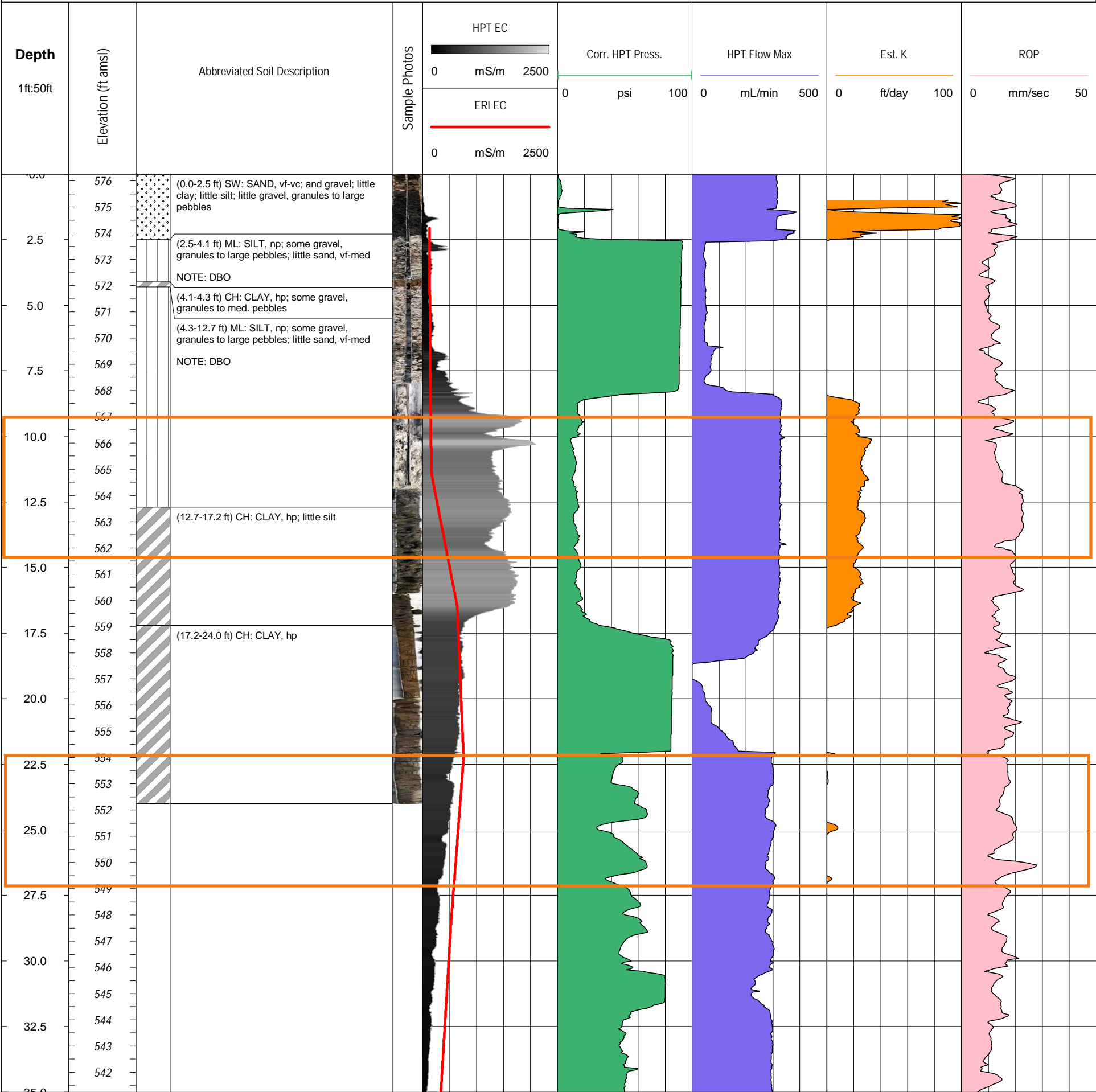
SB TOTAL DEPTH: 24.0 ft bgs

SURFACE ELEVATION: 576.3 ft amsl

REMARKS: See Appendix A for more
detailed soil description

ELEVATION DATUM: World Geodetic System 1984

☐ Proposed Piezometer P-09 Screen Intervals
for Hydraulic Investigation Work Plan



BORING NAME: E8

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/28/2022

LOGGED BY: Arcadis - SB and
Geophysics
Dakota - HPT

Logging Methods

- ☒ Soil Description
- ☒ Sample Photo
- ☒ HPT Pressure
- ☒ HPT Flow Max
- ☒ HPT Estimated Hydraulic Conductivity
- ☒ HPT Rate of Penetration
- ☒ HPT Electrical Conductivity (EC)
- ☒ Electrical Resistivity Imaging (ERI)
Electrical Conductivity (EC)

☐

Proposed Piezometer P-08 Screen Intervals
for Hydraulic Investigation Work Plan

BORING COORDINATES: X 323096.38
Y 4673548.70

HPT TOTAL DEPTH: 45.2 ft bgs

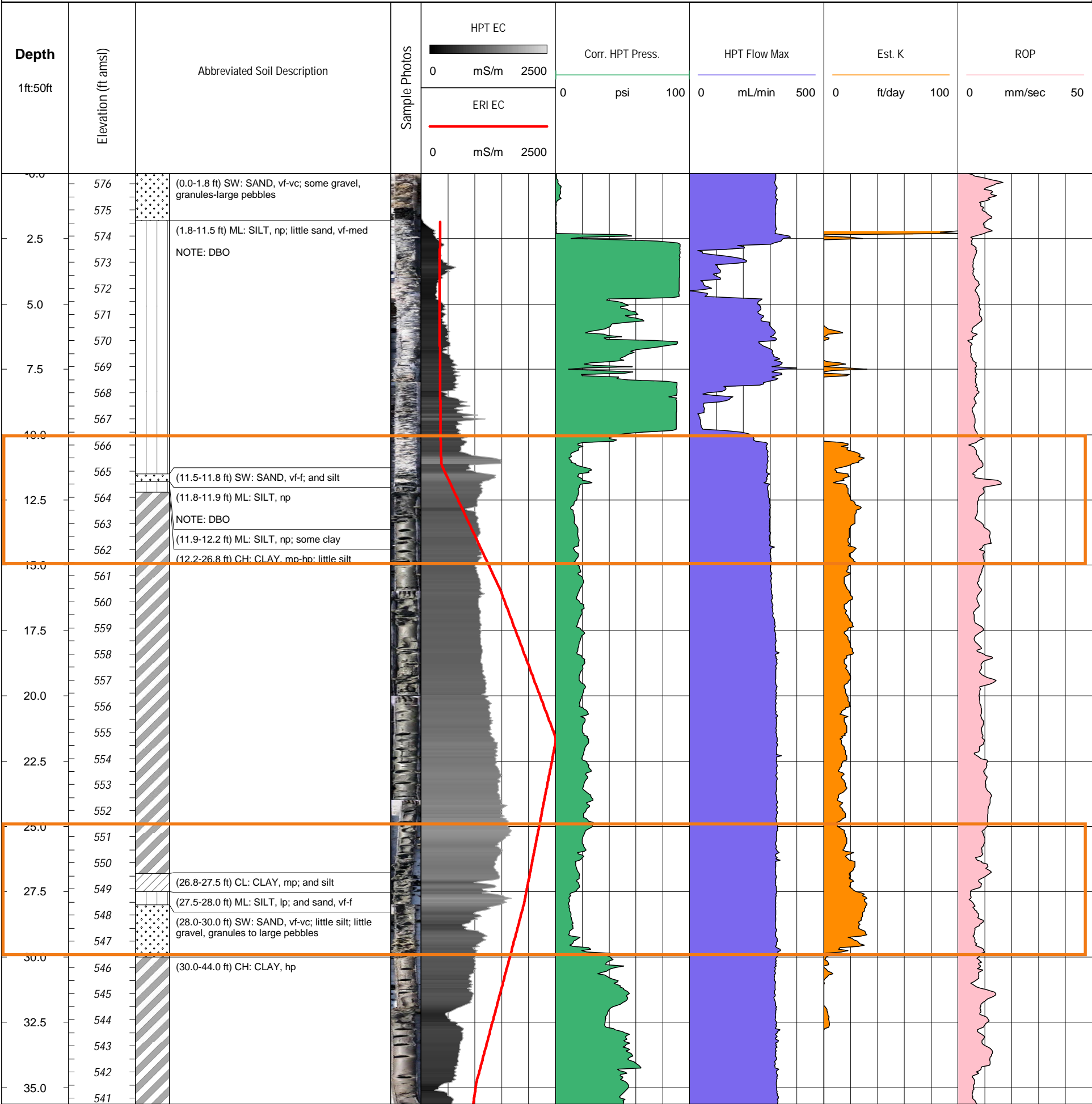
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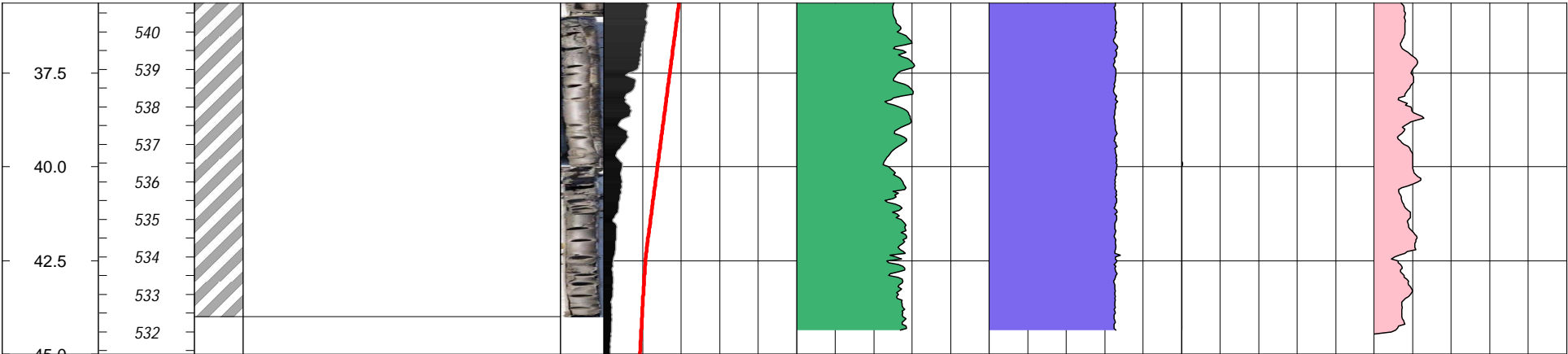
SB TOTAL DEPTH: 44.0 ft bgs

SURFACE ELEVATION: 576.4 ft amsl

REMARKS: See Appendix A for more
detailed soil description

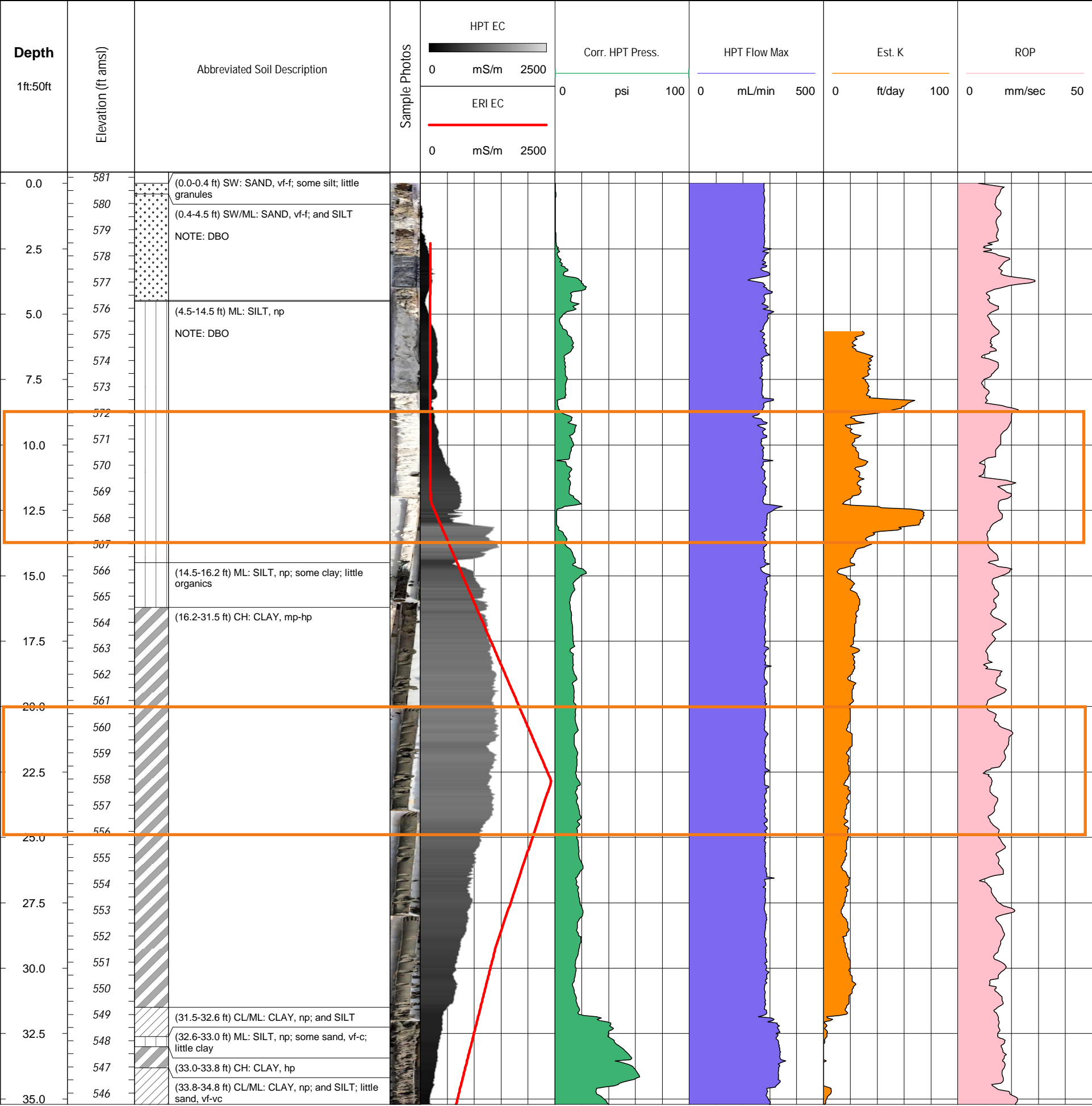
ELEVATION DATUM: World Geodetic System 1984

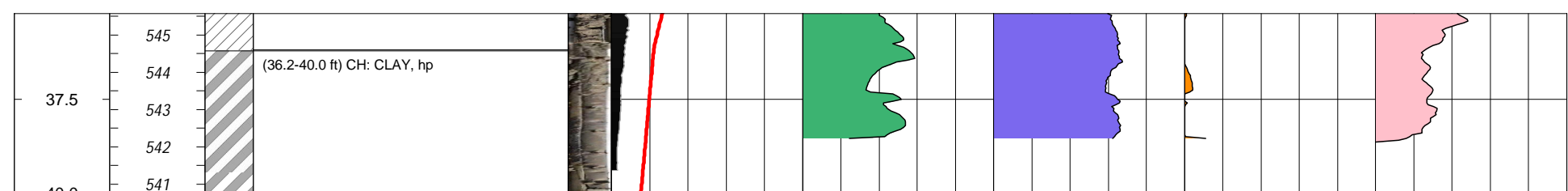




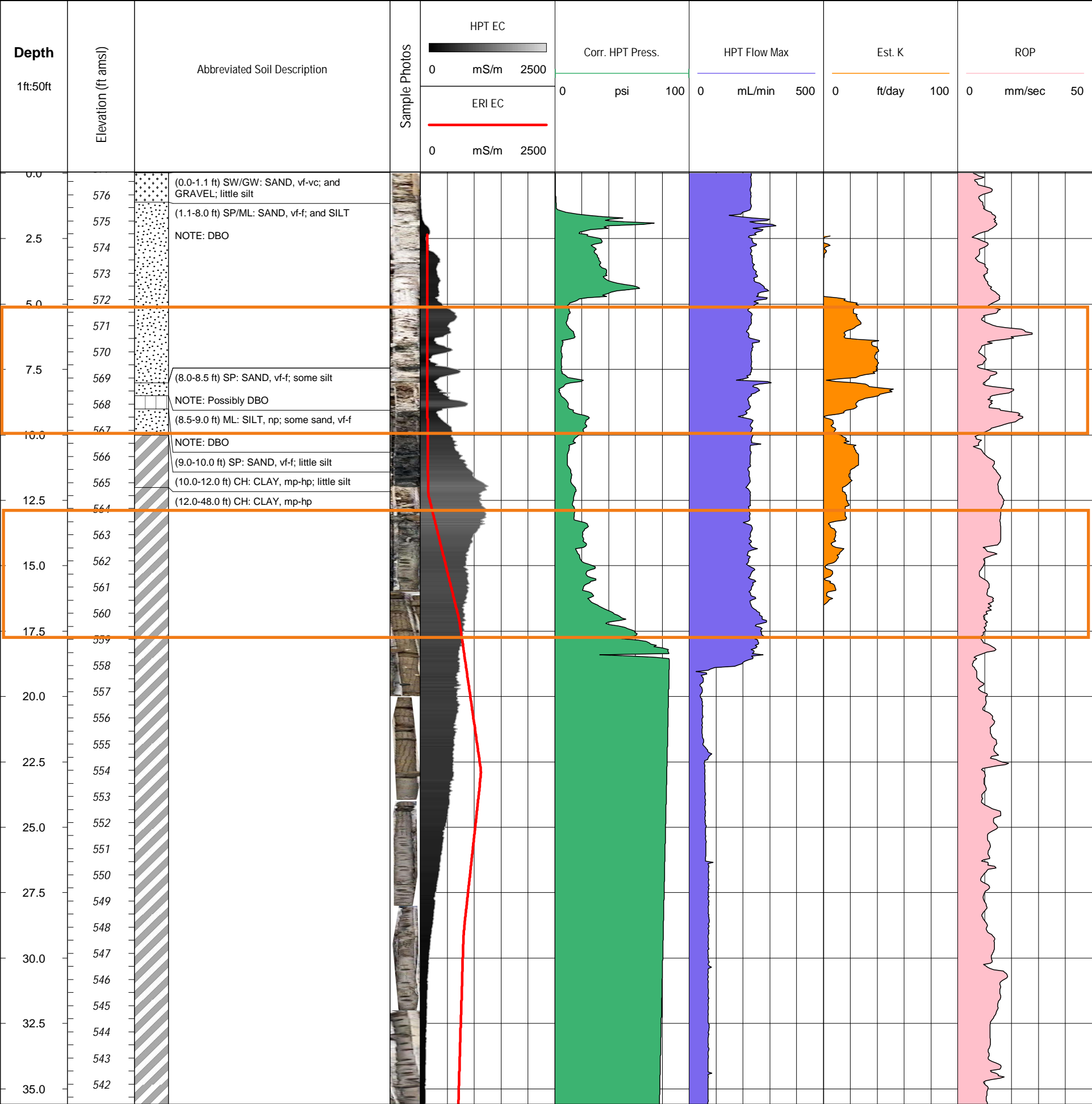


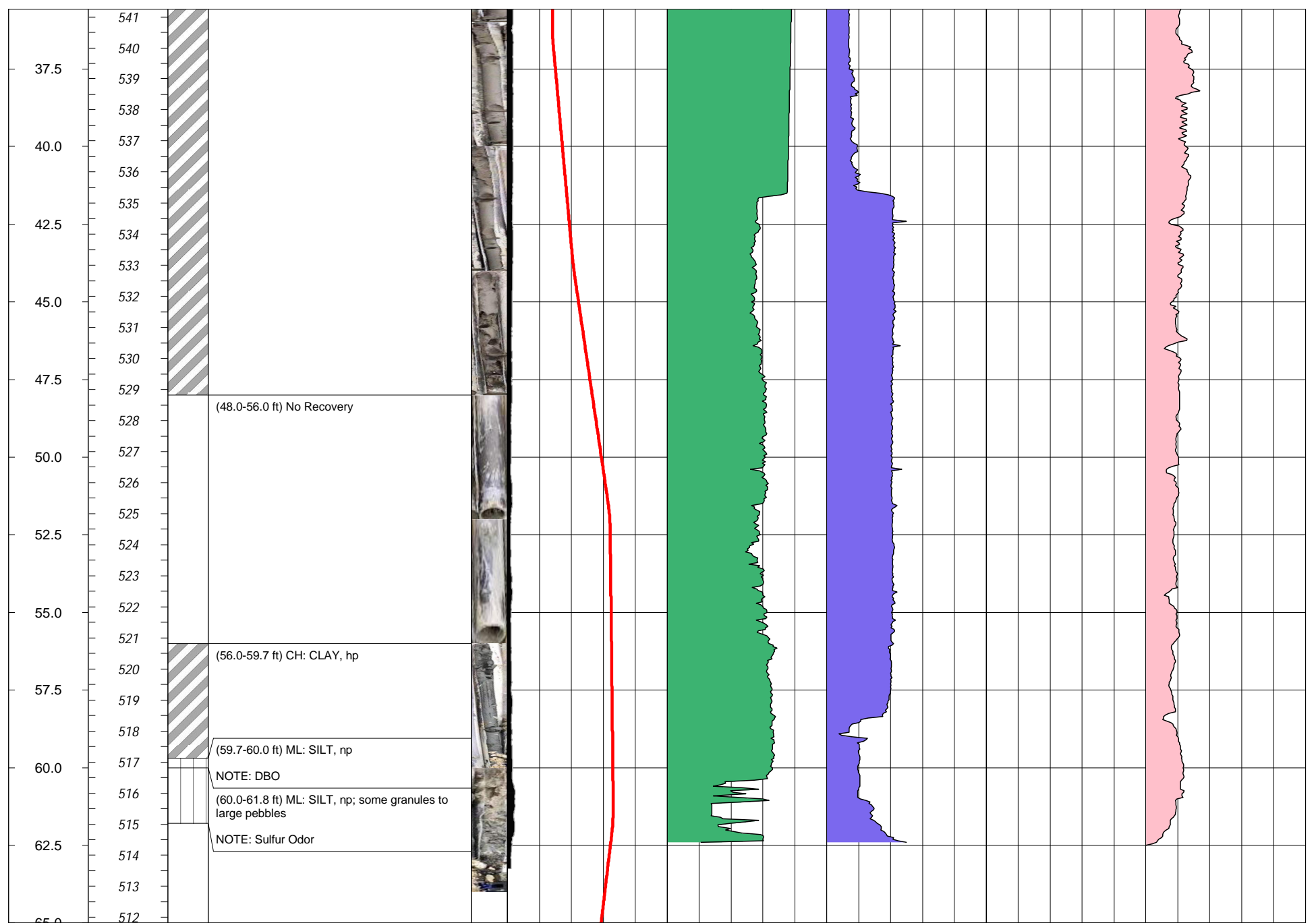
| | | | | |
|--|--|---|--|--|
| BORING NAME: E11 | | CLIENT: BASF | | <u>Logging Methods</u> <input checked="" type="checkbox"/> Soil Description <input checked="" type="checkbox"/> Sample Photo <input checked="" type="checkbox"/> HPT Pressure <input checked="" type="checkbox"/> HPT Flow Max <input checked="" type="checkbox"/> HPT Estimated Hydraulic Conductivity <input checked="" type="checkbox"/> HPT Rate of Penetration <input checked="" type="checkbox"/> HPT Electrical Conductivity (EC) <input checked="" type="checkbox"/> Electrical Resistivity Imaging (ERI) <input type="checkbox"/> Proposed Piezometer P-07 Screen Intervals for Hydraulic Investigation Work Plan |
| PROJECT NAME: BASF Point Hennepin | | PROJECT NUMBER: 30107326 | | |
| DATE LOGGED: 03/28/2022 | | LOGGED BY: Arcadis - SB and Geophysics Dakota - HPT | | |
| BORING COORDINATES: X 323161.09 Y 4673973.88 | | HPT TOTAL DEPTH: 39.4 ft bgs | | |
| PROJECTION: Universal Transverse Mercator (UTM) | | SB TOTAL DEPTH: 40.0 ft bgs | | |
| SURFACE ELEVATION: 580.8 ft amsl | | REMARKS: See Appendix A for more detailed soil description | | |
| ELEVATION DATUM: World Geodetic System 1984 | | | | |





| | | | |
|--|--|---|--|
| BORING NAME: W2 | | CLIENT: BASF | Logging Methods <div><input checked="" type="checkbox"/> Soil Description</div> <div><input checked="" type="checkbox"/> Sample Photo</div> <div><input checked="" type="checkbox"/> HPT Pressure</div> <div><input checked="" type="checkbox"/> HPT Flow Max</div> <div><input checked="" type="checkbox"/> HPT Estimated Hydraulic Conductivity</div> <div><input checked="" type="checkbox"/> HPT Rate of Penetration</div> <div><input checked="" type="checkbox"/> HPT Electrical Conductivity (EC)</div> <div><input checked="" type="checkbox"/> Electrical Resistivity Imaging (ERI)</div> <div>Electrical Conductivity (EC)</div> <div><input type="checkbox"/> Proposed Piezometer P-02 Screen Intervals for Hydraulic Investigation Work Plan</div> |
| PROJECT NAME: BASF Point Hennepin | | PROJECT NUMBER: 30107326 | |
| DATE LOGGED: 03/24/2022 | | LOGGED BY: Arcadis - SB and Geophysics Dakota - HPT | |
| BORING COORDINATES: X 322468.48 Y 4672540.45 | | HPT TOTAL DEPTH: 62.4 ft bgs | |
| PROJECTION: Universal Transverse Mercator (UTM) | | SB TOTAL DEPTH: 61.8 ft bgs | |
| SURFACE ELEVATION: 576.8 ft amsl | | REMARKS: See Appendix A for more detailed soil description | |
| ELEVATION DATUM: World Geodetic System 1984 | | | |





BORING NAME: W4

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/24/2022

LOGGED BY: Arcadis - SB and
Geophysics
Dakota - HPT

Logging Methods

- ☒ Soil Description
- ☒ Sample Photo
- ☒ HPT Pressure
- ☒ HPT Flow Max
- ☒ HPT Estimated Hydraulic Conductivity
- ☒ HPT Rate of Penetration
- ☒ HPT Electrical Conductivity (EC)
- ☒ Electrical Resistivity Imaging (ERI)
Electrical Conductivity (EC)

☐

 Proposed Piezometer P-03 Screen Intervals for Hydraulic Investigation Work Plan

BORING COORDINATES: X 322532.36
Y 4672795.34

HPT TOTAL DEPTH: 59.7 ft bgs

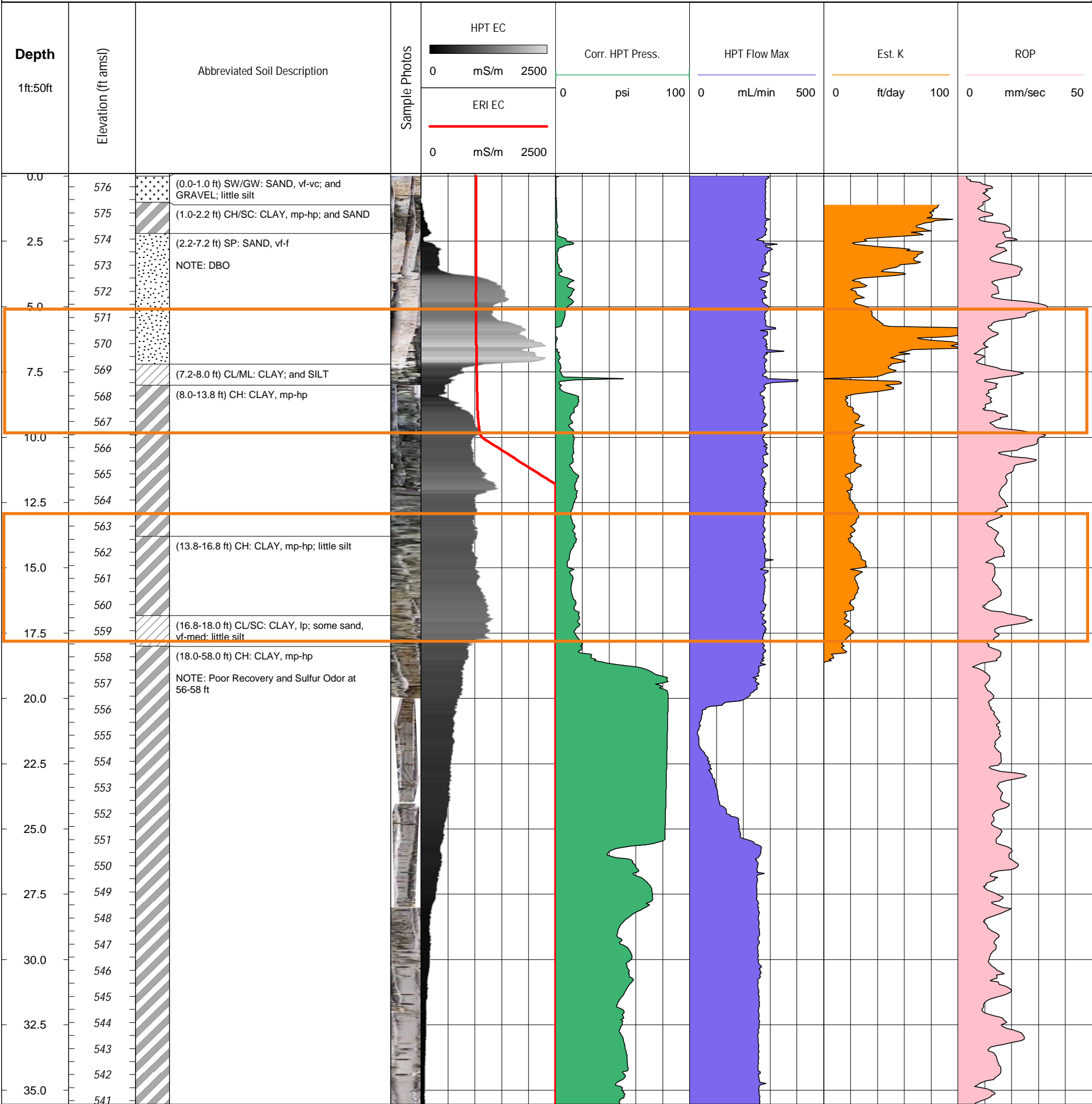
PROJECTION: Universal Transverse Mercator (UTM)

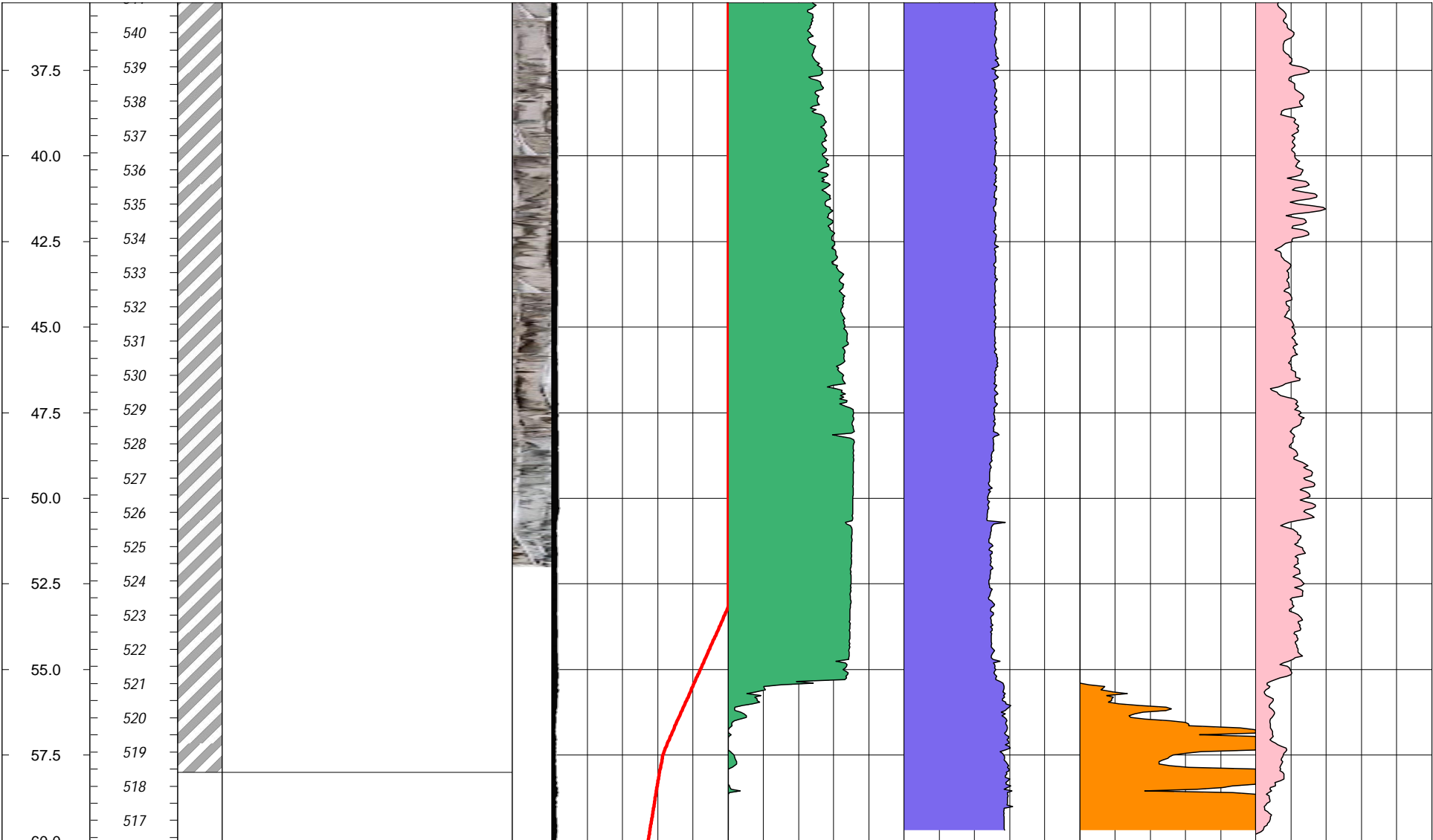
SB TOTAL DEPTH: 58.0 ft bgs

SURFACE ELEVATION: 576.4 ft amsl

REMARKS: See Appendix A for more
detailed soil description

ELEVATION DATUM: World Geodetic System 1984





BORING NAME: W8

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/25/2022

LOGGED BY: Arcadis - SB and
Geophysics
Dakota - HPT

BORING COORDINATES: X 322696.49
Y 4673278.09

HPT TOTAL DEPTH: 62.8 ft bgs

PROJECTION: Universal Transverse Mercator (UTM)

SB TOTAL DEPTH: 64.0 ft bgs

SURFACE ELEVATION: 589.3 ft amsl

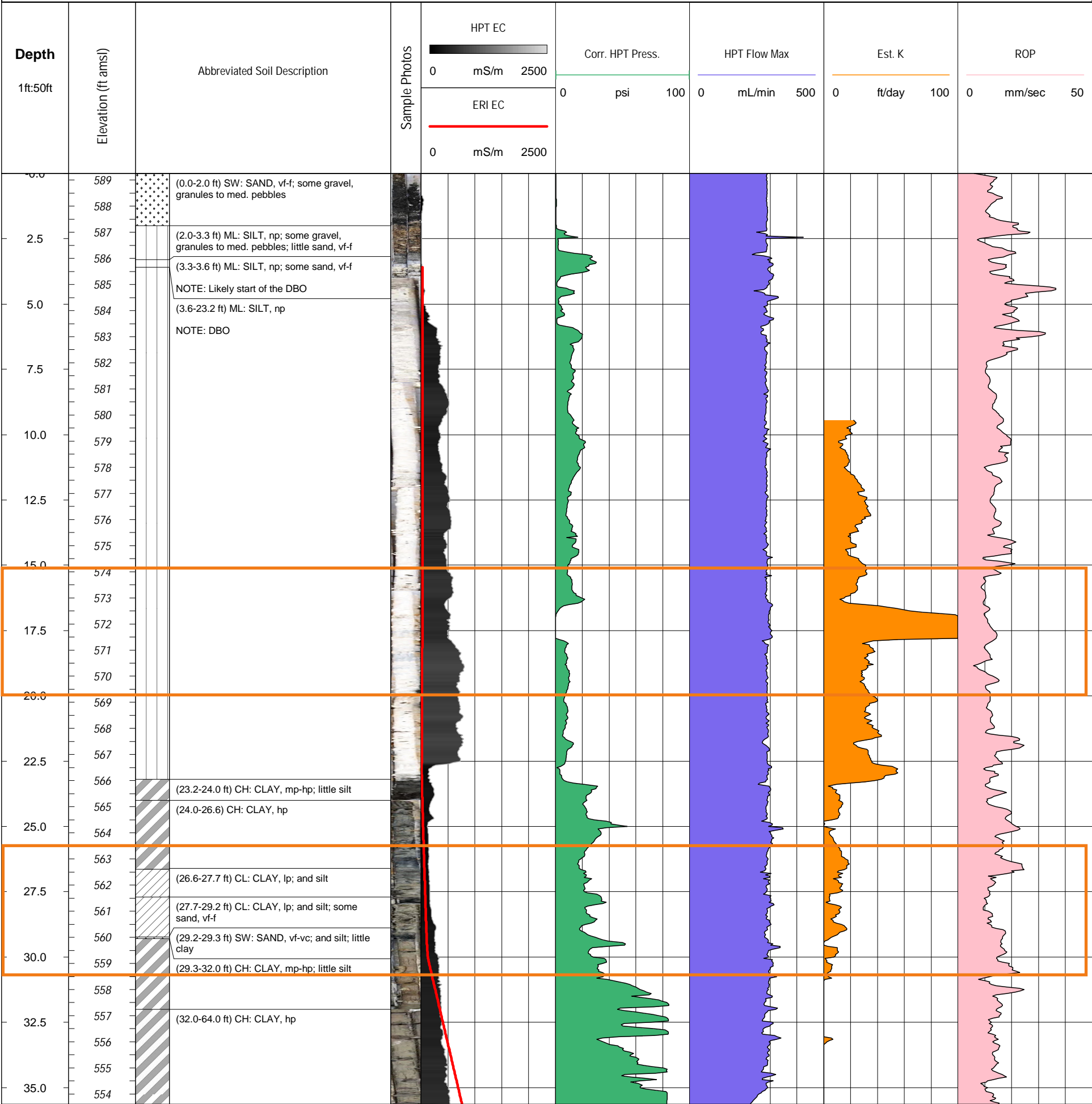
REMARKS: See Appendix A for more
detailed soil description

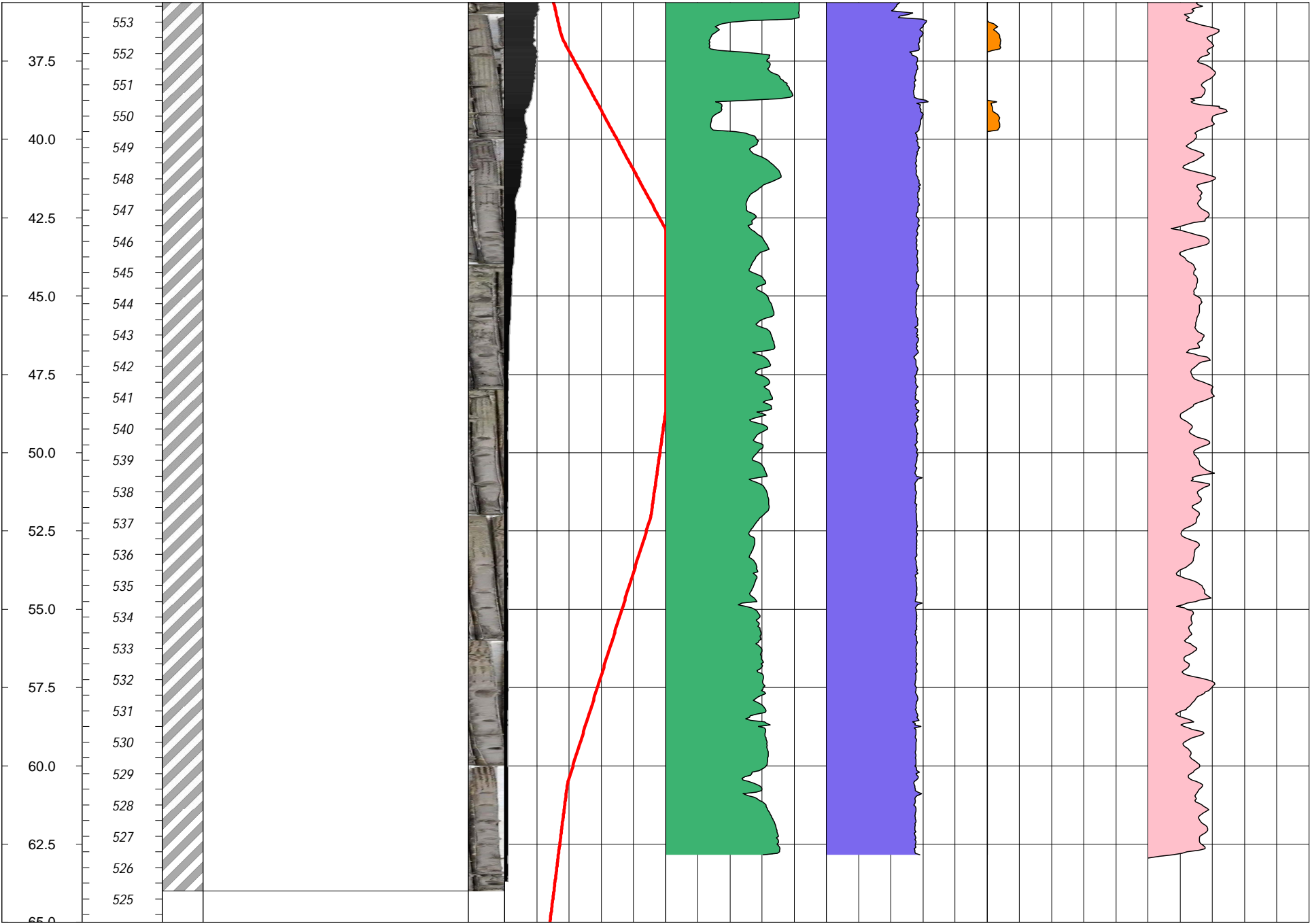
ELEVATION DATUM: World Geodetic System 1984

Logging Methods

- ☒ Soil Description
- ☒ Sample Photo
- ☒ HPT Pressure
- ☒ HPT Flow Max
- ☒ HPT Estimated Hydraulic Conductivity
- ☒ HPT Rate of Penetration
- ☒ HPT Electrical Conductivity (EC)
- ☒ Electrical Resistivity Imaging (ERI)
- Electrical Conductivity (EC)

☐ Proposed Piezometer P-04 Screen Intervals
for Hydraulic Investigation Work Plan





BORING NAME: W10

PROJECT NAME: BASF Point Hennepin

DATE LOGGED: 03/25/2022

CLIENT: BASF

PROJECT NUMBER: 30107326

LOGGED BY: Arcadis - SB and Geophysics
Dakota - HPT

- Logging Methods
- ☒

Soil Description
- ☒

Sample Photo
- ☒

HPT Pressure
- ☒

HPT Flow Max
- ☒

HPT Estimated Hydraulic Conductivity
- ☒

HPT Rate of Penetration
- ☒

HPT Electrical Conductivity (EC)
- ☒

Electrical Resistivity Imaging (ERI)
- ☒

Electrical Conductivity (EC)

☐

Proposed Piezometer P-05 Screen Intervals for Hydraulic Investigation Work Plan

BORING COORDINATES: X 322840.99
Y 4673919.77

PROJECTION: Universal Transverse Mercator (UTM)

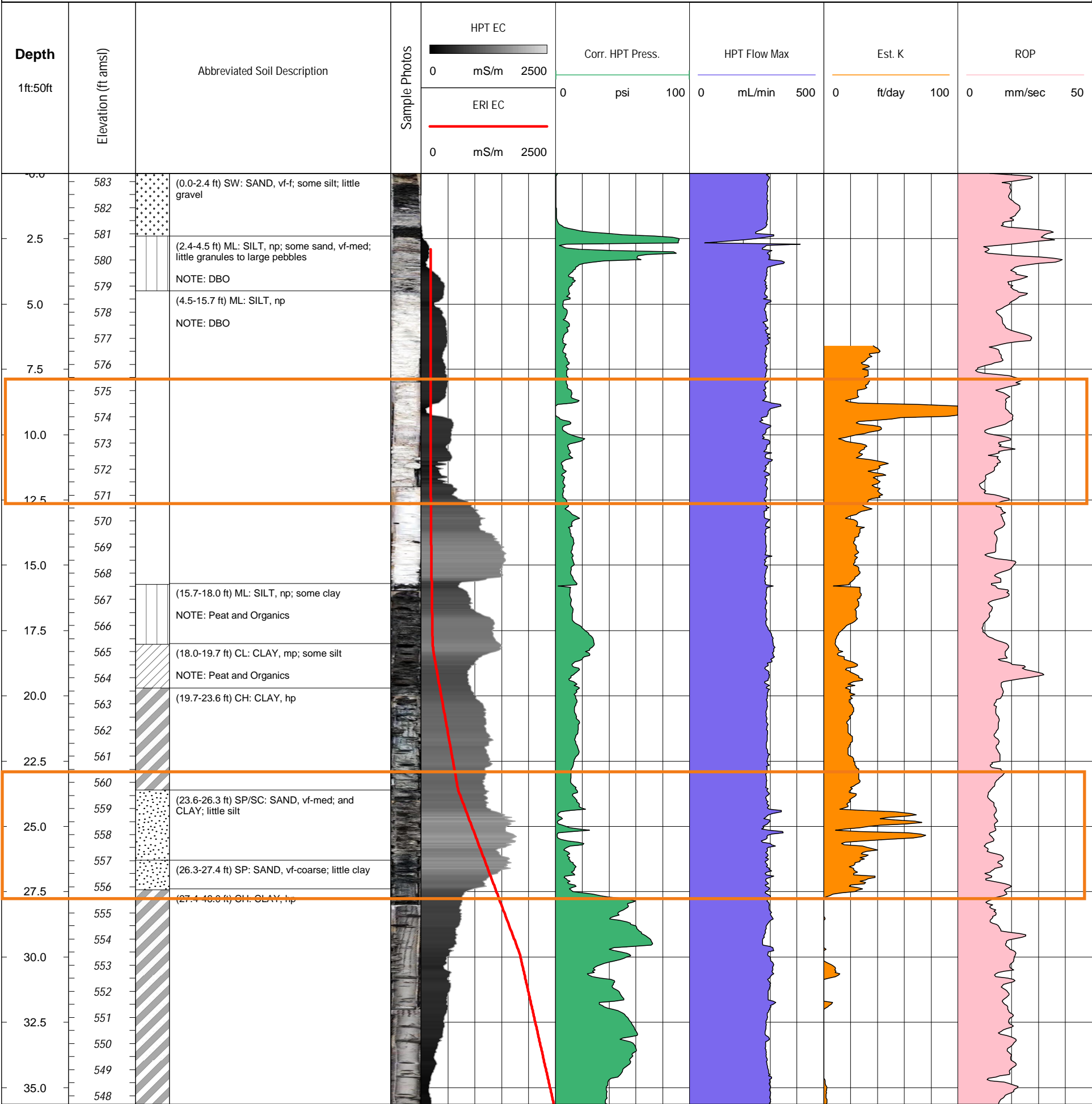
SURFACE ELEVATION: 583.3 ft amsl

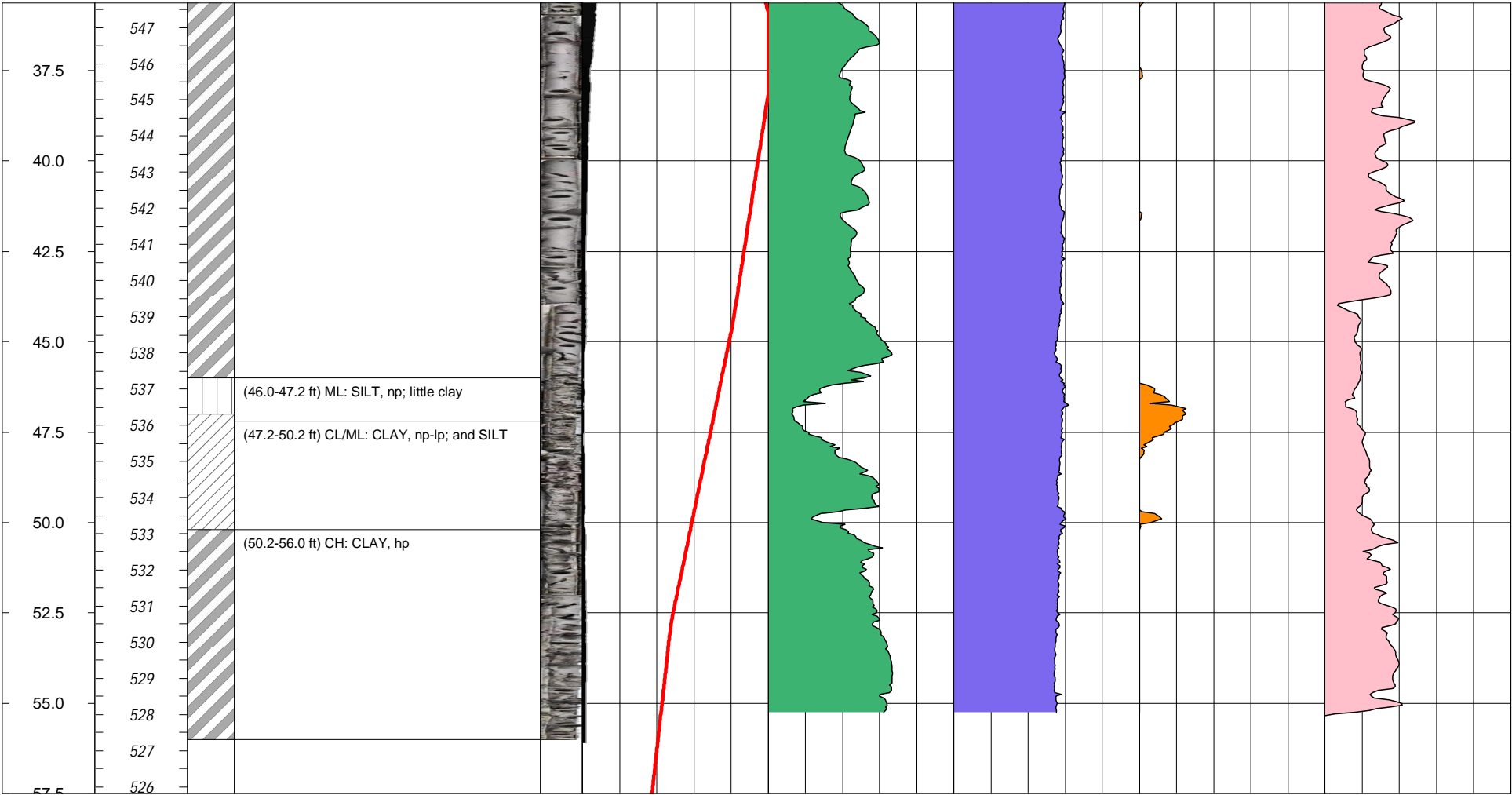
ELEVATION DATUM: World Geodetic System 1984

HPT TOTAL DEPTH: 55.2 ft bgs

SB TOTAL DEPTH: 56.0 ft bgs

REMARKS: See Appendix A for more detailed soil description





BORING NAME: W11

CLIENT: BASF

PROJECT NAME: BASF Point Hennepin

PROJECT NUMBER: 30107326

DATE LOGGED: 03/30/2022

LOGGED BY: Arcadis - SB and
Geophysics
Dakota - HPT

BORING COORDINATES: X 322893.15
Y 4674101.92

HPT TOTAL DEPTH: 39.8 ft bgs

PROJECTION: Universal Transverse Mercator (UTM)

SB TOTAL DEPTH: NA

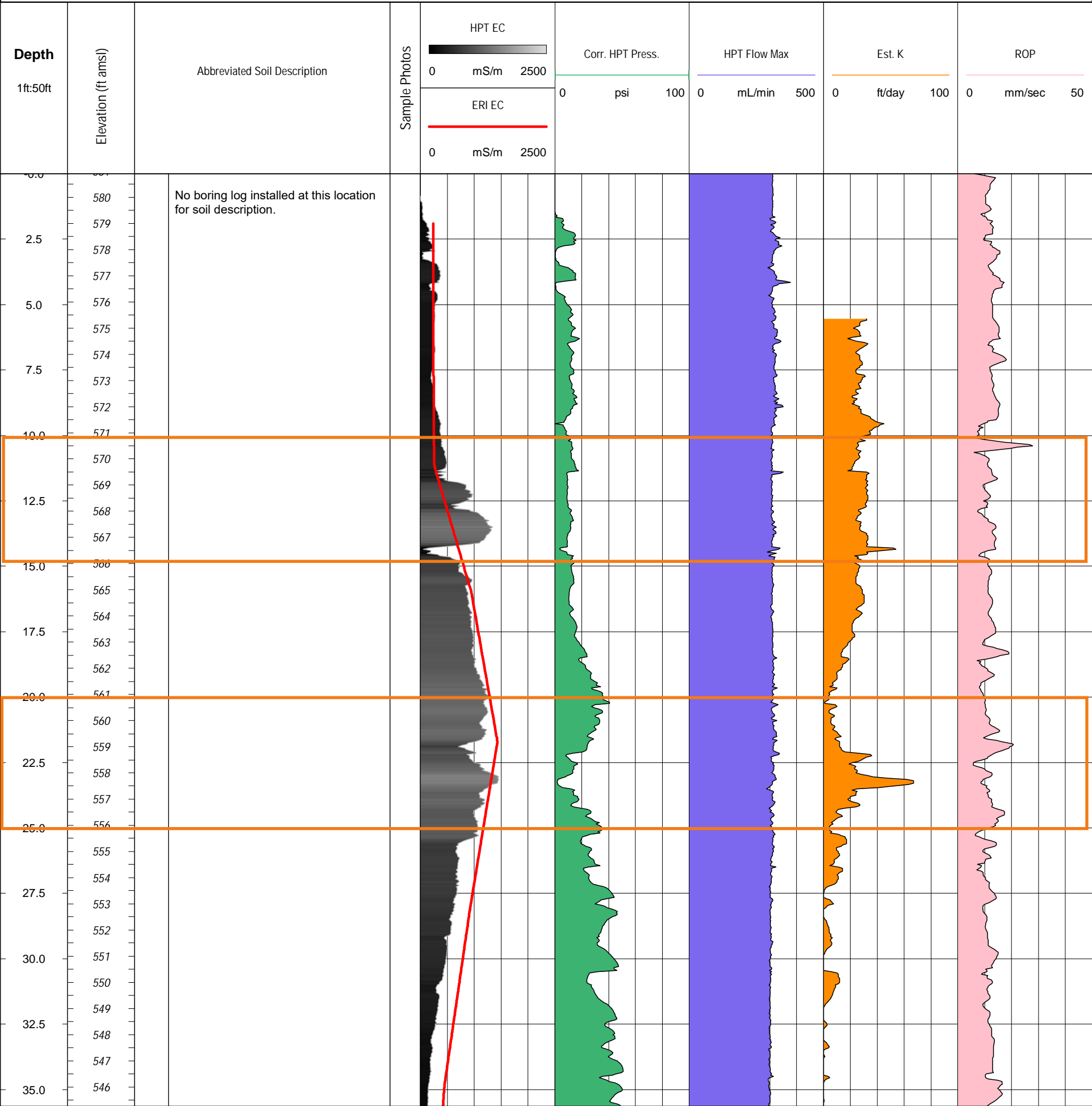
SURFACE ELEVATION: 580.9 ft amsl

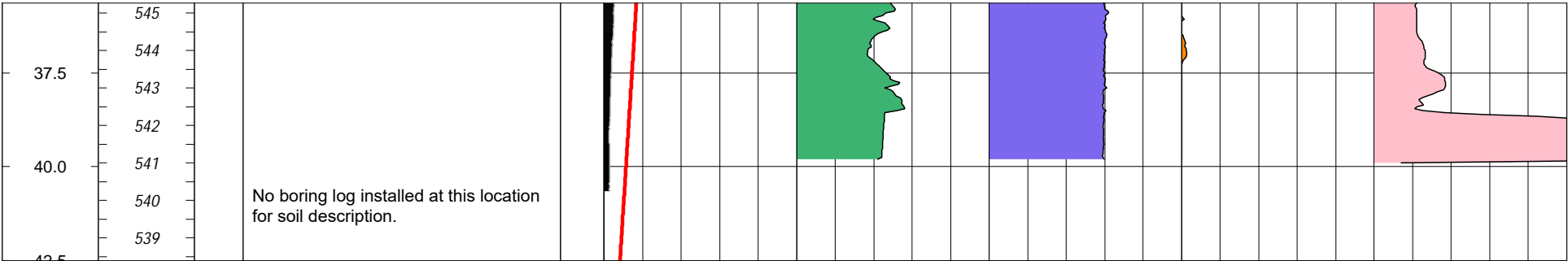
REMARKS:

ELEVATION DATUM: World Geodetic System 1984

Logging Methods

- ☐ Soil Description
- ☐ Sample Photo
- ☒ HPT Pressure
- ☒ HPT Flow Max
- ☒ HPT Estimated Hydraulic Conductivity
- ☒ HPT Rate of Penetration
- ☒ HPT Electrical Conductivity (EC)
- ☒ Electrical Resistivity Imaging (ERI)
Electrical Conductivity (EC)
- ☐ Proposed Piezometer P-06 Screen Intervals
for Hydraulic Investigation Work Plan





Arcadis of Michigan, LLC
28550 Cabot Drive, Suite 500
Novi
Michigan 48377
Phone: 248 994 2240
Fax:
www.arcadis.com