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MEMORANDUM

To: Tim Scott, PE / Red Plains Professional, Inc.

Date: May 18, 2023
(REVISED: May 26, 2023)

GRI Project No.: 6803-A

From: George A. Freitag, CEG; and Nicholas M. Hatch, PE

Re: Instrumentation Data Collection Summary
New Cannon Beach City Hall
South Wind Site
Cannon Beach, Oregon

This memorandum summarizes data recently collected from instrumentation installed by GRI to monitor ground movement and groundwater levels at the South Wind Site as part of our 2019 Geotechnical Feasibility Study for the New Cannon Beach City Hall (GRI, 2019). The general location of the South Wind Site is shown on the Vicinity Map, Figure 1. The South Wind site was one location being considered for the proposed new city hall in Cannon Beach, Oregon. However, based on information provided by you, we understand the City is now considering building the new city hall on the Cache site, which borders the southwest corner of the South Wind site. This recent data collection effort was completed to assist with estimating an adequate level of effort to complete a geotechnical investigation for the Cache site.

INSTRUMENTATION

General

For our 2019 study, a total of three borings, designated B-1 through B-3, were advanced to depths of 100 feet to 151.5 feet at the South Wind Site, and instrumentation consisting of two inclinometer casings and six vibrating-wire piezometers was installed in the completed boreholes. The approximate locations of the explorations are shown on the Site Plan, Figure 2. The instrumentation data were last collected on February 8, 2019, and were limited to about two months of monitoring. No obvious inclinometer readings indicative of active landslide movement were noted in 2019. New data was recently collected on May 5, 2023, and this memorandum provides our interpretation of the recent data.

Inclinometers

Inclinometer casings 140 feet and 150 feet long were installed in the completed boreholes of borings B-2 and B-3, respectively. An inclinometer is a device that allows measurements to be made of subsurface lateral movements. An inclinometer casing consists of a 2.75-inch O.D., acrylonitrile butadiene styrene (ABS)-plastic casing with orthogonal grooves or slots that permit a calibrated instrument to be lowered to the bottom of the casing in a fixed orientation. When the ground surrounding the casing moves, the casing distorts above the zone of movement, and the orientation of the casing changes. The inclination, or vertical orientation, of the casing is monitored by lowering an electronic measuring device to the bottom of the grooved casing and obtaining readings at 2-foot intervals as the instrument is withdrawn. An initial set of readings serves as a "benchmark" and is commonly portrayed as the vertical axis on a plot of casing deflection versus depth. All subsequent readings are then referenced to the initial readings. By comparing relative movements at fixed depths over the length of the casing, zones of horizontal movement can be identified. The total, or cumulative, displacement with respect to the base of the casing is obtained by summing the relative displacements from the bottom to the top.

A benchmark reading of each inclinometer was taken on December 12, 2018, with subsequent readings taken on February 8, 2019, and May 5, 2023. The inclinometer benchmark and subsequent readings are provided on Inclinometer Summary B-2 and Inclinometer Summary B-3, Figures 3 and 4. In general, the readings overlap and indicate that horizontal movement of the ground surface at these boring locations has not occurred since the inclinometers were installed in December 2018.

VIbrating-WIre Piezometers

Vibrating-wire piezometers were installed at depths of 50 feet and 90 feet in borings B-1 and B-2 and at depths of 100 feet and 150 feet in boring B-3. A vibrating-wire piezometer is a device that allows measurements to be made of subsurface fluid pressures. The piezometer consists of a sensitive steel diaphragm to which a vibrating-wire element is connected. A filter is used to keep out solid particles and prevent damage to the sensitive diaphragm. Changing pressures cause the diaphragm to deflect, and this deflection is measured as a change in tension and frequency of vibration of the vibrating-wire element. The square of the vibration frequency is directly proportional to the pressure applied to the diaphragm. To read the piezometer, a pulse of varying frequency is applied to the piezometer and causes the wire to vibrate at is resonant frequency. After excitation ends, the wire continues to vibrate, and a signal is transmitted to a readout box, where it is conditioned and displayed. The data on the readout box can then be converted to a fluid pressure based on the calibration data supplied by the manufacturer.

An initial reading of each piezometer was taken on December 12, 2018, and data loggers were attached to the piezometers to allow for continuous measurement of water pressures. During our recent site visit on May 5, 2023, the boring B-1 location could not be found due to overgrowth of brush and trees, and the data logger equipped to the boring B-3 piezometers was damaged. Therefore, the only data logger information collected was from boring B-2 piezometers, and the batteries in this data logger died on September 22, 2020. The water pressures recorded in the boring B-2 piezometers between December 12, 2018, and September 22, 2020, are provided on

Piezometer Summary B-2, Figure 5. GRI also collected groundwater data from the Boring B-2 and B-3 piezometers using a handheld readout device, and this data is summarized in Table 1 below.

TABLE 1: GROUNDWATER DEPTH AND PRESSURE MEASUREMENTS

Boring	Piezometer Depth, ft	Water Pressure, ft
B-2	50	42.3
	90	59.6
B-3	100	83.1
	150	130.6

The vibrating-wire piezometer readings indicate the perched groundwater level at borings B-2 and B-3 will typically occur at depths of 5 feet to 10 feet and 15 feet to 20 feet, respectively, throughout the year.

CONCLUSIONS

Current inclinometer data from borings B-2 and B-3 generally show that horizontal movement of the ground surface at these boring locations has not occurred at the South Wind Site since the inclinometers were installed in December 2018. The recent readings are consistent with observations documented in our 2019 report, notably that the previous proposed building area shown on Figure 2 is not underlain by an "active" landslide. In our opinion, the geotechnical and geologic findings of our 2019 report remain valid and should be used to evaluate future development of the South Wind Site.

The Cache Site is located at the base of a forested hillside that generally defines the southwestern property boundary of the South Wind Site. Boring B-3 was installed in the southwestern corner of the South Wind Site near the eastern side of the Cache Site, as shown on Figure 2. The recent inclinometer data from boring B-3 suggests the overall hillside bordering the Cache Site may not be an "active" landslide subject to continuous creep-like static movements. However, a more detailed geologic reconnaissance of that hillside is required to identify the presence of smaller, localized landslide topography. In addition, as discussed in our 2019 report for the South Wind Site, we anticipate seismic movement of the hillside towards Highway 101 could occur during a code-based seismic event. This is an important consideration as it relates to selecting the location of the new city hall building on the Cache Site. We recommend completing a geotechnical investigation that includes geologic reconnaissance to further evaluate the impacts of the hillside bordering the eastern side of the Cache Site.

LIMITATIONS

This memorandum should be considered an addendum to our March 14, 2019, feasibility study for the South Wind Site and is subject to the limitations stated therein.

Please contact the undersigned if you have any questions.

Submitted for GRI,

RENEWS: 02/2024

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Principal

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Senior Engineer

This document has been submitted electronically.

6803-A INSTRUMENTATION DATA COLLECTION SUMMARY MEMORANDUM

Enclosures: Figure 1, Vicinity Map
Figure 2, Site Plan
Figure 3, Inclinometer Summary B-2
Figure 4, Inclinometer Summary B-3
Figure 5, Piezometer Summary B-2

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NEW CANNON BEACH CITY HALL - SOUTH WIND SITE

VICINITY MAP

MAY 2023 JOB NO. 6803-A FIG. 1

N

BORINGS COMPLETED BY GRI (DECEMBER 3-10, 2018)

A A' CROSS SECTION USED IN SLOPE STABILITY ANALYSIS

SITE PLAN FROM FILE BY SRG PARTNERSHIP, 2018

0 180 360 FT

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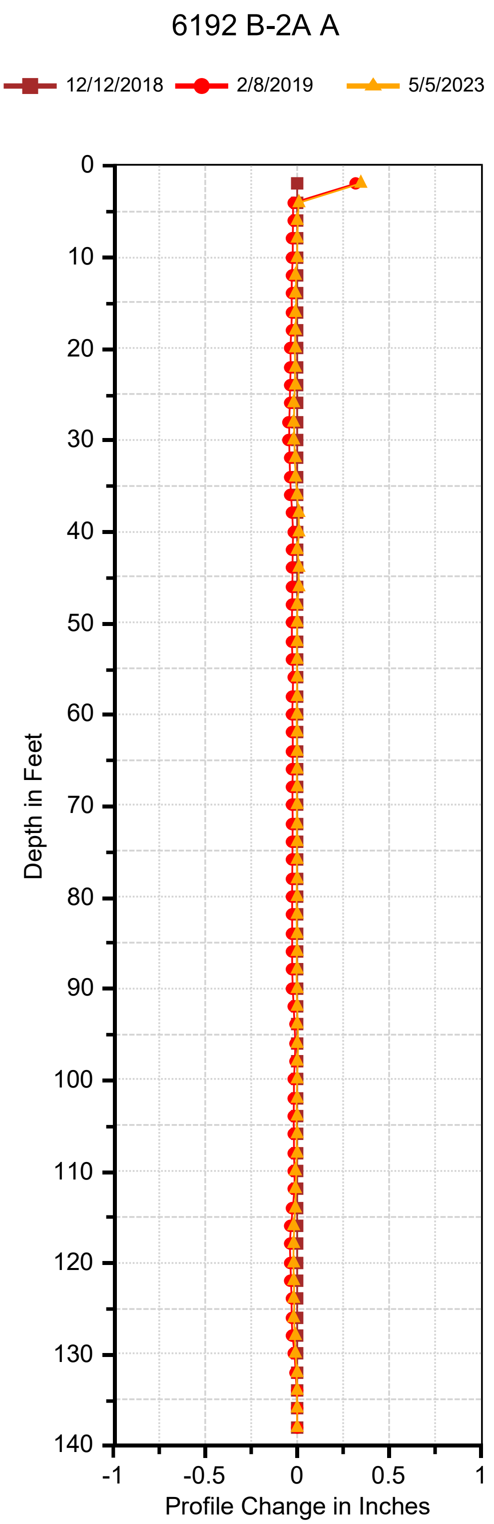
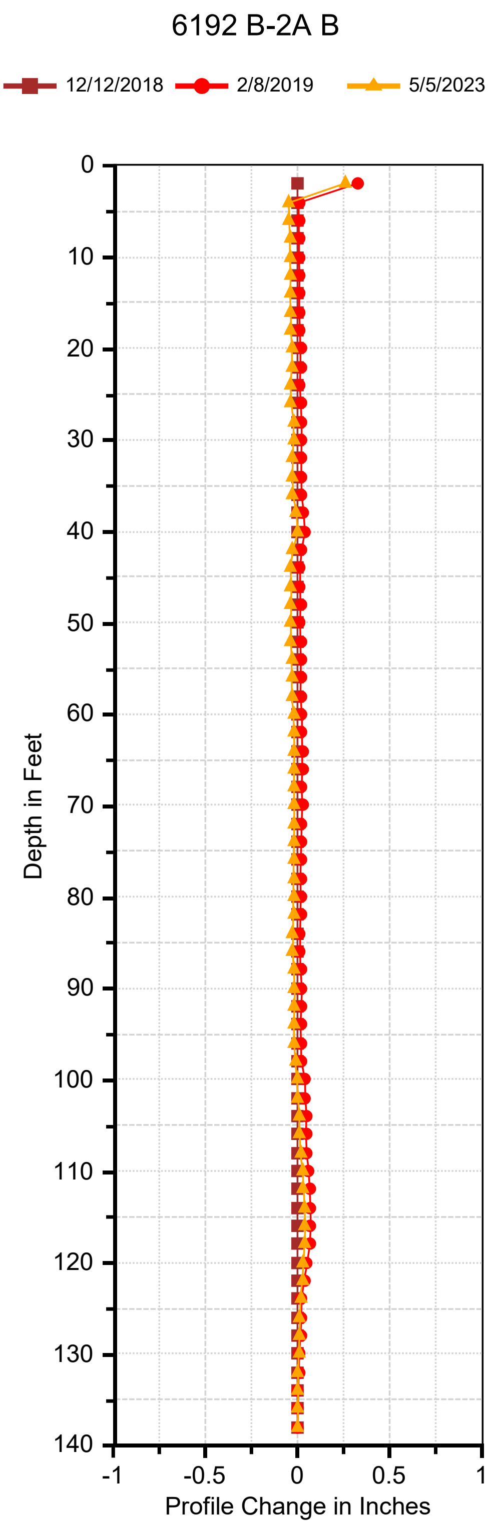
SITE PLAN

MAY 2023 JOB NO. 6803-A FIG. 2





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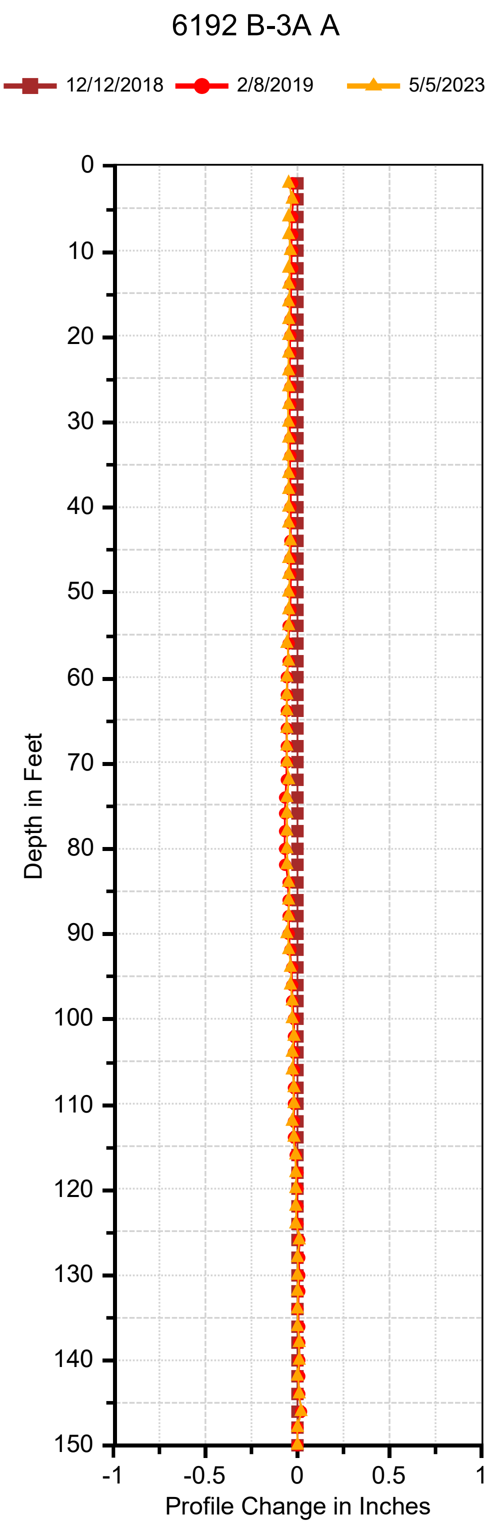
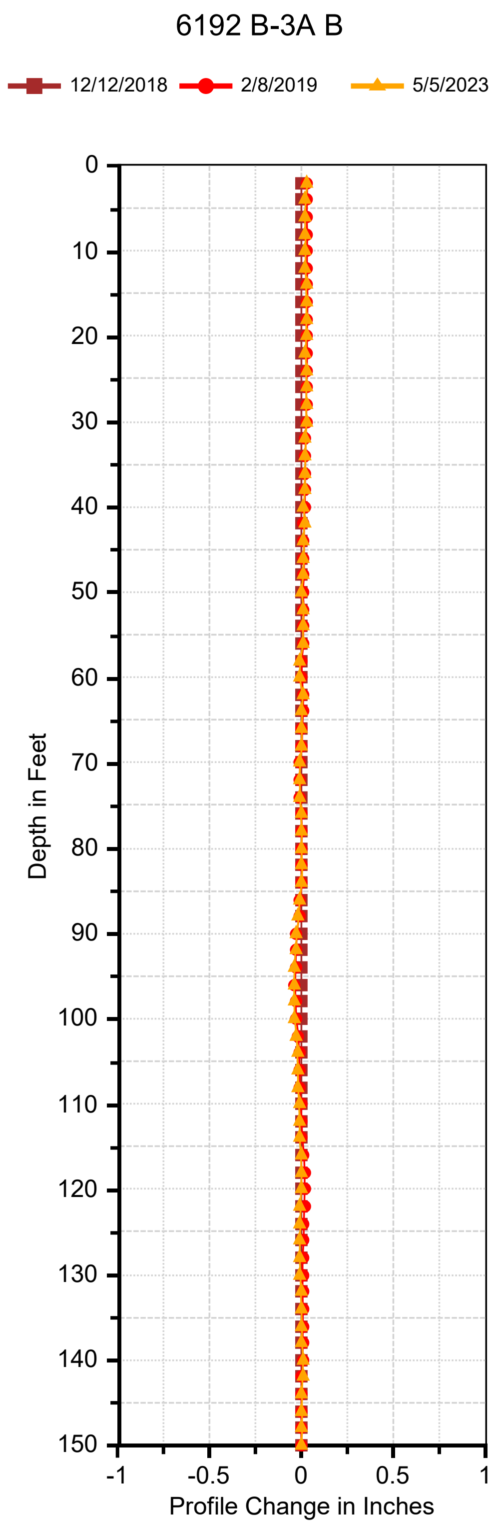
INCLINOMETER SUMMARY
B-2

MAY 2023 | JOB NO. 6803-A | FIG. 3





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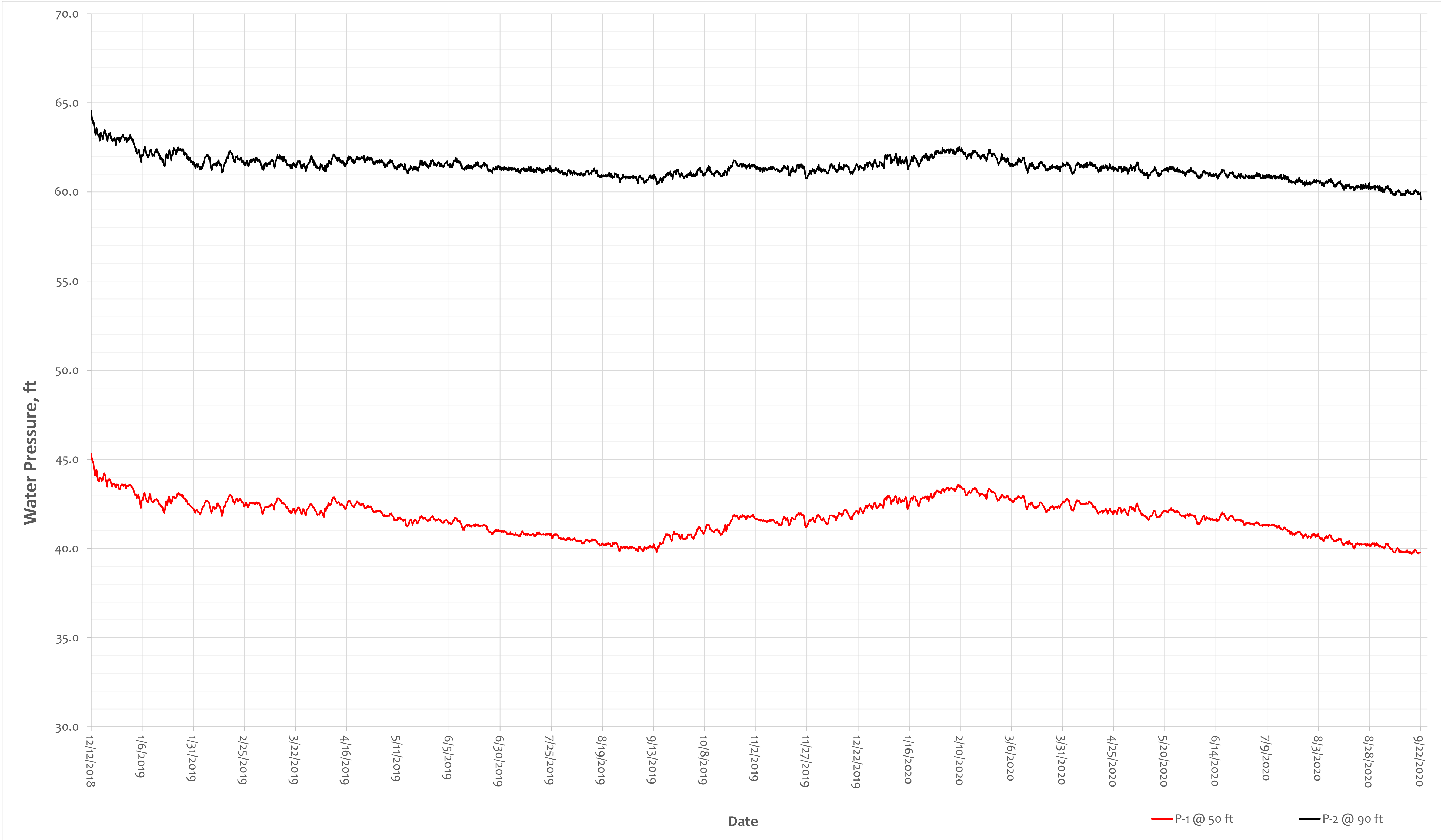
INCLINOMETER SUMMARY
B-3

MAY 2023 JOB NO. 6803-A FIG. 4



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PIEZOMETER SUMMARY
B-2

MAY 2023 JOB NO. 6803-A FIG. 5